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AArk partner Centro Jambatu de Investigación y Conservación de Anfibios brings amphibian conservation to Prince Charles...and the world!

Kevin Zippel, Amphibian Program Director, Amphibian Ark

Dr. Luis A. Coloma, widely considered Ecuador's premier amphibian biologist, is a titan in the field of amphibian science and conservation. He received his Ph.D. at the University of Kansas, where he studied amphibian systematics and ecology. Luis worked for nineteen years at the Catholic University in Quito where he conceived, launched, and oversaw the Balsa de los Sapos program ('life raft for frogs'), one of the first and most significant integrative amphibian conservation programs not just in Latin America but around the world. In 2010, Luis founded a second, equally significant amphibian program in Ecuador, Centro Jambatu de Investigación y Conservación de Anfibios (www.anfibioswebecuador.ec), which he currently leads through the NGO Fundación Otonga (www.otonga.org/?page_id=10). Luis is a proud member of the Amphibian Ark global network, personally overseeing around twenty AArk species rescue programs in Ecuador (see www.anfibioswebecuador.ec/arcasapos/especiesabordo.aspx).

In July of 2009, Luis contacted the AArk staff with a simple but brilliant idea: to name a new species of amphibian after His Royal Highness Charles, Prince of Wales, to honor his commitment to halt tropical deforestation and his campaign to mitigate the impact of climate change and to reach global sustainability, which simultaneously bring worldwide attention to the amphibian extinction crisis. Utilizing the AArk as a global network of partners, we took Luis' idea from the rainforests of Ecuador to administrative offices in UK where local partner Chester Zoo pitched the concept to the Prince's team. Almost exactly three years later, the plan came perfectly to fruition!

The event took place on the gorgeous afternoon of 5 July 2012. The Prince's team chose the venue for the unveiling of the new frog's name: Highgrove House near Tetbury England, where WWF UK had convened eighty regional schoolchildren to teach them about sustainability through their Green Ambassadors program. The AArk team comprised: Luis; AArk director Kevin Zippel; a party from Chester Zoo including ex-director Gordon McGregor Reid, herp curator Gerardo García, and managing director Barbara Smith; Madeleine Groves from Kew Gardens, who helped restart stalled communications in early discussions of the event; with CBSG's Onnie Byers representing IUCN as one of AArk's founding principal partners and Gerald Dick representing the World Association of Zoos and Aquariums



Kevin Zippel (AArk) introduces Luis Coloma (Centro Jambatu) to HRH Charles, Prince of Wales, as Onnie Byers (CBSG), Gordon McGregor Reid (Chester Zoo) and regional schoolchildren look on. Photo: Arthur Edwards.



After a great deal of creative work in the studio, the Frabel team produced a stunningly beautiful version of Prince Charles Stream Tree Frog, *Hyloscirtus princecharlesi*, which was presented to His Royal Highness on July 5. Photo: Luis A. Coloma.

(WAZA). Gordon McGregor Reid emceed the AArk's portion of the event, explaining why the species was being named for the Prince. Amphibians are our most imperiled terrestrial vertebrates, with habitat loss, climate change, and pathogens being their greatest threats to their continued existence. Unless humanity takes immediate action to stabilize the climate, while also fighting biodiversity's other threats, a multitude of species is likely to vanish.

Conserving important habitats like rainforests is therefore one of the most significant acts we can take to protect amphibians. The Prince's Rainforest Project (www.rainforestsos.org) is at the forefront of these efforts, and his role is now honored in perpetuity in the Latinized name of this precious species. Kevin then reviewed with the schoolchildren what amphibians are and why they are important before introducing Luis to the group. Luis spoke of his discovery of the species, including how much the event meant to him personally and professionally. Later, while he was interviewed by the media, he added "It is an opportunity to tell the world that frogs exist, that...we have as human beings a responsibility with these animals, to protect them, to help them to survive. I am the father of two kids and I know that there is the future, a new way of viewing nature, where animals like frogs are very important."



Prince Charles, Prince of Wales poses with a group of school children wearing AArk masks, and an Ecuadorian stream tree frog named in his honor.
Photo: WPA Pool, Getty Images 2012.

and some tadpoles in nearby areas. The frogs were found at night climbing on branches close to a waterfall of about eight meters high. For research and conservation purposes, some tadpoles were transported alive to the Centro Jambatu. DNA analyses have confirmed that this is indeed a new species for science; but, sadly, a species that is already Endangered by IUCN Red List criteria. If this rare species is to persist in the wild, it requires further scientific and conservation action in the field and in the laboratory.

Dr. Coloma and his team are instigating The Prince Charles Stream Treefrog Project to conserve this endangered species and its native habitat in the Ecuadorian forests. The main goal of the project is to develop activities that will result in the long-term conservation of the Prince Charles Stream Treefrog. The objectives of this ambitious project are to buy the land where the species lives; begin a monitoring and research program of the population (where some individuals were sighted in 2011); to restore and enrich the habitat so the population can have opportunities to grow; to analyze the incidence of pathogens; to implement a captive survival-assurance colony; to acquire knowledge on behavior and reproduction; to set up a public exhibit of this and other endangered Ecuadorian frogs to raise awareness about the importance of tropical forest and frogs, and to produce a web page with education materials such as a field guide of stream treefrogs, and to further develop a web site of *Hyloscirtus princecharlesi* (www.anfibioswebecuador.ec/fichaespecie.aspx?id=650).

To help recognize the Prince of Wales for his contributions to conservation, not only was a frog named after His Royal Highness, but Amphibian Ark also bestowed a princely gift – a commemorative gold medallion. Inspired by the beauty of *Hyloscirtus princecharlesi*, an image of the frog, looking quite charismatic, adorns one side. The obverse side, inspired by the Prince's Rainforest Project and the SOS campaign, which starred a rainforest ambassador (the Argentinian Horned Frog), has an image of a rainforest canopy for the background. The foreground contains an image of Prince Charles, displaying his affable nature.

It was a great pleasure for Danny Beckwith to try and capture the incredible work of His Royal Highness in the medallion. In fact, it was quite an honor to design something for The Prince of Wales, who has inspired so many to work to protect precious habitat for all species on the planet. To borrow from Charles Dickens, this opportunity was “as good as gold and better.”

Special thanks go to the following partners:

- Chester Zoo: for leading communications with the Prince's team, obtaining the gold medal from the Royal Mint, and handling media relations.
- Danny Beckwith: for design of the gold medal.
- Saint Louis Zoo: for significant and long-term financial support of Dr. Coloma's conservation programs in Ecuador.
- Kevin Op de Ehze, Harold Fineroff and the Frabel Glass Art Studio and Gallery: for donation of the glass frog sculpture.
- Zootaxa: for a quick fast review and publication of the paper, free online access, and free paper reprints.

The following video clips were generated during the presentation at Highgrove House:

- New frog species named after British Prince: http://english.ntdtv.com/ntdtv_en/news_europe/2012-07-07/new-frog-species-named-after-british-prince.html
- Dr Luis Coloma and The Prince of Wales on protecting frogs and rainforests: www.youtube.com/watch?v=9pXXOwyDZ3w
- Charles 'touched' by frog honor: www.youtube.com/watch?v=8XJv8Ou1aYE

Gordon gave the Prince a reprint of the paper (published in the journal for animal taxonomists, Zootaxa, www.mapress.com/zootaxa/2012/z03364p078.pdf), then Luis and Kevin presented him with a commemorative gold medallion struck by the Royal Mint and a stunning glass replica of the frog generously donated by the Frabel Glass Art Studio and Gallery (www.frabel.com). The Prince was admittedly moved by the event: “I'm very touched. I have a lump in my throat...must be a frog.”

We closed with a brief photo session with the Prince, our group, and the schoolchildren. A good time was had by all!

Dr. Coloma discovered the species as new to science in 2008, among museum preserved specimens. He organized three expeditions with Ecuadorian colleagues seeking additional specimens in the surroundings of Cotacachi-Cayapas National Park at about 2,800 m altitude in the Cordillera of Toisán in the Western Andes of Ecuador. Although the original locality had already been cleared for agriculture, the team was able to locate three adult specimens



AArk Associate Danny Beckwith designed a medallion which was cast in gold by the Royal Mint for the Prince. The coin features the new frog on one side, and Prince Charles, a section of rainforest, and the AArk logo on the other side. Photo: Luis Coloma.

Meet our new Amphibian Ark associate: Rachel Rommel, Community Education Officer

A Texas native, and currently based in Houston, Rachel has been an amphibian advocate for over fifteen years, and has close to ten years of experience managing education and outreach programs focused on community awareness and engagement for threatened and endangered species. She has worked with the endangered Houston Toad in multiple capacities for the last five years and launched a unique program in Houston called Toad Trackers, in which urban youth are conducting a population study of a common toad species. She has a special interest in private landowner stewardship, educator capacity-building, and citizen science programs which engage students and teachers with hands-on, direct field experience, which she believes is essential for people to develop their own stories, connections, and a life-long passion for wildlife conservation. Rachel is currently a graduate student in the Biodiversity Stewardship Lab at Texas A&M University.

She hopes to work with Amphibian Ark and partners to further develop and evaluate existing education programs, and help create new programs and resources that assist those in amphibian conservation to identify stakeholders, craft and communicate their message, and implement a strategic plan to garner much-needed community awareness, support, and cooperation for their *ex situ* and recovery programs.

Questions? Connect with Rachel at rachel@amphibianark.org



AArk's new Community Education Officer, Rachel Rommel, teaching primary school children in Zimbabwe about their native frogs and toads.
Photo: Cullen Geiselman.

Amphibian species assessed for urgent rescue

Kevin Johnson, Taxon Officer, Amphibian Ark

Since 2007, Amphibian Ark staff have facilitated assessment of the conservation needs of 3,018 (48%) of the world's amphibian species through 26 national or regional workshops (see www.amphibianark.org/planning-workshops/). The results of previous assessment workshops are available on AArk's data portal (www.amphibianark.org/assessmentresults.htm) and additional workshops are planned for other countries and regions over the coming months. The benefits of this assessment process are clear – we assemble the leading amphibian field experts in each region, to collectively determine the best course of conservation actions to help prevent the extinctions of threatened amphibian species in the wild. These actions include habitat restoration and preservation, threat mitigation, captive breeding for release and community awareness and involvement.

Without immediate captive management as a stopgap component of an integrated conservation effort, hundreds of species could become extinct. Because *ex situ* resources are limited, the Amphibian Ark must try to identify which species require *ex situ* rescue and management most urgently. A new page on the AArk web site, www.amphibianark.org/rescue-species/, lists the species that have been assessed in national or regional workshops as being in need of urgent rescue – these are species that still exist in the wild, but the threats being faced by them cannot or will not be reversed in time to prevent likely species extinction. Threats that constitute imminent danger of extinction include threats for which we currently have no remedy (e.g. chytrid fungus, www.amphibianark.org/chytrid-fungus/, including any species known or suspected to be susceptible, climate change, including any species documented to be drastically contracting its range, e.g., mountaintop salamanders in Central America (per Wake et al.) and mountaintop frogs in Madagascar (per Raxworthy et al.)) or threats for which we have a remedy but not the resources or will to intervene (e.g. imminent destruction of more than 50% of habitat by dam construction, mining/pollution etc., or species collected to brink of extinction).

Species in need of urgent rescue are listed for the following countries: Argentina, Brazil, Chile, Colombia, Cuba, Costa Rica, Dominica, Dominican Republic, Ecuador, France, Greece, Guatemala, Haiti, Hong Kong and Guangdong Provinces, Iran, Jamaica, Madagascar, Malaysia, Mexico, Morocco, Panama, Peru, Puerto Rico, Singapore, Southern Africa, Spain, Sri Lanka, Thailand, Turkey and Venezuela.

Ex situ conservation organizations that are considering the implementation of new amphibian conservation programs are strongly encouraged to consider the species listed on the Rescue Species page on the AArk web site, www.amphibianark.org/rescue-species/. Information regarding the likely availability of founder animals (www.amphibianark.org/founder-animals/) and the completion of a relevant phylogenetic study (www.amphibianark.org/species-knowledge/) is included where known. Such additional information may indicate which species are currently appropriate for *ex situ* rescue programs, and those which may benefit from additional *in situ* research prior to an *ex situ* program being established. Species expected to have wild founders available and which have undergone a phylogenetic review should perhaps be considered ahead of others where information is incomplete. Programs should be established within the range country of the species wherever possible.



Many thanks to our Amphibian Ark Associates

Amphibian Ark is incredibly fortunate to have a large group of professional associates who regularly offer their services to support our amphibian conservation work. These individuals have contributed many hundreds of hours of their time to share their expertise and help with workshop facilitation, instructing at training courses, and chairing advisory groups.

Our new "Associate Spotlight" section of the newsletter is an opportunity for us to give recognition and communicate our appreciation to these individuals, and their respective institutions, for their continued support.

For a list of our associates, visit: www.amphibianark.org/associates/.

Associate Spotlight:

Brad Wilson, Consulting veterinarian and husbandry workshop instructor

In late 1994, Brad met Ron Gagliardo at the Atlanta Botanical Garden at which time he began to study amphibian husbandry and disease and became the advising veterinarian for the Garden's Amphibian Conservation Program. He has successfully managed and bred a variety of tropical amphibians over the years. His extensive experience with both the captive management of amphibians and many years of field studies in North, Central, and South America and Southeast Asia have provided him with unique perspectives on clinical amphibian diseases and their management: education which is not available through classic university curriculum. He has learned that a great number of diseases of clinical significance in conservation collections are diseases of captive management and are not present in wild, native populations.

Brad is fortunate to travel, and spend much time assisting with amphibian field work throughout South and Central America in addition to assisting with Amphibian Ark and other independent amphibian conservation programs since 2005. He is a co-owner of two veterinary hospitals in north metro Atlanta, consultant with a regional wholesale pet distribution center, consultant for several area nature centers, and an adjunct lecturer at the Gwinnett Technical College veterinary technician program.

In addition to his interest in amphibians, Brad also assists with multiple plant conservation projects in the southeastern United States. He is also an avid photographer and many of his plant and amphibian photos have been published internationally.

Brad's tremendous generosity with his time, financial resources and images has helped many people (literally around the world) to not only develop their stewardship and veterinary skills but to also gain a greater appreciation of nature and biodiversity.



Brad Wilson DVM with *Hypsiboas picturatus* in north-west Ecuador.
Photo: Ron Gagliardo.

Are you in need of a fun, easy and educational amphibian activity for an upcoming festival or event?

Try the Toad Maze! Check it out @ www.amphibianark.org/links-to-curriculum-materials/. This interactive and educational obstacle course can be set up in the classroom or the great outdoors, utilizing a few simple materials you probably have lying around. Be creative and adapt it to fit your available resources, focal species, or specific conservation issues. Remember, this can be the salamander, frog or caecilian maze too! Audiences range from 3 years old to adults...really!

Need help coming up with ideas to adapt the messages for your unique and amazing amphibian? Contact rachel@amphibianark.org.



Conservation of *Scinax alcatraz* (Anura: Hylidae): Captive breeding and *in situ* monitoring of a critically endangered tree-frog species

Cybele Sabino Lisboa, Fundação Parque Zoológico de São Paulo, Brazil

Executive summary

Scinax alcatraz (Lutz 1973) is a tree frog, endemic to Ilha dos Alcatrazes and is listed as Critically Endangered in the International Union for the Conservation of Nature (IUCN) Red List. Part of this island belongs to the Brazilian Navy, and is used as an artillery target. This practice often causes spot fires on the island which can destroy bromeliads, the habitat of *S. alcatraz*. For this reason the establishment of an *ex situ* breeding program, as well as maintaining a viable population in captivity, was really necessary. In 2008 the Fundação Parque Zoológico de São Paulo (FPZSP) started a captive conservation program with this species. However, before working directly with the critically endangered species it was necessary to establish management and husbandry protocols with a surrogate species, *S. perpusillus*. After two years working with the surrogate, it was time to apply the techniques developed to *S. alcatraz*.

The founders were collected in October 2011 and were placed in a biosecure room inside the FPZSP facilities, and in January 2011 we had our first breeding. The Seed Grant funding received from AArk (www.amphibianark.org/aark-seed-grant/) was used to buy materials for the biosecure room. Parallel to the captive program, constant monitoring of the species will be conducted to enable the investigation of possible population declines, and if necessary, the genetic and viable population of *S. alcatraz* maintained in captivity will be ready for possible supplementation or reintroduction.

Introduction

Scinax alcatraz is a member of the *perpusillus* group (family Hylidae), which is characterized by species with a life cycle restricted to bromeliads (Peixoto 1987). This species is endemic to Ilha dos Alcatrazes off the coast of São Paulo, Brazil. The 135 ha Ilha dos Alcatrazes is the main island of the Alcatrazes Archipelago (24° 6' S 45° 42' W), which is located about 35 km from the coast of São Sebastião. The archipelago is inserted in the Tupinambás Ecological Station, under the current administration of Instituto Chico Mendes de Conservação da Biodiversidade - Chico Mendes Institute for Biodiversity Conservation, however, part of the main island belongs to the Brazilian Navy, which uses it as a training target.

Due to a limited natural range, *S. alcatraz* is susceptible to threats that can easily decimate the population, such as natural disasters or the introduction of new diseases or predators. Moreover the use of the island as an artillery target by Brazilian Navy (Bataus 2011) can easily destroy the habitat of this species as has already happened in the past. Measures to minimize the impact during the training season were agreed between the researchers and the Brazilian Navy, but the only way to eliminate this major threat to this population is to completely end this practice, which is already being discussed. Due to this significant threat, the establishment of an *ex situ* breeding program, as well as maintaining a viable population in captivity, has been deemed necessary (IUCN 2002; Zippel and Mendelson 2008).

Scinax alcatraz had never previously been maintained in captivity, so we conducted a pilot study utilizing *S. perpusillus* as a surrogate (Lisboa and Vaz 2012). After two years of captivity, learning and developing management and reproductive techniques with the surrogate species, we were able to start the conservation program with the endangered one. In this article we present the management and preliminary results of the maintenance of *S. alcatraz* in captivity.

Fieldwork

In October 2011 a five-day expedition to Ilha dos Alcatrazes was sponsored by Tupinambás Ecological Station. The main goal of this expedition was to continue the Conservation Action Plan of the island, which gathered researchers from different branches of activity, including our project, to monitor the population of *S. alcatraz* and to collect founders for the *ex situ* conservation program.

All materials and personal equipment were disinfected prior to the field trip to prevent accidental transmission of continental diseases to the island. Samples from the wild population were taken to investigate the presence of *Bathrachochytrium dendrobatidis* on the island, but we do not yet have the results of these tests.

The tadpole survey was conducted during the daytime, looking for them in the water deposited in bromeliad axils. However, we did not find any tadpoles, probably because the rainy season had not started and many bromeliads were dry. The survey for adults was conducted at night time by active calling search in areas with abundant bromeliads. Eleven *S. alcatraz* specimens were collected (five males, three females and three unsexed animals) and these became the founders of the *ex situ* program. During the time we spent at the island, and during the transportation process, the specimens were held in cups with water and leaves.

Ex situ program

Prior to the field trip a biosecure room was prepared to house the founders. An old room at the FPZSP was refurbished and the biosecurity model from the Amphibian Research Centre (www.frogs.org.au) was followed.

The facility consists of a section for permanent housing of the animals, one for culturing live food, and a bathroom with a shower. Staff are required to take a shower before and after working with the animals and everything that goes inside the room has to be disinfected before it is taken inside. The husbandry equipment was bought with the funds from the AArk Seed Grant funding, as outlined in the following table:



The Critically Endangered *Scinax alcatraz* is being bred in an *ex situ* population at São Paulo Zoo in Brazil. Husbandry techniques for this species were developed by housing a surrogate species, *S. perpusillus*. Photo: Cybele Lisboa.

Quantity	Item	Unit value	Total value
1	Air conditioner	R\$ 864,00	R\$ 864,00
1	Water supply filtering system	R\$ 879,00	R\$ 879,00
5	Tanks (35x35x40cm)	R\$ 318,00	R\$ 1.590,00
5	Tanks (45x 45x60cm)	R\$ 400,00	R\$ 2.000,00
11	Lightning	R\$ 61,10	R\$ 672,10
1	Ultrasonic water fogger (large)	R\$ 398,00	R\$ 398,00
2	Ultrasonic water fogger (small)	R\$ 136,00	R\$ 272,00
1	Digital precision balance	R\$ 1.040,00	R\$ 1.040,00
1	Digital caliper	R\$ 130,00	R\$ 130,00
1	Thermohygrometer	R\$ 63,00	R\$ 63,00
			R\$ 7.908,10

Table 1. List of materials acquired with funding received from the AArk.

On 29th October 2011, at the end of the fieldwork expedition, the founders were transferred directly to this biosecure room. On the next day in captivity, two males and a female were found dead. We believe these deaths were caused by stress from many days of the expedition and from the long trip, which took five hours by boat and then four hours driving. No other founders have died since then.

Adults were maintained in glass enclosures, with plants for refuge and a water dish. The water offered for the animals is treated with a carbon filter and UV light. UVB lighting was provided with the use of a single 20 watt Exo Terra® Repti Glo 5.0 Compact Fluorescent bulb fixture in each enclosure.

The adults were divided into two enclosures: one housing a male/female pair and the other housing two males and one female. The three juveniles were maintained for two months in the same plastic cup that was used for the original transportation because they were very small and could possibly have escaped from the aquarium.

Adults and juveniles were offered two to three-day old crickets (*Gryllus* sp.) dusted with Repashy Superfoods Calcium Plus ICB® vitamins twice weekly. Food was provided directly on the aquarium floor or, when the floor was inundated with water, crickets were offered in a plastic cup to prevent drowning.

Breeding and rearing tadpoles

On 22nd December 2011 an ultra-sonic fogger was used to increase the night-time humidity and to stimulate breeding (Lisboa and Vaz 2012). It was turned on every night, but alternating between the adult's enclosure. After thirty-three days, the first breeding event occurred in the enclosure housing two males and one female. The female deposited around 140 eggs.

Most of the eggs (around 110) were deposited in the water on the floor of the aquarium, around twenty were deposited on the plastic cups with the plant, and two were laid on the glass. Eggs were found in clusters of two, three, four, five and seven, but mostly as single eggs. This is different to what we observed with *S. perpusillus*, where the eggs were mostly in clusters of three or four, and rarely laid singly (Lisboa and Vaz 2012).

All eggs were maintained in the enclosure until hatching. From a total of 140 eggs, 132 tadpoles hatched and the time of writing (July 2012), 93 juveniles are being maintained. After this first breeding event, the fogger was no longer used.

Upon hatching, tadpoles were housed communally in a plastic enclosure filled to a depth of 3-4 cm with treated water and no substrate. Alcon® Spirulina Flakes were mixed with water and offered daily and water was changed daily.

Upon emergence of all four limbs, tadpoles were transferred to a tilted plastic cup, containing less water. No substrate was provided and no food was offered during the tail absorption period. Upon completion of metamorphosis, froglets were maintained in groups of four to seven individuals in these plastic cups and they were then maintained in aquariums similar to the adults, in groups of fourteen to twenty animals. Newly-hatched crickets were offered daily or every other day, dusted with Repashy Superfoods Calcium Plus ICB® vitamins.

Conclusions and next steps

The husbandry and reproduction of *S. perpusillus* has proven successful in the pilot study and the skills acquired during this process lasting thirty months, were really necessary for us to apply to the more threatened species, *S. alcatraz*. We used exactly the same protocols that were developed with *S. perpusillus* and after just three months in captivity *S. alcatraz* reproduced. As was observed with the *S. perpusillus*, the high humidity produced by the fogger stimulates the start of the breeding activity for our captive population. Also, as happened with the surrogate species, even though they are a bromeligenous species, specific clutch site was not essential in captive breeding once the animals found viable spots that replaced the bromeliads (Lisboa and Vaz, 2012).

After this first successful experience with *S. alcatraz*, new research will be conducted with the captive population in order to guarantee that it is really a safe alternative to help recover the wild population. The next research activities to be conducted are related to genetic viability, sanitary protocol, microbiota comparison and cryopreservation. As well, the monitoring of wild population and the involvement with the Alcatrazes Island Action Plan will be continued.

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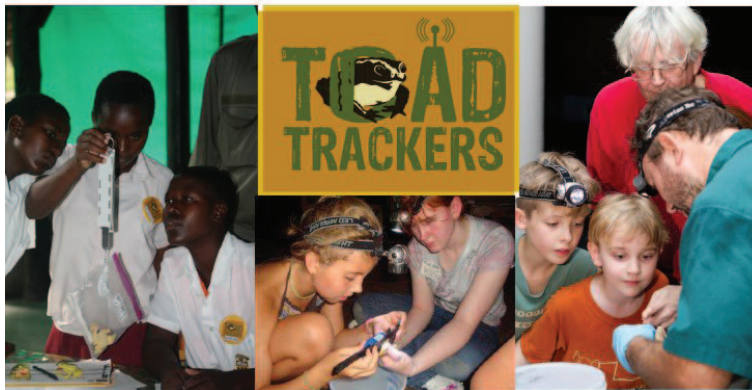
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[Editor’s note: The Captive breeding and in situ monitoring program for *Scinax alcatraz*, managed by the Fundação Parque Zoológico de São Paulo in Brazil, was awarded a \$5,000 Amphibian Ark Seed Grant in 2011.]

Toad Trackers: Assembling an army of Bufoniphiles!

Rachel Rommel, Community Education Officer, Amphibian Ark

What child does not like to gaze into the blank, albeit, quite judgmental stare of a googly-eyed toad? Reviled or revered, causing willies or wonder, children seem to have an innate interest in the charisma of the toad, and we are capitalizing on this connection. Toad Trackers, a unique and highly interactive conservation education program with the goal to build an army of amphibian advocates, has a new home with Amphibian Ark...with global aspirations!



The Toad Trackers program provides opportunities for people to experience biodiversity and the challenges that conservationists face, to help garner their appreciation, of wildlife and wild places.

In an increasingly urbanized and disconnected world between humans and nature, it is essential for youth to personally experience biodiversity and the challenges that conservationists face to help garner their appreciation, future support, and action on behalf of the protection and recovery of wildlife and wild places. If you are currently an amphibian biologist, conservationist, or enthusiast, chances are you may have had an unforgettable field experience alongside experts, or perhaps had personal discoveries with amphibians as a child or young adult. This was likely a key driving force behind your current admiration and dedication for the conservation of amphibians.

Originally launched in 2010 at the Houston Zoo, the Toad Trackers program hopes to provide these opportunities by training youth, educators and families to work alongside, and step into the shoes of wildlife biologists, to track and monitor urban toad populations. Participants develop advanced knowledge and understanding of the habitat needs and movement of toads through direct and hands-on experiences

with live animals. Through a combination of classroom workshops and field-based experiences, participants cover topics including amphibian adaptations, ecological roles, native frog and toad diversity, and current conservation challenges in an engaging atmosphere.

Ranging in complexity based on the audience age, students also learn aspects of data collection and amphibian population monitoring, all within the context of global amphibian declines and an emphasis on why monitoring local populations of “common” amphibians is important for detecting declines in their own region. Originally focused on urban audiences, the program was recently conducted for youth and teachers in Zimbabwe in collaboration with the Painted Dog Conservation Bush Camp, with much success. Now under shelter with Amphibian Ark, we hope to collaborate with *ex situ* partners to build capacity to expand programming to rural youth and those who live within the range of endangered amphibians.

We hope through Toad Trackers, or similar programming, we can contextualize amphibian conservation issues and engender a stewardship ethic with future landowners, land managers, and tomorrow’s decision-makers in priority recovery areas. If you would like to learn more about this program or would like to collaborate in the future, please contact rachel@amphibianark.org.

Many thanks to the Houston Zoo who will be providing start-up supplies to Amphibian Ark for expanding Toad Trackers in North America and abroad!

Ex situ management of five extant species of *Atelopus* in Ecuador - Progress Report

Luis A. Coloma and Diego Almeida-Reinoso, Centro Jambatu de Investigación y Conservación de Anfibios/Fundación Otonga



Executive summary

We began the management and *ex situ* breeding of assurance colonies of five extant species of harlequin frogs (*Atelopus*) in Ecuador. Given the threats this genus faces, *ex situ* management is one of the proactive solutions to save these extant species from extinction, and assisted reproduction is a technological tool to accelerate breeding of species, which have shown to be difficult to breed. Between June 2011 and June 2012 we further equipped the *ex situ* facilities of the program Arca de los Sapos of Centro Jambatu; we carried out eight field trips and collected founders of four species (*Atelopus* sp., *A. elegans*, *A. spumarius*, and *A. balios*), and acquired captive-born tadpoles of *A. nanay* (a donation from Amaru Zoo, Cuenca, Ecuador). Our field collecting efforts and lab-produced frogs increased the founder colonies, although current numbers are still insufficient to maintain genetically viable populations. We performed four essays of reproduction (two of them assisted with hormone treatments with Human Chorionic Gonadotropin (HGC)) and produced the first offspring of three species (*A. elegans*, *A. spumarius* and *A. sp.*, *spumarius-pulcher* complex). For the first time we recorded details of an oviposition event of *Atelopus* sp. Also, we raised and documented (or are documenting) the ontogenic color and morphological changes of four species: *A. balios*, *A. elegans*, *A. nanay*, and *A. sp.*, based on wild-caught and lab-born tadpoles. Keeping healthy individuals and successful breeding of these five species of *Atelopus* remains challenging. Assisted reproduction essays and rearing of tadpoles were generally successful, although management errors produced mortalities. Maintenance of wild-caught adults and lab-reared juveniles remain difficult and produced mortalities, some of which are yet of undetermined causes. A web page providing details of management of each of the species is being developed and scientific publications are being prepared.

Results

Field collections

We conducted eight field trips in the lowlands of eastern and western Ecuador between June 2011 and June 2012 to look for parental individuals and/or tadpoles of four species included in this project (*A. balios*, *A. elegans*, *A. spumarius* and *A. sp.* (*spumarius-pulcher* complex)). For *A. nanay*, we obtained a backup colony of captive-born tadpoles, donated by the Amaru Zoo, Cuenca, Provincia del Azuay. Localities, and number of male, female and juvenile founders kept before this project started and the ones currently kept at Centro Jambatu are summarized and indicated in Table 1.

Reproduction essays and feeding

Reproduction essays were performed in glass breeding tanks 60 cm long x 35 cm wide x 30 cm high. We used stream enclosures mostly as described by Poole (2006) with an open system of filtered water. We used four irrigation periods every day, each of five minutes length. Irrigation was carried out using a micro spraying system.



Given the threats this genus faces, *ex situ* management of five species of *Atelopus* is being carried out at the Centro Jambatu de Investigación y Conservación de Anfibios in Ecuador. *Atelopus elegans* was bred at the Centre earlier this year.
Photo: Luis A. Coloma.

The terraria contained large stones, live plants for perching, moving water (generated by a water pump), flat stones arranged so as to form shelters and caves in contact with water so that the females could lay their eggs. Physical, chemical, and environmental variables were controlled in each of the reproduction essays.

Tadpoles were fed two times a day with SAR type III (Super Food for Tadpoles) powder. SAR is a mixture of fiber, protein, carbohydrates and minerals developed specifically to feed the tadpoles of harlequin frogs. The powder was extra fine so the tadpoles can feed on it when it sinks to the bottom of the aquarium. A much more efficient feeding mechanism was by spreading humid SAR on sterile stones, drying it, and placing the stones on the base of the aquarium.

Frogs in early juvenile stages were fed with small springtails (*Folsomia candida*). Later, the diet included fruit flies (*Drosophila melanogaster*), crickets (*Gryllus* sp., *assimilis* complex) and newly hatched weevils (Curculionidae). Adults were fed with small crickets (between one and five days of hatching), fruit flies, and weevils. Both juveniles and adults were fed three times a week. The insects were dusted with vitamin supplements (Repashi) once a week before being placed in the terrarium.

The following is a brief summary for each of the species studied:

Atelopus balios

Initially we kept five males collected along the Patul River on the borderline of the provinces of Azuay and Cañar, which were collected on March 20, 2011.

- June 7, 2011. An extremely thin adult female and two males were collected in a water channel at the Patul River. The female apparently had already laid eggs before being collected. Tadpoles were also collected.
- June 7, 2011. An amplexant pair was found and collected, although the female died during transport to the laboratory. Tadpoles were also collected.
- June 2012. A male was collected.
- June 2012. Several males died. Some tadpoles died, others were raised to the juvenile stage. Their ontogenic development was documented.
- June 30, 2012. We currently maintain two males, one female, and a juvenile. To date no trials have been initiated because the only female kept at Centro Jambatu is currently gaining weight and developing oocytes.



Above: A pair of *Atelopus* sp. (*spumarius-pulcher* complex) in amplexus. This species was bred at Centro Jambatu late in 2011. Below: The tadpoles remained close to each other for several days. Although a number of tadpoles died during their development, nineteen juveniles from this breeding still survive. Photos: Luis A. Coloma.

Atelopus elegans

Initially we kept a colony of four adults (three males and one female) collected in Durango, Province of Esmeraldas.

- May 18, 2011. Two adult males were collected in Durango River on the riverbank vegetation
- September 1, 2011. A female found walking during the day was collected from a stream close to the Durango River.
- April 15, 2012. Twenty females were collected and kept in isolation for observation.
- June 30, 2012. We currently maintain seventeen females and three males.

Reproduction essay 1

- January 31, 2012. Two males and one female were placed in a breeding tank.
- February 1, 2012. Amplexus was recorded, and the non-amplexant male was returned to his terrarium.
- February 5, 2012. The male was found dead under a rock. The female returned to its home tank.



Reproduction essay 2

- May 9, 2012. Two males and two females were placed in the same breeding tank and they amplexed. Each individual was weighed before placed in the breeding cage.
- May 23, 2012. Both pairs continue with the amplexus. One female was stimulated with HGC in a dose of 0.05 ml. The dose used has been standardized after several trials since 2010 and is 10 IU per gram weight of the individual, based on reports from Kouba et al. (2009) and Browne et al. (2006). The hormone was administered with an insulin syringe (3 ml) in the lateral region of the belly at level under the skin. While in amplexus the injection was done in a period of less than 20 seconds to avoid stressing the pair. The amplexant pair was returned to the breeding tank.
- May 24, 2012. A clutch of eggs was observed under a stone.
- May 28, 2012. Adults were returned to their terrarium.
- June 1, 2012. Embryos were recorded.
- June 4, 2012. Embryos continue their development. We began to document their ontogenic development.

Atelopus nanay

Initially we kept a male collected in 2011 in the surroundings of Patul in Azuay Province.

- October 2011. Thirty tadpoles were donated by the Amaru Zoo. Their ontogenic development was documented.
- June 30, 2012. An adult male and three surviving juveniles are kept.

Atelopus spumarius

Initially we kept a male collected in 2011 on the banks of the river Pucayacu in Pastaza Province.

- August 27, 2011. We collected an amplexant pair on the riverbank climbing on a leaf at about 80 cm from the ground. Another female was found near the pair and collected.
- March 18, 2012. A female was collected on a fern at about 30 cm from the ground, at about 300 m from the margin of the Pucayacu River. Three males were collected in the same forest. They were on undisturbed primary forest on top of a hill.

Reproduction essay

- November 10, 2011. We placed a gravid female in a breeding tank.
- November 14, 2011. Two males were placed in the breeding tank.
- November 18, 2011. A pair is seen in amplexus. The solitary male is moved to its terrarium.
- January 3, 2012. The female is stimulated with HGC at a dose of 0.03 ml.
- January 4, 2012. A small clutch of eggs is recorded during the morning. It was placed among the roots of a plant. The pair is still in amplexus, the female apparently did not release all the eggs. In the afternoon (17:00 p.m.) the male releases the female and the two frogs return to their maintenance terraria.
- January 9, 2012. Embryos are recorded.
- January 12, 2012. Most embryos are dead. A possible cause was a drop in water temperature recorded on the night of 10 January 2012.
- January 24, 2012. We removed the plants and stones in the aquarium to check for surviving tadpoles. There are three tadpoles, which were transferred to a new aquarium.
- March 6, 2012. Two small tadpoles survive.
- May 1, 2012. We found the two tadpoles dead.

Atelopus sp. (*spumarius-pulcher* complex)

Initially we kept five adults (one female and four males) collected in 2010 in southeastern Ecuador.

- October 1, 2011. A field trip was made to San Carlos City of Limón, Provincia Morona Santiago. Individuals were collected on the banks of the river and the forest at 200 and 300 m from the riverbank. We collected two adult males and two females.
- 30 June, 2012. Currently we keep thirty individuals (four females, seven males and nineteen juveniles).

Reproduction essay

- October 10, 2011. An amplexant pair recently collected is placed in the breeding tank.
- October 11, 2011. The pair is seen immersed in water at 08:40 a.m.; they started spawning at 09:20 a.m. Laying of about 500 eggs ended at 16:55 p.m. The event was almost completely recorded by means of lab notes, video recordings and photographs. Details of this event will be described in a scientific paper which is in preparation.
- October 19, 2011. Photographs of embryos were taken.
- October 23, 2011. Tadpoles begin to hatch from the egg capsule. They remain close to each other for several days.
- November 2, 2011. We placed tadpoles into several groups in different aquariums.
- November 16, 2011. We moved another group of tadpoles to various aquariums.
- December 5, 2011. We moved another group of tadpoles to various aquariums.
- January 1, 2012. First tadpoles with four legs (Stage 42 of Gosner) are recorded.
- January 6, 2012. First early metamorphs (juveniles) are recorded and transferred to terrariums.
- June 1, 2012. Nineteen juveniles are maintained. Many of the juveniles died for unknown reasons. Individuals which were visually in good condition were dying. All dead individuals were fixed and preserved in 75% ethanol.

Literature cited

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Poole, Vicky. 2006. Panamanian Golden Frog husbandry manual: *Atelopus zeteki*. National Aquarium in Baltimore. Second Edition.

Budget expenses

The budget for this project was used to search for founder specimens in the field, to equip the labs, to start assisted reproduction, and to develop web pages. Matching funds were provided by Saint Louis Zoo. Items shown in brown are new items (not initially budgeted for) that were paid for with AARK funding. Items initially budgeted were bought with funds from other projects.

Item details	Budgeted	Spent
10 Water pumps \$50 each	500	412,24
3 Ebottoms \$200 each	600	Funds by Wikiri
Several lab materials (spumaflex, louver, silicone, plastic containers, nets, gloves, primers for molecular analyses of chytrid and <i>Atelopus</i> DNA analyses, etc)		846,79
1 Video camera	1000	Donation Nicolas Pezzote
Hormones	350	130
1 Ph meter	100	249,28
5 Thermohygrometers \$40 each	200	Funds by Wikiri
50 Terraria \$12 each; 3 terraria \$50	750	838,07
Domains Amphibiawebecuador and web page development		1142,6
Field trips		
Field researcher 5 trips/ 60 days/ \$15 day	900	1381,02
Field assistant 5 trips/ 60 days/ \$15 day	350	
Transport (gas)	250	
	5.000,00	5.000,00

Table 1. Budget expenses.

Species	Date	Locality	Frogs kept up to June 2012 (total in parentheses)	Frogs kept up to May 2011 (total in parentheses)
<i>Atelopus balios</i>	June 2011	Río Patul, Provincia Azuay	2 males, 1 female, 1 juvenile (4)	5 males (5)
	June 2012			
<i>Atelopus elegans</i>	September 2011	Durango-Alto Tambo, Provincia de Esmeraldas	4 males, 17 females (21), approx. 300 tadpoles	3 males, 1 female (4)
	April 2012			
	June 2012			
<i>Atelopus nanay</i>	Transfer of xxxx 2012	Zoológico Amaru (parents from nearby Patul, Provincia Azuay)	1 male, 3 juveniles (4)	1 male (1)
<i>Atelopus spumarius</i>	August 2011	Río Pucayacu, Provincia Pastaza	4 males, 3 females (7)	1 female (1)
	March 2012			
<i>Atelopus</i> sp. (limón)	October 2011	San Carlos de Limón, Provincia de Morona-Santiago	7 males, 4 females, 19 juveniles (30)	4 males, 1 female (5)

Table 2. Field trips, June 2011 June 2012

Chopsticks for salamanders

Lauren Augustine, Smithsonian National Zoological Park

The next time you tuck into a noodle bowl, or your favorite sushi roll, remember that you can help habitats and amphibians by reaching for reusable chopsticks. Join the BYOC movement - Bring Your Own Chopsticks!

Disposable chopsticks are made largely from old growth forests (Poplar, Spruce, Birch and Aspen) that are clear-cut in the search for the perfect straight-grained wood.

China produces roughly 63 billion chopsticks a year, half of which are used in China, and of the other half, 77% go to Japan, 21% to South Korea and 2% to the United States. This equates to approximately 3.8 billion trees felled annually.

Deforestation for disposable chopsticks has, and continues to happen in the United States and Canada too. These forests are critical for wildlife like salamanders. A new conservation initiative, called Chopsticks for Salamanders, has recently been started by Herpetology Keeper, Lauren Augustine (Smithsonian National Zoological Park), and supported by the National Capitol, Bronx Zoo and Greater Baltimore chapters of the American Association of Zoo Keepers to address the issue of deforestation for the production of disposable chopsticks.

Their mission is to: 1) to disseminate information about the production of disposable chopsticks 2) to increase awareness about salamander diversity in the United States and 3) to raise money for salamander conservation, education and research.

Caudates (salamanders and newts) utilize both terrestrial and aquatic ecosystems, both of which are affected by deforestation. Increasing run-off, raising ground temperatures, and disrupting vernal pools are just a few ways deforestation effects salamander habitat. The Appalachian Mountains are home to the highest diversity of salamanders in the world. These mountains range from Canada to Alabama and are home to 14% of the approximated 618 species of caudates in the world. Although two thirds of this region's land is publicly owned, a large portion is still unprotected and in the hands of private land owners. This habitat is vital to a plethora of species, and is currently threatened by mountain top removal, encroaching development, pollution and intensive logging. The old growth Appalachian forests could be targeted for chopstick production in the future as the disposable chopstick industry has targeted the United States and Canada in the past. This is vital habitat for salamanders, a group of vertebrate whose populations are already in decline from other threats such as Chytridiomycosis and climate change.

You can get your own salamander savvy chopsticks or learn more about the initiative by visiting www.ncaazk.org/member-pages/chopsticksforsalamanders/.

Follow us on Facebook, www.facebook.com/pages/Chopsticks-for-Salamanders/147985255332123, or contact us with questions @ reusechopsticks@gmail.com.



Request for amphibian-related education activities and curricula

Amphibian Ark needs to update the education resource links on our website, and we need your help! Please visit our webpage www.amphibianark.org/links-to-curriculum-materials/ and let us know if you are currently using, or know of, tried and true activities, curricula or resources that are not represented on our current list. Your contributions will be of much benefit to conservation groups, formal and informal educators, and/or natural resource professionals that are looking for resources, and interactive, hands-on activities to engage audiences to care about amphibians and their conservation.

Currently, materials or links provided in any of the following languages are needed: English, Spanish, German, and Portuguese. Please send these to rachel@amphibianark.org.

Spanish-language version of Amphibian Declines Teaching Module available for free download

Now available is a full Spanish translation version of this popular teaching module, via the Network of Conservation Educators and Practitioners (NCEP; a program of The American Museum of Natural History).

The Amphibian Declines Teaching Module is an outreach teaching module reviewing all aspects of the global crisis of amphibian declines and extinctions. The module includes a thoroughly annotated and illustrated PowerPoint presentation, an overview synthesis monograph with extensive literature citations, as well as proposed in-class teaching exercises and solutions. The module is aimed toward university-level students (e.g. Conservation Biology or Herpetology courses) but it is open-format so it can be edited and customized to any particular need or audience.

Citation and link for free download:

Mendelson, J. R., III, and R. Donnelly. 2011. The Crisis of Global Amphibian Declines: Causes, Consequences, and Solutions. Network for Conservation Educators and Practitioners, American Museum of Natural History. CD-ROM.

System requirements: IBM PC or Mac compatible. Windows 98 or higher. Also available electronically (PowerPoint Teaching Tutorial, plus associated pedagogical materials) 97+ pp.

www.ncep.amnh.org

For more information, or copies of these materials, please contact Joe Mendelson: ncep@amnh.org



A sample panel from the Spanish-language version of the Amphibian Declines Teaching Module.

Increasing amphibian conservation capacity in Latin America

Ron Gagliardo, Training Officer, Amphibian Ark

With the support of the U.S. Agency for International Development (USAID) and the Smithsonian Tropical Research Institute (STRI), Amphibian Ark will hold a workshop on the *ex situ* management of amphibians in Panama from March 31 to April 5, 2013. This is part of the USAID Bureau for Latin America and the Caribbean/Global Programs Biodiversity Program: Confronting Global Amphibian Declines in the Darien Region of Panama.



Student Michelle Castellanos learns parasitology techniques at an Amphibian Ark *Ex Situ* Training Workshop in early 2012. Photo R. Andrew Odum.

This one-week training opportunity will bring together participants from Panama and beyond to share their expertise in designing, implementing and maintaining *ex situ* programs for amphibians. Bringing programs to new levels of success will be a main focus along with husbandry, population management and coupling these programs with appropriate exit strategies. Staff will provide both lectures and 'hands-on' experiences in topics on animal husbandry, veterinary health, genetic population management, breeding and record keeping.

The course is limited to approximately twenty participants and we are inviting professionals from both Panama and the Latin-American region. Interested parties can contact Ron Gagliardo, Amphibian Ark Training Officer at ron@amphibianark.org for more information.

Amphibian Ark online learning modules

Rachel Rommel, Community Education Officer, Danny Beckwith, Creative Associate and Ron Gagliardo, Training Officer, Amphibian Ark

Amphibian Ark and its many partners, have organized and participated in dozens of training courses around the world, helping to build capacity for saving amphibians within range countries. These courses cover *ex situ* planning, husbandry, veterinary care and population management, among other topics. To complement these workshops and help build additional capacity, we have set out to create globally accessible on-line learning modules. Our primary goal in developing these modules is to provide a basic online resource to help build enthusiasm, and capacity, for safeguarding and breeding the world's most endangered amphibians with global partners and conservation practitioners.

This program will have several objectives:

1. Serve as a primer for those registered for the Amphibian Ark capacity building workshops, providing a basic introduction to topics that will be covered and expanded upon in the course.
2. Provide an interactive overview for those who are new to amphibian *ex situ* conservation projects, in addition to a much-needed resource for individuals seeking baseline information on amphibians, best practices, and considerations when breeding amphibians for conservation purposes.
3. Will be an interactive and self-paced resource utilizing on-line learning tools, including mixed media (photos, video, presentations, interactive maps, sound) and will quiz students so they may track their progress and comprehension of modules.

Currently development of this program is in process and will initially include an overview of amphibians, why they are important and the threats they face, along with modules on *ex situ* planning and an interactive global map of *ex situ* programs. The first modules will go live in late 2012 and can be accessed at www.amphibianark.org/trainingmodules. If you have expertise to share in this field and would like to contribute to this endeavor, please contact Rachel Rommel, Community Education Officer at rachel@amphibianark.org. Additionally, we will be seeking a small pilot group representing different audiences to provide feedback on focus of our first modules. If you would like to be included in this focus group and provide constructive feedback, please let us know!



Some example screens from AArk's new online learning modules, which will go live in late 2012.

Amphibian Academy - Serving amphibians

R. Andrew Odum, Curator, Department of Herpetology, Toledo Zoological Society and Ron Gagliardo, Training Officer, Amphibian Ark

Developing amphibian conservation expertise

It is approaching five years since the start of the Year of the Frog in 2008. A great deal has been accomplished since then for amphibians; however there are still so many species in decline and facing extinction, and just not enough people with the necessary skills to take action. AArk and its partners around the world have trained over 1,700 amphibian workers from 28 countries, with nearly 200 of these students as part of Association of Zoos & Aquariums (AZA) professional development programs. These efforts have created a contingent of skilled people that can make a difference. Yet the crisis for the class Amphibia is unprecedented and literally thousands of competent amphibian conservationists are needed to address the degree of threat to so many species. There is so much that needs to be done.

A core group of amphibian capacity-building experts came together and, through discussions and exchanges of ideas, concluded it was time to review what has been done and explore a fresh approach to amphibian conservation training. The current programs have contributed immensely to creating capacity. However periodic review of any program is beneficial and there is always room for improvement building on the foundations already laid. More importantly, it was felt that the program should be broad in perspective and beneficial to the diverse backgrounds of the people in positions to help amphibians. A new amphibian conservation capacity training program has been created to focus on both *ex situ* and *in situ* amphibian conservation. This new training effort will be very complete and holistic. A key difference between this effort and earlier endeavors is the increased emphasis on the individual student so that the training can best address their needs, so in turn they are in a position to address amphibian needs. The primary goal is simple: train amphibian people so that they can best serve amphibians.

The new course has been developed under the umbrella of AArk and the Toledo Zoological Society and is called Amphibian Academy. It will be a week-long course with robust *ex situ* and *in situ* conservation emphases. The first course is scheduled for 20-28 April 2013 at the Toledo Zoo. The amphibian programs at the Toledo Zoo are internationally known, the staff very talented, and the collection extremely diverse - an ideal environment for training amphibian conservationists. There are local field sites that will be utilized for field exercises with a good sample of diverse North American anurans and salamanders. Toledo is a friendly city with reasonably priced accommodations and food, as well as being centrally located in the United States. Costs to attend will not be excessive.

The course includes lectures, hands-on practical exercises, and fieldwork. Most of all there will be plenty of opportunities for students to have personal mentoring to address their specific interests and needs by globally recognized and successful amphibian conservationists. The hands-on activities are designed for students to learn by doing in small groups with an instructor and thus provide a better opportunity to learn. The faculty for the course will include true leaders in their fields of expertise of amphibian research, conservation, and husbandry. The students can count on the faculty members to remain as their mentors and professional contacts for their entire career. We will be inviting a diverse group of students from all countries. This will provide a great networking opportunity for everyone and will offer broad international perspectives on amphibian conservation issues. Amphibian conservation is a worldwide problem.

The goal and vision of this training course are to **Serve amphibians**. If this is your goal, this is the course for you and the opportunity to develop the skills to make a difference. Some scholarship opportunities will be available for deserving individuals with limited resources. There will also be a few short-term internships available to qualified students after the course. Registration will be open in October 2012. The exact tuition costs are currently being finalized and the process for obtaining financial support and internship opportunities are being developed. More information will be available on the AArk web site, www.amphibianark.org as soon as costs are finalized.

For further information, please contact Ron Gagliardo (ron@AmphibianArk.org) or Andy Odum (raodum@aol.com).



Students from Costa Rica and Brazil participate in field training in Toledo.
Photo: R. Andrew Odum.

Habitat modification and augmentation as tools for helping threatened amphibian species in Costa Rica

Ron Gagliardo, Training Officer, Amphibian Ark

Costa Rica is internationally recognized as one of the most biologically diverse countries on the planet. Despite its relatively small size (51,032 km²) it abounds in richness of flora and fauna. Costa Rica is especially well known for its amphibian life, having 199 species documented from within the country to date. Based on its small land mass, this equates to an incredible density of amphibian species per unit area (3.9 species per 1,000 km²). Many of these amphibians are struggling to survive in the ever-changing environment and their future remains uncertain. The majority of Costa Rica's amphibians are surrounded by mystery in regards to their basic biology and ecological roles. Today Costa Rica is not only ranked in the top twenty for countries with greatest amphibian species diversity, but it is also in the top twenty for greatest number and percentage of threatened or extinct species.

In response to the need for a better appreciation and more scientific knowledge of the amphibians of Costa Rica, the Costa Rican Amphibian Research Center (CRARC, www.cramphibian.com) was initiated in 2002. The center is dedicated to studying and conserving one of the most important animal groups of Neotropical humid forest ecosystems, the amphibians. As Director, Brian Kubicki is actively involved in numerous research projects on the 49 hectare private reserve and throughout Costa Rica. On site projects range from biological richness surveys and research to hands on action-oriented *in situ* conservation projects that directly benefit amphibians, such as creating artificial breeding sites, habitat improvement, and habitat rehabilitation. This area of breeding habitat creation and improvement has been of particular interest to the CRARC since its inception. Among the goals of these efforts is to help ensure that amphibians in Costa Rica will experience a brighter and more secure future.

While breeding programs may serve as effective conservation tools in saving species from imminent extinction, there are other, often overlooked methods that can and should be employed to assist recovery and colonization of species within their natural habitats. In many cases, species may appear to be affected by loss of habitat or other seemingly natural threats but in reality, it may be loss of specific habitat, such as reproductive sites that is the problem. Creating artificial breeding habitat or rehabilitating natural sites, while time and labor consuming, offers many advantages. These techniques eliminate the need to bring animals into captivity (and the associated expenses, biosecurity risks, political hurdles, etc.), for example. This allows species to recover more naturally and offers opportunity for natural selection and adaptation to occur. Brian Kubicki realized this and has been practicing these methods on the CRARC reserve. Starting in 2003 he developed and put into practice pioneering methods of *in situ* conservation by creating artificial breeding habitats for the critically endangered Lemur Leaf Frog (*Agalychnis lemur*), and the Splendid Leaf Frog (*Cruziohyla calcarifer*). Since that time his efforts have broadened to include even more taxa of amphibians benefiting from *in situ* conservation methodologies. Many scientists from around the world have visited the CRARC reserve to observe how well these projects have been working to boost species numbers with simple, yet sometimes labor intensive methods designed in Costa Rica by Brian.

For nearly a decade, Kubicki has been using these methods on the reserve and while doing so, has been able to observe many natural history aspects and behaviors at these artificial rearing sites. In addition to simply increasing the numbers of each species in



Splendid Leaf Frogs (*Cruziohyla calcarifer*) in amplexus at the Costa Rican Amphibian Research Center. Photo: Brian Kubicki.



An artificial rearing site for *Cruziohyla calcarifer*, the Splendid Leaf Frog at the CRARC reserve in Costa Rica. Photo: Brian Kubicki.

the area, one has to wonder how such methods can benefit other aspects of amphibian research and conservation. Could these methods also be utilized in support of *in situ* disease research for example or perhaps studying patterns of declines or emergences, etc? Clearly, there is a need for this research to continue as alternatives to *ex situ* programs. Involving local stakeholders to go beyond and get directly involved with *in situ* management techniques may well be the future for amphibian conservation. At the Costa Rican Amphibian Research Center, they have been leading the way to find out!

For more information about the research and *in situ* conservation methods being practiced by the Costa Rican Amphibian Research Center please visit their website: www.cramphibian.com.

Amphibian Ark donors, January-August 2012

The work of AArk is possible due to the generous support of the following individuals and institutions:

*Sustaining Donors

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Cleveland Metroparks Zoo*
Como Zoo
Frog Day 2011
Chandra Jessee
Nordens Ark*
Paignton Zoo
Philadelphia Zoo
Omaha's Henry Doorly Zoo
Sedgwick County Zoo*
Singapore Zoological Gardens
Toledo Zoo
Tremont Elementary School 2nd Grade
Zoo Zurich

Up to \$1,000

Jackie Attwood-Dupont
Loline Hathaway, in honor of George Rabb
Kansas City Zoo
Lake Superior Zoo
Minnesota Zoo
New Mexico Bio Park Society
Ocean Park Conservation Foundation
Rosamond Gifford Zoo
SAAMBR
Sacramento Zoo
Staten Island Zoo
Tampa's Lowry Park Zoo
Zoo de Barcelona

Up to \$500

Matthew Bond
Samuel Crothers IV
Stephanie Davis
El Paso Zoo
Gary Helfand
Howard Jackson

Emily Kabat
Rachael Ludwick
Brynn McCleery
Helen Medley
Jason Montgomery
Northern Light Roots & Shoots
Hannah Orlove
Jennifer Pramuk
Kelly Seals
Jason Searle
Elizabeth Snyder
The Bloomin' Bog
Alistair Ward
Alex Wiles
Brett Williams

Up to \$100

Amy Asci
Ashley Ballou
Casimir Borowski Jr.
Jennifer Bose
Buffalo Zoo
Chris J. Carvalho
Michael Christie
David Corsini
Sarah Cuypers
Dan Dieterich
Jonathan Exley
Christophe Hainaux – Urodèles Forum
Katie Holzer
Marilyn Hoyt & Dan Wharton
Thomas Johnson
Andrew Luk
Margaret B. Marshall
Scott McClure
Joseph Mendelson
Nashville Zoo
Pacific Northwest Herpetological Society
Leanne Paranik
Raymond Picciano
Julia Rampe
Sara Rex
Robert & Matthew Scherer
Bruce Staska
Sam Stroud
Georgette Taylor
Laura Twardy
Angela Van Dyck
David & Marvalee Wake
Georgianne Wilcox
Benjamin Winterbourne

Up to \$50

Edgar Akobyan
Kade Ariani
Robert Blum
Roman Bodinek
Rudolf Cerny
Christian Dannecker

Melvin Davis
In memory of Angelo DiPasquale
Mark Eddison
Frog City Art
Brian Gratwicke
Adrienne Hulf
Lake Superior Zoo AAZK
Ron Lane
Pamela Lenkov
Kanako Nishimoto
Kathryn Norman
In memory of Sally Rice
Crystal Robertson
Christopher Simons
Andrew Smith
David Stone & Robin Aronson
Frederic Strawbridge
Wild Over Wildlife Club
Tait Wilson
Donna Yannazzone

Up to \$25

April Armistead
Mindy Binnie
Shelby Bohn
Ted Bradley
James Curatolo
In memory of Parker Dinunno
Kathryn Dorn
Jill Dupaski
Wendy Free
Peggy Hogan
Peggy Houck
Douglas Hull
Kimberly Ingram
Heiko Janssen
Gary & Roberta Kirkland
Jim Krieger
Kathy Krizek
Amy Linden
Daniel Pomfret
Erika Samoff
In memory of Jean Scarangella
Bryce Silver-Bates
Jill Sink
George Sommer
Dion Walker
Cecilia Watt

Up to \$10

Julie Adler
Donna M. Fernstrom
Katie Gilroy
Michelle Hajder
Kim Moore
Isabel Pedrosa
Emily Reynosa
Erik Roels