amphibian ark

Keeping threatened amphibian species afloat

Newsletter

Number 21
December 2012

In this issue...

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

www.amphibianark.org

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

Training for sustainability of amphibian rescue programs in Ecuador

Ron Gagliardo, Training Officer, Amphibian Ark

Introduction

Latin America is very important in terms of amphibian conservation because this region contains the countries with extremely high numbers of threatened species. Through many joint efforts, numerous *ex situ* breeding programs have been established in the region largely focused on species that cannot be safeguarded in nature. While some of these programs have enjoyed success in reproducing critically endangered species, hurdles still exist for obtaining long-term success due to health and nutrition issues. In regards to using *ex situ* techniques for saving species, it is not enough to simply collect them, place them in glass boxes, and consider the job finished. Those responsible for safeguarding rescue populations first must be enabled with the skills to properly manage the species in their care, including veterinary and nutritional aspects. Through its Amphibian Veterinary Outreach Program, Amphibian Ark has worked to build capacity using on-site consultations with facilities in the region since 2009; however, it would be desirable to engage a local community of veterinarians in the region to work together and ultimately alleviate the need for constant veterinary care which is currently imported from other places.

The World Association of Zoos and Aquariums (WAZA) is committed to capacity building measures that save species within captive breeding programs around the globe. Conservation training is a major part of the WAZA Resource Centre and through the help of the 2012 Training Grant Award, the Amphibian Ark conducted an intensive veterinary and husbandry training workshop from September 26-28 in Ecuador to share veterinary and other skills for amphibian conservation management. The purpose of this workshop was to provide technical knowledge, motivation and other resources to stakeholders in Ecuador and surrounding countries to enable proper planning, implementation and completion of *ex situ* amphibian conservation programs. Primary objectives were: to build technical capacity by sharing techniques for managing the health of amphibian species in captivity; to stimulate communication, synergy and partnerships among existing facilities and stakeholders in this amphibian-rich region; and to help facilitate new programs that will be needed in the future.

Held in the facilities at the Universidad San Francisco de Quito in Quito, Ecuador, the three-day workshop utilized the skills of international, regional and local experts in the fields of disease diagnostics, veterinary care, and husbandry. Classroom lectures and interactive discussion sessions were combined with on-site hands-on experiences that will build confidence within the participants to utilize these skills and techniques at their respective institutions. Instructors will also consult with students on individual projects and ideas to encourage more conservation action. The participants were selected based on the degree of veterinary training or need for enhanced husbandry training as they are working in programs where there was deficiency in veterinary care. They represented professionals from the zoological, academic (university), and private community who are working together to advance amphibian conservation efforts in the region.

Goals

This workshop was specifically engineered to help facilitate professionals in Latin America to engage in properly planned, implemented and maintained ex situ amphibian programs through specialized veterinary training.

Objectives

1. To provide hands-on and stimulating classroom training that will help in-country personnel successfully care for amphibians in captivity focusing on:

- Husbandry in relation to animal health
- Dietary and nutritional issues
- Disease diagnostics
- Clinical veterinary care.
- Pathology and necropsy aspects.
- Biosecurity and quarantine needs.
- Necropsy techniques

2. To encourage and facilitate regional networks and partnerships.

Dr. Sam Rivera and Dr. Brad Wilson lead handling and restraint practical. Photo: Ron Gagliardo.

Methodology

This training workshop was held at the Veterinary Clinic of the San Francisco University in Cumbaya, Ecuador where there are excellent classroom and lab practical facilities. This was a central location for participants from many places in the region, including Brazil, Chile, Colombia, Dominican Republic, Ecuador and Peru.

Utilizing eleven lectures and eleven interactive sessions, this intensive training focused on husbandry, hygiene and health, all subjects crucial to maintaining successful assurance populations and protecting species within range country. Initiating the course was a group session where students shared their current experiences amongst their peers, facilitating further discussions and possible collaborations through the duration of the course and beyond. Another important part of the course was the ability to demonstrate and have students participate in quantitative PCR techniques by having this equipment and technician on site (courtesy of San Diego Zoo). The course utilized working groups where the students participated in discussions on biosecurity and quarantine issues. This was the first workshop of its kind in the region to utilize such a focused approach to veterinary care and amphibian health.

Our instructor team consisted of Amphibian Ark Veterinary Associates:

- Sam Rivera DVM (Zoo Atlanta)
- Brad Wilson DVM (Atlanta)
- Luis Carrillo DVM (ZooFari, Mexico)
- Allan Pessier DVM (San Diego Zoo)
- Jennifer Burchell (San Deigo Zoo)
- Ron Galiardo (Amphibian Ark)
- Carolina Proano (University of San Francisco, Quito)

Dr. Brad Wilson and Dr. Luis Carrillo demonstrate non-invasive diagnostics techniques. Photo: Ron Gagliardo.

Outcomes

This workshop brought together thirty-four students from six countries in Latin America. After careful review of the post-course evaluations, it is very clear that the participants assimilated many important aspects including:

- The importance of natural history research for focal species or analogs.
- Animal health is directly related to good husbandry practices. Physical enclosures, climate control and water quality affect animal health.
- The need for special attention to diet.
- The concept of biosecurity and quarantine as preventative measures for creating and maintaining disease free colonies.
- Infectious diseases and parasites are important considerations for all *ex situ* programs and proper diagnosis is very important prior to beginning clinical care.
- The knowledge that there are indeed others in the region with whom to communicate and exchange ideas.

Next steps

Upon leaving, each student was provided with an electronic version of all course materials and they committed to using these materials in their own practice. Course examinations were given and are in the grading process. We strongly encouraged this activity and made it very clear where the students could go for any additional help. All students committed to using the AArk AVOP listserve as in interactive way to communicate case studies and obtain opinions on diagnosis and treatment. Students were encouraged to use all AArk resources available to them for program husbandry, veterinary care and other useful information that is at their fingertips.

This workshop was made possible with the financial and logistical support of the World Association of Zoos and Aquariums (WAZA), AArk, the University San Francisco of Quito, Zoo Atlanta and the San Diego Zoo.

We wish to thank all of the staff of the USFQ Veterinary Clinic for their time, expertise and support in making this workshop a success. We also thank Luis A. Coloma, Director of Jambatu Center and Andres Merino-Viteri, Director of the Balsa de los Sapos Program for their generous contributions of time and resources needed to execute the practicals for this workshop.

Small grant application

A significant part of the Chopsticks for Salamanders mission is to provide funding for salamander conservation, education and research. Chopsticks for Salamanders is proud to offer a $1,500 grant for 2013, to be distributed to a single applicant who demonstrates an excellent use for the funds tied to our mission.

Application materials in Microsoft Word format must be submitted to the Grant Committee at reusechopsticks@gmail.com by January 1, 2013. Should your project receive funding, we will disburse funds as specified in the award letter. Recipients will be notified by February 1, 2013.

Please download and complete the Chopsticks for Salamanders grant application from http://media.wix.com/ugd/78b760_5f2339ecd84a31e57dee5f685f291438.docx. Any questions can be directed to reusechopsticks@gmail.com.

Thanks to our Amphibian Ark Associates

In the last edition of the AArk newsletter we began a series of articles highlighting our professional associates, who regularly offer their services to support our amphibian conservation work. These individuals have contributed many hundreds of hours of their time to share their expertise and help with workshop facilitation, instructing at training courses, and chairing advisory groups.

We very much appreciate the continued support of these individuals, and their respective institutions.

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

Associate Spotlight: Michael McFadden

Herpetofauna Keeper, Taronga Zoo, Sydney

Michael McFadden started working in the Herpetofauna Department at Taronga Zoo, Sydney, in early 2003, after completing a zoology degree. Ever since he was a young child, he was fascinated by reptiles and amphibians and had kept and bred a range of species throughout his school and university life. Soon after beginning work at Taronga Zoo, he developed a real passion and interest for amphibian conservation. Six species of frog had disappeared in recent decades in Australia, and a number of other species were sitting near the brink of extinction. There was a clear need for *ex situ* conservation measures. Thus, the perfect opportunity opened up for Michael to get involved. Presently, amphibian conservation activities are the primary focus of much of his work, with a little time aside for other interests in varanid lizards and elapid snakes.

Michael first became involved with Amphibian ARK in 2008 when he was asked to facilitate the husbandry component of an amphibian workshop held at Zoo Negara in Malaysia. This was soon followed by additional instructing opportunities at workshops in Thailand, Australia, New Zealand, Indonesia and a second workshop in Malaysia. The workshops have been a great opportunity to communicate the current knowledge on amphibian husbandry and conservation, and to inspire others to participate in amphibian conservation efforts. They have also been a great learning opportunities for Michael by working alongside experts like Ron Gagliardo (AARK), Andy Odum (Toledo Zoo), Mike Read (Sandfire Dragon Ranch) and Brad Wilson (Atlanta veterinarian).

Taronga Zoo currently operates *ex situ* amphibian conservation programs for six threatened frogs form south-eastern Australia. The most notable of these are the Southern and Northern Corroboree Frogs (*Pseudophryne corroboree* and *P. pengilleyi*), with their striking colouration and their critically low population numbers. Both species are being bred at the zoo in climate-controlled facilities and have been the focus of experimental reintroductions over the last three years. The Green and Golden Bell Frog (*Litoria aurea*) has been the focus of conservation efforts since 1994, with over 26,000 tadpoles and frogs reintroduced from the zoo, including over 6,000 in 2012. Taronga Zoo has maintained a population of the Critically Endangered Booroolong Frog (*Litoria booroolongensis*) since 2007, with this species being the focus of husbandry research, experimental reintroductions, community education and research into immunity of amphibians to chytrid fungus in collaboration with James Cook University. This research has carried on with the threatened Alpine Tree Frog (*Litoria verreauxii alpina*), which is being reared at the zoo for additional chytrid research and reintroduction in the coming season. Finally, another exciting project they are involved in is the *ex situ* program for the Yellow-spotted Bell Frog (*Litoria castanea*), which was thought to be extinct since the late 1970s until its rediscovery nearly three years ago. Taronga Zoo currently has a small population of this species they hope to breed in the coming season in order to conduct experimental reintroductions into former and modified habitats.

Houston Toad Educator Workshop - Important roles for *ex situ* partners in educator capacity building

Rachel E. Rommel, Community Education Officer, Amphibian Ark

"*I care more about wild Houston toads after meeting the live toads from the Houston Zoo*."

This is a statement that 96% of educators "strongly agreed" or "agreed" to in a post-workshop survey at a recent Houston Toad Educators Workshop on September 29th, 2012 in Bastrop, Texas. To see living ambassadors of one of the most endangered and elusive amphibians in North America, and learn about their unique adaptations and behavior from their caretakers, was indeed a treat for participants. This was an experience that could only be delivered by the *ex situ* program and toad staff at the Houston Zoo. A memorable event, close to sixty teachers, the majority from the current range of this highly endangered toad, and some from big cities like Houston and Austin, braved buckets of rain on an early Saturday morning, to come learn more about amphibians, the Houston Toads (*Anaxyrus houstonensis*), and how they could incorporate lessons about amphibians into their teaching activities.

Educators can include "formal" K-12 school teachers, or "non-formal" educators, which might include city, state or national park interpreters, urban environmental educators, citizen science volunteers, nature center staff, community naturalists, camp instructors, or zoo and aquarium educators. All of these groups have the collective potential to reach thousands (if not millions) of children, and adult audiences each year through their programming. In many circumstances, as with the Houston Toad, information and resources can be limited, or not readily available for educators. If available, many times they don't know where to find the information, or they don't know how to apply it once it is located. *Ex situ* amphibian programs, especially when a part of zoos and aquariums, or other learning centers, have a special opportunity to collaborate with conservation partners to help build educator capacity and enthusiasm to use amphibians and flagship endangered species (like the Houston Toad) as a channel for exploring, understanding and valuing our natural resources.

In 2011, some of the partners working in the conservation and management of the toad formed a very informal Houston Toad Education Working Group – members including the Texas Parks and Wildlife state herpetologist, interpreters and resource managers from Bastrop State Park (perhaps the only public land where the toad exists), Houston Zoo conservation staff (*ex situ* program) and Houston Zoo education staff who were able to offer much needed expertise in curriculum writing. To date, significant deliverables from this collaboration include an Educator's Guide to Houston Toads, a toad trunk loan program that any educator can check out free of charge, and a mixed media and resource flash-drive for Houston Toads, thanks in part to the hard work of collaborating institutions, and a small local grant from the Terese Hershey Foundation. All of these materials were distributed at our first Houston Toad Educators Workshop.

The workshop included enthusiastic presentations and multimedia, led by partner educators and interpreters from Texas Parks and Wildlife and Amphibian Ark, an amphibian biologist from the Houston Zoo, and a state natural resource manager. Topics included an overview of amphibian diversity, natural history and biology, ecosystem function, habitat health and human connections to these natural processes. Global amphibian declines and causes were covered, and tangible things individuals can do on a local scale were explored. Focus was then geared regionally towards the decline of the Houston Toad, its endemism, uniqueness, decline and conservation, why endangered species matter, what they might be telling us, and why we should listen. After the morning presentations, the educators were rotated through break-out activity stations which were designed to share resources and train in hands-on activities that can be used in the classroom, or adapted for non-formal education settings. Activity stations included:

- a life cycle maze, including threats and conservation measures (like head-start programs) for various stages of the life cycle in aquatic and terrestrial environments
- amphibian adaptations and activities for lessons on pollution and wetland health
- a frog call activity from the Texas Parks and Wildlife Department's Texas Amphibian Watch citizen science program
- an advanced role play activity about habitat loss and fragmentation.

Participants at the recent Houston Toad Educator Workshop in Texas. Photo: Rachel Rommel.

Educators were given the resource flash including the educators' guide, mixed media resources such as video and photographs, frog call files and activities from the workshop, supplemental resources, and contact information, etc. An optional field visit and interpreter guided hike to a Bastrop State Park burn site and a historic Houston toad breeding pond was available to teachers following the workshop, and a large percentage of participants attended this trip. A highlight for the hike was a chorus of Southern Leopard Frogs (*Lithobates sphenocephala*), a great teachable moment for park interpreters.

As for our evaluation, a pre and post survey was conducted to gauge the participant's level of enthusiasm, values, knowledge, current practices and intent to utilize information and resources gained from the workshop in their respective education settings. Preliminary results show great success in increasing capacity and intent for utilizing the Houston Toad in the participants' education activities and will be submitted for future publication. A follow-up survey in the summer of 2013 will tell us if the participants' new found knowledge and resource availability were utilized. There has been little research to determine the short and long-term effectiveness of educator capacity building programs for an endangered species, and the factors influenc-

ing the long-term use of resources by participating educators in their respective settings. We hope to provide insight through this case study with the Houston Toad, into some of the factors which may influence use, which may better inform conservation practitioners wishing to implement similar educator programs.

We do know that we were able to pull off this great event resulting from a strong collaboration with partners, utilizing the knowledge, talent and resources from various individuals and institutions working toward the conservation of the Houston Toad. Ex situ practitioners can be an invaluable resource in these efforts with their extensive experience, knowledge and stories working with endangered amphibians. Education departments, often available at ex situ institutions (like zoos and aquariums) often want to contribute to conservation programs and can be critical for helping to create and write curriculum materials when working in collaboration with amphibian experts. In addition, Houston Zoo's Houston Toad program (see article on page 13) was able to bring live ambassador toads which went a long way in helping to build enthusiasm and concern for the Houston Toad.

If you are interested in obtaining a copy of the Houston Toad Educators Guide, or further information on this workshop, please contact rachel@amphibianark.org.

Special thanks to partners at the Texas Parks and Wildlife Department, Houston Zoo, Lower Colorado River Authority, Amphibian Ark and the Jacob and Terese Hershey Foundation.

Ex situ rescue: accommodating threatened frog species in Melbourne Zoo's animal collection

Hans van Weerd, General Manager Life Sciences, Jon Birkett, Precinct Supervisor Herpetofauna and Invertebrates, Peter Courtney, Curator Native Fauna and Birds and Sjoukje Vaartjes, Animal Records Officer, Melbourne Zoo, Australia

Melbourne Zoo is one of the three Zoos Victoria properties, together with Werribee Open Range Zoo and Healesville Sanctuary. Melbourne Zoo, located near Melbourne's city centre, aims to provide 'windows' to the different faunal regions of the world, from a city zoo, close-up perspective. Werribee Open Range Zoo exhibits mainly exotic animals in large, open-spaced enclosures, whereas Healesville Sanctuary has native animal species only.

Zoos Victoria aspires to become the world's leading zoo-based conservation organization and is committed to fighting extinction of animal species. The goal is to be the Australian authority on captive holding and management of native threatened species, and the major facilitator of wildlife knowledge for conservation action.

Australia has an abundant reptile and amphibian fauna. In the whole of Australia, over 850 species of reptiles and over 230 species of amphibians can be found. While the reptiles cover all but one of the living orders (Chelonia, Squamata and Crocodilia), amphibians only represent one of the three living orders (Anura). In the state of Victoria there are many different reptiles, with some 87 species of lizard, 52 skinks, 12 dragons, 11 legless lizards, 9 geckoes, 3 monitors and 27 species of snake. Thirty-six species of frogs are found in Victoria.

In 2010 Zoos Victoria started a program committed to ensuring that no Victorian terrestrial vertebrate species would go extinct. In south-eastern Australia, twenty species are teetering on the brink of extinction due to habitat loss, feral animals, landscape fragmentation, disease and climate change. Zoos Victoria aims to secure these species (1 invertebrate, 3 lizards, 5 frogs, 3 birds, 5 marsupial mammals, 3 placental mammals) in our care, support recovery programs, continue researching into captive breeding and reintroduction, and raise community awareness by providing people with the opportunity to connect with and better understand these species. The campaign for saving these twenty species is called 'Fighting Extinction'.

Above: Within Melbourne Zoo's conservation program for Southern Corroboree Frog (*Pseudophryne corroboree*), large numbers of frogs have successfully reach adulthood and eggs have been released back into the wild. Photo Damian Goodall.

Baw Baw Frog (*Philoria* frosti) eggs were collected from the alpine regions of Victoria (Mount Baw Baw) in November 2011 and brought to Melbourne Zoo for hatching and on-growing. Photo Mike Swan.

Melbourne Zoo has an eclectic animal collection composed of Australian and non-Australian species of invertebrates, fishes, reptiles, amphibians, birds and mammals. Its herpetofauna collection too is a mix of Australian and non-Australian species, some of which are threatened in their native habitat, and cared for by a five-person strong keeping staff. It has some 68 species (over 300 specimens) of reptiles and 18 species (over 300 specimens) of amphibians at present.

Apart from one species of salamander, Melbourne Zoo's amphibian collection presently has 3 species of exotic (*Dendrobates*) and 13 species of Australian frogs (*Litoria, Limnodynastes, Mixophyes, Notaden, Pseudophryne, Philoria*). One of the Australian frog species (Stuttering Frog, *Mixophyes balbus*) is IUCN-listed as Vulnerable and two as Critically Endangered (Southern Corroboree Frog, *Pseudophryne corroboree* and Baw Baw Frog, *Philoria frosti*). All three form part of the Fighting Extinction campaign and as such have received specific resourcing and funding.

The Southern Corroboree Frog became part of Melbourne Zoo's collection as early as 2001. With ups and downs this species has become a success to the extent that large numbers of frogs successfully reach adulthood under carefully controlled climate controlled conditions, and also that eggs could be released back into the wild (the alpine regions of Mount Kosciusko) for hatching and repopulation of their habitat.

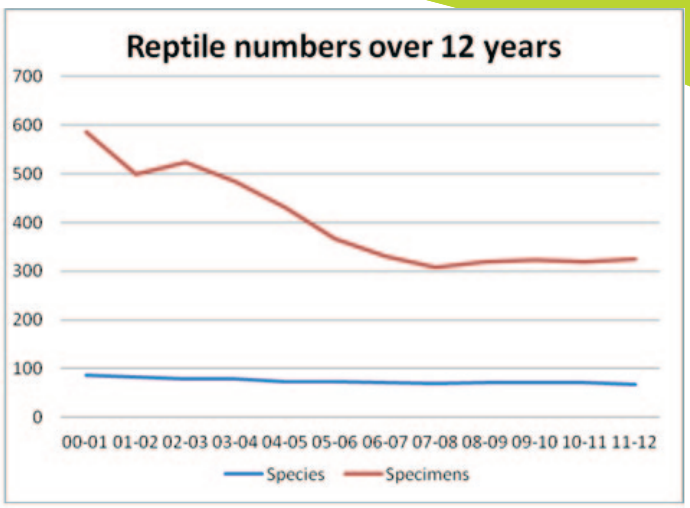
Recently, in 2011, the Baw Baw frog became part of the Zoo's animal collection. Eggs were collected from the alpine regions of Victoria (Mount Baw Baw) in November 2011 and brought in for subsequent hatching and on-growing, again under carefully controlled climate conditions. Of the more than 50 eggs collected, 8 tadpoles successfully went through metamorphosis, but unfortunately died soon after. Another attempt to collect eggs is being undertaken during this year's breeding season.

The Fighting Extinction campaign is only one of the many new activities and programs that Melbourne Zoo has been delivering while taking care that its day-to-day operations were not

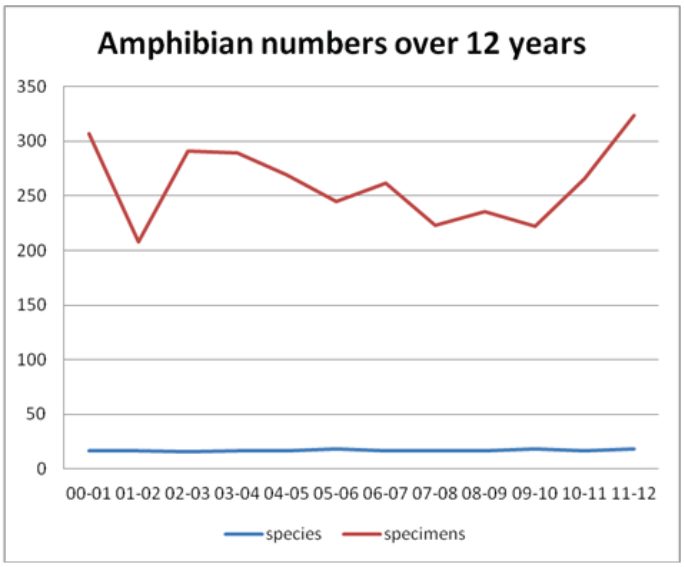
negatively impacted, but also without expanding its keeping staff with each new addition. Another such addition for the herpetofauna team has been the commitment to care for Striped Legless Lizards (*Delma impar*) in need of relocation due to urban development encroaching on their habitat.

Together with an increasing demand for orchestrated close-up encounters of visitors with animals, these developments necessitated a re-balancing of tasks with resources. Back-of-house holding and managerial efficiency (work routines) have been addressed. Rationalization of herpetofauna species and specimens maintained has been an essential part of this rebalancing.

The graph on the right (upper) shows that the number of reptile species was decreased over the past twelve years, from 86 to 68. This led to a more dramatic decrease in specimen numbers, from 589 to 326 specimens.



On the other hand, the graph on the right (lower) amphibian species numbers were maintained at around 17-18, with specimen numbers being allowed to go up in the last three years after a steady decrease over the preceding years.



Decreasing reptile numbers (species and specimens) have freed up time to deliver the activities mentioned above. Underlying the constant numbers of amphibian species over the past twelve years however, has been a shift from exotic to native species and from species with low conservation concern to those with high conservation value - the Stuttering Frog, Southern Corroboree Frog and Baw Baw Frog being a point in case.

Indeed, the reason for the increased amphibian specimen numbers over the last three years has largely been the success of the Southern Corroboree Frog breeding program. The number of metamorphosed frogs has increased from 33 in 2009-2010 to 60 in 2010-2011 and then to 123 in 2011-2012.

Finally, in the past two years a process of reviewing Melbourne Zoo's entire animal collection has started. The herpetofauna animal collection has been assessed in a 'value-effort' exercise, in which each species receives a 'score' regarding its contribution to the zoo-based conservation organization objectives of Melbourne Zoo and at what cost ('effort'). Possibilities to increase the 'value' of presently low scoring species will be addressed, e.g. by upgrading their display or interpretation. When this is not feasible, the species will be phased out from the collection. This again will free up resources and facilities that will enable us to better focus on our zoo-based conservation organization objectives.

AZA's Amphibian Management School (formerly Amphibian Biology, Conservation, and Management)

When: Monday September 30, 2013 – Friday October 4, 2013
Where: Hosted by the Detroit Zoo's National Amphibian Conservation Center in Royal Oak, Michigan

The Association of Zoos and Aquariums (AZA) has partnered with our Amphibian Taxon Advisory Group (ATAG) to update the amphibian course and create a hands-on learning experience focusing on the latest in amphibian husbandry techniques and best practices in captive management. This course is designed for novice to moderate experience level amphibian zoo and aquarium keepers; education staff who need more training on handling and husbandry of amphibians; and staff at nature centers, natural history museums, or science centers with limited amphibian experience.

Participants will learn not only about husbandry, but also exhibit design, how to connect with conservation projects, breeding program management, enrichment basics, and more to improve amphibian management at their institutions and impact amphibians globally.

Learn more and register at www.aza.org/AMS.aspx

AZA would also like to recognize Amphibian Ark for their new Amphibian Academy course hosted by the Toledo Zoo (see www.amphibianark.org/amphibian-academy/), which provides training focused on developing and managing an amphibian conservation program.

These courses are a great complement to one another and provide a wealth of high-quality training for professionals working with amphibians in zoos, aquariums, universities, nature centers, and in situ programs around the world.

Gopher Frog head-starting project reaches major milestone

Robert Hill, Department of Herpetology, Zoo Atlanta

In 2007, in partnership with multiple organizations (Atlanta Botanical Garden, University of Georgia's Warnell School of Forestry, Zoo Atlanta, Joseph W. Jones Ecological Research Center, The Nature Conservancy, and Bear Hollow Zoo) the Georgia Department of Natural Resources' Wildlife Resources Non-game Section began a very ambitious project to establish a new population of Gopher Frogs (*Lithobates capito*) onto restored Nature Conservancy land in southwest Georgia.

The Gopher Frog is listed by the IUCN as Vulnerable and it is protected by the state of Georgia. This species has lost over 90% of its former range in the south-eastern USA. Georgia is believed to have perhaps a dozen populations remaining. Primarily inhabiting the upland burrows of Gopher Tortoises (*Gopherus polyphemus*) they migrate to low-lying ephemeral ponds during heavy rains in the winter or early spring. Females may deposit egg masses containing over 2,000 eggs. These eggs are typically attached to emergent vegetation in the deeper portions of the breeding pond. Larvae hatch in about a week and metamorphose in roughly three months. Young frogs feed mainly on insects while adults are known to eat other frogs.

Since the spring of 2007, the Georgia Department of Natural Resources and partners have collected portions of freshly laid egg masses from a Gopher Frog breeding site on protected state land. These eggs are transferred to partner institutions for rearing to metamorphosis under safe captive conditions. In an effort to mimic natural conditions as much as possible, the tadpoles are reared outdoors in large aquaculture tanks with plant matter from the site where the eggs were collected. They were offered some supplemental feeding, but mostly lived off of algae growth and other plant matter. The resulting froglets are then marked, and transported to the Nature Conservancy's Williams Bluffs Preserve in Early County. While the preserve has the proper habitat, including a large number of tortoise burrows and several ephemeral ponds, no natural population has been observed. Since beginning this project, over 4,300 young frogs have been released into the preserve. The ultimate goal is that a self-sustaining population can be established on the preserve and that if successful, the methods used can help to establish other populations in restored habitat.

Monitoring of tortoise burrows by Vanessa Kinney Terrell and other University of Georgia researchers was started this summer. This also was the first year in which frogs were released directly into burrows to give them more of a head start as drought conditions have prevented the ponds from filling. While some young frogs from 2012 releases have been observed, in October, a large adult was discovered and captured. This 46.3 gram female is the first adult to be found on the preserve and offers proof that the project is working as the clipped toes trace her to the 2010 batch of releases. This is a huge milestone for the project and there are plans to deploy more intensive monitoring of the ponds at Williams Bluffs Preserve over the upcoming breeding season. This discovery also gives hope to similar efforts that have recently started in North and South Carolina.

This project has been supported through a State Wildlife Grant and grants from the Association of Zoos and Aquariums' Amphibian Taxon Advisory Group and the Georgia Herpetological Society.

The Gopher Frog is protected by the state of Georgia. This species has lost over 90% of its former range in the south-eastern USA, with perhaps only a dozen populations remaining in Georgia. Photo: Robert Hill.

Save The Salamanders

Matt Ellerbeck, Salamander Conservationist

Salamanders are among the world's most endangered animal groups, with around half of all the world's species being listed as Threatened by the International Union for Conservation of Nature (IUCN). These species are all facing a high risk of extinction. Unfortunately, salamanders often get far less attention from conservationist than other endangered species. It is due to this high level of decline and lack of attention, that I have decided to focus my conservation efforts on salamanders.

I focus mainly on outreach education, visiting classrooms, kids' clubs, national parks, and conservation areas. I have educated students at every academic level, giving presentations or talks to pre-schools, elementary schools, high schools, and colleges/universities. It has been said that in the end we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught. This is why I aim to teach - to help foster a concern for the preservation of salamanders. I believe that all ages and all walks of life need to be taught an appreciation for salamanders. During my educational lectures and presentations I highlight the threats that salamanders face and ways in which individuals can aid in their recovery. I strongly promote land stewardship/habitat management activities as one way to help salamanders. I also inform rural landowners about the useful roles that salamanders play in eco-systems (i.e. natural pest controllers, as they prey heavily on various arthropods and invertebrates). I hope that when people learn about the benefits that salamanders provide, they will be more inclined to protect them. My presentations also allow for people to get an up-close look at live salamanders, as I bring captive-bred and adopted specimens with me. This connection with live salamanders helps people further develop a sense of empathy and concern for these amphibians.

To further bring my message of conservation to the public, I often appear in the media, giving radio and newspaper interviews. Many of my presentations also draw attention from the local media, allowing for more people to be reached and educated about conservation. Alongside these activities, I am also an avid salamander observer. During the spring, summer, and autumn months I spend much time out in the field gathering observational records of salamanders. These are sent to the Natural Heritage Information Centre to help gain a better understanding of salamander populations, habitats, ranges, and behaviors across the province of Ontario. Over the past summer I have viewed hundreds of salamanders in their natural habitats.

Above: Matt Ellerbeck from Save the Salamanders, focuses mainly on outreach education, visiting classrooms, kids' clubs, national parks, and conservation areas to help foster a concern for the preservation of salamanders.
Below: Teaching a group of summer camp participants about salamander conservation. Photos: Matt Ellerbeck.

One of the efforts I am most proud of is creating a salamander sanctuary. This came about after a visit to the Mazinaw Lakeside Resort Campground, where I was set to do a presentation as part of their grand opening. After the presentation I went to explore the grounds and was pleased to find an area on the property rich in salamanders, both in terms of species and in the numbers seen. I was intrigued about the numerous sightings of salamanders that occurred within a short time. I was also filled with a sense of concern about the prospect that their habitat would be under threat from the development of the campground. There had been talks about expanding and developing certain areas of the grounds that were still in their natural state. I met with the owners and discussed why I felt it was important to leave these (salamander) areas untouched and undeveloped - not always an easy pitch to new business owners! However, my enthusiasm for preserving the salamanders habitat must have worked, as they agreed. I returned to the area the following weekend, and my assistant and I marked off the area which would be designated as the sanctuary, and put up signs to ask visitors not to go into the area, to prevent habitat degradation. I regularly do presentations at the campground and continually monitor the sanctuary.

The internet is another place in which I aim to have a large presence for salamanders. I have developed a website called Save The Salamanders (www.savethesalamanders.com). The site has been designed as a hub of information where individuals can learn about the threats that salamanders face, and more importantly, things they can do to help. This is extremely important to me, and why I focus on outreach education and raising awareness: to encourage others to get active and involved with helping salamanders! Again, I feel conservation will be most effective when all ages and walks of life have a passion for the issue and a desire to make change!

I sincerely hope my efforts to educate and raise awareness will have a positive impact on salamanders and their populations, and that is why I am committed to continuing with my endeavors to help them. Scientist Stephen Jay Gould once said ''We cannot win this battle to save species and environments without forging an emotional bond between ourselves and nature as well - for we will not fight to save what we do not love." I am going to make sure I am doing my part to spread that love.

A contribution to conservation of the Kurdistan Newt in Western Iran

Nasrullah Rastegar-Pouyani and Mohsen Takesh, Department of Biology, Faculty of Science, Razi University, Robert Browne, Royal Zoological Society of Antwerp

The Kurdistan Newt (*Neurergus microspilotus*) has been held in zoological organizations since 1916 (Nesterov, 1916), but available information on conservation, behaviour and ecology of this newt is scarce. Some data on conservation and ecology of the Kurdistan Newt have been obtained via recent studies (Rastegar-Pouyani et al, 2005; In press (a,b), submitted; Rastegar-Pouyani, 2006). Nonetheless our knowledge for making a frame to conserve and protect the Kurdistan Newt is insufficient. On the basis of this fact, a group of people from Razi University, Kermanshah, Iran motivated to undertake this project, and collect comprehensive information on various aspects of biology, natural history and conservation of the Kurdistan Newt.

An adult Kurdistan Newt, *Neurergus microspilotus*, perching on the rubble stones in the Dorisan region, between Ravansar and Paveh, northwestern Kermanshah province. Along with a captive breeding program at Razi University in Iran, extensive field work has been conducted in almost the whole range of distribution of this species in Kermanshah and southern Kurdistan. Photo: Nasrullah Rastegar-Pouyani.

Through March to July 2012, the *Neurergus* team members performed extensive *in situ* investigations in the areas of distribution of the Kurdistan Newt and gathered invaluable data on various aspects of conservation and natural history of this taxon (Rastegar-Pouyani et al, In press (a,b), Submitted). As well, through constructing a series of high performance aquaria, small populations of the Kurdistan Newt were kept in captivity to establish a captive breeding program for the species.

Through these investigations, we studied the effect of water chemistry and other non-biotic and biotic variables on the habitat selection of the Kurdistan Newt, and statistical comparison has been made between chemical analysis of water and habitat suitability as two main ecological components for habitat selection by this newt. Other significant factors of the surrounding water including pH, conductance, alkalinity, temperature, sodium, potassium, calcium, magnesium, iron, cadmium, fluorine, chlorine, nitrate, phosphate, sulphate were indicated.

The second topic in our investigation on this taxon was the ecology of the Kurdistan Newt population and conservation with an appraisal of the potential impact of urbanization. In this study we paid attention to habitats threats, statistical discrimination between conductivity and pH of water as a factor for indicating the affectability of habitats by urbanization, and the relationship between the increase of ambient temperature and the presence and density of newts through Spring. Separate studies of the sexual size dimorphism in the species were undertaken and it was shown that there is a relatively clear pattern of sexual dimorphism in the size between the sexes of this species, which is important in an evolutionary and systematic context.

From March 2013, we will continue to broaden our studies on various aspects of conservation and natural history of the Kurdistan newt and possibly the Loristan Newt, *N. kaiseri*.

Mohesn Takesh (now a PhD candidate) (left) and Professor Nasrullah Rastegar-Pouyani (right) (the project leader) checking a small water hole in the hope to find a trace of the Kurdistan Newt in the Kawat region. Photo: Nasrullah Rastegar-Pouyani.

Some major topics of our future investigations are:

- Continuing swab-preparation to determine the prevalence of chytridiomycosis in the Kurdistan newt
- Molecular studies
- Indicating the degree of asynchronization among populations in different localities
- Appraisaling the role of sexual size dimorphism in mating behaviour
- Population studies: sex ratio, natural threats, the effect of environmental and habitat variables on presence and density of the Kurdistan newt.

For more information please email Nasrullah Rastegar-Pouyani nasrullah.r@gmail.com

Literature cited

Nesterov P. V. (1916), "Trois formes nouvelles d'amphibies (Urodela) du Kurdistan," *Ezhegod, Mus. Zool. Nauk, Petrograd*, 21, 1 – 30 [in Russian].

Rastegar-Pouyani, N., M. Sharifi And S. Assadian. 2005. Analysis of Geographic Variation within Populations of *Neurergus microspilotus* and between *N. kaiseri* and *N. microspilotus* (Caudata: Salamandridae). *Russian Journal of Herpetology* 12(2): 127–134.

Rastegar-Pouyani, N. 2006. Conservation and distribution of *Neurergus microspilotus* (Caudata: Salamandridae) in the Zagros Mountains, Kermanshah Province, Western Iran. In Vences, M., J. Köhler, T. Ziegler, W. Böhme (eds), Herpetologia Bonnensis II. Proceedings of the 13th General Meeting of the Societas Europeae. Herpetologica 115–117.

Rastegar-Pouyani, N., M. Takesh, A. Fattahi and R. Browne (In press, a). Sexual dimorphism in the yellow-spotted newt, *Neurergus microspilotus* Nesterov, 1917 (Caudata: Salamandridae), from Kermanshah Province, Western Iran (Russian Journal of Herpetology).

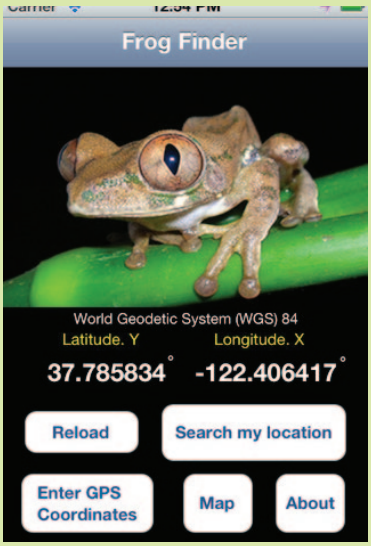
Rastegar-Pouyani, N., M. Takesh, A. Fattahi, M. Sadeghi, F. Khorshidi, , D. Naderi and R. Browne (In press, b). Ecology of Kurdistan Newt (*Neurergus microspilotus*: Salamandridae): Population and Conservation with an Appraisal of the Potential Impact of Urbanization (Amphibian-Reptile Conservation).

Rastegar-Pouyani, N., M. Takesh, A. Fattahi, M. Sadeghi, F. Khorshidi, , D. Naderi and R. Browne (Submitted). The effect of water chemistry and other habitat variables on the habitat selection of the Kurdistan newt, *Neurergus microspilotus* (Amphibia-Reptilia).

The Frog Finder

Find frog species that occur in your area, or anywhere in the world

The new Frog Finder app for iPhone and iPad is a unique smartphone guide for searching worldwide frog and toad distributions. It is designed for amphibian researchers, naturalists, educators, hobbyists and anyone interested in knowing species that might occur - or may have once occurred - in specific locations.



The Frog Finder searches spatial data provided by the 2010 IUCN Red List of Threatened Species. Search results show intersections between map coordinates and IUCN ranges (see www.iucnredlist.org/technical-documents/spatial-data) for 5,561 of the world's frog and toad species. Results do not guarantee presence or absence of species, but simply indicate species with ranges that extend over the user's location or designated coordinates. Ranges in this case are based on WGS 84 map layers scaled to zoom level 10. Searches are accurate to within 153 meters.

The Frog Finder was created by Seungkeol Choe and Jeff Rice, with support from the University of Utah J. Willard Marriott Library in conjunction with the Western Soundscape Archive and the Encyclopedia of Puget Sound at the University of Washington. Special thanks to James Reynolds for his comprehensive advice on iPhone app development, and to AmphibiaWeb (www.amphibiaweb.org) for allowing us to link to their online species accounts. Photo of *Leptopelis occidentals* copyright © 2012 by Adam Leache. All rights reserved. Photo used by permission.

You can download the free Frog Finder iPhone app from the iTunes store, http://itunes.apple.com/us/app/frog-finder/id564537481. This app is designed for both iPhone and iPad.

Requirements: Compatible with iPhone 3GS, iPhone 4, iPhone 4S, iPhone 5, iPod touch (3rd generation), iPod touch (4th generation), iPod touch (5th generation) and iPad. Requires iOS 5.0 or later.

Copyright © 2012 by Seungkeol Choe and Jeff Rice. All rights reserved. For more information, please contact celebratedfrogs@me.com.

The recovery program for the Houston Toad

Paul Crump, Amphibian Program Coordinator, Houston Zoo and Cassidy Johnson, Houston Toad Keeper and Research Technician, Houston Zoo

A male Houston Toad calling. It is estimated that only around 100 adult toads may remain in the wild Photo: Paul Crump.

The Houston Toad (*Anaxyrus houstonensis*), endemic to the forested, sandy soils of east-central Texas, has the unfortunate distinction as the first amphibian to have been included on the U.S. Endangered Species List in 1973. The toad was extirpated from its namesake city in the 1960s and is likely gone from about 25% of its former range. As of today, only a few small and scattered populations exist in nine Texas counties. Habitat fragmentation, urban development, and natural disasters continue to pose significant threats to the toad's survival. While in the midst of a severe drought that plagued the state in 2011, the Labor Day Bastrop-Complex wildfires started and burned around 35,000 acres. The fire is believed to have destroyed approximately 40% of the toad's habitat in Bastrop County, the county with the most robust toad populations, and all the toad habitat found in Bastrop State Park, the only protected area in which this species occurs. It is estimated that only around 100 adult toads may remain in the wild; therefore continuing efforts to preserve and protect the Houston Toad are more critical now than ever.

In 2006, the Houston Zoo, in collaboration with Texas State University, U.S. Fish and Wildlife Service (USFWS), and the Texas Parks and Wildlife Department (TPWD) started a Houston Toad captive assurance colony and head-start program in which wild egg strands are collected and larvae are raised in captivity for release in order to supplement wild populations. The zoo facility is approximately 1,200 sq ft and divided into three biosecure rooms. We also have four outdoor exclosure tubs containing preferred toad substrates, as well as an outdoor "caged" quarantine area for cycling toads with the intent to stimulate natural reproduction. The facility currently houses around 600 toads in the captive assurance colony and about 1,200 adult toads that are slated for release in spring 2013.

The majority of land in Texas is privately owned; therefore, the survival of the toad will depend on the interest and commitment of landowners to preserve and protect critical habitat. Traditionally, the USFWS and TPWD have focused attention predominately on the Bastrop County area. Since 2008, Zoo staff has been actively fostering relationships with individuals who own property in other areas of the range of the Houston toad. In February 2012, the Zoo, Texas Forest Service, and Agrilife Extension partnered in hosting a "Wildlife, Woodlands and Drought" workshop in the town of Cat Spring, Texas, where over 200 landowners watched presentations with topics covering forest resiliency, wildlife management, Houston Toad ecology, and landowner cost-share and assistance programs. To date, over twenty-five private landowners, totalling nearly 5,000 acres have expressed interest and are participating in restoration and stewardship efforts to some degree. Education and public outreach are also critical to procure the public's interest in this rapidly vanishing species. In September 2012, the Houston Zoo in partnership with TPWD and Amphibian Ark held the first ever Houston Toad Educators Workshop at McKinney Roughs in Bastrop, Texas (see article on page 5 for details).

One of the rooms in the Houston Toad quarantine facility at Houston Zoo. Three dedicated technicians work on the project at the Zoo and in the field. Photo: Paul Crump.

The *ex situ* conservation component has been well integrated into the overall recovery strategy for the Houston Toad since the start of this current round of conservation efforts for this species. The USFWS recognized early on that captive propagation would have to play a role in bringing this species back from the brink. They encouraged the development of captive breeding protocols, along with head-starting, and provided some funds through a Preventing Extinction grant to enable it. To date we have captive bred and produced seven egg strands from individuals from Bastrop County, all using assisted reproductive techniques with the assistance of Dr. Andy Kouba. We look forward to producing second generation captive-bred animals in the coming years and experimenting with and encouraging natural reproduction. Meeting the demands of the draft reintroduction plan, which could call for as many as one million tadpoles to be released each year, will be a test. Along with our colleagues at the Fort Worth and Dallas Zoos, we feel ready for the challenge. As we all know though, not everything always goes as planned.

Like all release programs, we maintain constant vigilance for diseases thanks to a wonderful working relationship with our Veterinary Services Department. Mycobacteria, Chlamydophila, and Ranavirus have all been detected in the captive colony. Some have little clinical significance but are of release concern for wild populations, others are artifacts of a dense captive setting and are ubiquitous in nature and are of little threat to wild populations.

The Houston Toad program is still in its infancy when compared to other long-term bufonid conservation programs, such as the

A Houston Toad in one of the Zoo's new outdoor exclosures. The facility at Houston Zoo currently houses around 600 toads. Photo: Cassidy Johnson.

Puerto Rican Crested Toad and Wyoming Toad programs. However, we have been able to "stand on the shoulders" of these giants and bypass a decade of research into such things as nutrition, assisted reproduction, release procedures, and disease management, saving much effort and buying precious time that this species does not have.

Since 2007, we have head-started thirty-one partial egg strands and put over 20,000 Houston toads back into the wild at ten different sites in three counties. No head-starting occurred in the last two years due to space constraints in the facility. Head-starting success has been mixed and difficult to determine conclusively. Drought and difficulty relocating released toads on private property has interfered with evaluations. We recently published a report that detailed the release procedures and results in the *2011 Global Reintroduction Perspectives* by the IUCN (Forstner and Crump, 2011. Houston toad population supplementation in Texas, USA. p.71-76).

From its humble beginnings in 2007, tucked away in an old, disused behind-the-scenes aviary, the current Houston Toad program now includes three institutions with over 700 individuals in the captive assurance colony. The Houston Zoo now as has dedicated breeding facilities, three dedicated technicians working on the project at the Zoo and in the field, and a growing army of supporters throughout Texas. Although the path is long and arduous, it's time to create space in the future for this Texan in trouble.

An update on the amphibian programs at Perth Zoo

Kay Bradfield, Supervisor Native Species Breeding Program, Perth Zoo

In late September, Perth Zoo and Western Australian Department of Environment and Conservation (DEC) staff released 44 juvenile White-bellied Frogs (*Geocrinia alba*) into the wild in the south west of the State. Five of the frogs were bred at Perth Zoo and 39 were head-started at the Zoo; this was the first release of captive-bred White-bellied Frogs to the wild.

A small group of juveniles was retained at the Zoo for future use in the breeding program.

The frogs were released at the same site that frogs were released to in 2010 and 2011, bringing the total number of frogs released at this site to 145. Monitoring of the release site by DEC staff confirms the presence of a sizeable group of adult frogs.

White-bellied Frog (*Geocrinia alba*). Photo: Perth Zoo.

Perth Zoo and DEC staff also released 20 head-started Orange-bellied Frogs (*G. vitellina*) to supplement numbers at a translocation site in Blackwood River National Park in the state's south-west.

Following the frog releases, Zoo staff spent time in the field searching for and collecting egg clutches of both species to bring back to the Zoo for our head-starting programs. In the wild, *Geocrinia* clutches are subject to high levels of mortality, due largely to predation by invertebrates. Head-starting protects them through this highly vulnerable stage. We collected five *G. alba* clutches and ten clutches of *G. vitellina*, and metamorphs started emerging in mid-November. These will be reared at the Zoo through until spring 2013, when they will be released to the wild.

Volunteer opportunities with amphibian field projects

Amphibian Ark's Frog MatchMaker program (www.FrogMatchMaker.com) currently includes 56 amphibian conservation programs from 24 countries that are hoping to find support for their programs. Although many of these programs are hoping for financial support, we've recently started identifying programs that are in need of volunteers to help with their programs. So far, six conservation projects in Bolivia, Brazil, Ecuador, Kenya, Mexico and Vietnam, and all looking for volunteers to help in various ways.

Volunteer opportunities currently exist for field work, research, lab assistants and data recording. If you'd like to support these projects by offering a little of your time, the project coordinators would love to hear from you.

For more information about those projects seeking volunteer help, please visit www.amphibianark.org/volunteer-opportunities.htm.

The Splendid Leaf Frog (*Cruziohyla calcarifer*).
Photo courtesy of Ron Holt.

Sustainable Amphibian Conservation of the Americas Symposium

July 31- August 4, 2013, Siquirres, Costa Rica

A celebration of amphibian conservation efforts in Latin America and beyond, this event is open to the public and welcomes participation from amphibian enthusiasts, researchers, zoo professionals, students, amphibian conservationists, as well as frog lovers of all kinds.

The program will consist of five days of lectures, presentations, and round-table discussions featuring sixteen accomplished researchers, biologists and other professionals associated in the field of amphibian study and conservation. Additionally, there will be exciting and interesting field trips and tours which will leave you with a comprehensive understanding of why sustainable amphibian conservation is so important.

The main force behind this symposium is to act as an exciting and educational fundraising event for conservation organizations like the Costa Rican Amphibian Research Center, Wikiri of Ecuador, Mitsinjo of Madagascar, and Tesoros of Colombia. Proceeds will directly benefit these organizations. Space is limited so early registration is encouraged.

The location in Siquirres, Costa Rica has been chosen in part due to its close proximity to the Costa Rican Amphibian Research Center (CRARC) and also because its rainforests offer access to some of the most diverse biotypes and amphibian densities in the world.

For more information see www.anuran.org.

Amphibian Ark donors, January-October 2012

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

***Sustaining Donors**

Up to $51,000

Chester Zoo
Ronna Erickson
Josie Lowman*
George Rabb, in honor of Mary Sughrue Rabb
St. Louis Zoo

Up to $10,000

Allwetterzoo Münster
AZAD 2010 Planning Committee Volunteers, Chicago Zoological Society
Bristol Zoo
Columbus Zoo & Aquarium
Denver Zoo*
The Living Desert
Woodland Park Zoo
Kate Woodle
Zoo Garten Leipzig
Zoos South Australia

Up to $5,000

Andrew Sabin Family Foundation*
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
Julia Hertl
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
Benjamin Winterbourne

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
Marvin Goldberg
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
Paul Pearce Kelly
Raymond Picciano
Julia Rampe
Sara Rex
Robert & Matthew Scherer
Bruce Staska
Sam Stroud
Georgette Taylor
Laura Twardy
Angela Van Dyck
David & Marvalee Wake
Georgeanne Wilcox

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
Kate Madin
Kanako Nishimoto
Kathryn Norman
Lloyd O'Brien Jr.
In memory of Sally Rice
Crystal Robertson
Doug Scrimager
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 Dininno
Kathryn Dorn
Jill Dupaski
Darby FitzSimmons
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