amphibian ark Newsletter

Keeping threatened amphibian species afloat

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In this issue...

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A decade on from the Global Amphibian Assessment: how have the world's zoos responded?

Jeff Dawson, Durrell Wildlife Conservation Trust, Jersey, United Kingdom; Freisha Patel, School of Animal, Rural and Environmental Sciences, Nottingham Trent University, Brackenhurst, United Kingdom; Richard A. Griffiths, School of Anthropology and Conservation, University of Kent, Canterbury, United Kingdom; and Richard P. Young, Department of Life Sciences, Imperial College London, Ascot, United Kingdom

This is an extract of a paper published in Conservation Biology Volume 0, No. 0, 2015, Society of Conservation Biology, DOI: 10.1111/cobi.12563.

Background

Target 12 of the Aichi Biodiversity Targets states that, "By 2020 the extinction of known threatened species has been prevented" (www.cbd.int/sp/targets/). If we are to meet this target then the huge conservation challenge posed by global amphibian declines, brought to the world's attention by the 2004 Global Amphibian Assessment (GAA), must be addressed.

Key actions and issues required to address the crisis were outlined in the subsequent Amphibian Conservation Action Plan one of which was *ex situ* captive breeding and the need to establish multiple captive amphibian programmes to safeguard those species most at risk (1) The global zoo and aquarium community (hereafter zoos) represent one of the most influential and important groups of institutions to undertake such programmes (2, 3) Globally, zoos have contributed substantially to the recovery of seventeen out of sixty-eight vertebrate species including at least one amphibian species, *Alytes muletensis* (4, 5).

Ten years on from the GAA, the overall feeling in the conservation community has been one of disappointment at the slowness of the response to the amphibian crisis with many conservation organisations still not addressing the issue (6, 7). A similarly slow response had been suggested amongst the zoo community, with amphibians being seriously underrepresented in both collections and *in situ* projects supported by zoos (8, 9).

As part of Durrell's Saving Amphibians From Extinction (SAFE) Programme we set out to assess what the response within the international zoo community had been; identify areas of success but also gaps. Using information from the International Species Information System (ISIS) zoo network, we examined trends in global zoo amphibian holdings across species, zoo region, and species geographical region of origin from 1994 to 2014. These trends were compared before and after the 2004 GAA to assess whether any changes occurred and whether zoo amphibian conservation effort had increased. The full results of this have study have recently been published in Conservation Biology and presented below is a short synopsis of the principle findings.

A number of zoos around the world have responded well to the amphibian crisis, establishing many rescue, research and head-starting programs for threatened species. But a slow response overall had been suggested amongst the zoo community, with amphibians being seriously underrepresented in both collections and *in situ* projects supported by zoos. Photo: Kevin Johnson.

Summary of findings

Over the last twenty years it appears that zoos at the global level have put more effort into globally threatened species (GTS) than non-globally threatened species, which is reflected in a number of metrics. Firstly, the proportion of amphibian holdings that were GTS increased from 17.2% in 1994 to 23.9% in 2014. Secondly, the proportion of all amphibian individuals held that were GTS increased much faster than the proportion of holdings that were GTS, from 16.2% in 2004 to 43.9% in 2014. This is also reflected in the proportion of GTS with metapopulations (i.e. the total number of individuals held across all zoos) greater than 250 which increased significantly more than the corresponding proportions of non-GTS.

Whilst very positive and encouraging, the absolute numbers and proportions of GTS held in zoos in 2014 was still very low with only 121 species or 6.2% of all globally threatened amphibians being held. This is a much smaller figure than for birds 15.9%, mammals 23% and reptiles 38% (data from 8). Additionally whilst 23.9% of all amphibians held by zoos were GTS an estimated 41% of those in the wild are threatened with extinction. To reach a similar composition in zoos, as would be expected if a random global sample were to be taken, would take a further twenty-one years to reach at current rates of change.

Perhaps even more surprising and worrying are those figures relating to the 801 species assessed by Amphibian Ark through their Conservation Needs Assessments as being *ex situ* priority species. Containing both GTS and non-GTS, only seventy-six of these AArk species were held in zoos over the last twenty years with no difference in holdings in years before or after their assessment year.

Some very successful *ex situ* breeding programs, such as the one for Southern Corroboree Frog at several zoos in Australia, result in large numbers of animals being released back to the wild. Photo: Michael McFadden.

Clear differences were found in holdings of GTS based on the species region of origin. The best represented i.e. regions with the highest proportion of all GTS held in zoos globally, in 2014 were North America (45.6%), Oceania (23.6%) and Europe (15.6%) whilst South America (2.1%) and Asia (2.6%) were the most poorly represented. When looking at the proportion of species held from a specific region that were globally threatened then Oceania and Caribbean saw the greatest increase especially in the last 10 years, indicating that zoos holding species from those regions have changed their collections significantly in favour of GTS.

Differences were also found in the holdings at the regional zoo level. European zoos held a lower proportion of GTS in 2014 (17.6%) than zoos in North America (24.4%) and the Rest of the World (20.8%) and unlike the other two regions this had not increased since 2004.

Main conclusions

Encouragingly zoos have put increased efforts into amphibians over the last twenty and in particular the last ten years. Whether this is a direct response to the amphibian crisis or simply reflects a change in general policy however is unclear. Should similar changes also be seen amongst bird and mammal holdings then it likely indicates the latter. What is apparent though is that more focus is needed on *ex situ* conservation priority species and clear gaps exist in efforts in relation to certain regions.

Worryingly, only 76 out of 801 species assessed by Amphibian Ark through their Conservation Needs Assessments as being *ex situ* priority species were held in zoos over the last twenty years, with no difference in holdings in years before or after their assessment year. (www.ConservationNeeds.org).

It is therefore crucial to understand the barriers to increasing numbers of globally threatened and *ex situ* priority species in zoos and to understand why certain regional faunas are severely underrepresented. With this knowledge, measures can be undertaken to increase numbers and proportions of globally threatened amphibians held, such as improving the level of husbandry expertise.

The study also highlights another key issue; the lack of accessible and complete information on amphibian holdings. Although ISIS is the most comprehensive database available, it is not complete and there are potentially many other amphibian captive programs not being publicly recorded. This complete data set is critical if the full response to the crisis is to be assessed, identify gaps and opportunities within these efforts and further develop an evidence-based approach to amphibian conservation planning at a global level, help achieve Aichi Target 12 and prevent the amphibian crisis becoming a catastrophe.

Full paper reference: J. Dawson, F. Patel, R. A. Griffiths, R. P. Young, Assessing the global zoo response to the amphibian crisis through 20-year trends in captive collections, Conservation Biology DOI: 10.1111/cobi.12563 (2015). www.ncbi.nlm.nih.gov/pubmed/26219401.

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Amphibian Advocates

In this newsletter we are highlighting two zoo-based amphibian conservationists, Diane Barber from Forth Worth Zoo, Texas, USA and Robert Hill, Zoo Atlanta, Georgia, USA. Diane and Robert, along with many others around the world focus much of their efforts on captive rescue and research programs for some of the most threatened amphibian species. These captive efforts allow us to buy time, so that the threats faced by the species in the wild can be properly evaluated and overcome, and eventually, captive-bred animals can be returned to a safe environment. 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!

Robert Hill, Lead Keeper of Herpetology, Zoo Atlanta

My name is Robert Hill and I'm currently the Lead Keeper of Herpetology at Zoo Atlanta in the USA. I've had an interest in amphibians and reptiles for as long as I can remember. As a youngster I would go out as much as I could to catch frogs, snakes, turtles, and pretty much anything I could find. As I grew older I couldn't shake my interest (or what some might call obsession) in these animals. Any book, article, or documentary highlighting herps of any kind I could get my hands on was like gold, and I kept a number of species of herps (including various frogs) at home for years. Despite all of this, I never realized that there was much of a career as a herper, so I didn't pursue herpetology outside of a hobby until I was in my mid-20's and even then, being directly involved in amphibian conservation seemed a distant, abstract concept.

It was around that time, while working at a local animal wholesaler, that I ran into an old friend I hadn't seen for some time. Many of you reading this are likely familiar with his name, Ron Gagliardo. Thankfully, Zoo Atlanta had also recently hired a new Curator of Herpetology by the name of Joe Mendelson. Ron, being the networking guru he is introduced me to Joe and as soon as possible I applied for a position as a herp keeper. That was the best opportunity I could have ever gotten. Aside from being able to work with a massive collection of animals and some awesome people, I had the opportunity to travel to Panama in July 2006. The reason was unfortunate as it was to assist with husbandry of rescued amphibians from the El Valle de Anton region that was being ravaged by amphibian chytrid fungus. However that experience would change my life forever and bring me fully into the amphibian conservation fold.

Eventually I left the zoo for a position in the Atlanta Botanical Garden's Research and Conservation department. Working there really opened my eyes and allowed me to grow exponentially. The number of tropical frogs I was able to gain experience keeping, breeding, and rearing was incredible. Many of these were from El Valle and I became even more involved in the efforts in Panama, including helping with the construction of the El Valle Amphibian Conservation Center. In addition, I was allowed to follow my interests in native amphibians from Georgia through field studies of emergent amphibian diseases (focusing on plethodontid salamanders), population assessments, and head starting. I left the garden after nearly five years to go back to Zoo Atlanta, where I've been able to grow even more. Since returning, I've continued my involvement in many of these projects as well as many others. I was recently named fundraising coordinator for Project Golden Frog, which works to keep captive assurance colonies of Panamanian Golden Frogs (*Atelopus zeteki*) with the ultimate goal of reintroduction into their native habitat. Despite the number of times I was able to visit Panama, I never got to see a Golden Frog *in situ*. Hopefully through Project Golden Frog's efforts, maybe one day I can.

Throughout the years I've been able to participate in a number of amphibian conservation focused projects, including a head-starting effort to establish a new population of Gopher Frogs (*Lithobates capito*) at a restored site in southern Georgia. This project has been a major high point in my career. Very often working with captive animals you don't get to see them return to the wild, but through this effort (which includes the Georgia Department of Natural Resources, University of Georgia, The Nature Conservancy, Atlanta Botanical Garden, and Zoo Atlanta) over 5,000 Gopher Frogs have been released and there has been evidence of reproduction at our release site.

Robert Hill with Cane Toad in Panama. Photo: Edgardo Griffith.

I've also worked on population and emergent infectious disease surveys of Eastern Hellbenders (*Cryptobranchus alleganiensis alleganiensis*), helped conduct stream salamander studies, and been able to see some incredible amphibians doing what they do in the field.

I look forward to continuing with these projects and hope to be involved in many more in the future in the southeast United States and abroad. I hope very soon that we can stop rearing Gopher Frogs for release and to see Panamanian Golden Frogs signalling to each other in the cloud forests of Panama instead of in glass boxes. I think these things can happen in my lifetime, along with the success of many other amphibian conservation initiatives around the world, and that thought will always keep driving me forward.

Diane Barber, Curator of Ectotherms, Fort Worth Zoo

I began my career with amphibians as a zoo keeper in the late 1980s when scientists were mobilizing on a global scale to determine causes for increased declines of amphibians. Early on, “red-leg” was a common term pegged for immunosuppressed amphibians whose suspected cause of demise were unknown stressors or environmental toxins, rather than a pathogenic disease later identified as the amphibian fungus, *Batrachochytrium dendrobatidis*. Also during that time very little was known about captive husbandry requirements and medical treatments for amphibians. As a young, enthusiastic keeper, I quickly immersed myself in everything amphibian to learn more about them, provide better care for the animals in my charge and to help solve the mystery of their declines.

In 1993, I was asked to assist with the last remaining Wyoming Toads which had been pulled from the wild in a last ditch effort to save them from extinction, and later released first-generation offspring back to Laramie, beginning reintroduction efforts for this species. I will never forget the sensation of happening upon an adult Wyoming Toad peering up at me from a pond, years after it was first released as a tadpole under my care. From then on my enthusiasm towards amphibian conservation grew two-fold, and as my former director said, “started a fire in my belly” which has never been extinguished (although I do take anti-acids on seemingly increased occasions to subdue the burn).

I currently have the privilege of working with several reintroduction programs for endangered amphibian species including the Houston Toad and Chiricahua Leopard Frog. I also serve as the Coordinator for the Puerto Rican Crested Toad Species Survival Plan and am actively involved in all aspects of its recovery. Although reintroduction programs can be rewarding, current and emerging threats, lack of resources, political challenges and changing landscapes can lead to major hurdles, reducing momentum and optimism for all involved. Despite these hurdles and the seemingly snail-like pace of the “race” to halt extinction, this remains the most rewarding part of my job and I enjoy sharing my successes and failures for the benefit of others.

I have acted as chair of the Association of Zoos and Aquarium’s Amphibian TAG since 2006 and serve on various working groups including IUCN Amphibian Specialist Group. As more species are identified for immediate conservation actions, space and resources continue to decline and the need for a holistic approach to species prioritization and allocation of resources, at the global level, from the top-down, rises. In my experience, if we are to be successful, then leaders in our field need to work alongside lawmakers and governing agencies to develop realistic, common-sense approaches to conservation in tandem.

Diane Barber, working with Chiricahua Leopard Frog tadpoles at Fort Worth Zoo, Texas, USA.

Many of the people I have met or worked with over the past thirty years have served as extraordinary models of inspiration - often reminding me that individuals CAN make a huge difference when they are passionate and empowered to effectively do their jobs. Amphibian husbandry and medical practices have improved since I was a zoo keeper, but there is still so much to learn about the 6,000-plus species that remain today. Hopefully, these unknowns will continue to peak interests and create more amphibian stewards who can center efforts globally, as I remain confident that our future includes wild places for humans to coexist with amphibians, learn from them and continue to witness first-hand their amazing adaptations for life.

Amphibian Conservation Volunteer wanted in Madagascar

Parc Ivoloina is looking for an amphibian husbandry assistant to spend six to twelve weeks at our zoological and botanical gardens in eastern Madagascar to further develop an *ex situ* conservation facility for local Malagasy frog species. General responsibilities will include working with staff in terrarium construction and maintenance, live food production, data collection and management, reinforcement of biosecurity principles, development of amphibian education and awareness materials, and the acclimation of local common species to captivity for training and husbandry research.

There may also be opportunities to assist with other zoo-related projects. Housing is provided free at the park. There is no electricity on site and cell phone reception is not very reliable. Internet, communications, and conveniences are available nearby in the city of Toamasina. Position open until filled, the sooner the better.

Preferred qualifications

- Understanding of amphibian captive management, ideally in a conservation setting
- Knowledge about maintaining live foods, amphibians, and their environments
- Experience living, traveling, or working abroad in a developing country
- Flexible nature; comfort with downtime and living in a rural area
- Familiarity or ability to speak French preferred

For more information, please contact Maya Moore: maya@savethelemur.org.

AArk launches its new web site!

Amphibian Ark's web site, www.amphibianark.org has undergone metamorphosis, and the new site was launched earlier this month. As well as a fresh, clean look, the main navigation menu has been rearranged, providing much easier access to the most frequently-visited pages.

Two menu items, Amphibian Declines and Education provide quick access for general visitors to our site to find general information about amphibian issues, facts and figures, videos and curriculum materials, while the Conservation and Husbandry Documents menus contain a huge amount of information of specific use to people actively involved with amphibian conservation and breeding programs in captivity. We are often adding new information to the site, and recently-updated pages are shown on the left side of the home page.

We've also added lots more images - there are so many incredibly beautiful amphibians in the world, and we think people need to see more of them!

And of course the web site is still available in Spanish, Portuguese and German versions, and we hope to complete the pages that have not yet been translated within the next couple of months. If you are fluent in Spanish, Portuguese or German and would be willing to give us a little of your time to help with the translations, we, and our non-English speaking visitors would very much appreciate your time!

We hope you enjoy the new-look web site, and if you have any comments or suggestions that would improve the site even more, please feel free to let us know - webmaster@amphibianark.org.

Shirts for salamanders - Buy yours now!

As we reported in the September edition of the AArk Newsletter, this fantastic "Support Local. Support Global." salamander t-shirt design was created by Natalie Criss and was the winning entry in National Amphibian Expo's Shirts for Salamanders contest. Proceeds from the sales of these great shirts will be sent to two AArk-supported programs, Flatwoods Salamanders (*Ambystoma cingulatum*), run by Mark Mandica at the Atlanta Botanical Garden; and a research and recovery project for eight species of moss salamanders (genus: *Nototriton*) which is run by Brian Kubicki from the Costa Rican Amphibian Research Center. For more information regarding this campaign and the target species please visit www.naexpo.org/conservation.

What better gift for the holidays than an awesome t-shirt that supports conservation. Get Yours Today! $15.00 plus shipping *, all tees are being sent using EcoEnclose 100% recycled poly mailers.

Order yours here: www.naexpo.myshopify.com.

(* *Unfortunately these shirts are only available for delivery within the US at this stage.*)

Update from the ASG Captive Breeding Working Group

Kevin Johnson, Amphibian Ark and Ben Tapley, Zoological Society of London

In 2013 the Amphibian Specialist Groups (ASG, www.amphibians.org/asg/) and the Amphibian Survival Alliance (ASA, www.amphibians.org) jointly established a number of amphibian conservation working groups, based on each of the chapters in the Amphibian Conservation Action Plan (ACAP, www.amphibianark.org/pdf/ACAP.pdf). The goal of each of the working groups is to review progress of the actions outlined in the ACAP, identify and address challenges, develop and prioritize further actions, and support the implementation of those actions. The first revision of the ACAP is complete, and each of the working groups has identified short, medium and long-term goals and actions. The working groups are listed on the ASG web site, www.amphibians.org/asg/workinggroups/, with links to the visions, goals, challenges and priority actions for each group. Amphibian conservation involves a wide range of actions and expertise, and the joint efforts of these groups will hopefully result in a decrease in amphibian declines and will see amphibian populations once again safe in the wild.

One of these groups, the Captive Breeding Working Group (CBWG) is co-facilitated by Ben Tapley, Team leader, Herpetology Section at ZSL London Zoo, and Kevin Johnson, Taxon Officer at Amphibian Ark. Membership of the group is made up of over forty amphibian husbandry experts from twenty-six different countries. The first task of this group was to develop a vision for the group, which is: "*All amphibian species assessed by Amphibian Ark Conservation Needs Assessments or other nationally-recognized organizations that are recommended as priorities for conservation breeding, are established in genetically and demographically viable and financially stable* ex situ *programs. Where possible, programs should be within the indigenous range, with program outlines which identify short, medium and long term goals and an exit strategy.*"

A series of goals has been further broken down into a range of short-term (1-3 years) and long-term (3-10 years) actions, with priorities and responsible organizations assigned to each. The goals of the group are:

Species selection and responding to new threats

- Identify species that are both priorities for *ex situ* conservation action and are appropriate candidates for such action.
- A community that can respond to new demands and challenges as they emerge.
- Implement *ex situ* conservation action in accordance with the national and international legislations and agreements.

Capacity building, training and mentors

- Provide high quality training/capacity building and long term support in regions where captive breeding programs are required but there is not currently sufficient expertise.
- Advise organizations on transparent, efficient and responsible use of resources.
- An Amphibian Ark staff member in every amphibian-rich country of the world, reviewing and updating the conservation needs assessments, organising and delivering training, lobbying for habitat protection, raising funds and managing and supervising species programs.

Program implementation

- Leverage the resources required to ensure that when high priority species are brought into captivity, they are held in effectively managed facilities.
- Ensure that effective program planning, including methods of evaluating the success or failure of the program and its goals, and an exit strategy is developed for each new conservation program, before the program is actually implemented.
- Ensure that all necessary import and export permits are obtained for all interstate and international movements of animals, and when collecting animals from the wild.

Captive husbandry

- The effective management of disease in captive populations.
- Maintain genetically and demographically viable populations in captivity while threats are either better understood or mitigated in the wild.
- Provide fit, healthy animals for release that are capable of establishing self-sustaining populations in the wild once threats have been correctly identified and removed or sufficiently reduced (released animals should not provide a disease risk to other individuals/species at the release site).
- All breeding programs will endeavour to the best of their ability to comply with all national and international requirements on activities involving specimens in captive breeding colonies.
- Provide best practice recommendations to the community for screening animals prior to release in order to mitigate unintentional transfer of disease or disease strains.

Effective partnerships

- Foster/contribute to partnerships and collaborations that facilitate positive conservation outcomes, funding and political support.
- Foster scientific research on captive colonies to generate information relevant for amphibian conservation.
- Engage national agencies to pledge resources and support ex situ conservation action.
- Implement actions of ACAP through nodal agencies/persons identified in different regions.

Communication

- Captive amphibians on public display are used to effectively convey conservation messages to the visiting public, in order to develop a feeling of responsibility for amphibian conservation.
- Share and communicate results and network with the amphibian conservation community.

A summarized version of the Captive Working Group Action Plan is available on the ASG web site at www.amphibians.org/asg/working-groups/captive-breeding/ and the complete plan can be found on the AArk's web site, www.amphibianark.org/?wpfb_dl=187.

If you are currently working with captive amphibians and would like to assist with any of the actions, please contact Ben Tapley (Ben.Tapley@zsl.org) or Kevin Johnson (kevinj@amphibianark.org). We all have a responsibility to help care for amphibians, and our collective efforts will benefit all amphibians around the world.

2015 Frogs Exhibit at Royal Botanical Gardens, Hamilton and Burlington, Ontario, Canada

David Galbraith, Head of Science, Royal Botanical Gardens, Hamilton and Burlington, Ontario, Canada

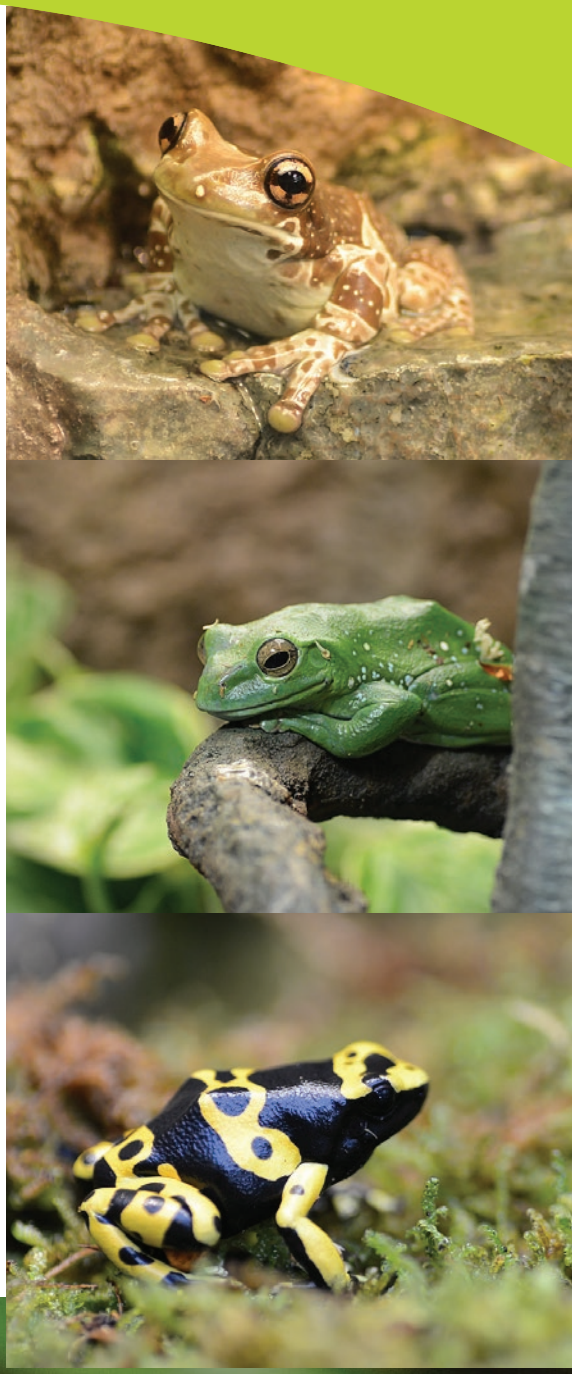
The Royal Botanical Gardens (RBG, www.rbg.ca), located in Hamilton and Burlington, Ontario, Canada, is a major center for nature interpretation and conservation in southern Ontario. With 2,400 acres of nature sanctuaries, including critical wetland habitats, RBG's work has included the conservation of amphibian populations in the wild for many years. In 2008 these nature sanctuaries were designated as an IMPARA: an Important Amphibian and Reptile Area, by the Canadian Amphibian and Reptile Conservation Network. As many of our outdoor areas are closed in the winter months, RBG mounts a large indoor winter educational exhibit each year.

The 2015 exhibit was entitled "Frogs: A Chorus of Colours" and ran from January 17 to April 12, 2015. The exhibit at RBG included a large display of living frogs and interpretive material provided by Clive Peeling's Reptiland in Allenwood, Pennsylvania, as well as extensive interpretive material, live interpreter programs, and additional local living animals provided by Ontario's Sciensational Snakes, an education and outreach organization.

Almost 50,000 people toured the exhibit and took part in the educational programming developed to accompany the more static elements. A large number of programs, such as amphibian-themed crafts, indoor physical challenges, puppet shows, and stories proved very popular with all ages. In addition to the world-side frog diversity presented in the exhibit from Reptiland, seven local reptile and amphibian species, Eastern Tiger Salamander, American Toad, Grey Treefrog, Wood Turtle, Eastern Milk Snake, and Eastern Garter Snake, were presented to and interpreted for the public.

About one in six visitors came to the exhibit from more than 30 miles away. Exit interviews indicated extremely high satisfaction with the experience. Royal Botanical Gardens feels that "Frogs: A Chorus of Colours" was extremely successful in introducing the public to the world of frogs, and presenting conservation and biodiversity concerns to the public in an accessible and enjoyable package. It is considered to be our most successful exhibit to date.

For more information, please contact Barb McKean, Head of Education, Royal Botanical Gardens (bmckean@rbg.ca) or David Galbraith (dgalbraith@rbg.ca).



(Top to bottom) Amazon Milk Frog, Chinese Gliding Frog, Poison Dart Frog, Wax Monkey Frog. Photos: David Galbraith, courtesy of Royal Botanical Gardens.

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

Location: The course will be held in joint venues at Zoo Atlanta and Atlanta Botanical Garden, Atlanta, Georgia.

Dates: April 11th – 15th, 2016

Amphibian Ark, Atlanta Botanical Garden and Zoo Atlanta are pleased to announce the 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.

Cukra Climbing Salamander (*Bolitoglossa striatula*). Photo: Brian Kubicki.

Neotropical Salamander Biology, Management and Conservation Training Course

Location: Costa Rican Amphibian Research Centre, Siquirres, Costa Rica

Dates: March 14-18, 2016

Amphibian Ark and the Costa Rican Amphibian Research Center invites you to the Neotropical Salamanders Biology, Management and Conservation Training Course designed for biologists and other professionals with expertise in *ex situ* conservation programs for neotropical amphibians.

Contact Luis Carrillo, luis@amphibianark.org for more information.

Plantanillo Gorge Salamander (*Nototriton major*). Photo: Brian Kubicki.

Ex situ conservation of the Wampukrum Harlequin Toad, McDiarmid's Glass Frog, and Sabetari Glass Frogs at the Amphibian Conservation Center - Zoo AMARU

Fausto Siavichay Pesántez, Zoo AMARU, Cuenca, Ecuador and Carlos C. Martínez Rivera, PhD, Philadelphia Zoo, USA

Cordillera del Cóndor in extreme southeast Ecuador represents a unique mountain chain with an incredible, yet under-sampled amphibian diversity. Its lush vegetation, humid environment with Andean and Amazonian influences, along with a rugged terrain, have all created different habitats that are unique to the region. Some of its amphibian species, like the harlequin toads (*Atelopus*) and the glass frogs, (*Cochranella*, *Hyalinobatrachium*, *Rulyrana*, etc.) can only be found here and require pristine environments, but their populations are negatively impacted by human activities.

Unfortunately for this unique habitat, several hydroelectric and mining projects are underway in the area, and the development of international roads and the creation of small towns and gardens needed to support the people working in the area have placed Cordillera del Condor at risk, along with the endemic wildlife that lives here. The Amphibian Conservation Center - Zoo AMARU in Cuenca (ACC-Amaru), is dedicated to helping save Ecuador's endangered amphibians and currently holds populations of several endangered amphibians unique to Cordillera del Condor, including the Wampukrum Harlequin Toad (*Atelopus wampukrum* sp. nov.), McDiarmid's Glass Frog (*Rulyrana mcdiarmidi*), and Sabetari Glass Frogs (*Cochranella erminea*), which have been rescued from mining sites slated for total deforestation. With the support of Amphibian Ark, the Philadelphia Zoo and in coordination with the Ministry of the Environment, ACC-Amaru has been able to rescue these species in an effort to establish assurance colonies in captivity while looking for ways to halt the deforestation.

Juvenile Wampukrum Harlequin Toads (*Atelopus wampukrum* sp. nov.) searching for insects during feeding time. Photo: Carlos C. Martínez Rivera.

Currently, the main objective of our project is to breed our target species and establish the basic behavioral and developmental parameters of their husbandry while raising the young froglets. With the help of the grant from Amphibian Ark, we have been able to design a much simpler setup for our terrariums used for the developing frogs, which allows easy daily maintenance, while keeping our growing frogs healthy. Our terrariums are small (35cm x 40cm x 10cm), and have moist paper towels as the main substrate, which are changed every forty-eight hours. We found that this system, together with weekly cleaning of tanks, is very effective and much more sanitary than a heavily-planted terrarium. In this setup, we can easily monitor food intake by all animals, and we can collect feces, uneaten and dead insects much more easily as well. We also found that the time spent changing towels and cleaning tanks is less than the time spent checking animals and searching for dead insects and feces in the heavily planted terrariums. We include half coconut shells as refugia in all tanks and also add empty plant pots and clippings of plants for hiding and perching. These smaller tanks house up to three juveniles of the Wampukrum Toads; we may house glass frogs singly or in groups of three.

All substrate used for the small terrariums is as sterile as possible and all objects used for perching are thoroughly cleaned once or twice a week. Plant clippings are also changed regularly and destroyed. The top of the tanks allows for easy breathing and airflow. The room where these tropical frogs are housed is also equipped with an electric space heater to ensure that the room temperature stays between 27ºC and 30ºC.

Breeding tanks for Wampukrum Harlequin Toads (above) and glass frogs (below). Photo: Carlos C. Martínez Rivera.

We have also worked with the setup for the breeding tanks for our mated pairs of the Wampukrum Harlequin Toad. The breeding tanks are also smaller than originally proposed (150cm x 70cm x 40cm) for the Wampukrum Toads but have demonstrated to be very effective. These tanks are heavily planted and may have one third or half of the tank with flowing water on a closed cycle, since they only breed in fast flowing streams. We have not finished the breeding tanks for the colonies of Sabetari Glass Frogs and McDiarmid's Glass Frogs as we are trying to establish the adults and reduce their parasite load.

Specialized wildlife veterinarians from Zoo Amaru routinely conduct parasite monitoring and control by doing fecal analyses and other routine exams at our Amphibian Clinic, a separate quarantine unit within ACC-Zoo Amaru. The staff tries to identify parasites that are known pathogens, such as nematodes, trematodes, and other worms. When we know that animals are loosing weight or look listless we may treat the animals with Metronidazole, Ivermectin or medicated baths as needed following standard protocols.

Feeding a varied diet is very important and we consider it key to our success. We feed our colony a variety of invertebrates, such as moths (especially for glass frogs), fruit flies, crickets, forest roaches, mealworms and bean beetles. All feeder insects are provided with fresh vegetables and fruits, according to the insects' biology. Crickets are provided with dry dog kibble or fish pellets as substrate in their terrarium, and fruit flies are supplemented with fish flakes and green algae dust (Spirulina and Chlorella) when possible. Insects are also dusted with calcium and vitamins prior to being offered as foods to our frogs. We raise all of our food at our feeder insect room, which we've been able to double in size and increase production thanks to the help of the Amphibian Ark.

The veterinary assistant at ACC-Zoo Amaru conducting a routine checks. Photo: Carlos C. Martínez Rivera.

Shelving units with small housing tanks for Wampukrum Harlequin Toads and glass frogs. Photo: Carlos C. Martínez Rivera.

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. Four new documents have been added recently:

Ex situ Management of Amphibians (1.9 MB)

Gupta, B.K., Tapley, B., Vasudevan, K., and Goetz, M.

In December 2013 , the Central Zoo Authority (CZA) organised a workshop "Building National Capacity for ex-situ Amphibians Management and Conservation" in Guwahati, where a list target and practice species of amphibians were identified. During this workshop the Central Zoo Authority with the assistance of the Durrell Wildlife Conservation Trust and the Zoological Society of London has strengthened national capacity in amphibian management. More than 80 delegates from all over India representing nearly 40 institutions participated in these workshops. The participants were exposed to the specific requirements of amphibians in the design and management of *ex situ* facilities. The present guidelines on the *ex situ* management of amphibians are part of output of *Ex situ* Management of Amphibians the workshop on "Building National Capacity for *ex situ* Amphibians Management and Conservation" held at the Assam State Zoo, Guwhati, Assam, India during December, 2013.

Download: www.amphibianark.org/?wpfb_dl=185.

Itraconazole treatment of *Batrachochytrium dendrobatidis* (*Bd*) infection in captive caecilians (Amphibia: Gymnophiona) and the first case of *Bd* in a wild neotropical caecilian (803.1 KB)

Matthew Rendle, Benjamin Tapley, Matthew Perkins, Gabriela Bittencourt-Silva, David J. Gower and Mark Wilkinson

Batrachochytrium dendrobatidis (*Bd*) is the causative agent of the disease amphibian chytridiomycosis, one of the factors driving amphibian population declines. *Bd* infections are treatable in at least some cases, but in the Gymnophiona has been little reported, and restricted to heat treatment in the form of increased environmental temperature. We report the successful treatment of *Bd* infection in the terrestrial African caecilian *Geotrypetes seraphini* and the prophylactic treatment of the aquatic neotropical caecilian *Potomotyphlus kaupii*, using 30 minute immersions in a 0.01% solution of the antifungal itraconazole over a period of 11 days. Previously only recorded in wild African Gymnophiona, our report of *Bd* in *P. kaupii* is not only the first record of infection in a wild aquatic caecilian but also in a caecilian of neotropical origin. To improve our understanding of the impact of *Bd* on caecilians, *Bd* isolates should be obtained from wild caecilians in order to ascertain what lineages of *Bd* infect this order. In addition, more wild individuals should be subjected to *Bd* diagnostic surveys, including in Asia where caecilians have not yet been subject to such surveys.

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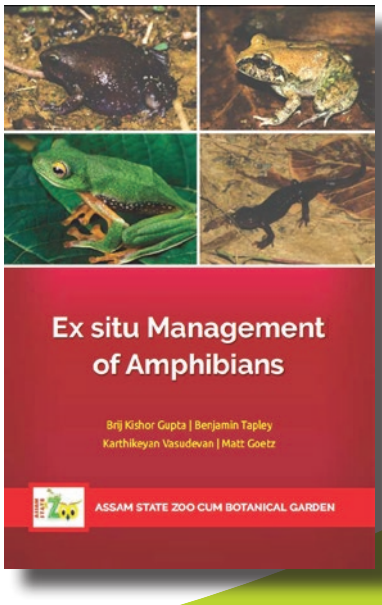
Download: www.amphibianark.org/?wpfb_dl=186.

Ex situ management of amphibians in India

A great new publication, *Ex situ* Management of Amphibians by Brij Kishor Gupta, Benjamin Tapley, Karthikeyan Vasudevan and Matt Goetz is the result of an amphibian conservation workshop, Building National capacity for *ex situ* Amphibians management and conservation, held in Guwahati, India, in 2013. This workshop was hosted by the Central Zoo Authority and Assam State Zoo, Guwahati in collaboration with the Durrell Wildlife Conservation Trust and the Zoological Society of London and it focussed on prioritizing Indian amphibians for *ex situ* conservation and the development of amphibian husbandry expertise using surrogate species in the first instance.



The guidelines provided in this book will help zoos and other captive breeding facilitates in India to focus their initial efforts on the most appropriate species for developing and expanding husbandry skills; and then ultimately, to working with the most threatened local amphibian species.

This book features sections on the most of the amphibian groups found in India, each of which include valuable life history details, captive management, reproduction and rearing information. At the end of the book is a section listing the prioritized target species for India, along with recommended husbandry analog species for each of twenty-three zoos and other captive breeding facilities. The lists will be updated as additional assessments are carried out.

A printed copy of the book is available at the price of INR 300 or equivalent in any other currency, which includes postal charges by air mail - please contact the author to order you copy (brijkishor68@yahoo.com). The book can also be downloaded from the General Husbandry Documents folder on the Husbandry Documents page, www.amphibianark.org/husbandry-documents/, on the AArk web site using the link www.amphibianark.org/?wpfb_dl=185.

Ex situ reproduction of Vanzolini's Spiny-chest Frog: 2013 – 2015 progress report

Camila Castro, M.V., MSc, In situ manager; Carlos Barrientos, M.V. MSc, Ex situ manager; Juan Carlos Ortiz, Director, Rucallinqui

Since 2009 the University of Concepcion in Chile, in partnership with Leipzig Zoo, Germany, has been developing an *ex situ* breeding program for Darwin's Frog (*Rhinoderma darwinii*) to preserve this unique species that demonstrates parental rearing during larval development.

After our success with this species we decided to expand our amphibian reproductive centre and raise *Alsodes vanzolinii*, a species which is listed as Critically Endangered by the IUCN. This species is endemic to the mountains of Nahuelbuta and also has very restricted populations which are threatened by habitat loss. The species was believed to be extinct until 2010 when it was rediscovered, with its distribution outside the national system of protected areas of the State of Chile (SNASPE), so their conservation is essential. Thanks to funding from an Amphibian Ark seed grant in 2013, the Leipzig Zoo and other institutions (European Union of Aquarium Curators, Stiftung Artenschutz Zoological and the Society for Conservation of Species and Populations) and the support of Forestal Arauco SA, we added a fly breeding center and amphibian conservation center called "Rucallinqui". This is a Mapudungun word (Mapuche language) which means "house of amphibians".

Laboratories for the *Alsodes vanzolinii* breeding program in one of the new shipping containers. Photo: Camila Castro.

To date we have purchased materials and installed the laboratories for the *Alsodes vanzolinii* program, using three new containers, in addition to the two that we already had. We have also expanded production of live food for the amphibians and we raise now crickets, flies *Drosophila*, isopods and mealworms.

Three new shipping containers in the amphibian conservation center called "Rucallinqui". This is a Mapudungun word (Mapuche language) which means "house of amphibians". Photo: Camila Castro.

During 2015 we devoted our efforts to finding specimens of *Alsodes vanzolinii* as founders for the captive program, however, because of the rarity of their populations and the difficult environment they are found in, this task has been extremely complex. After numerous field trips we have managed to collect two adults of the species, both females. Given the delicate situation of this species in critical danger of extinction, in 2016 we will have to double our efforts and increase field trips to obtain the proposed number of pairs, so as to preserve the species. Another goal for 2016 is to achieve a wider dissemination of the importance of amphibian conservation, to promote the care of our amphibian species, most of which are endemic and are in categories of threat.

To contact us, please email: rucallinqui.anfibios@gmail.com.

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