amphibian ark

Keeping threatened amphibian species afloat

Newsletter

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In this issue...

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Towards the long-term conservation of Valcheta's Frog - the first program to reintroduce threatened amphibians in Argentina

Federico Kacoliris, Melina Velasco, Jorge Williams and Dra. María Luz Arellano, Division of Vertebrate Zoology, Faculty of Natural Sciences and Museum of La Plata, Argentina

The Critically Endangered Valcheta's Frog (*Pleurodema somuncurense*), is restricted to an isolated area of only ten square kilometers, where it faces a number of threats. Photo: Melina Velasco.

Valcheta's Frog (*Pleurodema somuncurense*), is a microendemic species of the headwaters of the Valcheta stream, located in the remote Somuncura Plateau, Patagonia, in Argentina. This stream originates from hot springs, which means that the first five kilometers have high temperatures throughout the year, which is unusual for a Patagonian stream. Because the Valcheta's Frog has adapted to live in these warm waters, its total range of distribution is restricted to an isolated area of only ten square kilometers. This makes the species vulnerable to all problems associated with small populations, such as inbreeding and environmental and biological stochasticity. Additionally the Valcheta's Frog faces a number of other challenges, including fragmentation and deterioration of its natural habitats, predation by exotic trout and chytrid fungus (*Batrachochytrium dendrobatidis*). Although the actual effect and interaction between these threats is still the subject of studies, the consequences are evident and to date, at least two sub-populations of this species have disappeared from sites of historical occurrence. All this has led to the species being listed as Critically Endangered in the IUCN Red List (IUCN, 2016) and as Endangered in the National Red List for Argentina (Vaira et al., 2012).

Local school children were involved with the first release of captive-bred Valcheta's Frogs (*Pleurodema somuncurense*) into restored and protected habitat. Photo: Melina Velasco.

In order to promote the long-term conservation of Valcheta's Frog and other threatened and endemic species of the Somuncura Plateau, in 2012 we established the "Wild Plateau Initiative". Our activities focus on reducing threats, habitat restoration and raising awareness within the local community. However, seeing that the situation facing Valcheta's Frog was at a very delicate point and that the natural recovery of its populations was unlikely, we decided to develop a captive breeding and reintroduction program to promote the long-term survival of this species.

With support from an Amphibian Ark seed grant, the Cururu Program (Museum of La Plata) and the Felix de Azara Foundation, in 2014 we created the first rescue center for threatened amphibians in Argentina and in February 2015 we established twenty breeding pairs of Valcheta's Frogs in enclosures specially designed to replicate their natural environments. The animals adapted to the captive conditions very well and about a year and a half

later we achieved the first successful breeding of the species in captivity. About fifteen clutches were produced, with approximately 300 individuals reaching metamorphosis. These juvenile individuals underwent diagnostic evaluations to establish their health status and after confirming their good general health we decided to carry out the first experimental reintroduction of the species. Each individual was identified with a unique marking code through the application of Visible Implant Elastomer (VIE) tags.

For the first reintroduction attempts, we selected a site where the species occurred historically, but the original population disappeared after the habitat was highly disturbed by the construction of an artificial dam that resulted in an increase of environmental pressure from cattle. After offering the local people an alternative to the dam, we proceeded to destroy part of the dam to restore the original course of the stream. At the same time we fenced the area to prevent the entry of livestock. As a result, the original environment was quickly restored. This particular site is free of trout due to the existence of a downstream cascade that acts as a barrier preventing the entry of these exotic predators.

Before: The original population of Valcheta's Frog disappeared from one area after a dam was created for cattle. Photo: Melina Velasco.

After: Part of the dam was destroyed to restore the original course of the stream, and the area was fenced to exclude livestock. Photo: Melina Velasco.

In March 2017, with support from the Secretariat of Environment and Sustainable Development of Río Negro (SAyDS, a government entity in charge of the Somuncura Plateau), we transported 196 individuals born in captivity from the rescue center to their natural environment. In an event attended by students and teachers of the local school, park rangers from the SAyDS, local residents and the members of this project, the young froglets were released at the selected site. Each student named and then released a frog. Since each animal has a unique individual VIE tag, future follow-up will allow students to be updated on the health status and size of their individual animals.

After the release we implemented a monitoring protocol so we could confirm that the individuals were feeding naturally in the wild habitat, and showing signs of good general health. Continuous annual monitoring will allow us to assess the degree of resistance of the animals to the cold winter months. However, we will have to wait a few years until we have conclusive evidence of successful reestablishment of these animals, since this will be based on successful reproductive activity (i.e. released animals reaching maturity and then successfully reproducing).

This first experimental release will provide key information for the successful development of the next steps in the reintroduction program for the Valcheta's Frog. These next steps are based on ongoing supplementation of this wild population, including the reintroduction and subsequent supplementation of at least two other populations and the creation of threat-free corridors to allow movement of animals between the populations. In preparation for this a management program for the exotic trout in Arroyo Valcheta will begin during the second half of 2017.

The release of these individuals represents the first reintroduction of captive-bred amphibians in Argentina and one of the few currently under development in South America. We hope that the information generated will serve as a basis for the development of future neotropical amphibian conservation programs. Although there is still a lot of work to do, we are happy to know that we are a few steps closer to our final goal, which is to achieve the long-term survival of the Valcheta's Frogs in the wild.

2017 Amphibian Ark seed grant winners

We're very excited to announce two excellent new projects that have recently been awarded Amphibian Ark Seed Grants. We look forward to seeing great progress and success for both of these programs.

A second round of AArk seed grant applications will be accepted in the second half of 2017. Please check the AArk web site, www.amphibianark.org and our Facebook page, www.facebook.com/AmphibianArk/ in a few months time, for more information.

AArk's $5,000 competitive Seed Grants are designed to fund small start-up projects that are in need of seed money in order to build successful long-term programs that attract larger funding. More information about the grants can be found on the Seed Grant page (www.amphibianark.org/aark-seed-grant/), and all past grant recipients can be seen on the Seed Grant Winners page (www.amphibianark.org/seed-grant-winners/). We would like to acknowledge the generous support of the following individuals and organizations for establishing and supporting these grants: The Wildlife Conservation Society, the Andrew Sabin Family Foundation, Chester Zoo, Ronna Erickson, Josie Lowman, Woodland Park Zoo, the European Association of Zoos and Aquariums and the Naples Zoo, Florida.

The recipients of seed grants in 2017 are:

- Reintroduction of the Northern Pool Frog to the UK, Jim Forster, Amphibian and Reptile Conservation Trust, Bournemouth, United Kingdom
- Guanajuato Program for the rescue of the Big-footed Leopard Frog, L.A.E. Rubén David Rocha Lemus, Leon Zoo, Guanajuato, Mexico

Reintroduction of the Northern Pool Frog to the UK

Jim Forster, Amphibian and Reptile Conservation Trust, Bournemouth, United Kingdom

The Northern Pool Frog (*Pelophylax lessonae*) became extinct in the UK in 1995, largely as a result of habitat loss and deterioration. A reintroduction program initiated by the Amphibian and Reptile Conservation (ARC) Trust and partners in 2005 has restored one population to a specially prepared UK site using wild-to-wild translocation of Swedish founders. Whilst that intervention appears to be successful to date, the result is that UK has had only a single population of Northern Pool Frogs in recent years. This is clearly a perilous situation: should any harm come to that population, the species would again risk being extirpated from the UK. Therefore, the ARC Trust has been working to establish a second population. The outcome of this carefully planned *ex situ* intervention will be that the UK conservation status of the Northern Pool Frog will be considerably improved, via the establishment of a second viable population. The Northern Pool Frog is the UK's rarest amphibian species, and is strictly protected by national and European legislation.

The complete project proposal can be viewed at www.amphibianark.org/seed_grants/Northern-Pool-Frog.pdf.

Guanajuato program for the rescue of the Big-footed Leopard Frog

L.A.E. Rubén David Rocha Lemus, Leon Zoo, Guanajuato, Mexico

Given the situation that amphibians face nowadays and the little study that exists in their regard in the state of Guanajuato, Mexico; the Leon Zoo decided to join the amphibian conservation efforts worldwide. We intend to do this by developing a conservation program for the Big-footed Leopard Frog (*Lithobates megapoda*) that includes the creation of efficient protocols for *ex situ* breeding and husbandry, mitigation of the identified threats that this species faces, and working along with the community about the importance of conservation and protection of the Big-footed Leopard Frog. The Amphibian Ark funds will help start the project and obtain the necessary equipment and materials that will be required in the *ex situ* conservation laboratory.

The complete project proposal can be viewed at www.amphibianark.org/seed_grants/Big-footed-Leopard-Frog.pdf.

The whistling sapphire of Merida is whistling again!

Enrique La Marca, Center for the Conservation of Venezuelan Andean Reptiles and Amphibians, Venezuela

As cities continue to develop, it is expected that their natural spaces will disappear to give rise to large urbanized lots or others that are part of the urban fabric. In this process of transformation of nature, many populations of various species are displaced or end up becoming extinct. This is the case for the amphibians inhabiting the Merida terrace, an extensive natural formation resulting from the sediments of four mountain rivers in the middle basin of the Chama River, in the Cordillera de Mérida, Andes of Venezuela. The Common Toad (*Rhinella marina*), Banana Frog (*Boana* cf. *xerophyla*), Merida's Collared Frog (*Mannophryne collaris*) and the Merida's Whistling Frog (*Leptodactylus* sp.) can all be found in that area. The first two are common species, probably invasive of the altered habitats. The last two are endemic to the metropolitan area of Mérida and its surroundings, and are threatened.

Within the endangered species rescue program of the Center for the Conservation of Venezuelan Andean Reptiles and Amphibians (CC-RAAV), we chose these last two species for *ex situ* programs to recover and protect isolated populations, and to reintroduce captive-bred animals back to the wild. The Merida's Collared Frog program has been running for a little more than two years and has paid off, as has the *Leptodactylus* program, which has been running for just over a year. The joint management of these amphibians can serve as an example for cases in which more than one species is threatened within the same ecological unit. In our case, the environments of premontane humid forest where these frogs live have been almost completely destroyed in the urban parts and severely fragmented in the rural ones, mainly because that area is better for growing coffee, requiring selective or total felling of the primeval forest environment.

The case of the Merida's Whistling Frog is very interesting because it is a little showy species and little known. We have not yet been able to determine its taxonomic identity and we are trying to compare it with material from other species of the same genus that are housed in foreign museums. If not described, it would be another case in which a species is threatened with extinction without having been formally classified for science. If it corresponds to another species whose name should be revived from the neglect of museums, it would be another case in which scientific collections serve as valuable support for conservation programs.

The whistling sapphire of Merida has returned to sing in the Botanical Garden of Mérida, a protected natural area within the system of the Metropolitan Park of the river Albarregas where we have established a pilot plan for the reintroduction of the species. A new population has recently been established here in relatively open environments that we conditioned through the construction of artificial lagoons. In another part of the city we are working together with the local communities and the municipal mayor to protect a wooded lot where the species can still be found, but these might be the last remnants of this species on the terrace. In this way, we are trying to combine efforts between the organized community (community and neighbourhood councils), official bodies (Ministry of the Environment, National Parks Institute), the University of Los Andes, and non-governmental organizations (Biocontacto, Biogeos), for the survival of another endangered species that was once common in places where it has been displaced by man.

A conservation breeding program for the Merida's Whistling Frog (*Leptodactylus* sp.) has been established in Venezuela, to recover and protect isolated populations, and to reintroduce captive-bred animals back to the wild.
Photo: Christian Reymondin.

A clutch of Merida's Whistling Frog eggs at the Center for the Conservation of Venezuelan Andean Reptiles and Amphibians. Photo: Enrique La Marca.

An adult Merida's Whistling Frog, along with the newly-hatched tadpoles. Most of these tadpoles were eventually released into repatriated land in the Botanical Garden of Mérida.
Photo: Enrique La Marca.

Upgrades to Conservation Needs Assessment web site

Kevin Johnson, Taxon Officer, Amphibian Ark

Conservation resources are limited, and with thousands of threatened species in need of help, the Conservation Needs Assessment process managed by Amphibian Ark objectively and consistently identifies priority species and their immediate conservation needs.

The Conservation Needs Assessment process was initially developed in 2006, during an Amphibian *Ex Situ* Conservation Planning workshop in El Valle de Anton, Panama, when a taxon selection and prioritization working group developed a decision tree for the selection and prioritization of species that are most in need of *ex situ* (captive) assistance. Since then, the process has been further reviewed and refined, and evolved into the Conservation Needs Assessment process, which now generates prioritized recommendations for both *in situ* (in the wild) and *ex situ* conservation actions. The assessment process has proven to be a logical, transparent, and repeatable procedure for guiding amphibian conservation activities within a country or region.

Between 2007 and the end of 2014, the conservation needs of 3,375 (46%) of the world's amphibian species were assessed during twenty-six national or regional workshops. With funding for physical workshops becoming scarce, an online application was created to replicate the assessment process, as a solution for ensuring assessments could continue, and recommendations for conservation actions could continue to be generated (www.ConservationNeeds.org). In late 2014 the online assessment program was developed, with support from the European Association of Zoos and Aquaria (EAZA), the Zoo and Aquarium Association (ZAA) and the Association of Zoos & Aquariums (AZA), with previous assessments being migrated into the online database. The online program was launched in early 2015.

Now, just over two years later, the online version assessment tool has been used to develop 407 assessments in 14 countries, with 366 of these being completed. Assessors and other users have provided great feedback on using the program, with a number of excellent suggestions being made for modifications and additions. We have just released a second version of the program, with many additions and improvements, including:

- Added a new report - Species recommended for *ex situ* rescue. This report includes all species in a selected country which have been recommended for *ex situ* rescue, with options to include those that do or don't have potential founders available; habitat for reintroduction available, and/or a complete taxonomic analysis done. The report can be sorted by priority or in taxonomic order, and is excellent for assisting with selection of potential species for new *ex situ* rescue programs.
- Definitions of all actions included in the Recommended Conservation Actions section of each assessment can now be seen from the assessment page by hovering the mouse over each of the conservation actions.
- Added the number of assessments which match the search criteria selected on the View Assessments and Add Assessments screens (e.g. 16 completed assessments for *Mantella* in Madagascar).
- Added a summary of the numbers recommended for each conservation action in a selected country in the National Recommended Conservation Actions report, e.g.

  Recommended Conservation Actions in Ecuador:
  55 recommendations for Rescue
  202 recommendations for *In Situ* Conservation
  185 recommendations for *In Situ* Research
  10 recommendations for *Ex Situ* Research
  61 recommendations for Conservation Education
  55 recommendations for Biobanking
  17 recommendations for No Conservation Actions

- Linkages with CalPhotos photo library improved. All assessments now include a link to any existing photos of the species in the CalPhotos database.
- The number of rows in results grids (e.g. on the View Assessments page, and in reports) has been increased from 25 to 50. This reduces the number of pages required to view all results matching your selection criteria when many results are included on screen.
- Added a new filtering option on the Add Assessments page, which allows filtering of species lists to include all species that already have assessments, or all species that do not yet have assessments.
- Notes prompting additional research are automatically inserted into assessment comments under certain conditions. If the answer to the question "Are sufficient animals of the taxon available or potentially available (from wild or captive sources) to initiate the specified *ex situ* program?" is Unknown, the comment "Research into availability of founders needs to be prioritized" is added to the assessment. If the answer to the question "Has a complete taxonomic analysis of the species in the wild been carried out, to fully understand the functional unit you wish to conserve (i.e. have species limits been determined)?" is "No", the comment "Research into species validity needs to be prioritized" is added to the assessment.
- Outdated assessments can now be archived. If a new assessment for a species has been made, the older one can be marked as "archived", and the archived assessment is no longer included in consolidated assessments for the species, although the outdated assessment can still be viewed.
- Minor program bugs corrected.

We are currently working on adding all synonyms to the species database, to allow species to be found using their current names or any synonyms. Our species list is also being updated to follow the taxonomy the in AmphibiaWeb species list (see http://amphibiaweb.org/taxonomy/index.html), and this will also allow our species list to be updated automatically, as changes are made to the AmphibiaWeb species list.

The online Conservation Needs Assessment program is available at www.ConservationNeeds.org. For more information about amphibian Conservation Needs Assessment, please email info@ConservationNeeds.org.

Amphibian Advocates

In this edition of the AArk Newsletter we're pleased to share news from Mark Mandica from the Amphibian Foundation in the USA. Mark has a long history of involvement with *ex situ* amphibian conservation programs, and will no doubt be well-known to many of our readers.

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

Mark Mandica, Executive Director, Amphibian Foundation, USA

I have always loved amphibians.

Growing up in central New Jersey I didn't have many opportunities to behold frogs and salamanders in nature. Yet this love would eventually develop into a career and passion, leading me to establish and direct the Amphibian Foundation, in Atlanta, USA. The foundation's primary mission is to protect amphibians and their habitats by working with partners to form lasting solutions to the amphibian extinction crisis.

It started in college, where I maintained a healthy passion for these fascinating animals. I had no biological background, but like many frog enthusiasts, I had a pet Argentine Horned Frog (*Ceratophrys ornata*). When he became ill, it was suggested I reach out to the mysterious "frog guy" at the University of Massachusetts. Meeting Dr. Alan Richmond, a professor of comparative anatomy and herpetology, and subsequently taking his herpetology course was a pivotal point in my life. I added two more years to my undergraduate studies when I added biology as a second degree. I became immersed in course and field work. I witnessed Spotted (*Ambystoma maculatum*), Jefferson's (*A. jeffersonianum*) and Marbled Salamander (*A. opacum*) breeding migrations within a year. I also volunteered in the live herpetological collections at the natural history museum. I was hooked.

These projects fuelled my passion and curiosity, but nothing grabbed my attention more than the field of biomechanics and functional morphology of amphibian feeding. While researching how aquatic frogs (family: Pipidae) are able to capture prey (without a tongue or teeth, I might add), I was introduced to scientific illustration. After illustrating the anatomy and associated musculature in the feeding apparatus of the aquatic frog *Hymenochirus*, I realized that I loved illustrating. Creating art for science allows me to learn in a new way and see aspects of biology I may not have otherwise experienced, especially when illustrating a fellow scientist's research.

My developing passion for amphibians was contrasted by an increasing awareness that these animals were in trouble. By the time I reached graduate school at the University of Miami, amphibian declines were documented in pristine and developed areas with some causes remaining elusive. I felt a strong obligation to focus on the conservation of these animals I love so much, so I decided to shift my focus to applied research with conservation goals.

I joined the Atlanta Botanical Garden, which had one of the longest running US amphibian conservation programs. I worked with extremely rare and endangered neotropical species like Eyelash Marsupial Frog (*Gastrotheca cornuta*), Crowned Tree Frog (*Anotheca spinosa*), Lemur Leaf Frog (*Agalychnis lemur*) and Fringed Leaf Frog (*Cruziohyla craspedopus*). Later, I was directing the program and shifted the scope to focus on native US threatened species, such as the Frosted Flatwoods Salamander (*Ambystoma cingulatum*), a relative of the *Ambystoma* salamanders which stole my heart from the beginning. Up until the program was discontinued in 2016, we worked vigilantly to protect amphibian species and increase public awareness.

In August 2016, I founded the Amphibian Foundation, a nonprofit based in Atlanta. Through our partnerships with organizations like Amphibian Ark, we bring hope for amphibians and their advocates at a time where climate and environmental policy is less than encouraging. We develop *ex situ* and *in situ* conservation plans with partners for native southeastern US amphibian species, including the Frosted Flatwoods Salamander and Gopher Frog. We educate and train interns from around the globe to increase capacity towards conserving amphibians. We work in our community through courses, camps and citizen science training to educate and change the public perspective on amphibians and why their declines are important to us, the community, and the world.

Still in our first year of development, the Amphibian Foundation has received steadfast support from the amphibian community across the globe. We appreciate and enjoy the many opportunities to partner and focus on saving amphibians. I envision the foundation growing to wherever we may be of further service to the amphibians and the amphibian conservation community.

Meridian Mist Frog, a threatened Venezuelan frog that deserves conservation efforts

Osmary Leal Peroza and Enrique La Marca, Center for the Conservation of Venezuelan Andean Reptiles and Amphibians, Venezuela

Like many countries in the world, Venezuela has been experiencing an accelerated and drastic decline in its amphibian populations. This is especially noticeable in the Cordillera de Mérida, one of the most biologically diverse regions in the country. The threats faced by frogs are multiple (e.g. climate change; habitat loss and fragmentation; introduction of exotic species; increase of UV-B radiation; agrochemical pollutants; and pathogens such as the chytrid fungus, *Batrachochytrium dendrobatidis*). *Ex situ* conservation may be the last hope of survival for some of them and today, more than ever, *ex situ* management is one of the priority tools in the human fight against extinction.

There are about a dozen species of *Aromobates*, a genus of dendrobatid frogs that inhabit the Venezuelan mountains - the Meridian Mist Frog (*Aromobates meridensis*) is one of them. This rare species that lives among streams in fog forest is perhaps one of the best known in the genus. This does not mean however that there are no gaps in our knowledge of the species, especially in its ecology and conservation. The species faces different threats; among the main ones are the loss of habitat due to agro-pastoral activities, agricultural pollution, and the presence of the exotic Bullfrog (*Lithobates catesbeianus*). Because its area of occupancy is probably less than 10 km^2, all currently known individuals are in remnant populations, and the extent of their habitat is declining, the Meridian Mist Frog has been listed as Critically Endangered in the IUCN Red List.

The critical situation facing this species is what motivated us to undertake an *ex situ* breeding project with the objective of establishing a conservation program with founder stock extracted from the wild, to finally reintroduce captive-bred descendants to their natural habitat. In the course of our experiences we have generated information that has been included in management guidelines (www.amphibianark.org/pdf/Guia-para-el-manejo-de-Aromobates-meridensis.pdf (in Spanish)) as well as a conservation action plan for the species (www.amphibianark.org/pdf/Species-Action-Plan-Aromobates-meridensis.pdf (also in Spanish)).

When we began the program we compiled information about the species, to gain more knowledge about its bioecology and so we could attempt to replicate its wild requirements in captivity. As expected, information was limited, so in three separate field trips

The Meridian Mist Frog (*Aromobates meridensis*) is a Critically Endangered Venezuelan species that faces threats including loss of habitat due to agro-pastoral activities, agricultural pollution, and the presence of the exotic Bullfrog (*Lithobates catesbeianus*). Photo: Enrique La Marca.

we collected data to serve to replicate as accurately as possible the favorable conditions in terrariums. During the first trip we captured a few adult specimens and some tadpoles, to evaluate adaptation to captive conditions. Given the success in maintaining these specimens, in a second trip we collected more specimens in reproductive condition and a large group of tadpoles.

While it is true that we have not yet had eggs laid in captivity, all of the collected tadpoles completed their development and were reintroduced as juveniles to their natural habitat during a third field trip. This undoubtedly represents an important contribution to the population, while generating valuable information about their development in captivity.

One of the immediate plans of the project, which is part of the action plan for the species, is to share knowledge about this species and its natural habitat among regional communities and select educational centers. Given the complex socio-political-economic situation that Venezuela currently faces (April-May 2017), this plan has not yet been implemented, however, the educational program has already been developed and we plan to implement it as soon as conditions improve.

Terrariums for the Meridian Mist Frog at the Center for the Conservation of Venezuelan Andean Reptiles and Amphibians in Venezuela which attempt to replicate the wild conditions where the species is found. Photo: Osmary Leal Peroza.

New opportunity to publish amphibian husbandry articles

Kevin Johnson and Ben Tapley, Co-Chairs, Amphibian Specialist Group Captive Breeding Working Group

There are currently over 200 captive conservation programs for threatened amphibian species around the world, with hundreds more involving less threatened species, where populations are housed for research, conservation education, or for display. In a lot of cases, species have been brought into captivity for the first time, with almost no knowledge of their specific captive needs, and husbandry protocols have been developed, fine-tuned and then adopted by those managing the captive programs. Unfortunately, often all of the knowledge about those husbandry protocols remains within the institution that developed them, and they are seldom published and shared for the benefit of other amphibian program managers. We are really excited to announce a new opportunity for amphibian husbandry articles to be published in *Herpetology Notes* (www.biotaxa.org/hn), an online, open-source journal. All papers published in *Herpetology Notes* are available without charge.

The collaboration with the team at *Herpetology Notes* came about as a result of one of the actions in the Amphibian Specialist Group (ASG) Captive Breeding Working Group's Action Plan, to develop an open access, online journal of amphibian husbandry that publishes tips, techniques, advances, etc. as well as short papers on husbandry. This allows the amphibian *ex situ* conservation community to continually share information and experiences with one another and encourages program managers to publish their experiences. *Herpetology Notes* seemed to be a great fit, and working with an established journal saved us from reinventing the wheel. The folks at *Herpetology Notes* welcome this new initiative and are looking forward to seeing some great amphibian husbandry articles in the future.

Herpetology Notes is published by the Societas Europaea Herpetologica. Manuscripts are edited and typeset by an international team of editors, and a new, separate team of Associate Editors is being created to focus specifically on reviewing and editing amphibian husbandry articles. A new Husbandry section will be created which will be used for both reptile and amphibian husbandry notes and articles. All submitted papers will need to be

conservation-, zoo-, or science-related, they must be written with a "scientific" tone, and the work needs to conform to all existing publication guidelines for *Herpetology Notes* (see www.biotaxa.org/hn/about/submissions#authorGuidelines). Manuscripts that do not follow the editorial style will not be considered for publication and will be returned to the authors.

English is the official language for Herpetology Notes contributions, but Amphibian *Husbandry Notes* articles can also be submitted in Spanish. The submitted articles would be reviewed and edited in Spanish, and then translated to English, with both versions being published. We hope this will be very beneficial for amphibian program managers in Spanish-speaking countries, where there is a very high concentration of *ex situ* amphibian conservation programs.

Herpetology Notes offers an open access forum, which offers relatively fast publication of natural history articles that might not be published in other journals. The addition of the new Husbandry section will provide a great opportunity to share successes (and failures) relating to the development of amphibian husbandry protocols, which in turn will hopefully be of use to other amphibian keepers who are considering working with species with which they are not very familiar. We'd like to encourage all program managers to develop husbandry protocols and guidelines and submit them to *Herpetological Notes*.

A range of species-specific amphibian husbandry guidelines are also available on the Amphibian Ark web site (www.amphibianark.org/husbandry-documents/), as well as templates that can be used when writing husbandry guidelines which are not planned for submission to *Herpetology Notes*.

AArk Newsletter index

The Newsletter page on the Amphibian Ark web site (www.amphibianark.org/aark-newsletter/) now contains an index of all articles in previous AArk Newsletters (www.amphibianark.org/Newsletters/AArk-Newsletter-Index.pdf). So if you are looking for a specific article on amphibian programs, why not search through the index, and click on the links to each Newsletter to read the article.

Adventure of the Achoques in Mexico

Erika Servín, Parque Ecológico Zacango, Mexico

In 2016 we were very fortunate to be awarded an Amphibian Ark seed grant, which was used to developed an *ex situ* conservation project for the Pátzcuaro Axolotl (*Ambystoma dunmerilii*), but why did we choose to work with this species? The Patzcuaro Axolotl, better known as Achoque in its place of origin, is an endemic species from Lake Patzcuaro in Michoacán, Mexico. It is well-known by the locals for many years, as it is thought to have medicinal properties used to treat anemias, poor nutrition and respiratory problems. For a long time it was the most nutritious food that poor people could consume. It also has very particular biological features and has the ability to regenerate tissues.

Nowadays the Achoque is Critically Endangered, mainly due to the destruction of its habitat and to fishing activities. Vey little is known about the species, so it is important for us to learn as much as we can. This is why, with a little push from the Amphibian Ark we decided to undertake this *ex situ* conservation project.

The Patzcuaro Axolotl (*Ambystoma dunmerilii*), better known as Achoque in its place of origin, is an endemic species from Lake Patzcuaro in Michoacán, Mexico. Photo: Erika Servín.

We already had experience with the Xochimilco Axolotl (*Ambystoma mexicanum*) but we needed to learn to take care of this new species. The Achoques that we started the project with came from a breeding center at the convent of the Dominican Nuns of Patzcuaro. Always very kind, Sister Ofelia selected the juveniles which were used to start our new colony, after waiting a few months until we received all the necessary permits that were required, since we are dealing with an endangered species.

We arranged the facilities, and bought aquariums and all the necessary equipment, using the funding from the seed grant. Initially, we began to fix the existing facilities at the Chapultepec Zoo in Mexico City, however it was not possible to run the project there, so the project moved to the Ecological Park Zacango in the State of Mexico, along with the tanks, equipment, and of course the Achoques. We have now collected valuable data that are giving us a more complete idea about the care and management required by the species in captivity. I should mention that the species is very different from the Xochimilco Axolotl: its husbandry, water quality and food requirements have their peculiarities, for example, they are sensitive to high levels of nitrites in the water, they usually eat exclusively on the substrate, and they change color when they are stressed. With this information we are developing a Handbook for Captive Care of the Achoque, which we hope will be useful and as a basis for others to understand the species better, offering the opportunity to increase the number of Achoques. This will allow for more research to be done, gaining a better understanding of the species and in the future, to collaborate with other local institutions and think about a possible reintroduction. The information we are getting also allows us to develop techniques and veterinary medicine for animals in the wild, thus also supporting the conservation of the species.

New facilities for Achoque at the Zacango Ecological Park. Photo: Erika Servín.

This is only the beginning, because we are planning to work on educational programs and to do more scientific research on the species. But this is the interesting part of a seed grant - it's just the beginning, the first impetus for a good project.

Working with Achoques has been a challenge, but also a great pleasure, to watch them grow and feed themselves. This has been a team effort, and it would not have been possible without the support of Lic. Anna Sofía Manzur, Engineer Jorge Domínguez, MVZ's Hugo González, Héctor Castellán, Huitzin Barrera, Juliana Leal, Sister Ofelia and all those who support us every day to take care of this fascinating species.

We hope that this work will help support the conservation of the species in an integral way, helping to safeguard the Achoque, a Mexican species which is emblematic of the Patzcuaro Lake.

Follow the progress of amphibian conservation programs

Kevin Johnson, Taxon Officer, Amphibian Ark

Amphibian Ark has been helping zoos, aquariums and other *ex situ* (captive) facilities to address the captive components of the Amphibian Conservation Action Plan (ACAP, www.amphibianark.org/pdf/ACAP.pdf), to save as many threatened amphibian species as possible. One of the actions from the ACAP is to conduct regular evaluations of each captive program, to determine its relative success or failure, and for the past few years we have attempted to monitor and document the progress of each *ex situ* amphibian program which is specifically linked to conservation or research (see www.amphibianark.org/progress-of-programs). There are now an impressive 230 programs in this list, with 188 of them being active, conservation-related programs. Clicking on the species names in this list will show the most current details for each program, while clicking on the institution name will show all the programs managed by that institution.

The progress of these programs includes a series of key steps and milestones in the progression of successful amphibian conservation programs, including how and where the program is managed, whether the species has been bred in captivity, whether animals have been released back into the wild, and whether the reintroduced animals have subsequently bred in the wild. The programs that we monitor include those assessed during an Amphibian Conservation Needs Assessment (www.ConservationNeeds.org) as needing urgent *ex situ* rescue or research, and similar recommendations in countries where a Conservation Needs Assessment has not yet been carried out.

The online database that is used to document the progress of these programs was developed in 2013 by Canadian Chief Technology Officer, Daryl Manning (http://wakatara.com), currently living in Singapore, who generously donated many hours of his time to build this application for us. The benefits of this online application are that it is easy for us to share a variety of reports online, and that managers of amphibian programs are able to login to the application at any time to update their data. Prior to this, AArk staff sent annual surveys to all program managers, and then manually updated the data into Excel spreadsheets. Over the past couple of months, Daryl has again volunteered his time and has made a number of additions and improvements to the application.

The application is now considerably faster when searching and sorting the data, and we have resolved a couple of small bugs in the program. We've also modified the primary report from the application so it now includes programs which have finished, and are no longer active - these programs are shown with a pink or green background, depending on why they are no longer running.

We have also modified one of the other most-used reports, Programs Needing Support (www.amphibianark.org/programs-needing-support/). This report includes any programs that have indicated that they require some form of additional support in order to best achieve their conservation goals. The programs are grouped by country, and the types of resources required by each program are shown with a red indicator. Clicking on the species name will show the most current details for the program, and in many cases, program managers have included additional information about their resource needs. This is a great tool if you are looking for an existing amphibian conservation program that you'd like to add your support to. The managers' contact details are included in the report.

If you manage an *ex situ* amphibian rescue or husbandry research program, and would like to add or update information about your program, let us know via email at exsituprogress@amphibianark.org and we'll update your information. If you are in need of additional resources for your programs, adding a note about your needs in the database will allow us to try to find the resources you need, as well as providing a means for other people and organizations to find opportunities to support your programs.

As well as fulfilling one of the actions from the ACAP, regular monitoring of *ex situ* conservation programs allows us to see the progress being made towards saving threatened species. Importantly, it also allows people who are considering starting a new conservation program to see which species are already in captive programs, so they can consider alternate species that have been recommended for captive work.

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

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

Dates: September 18th – 22nd, 2017

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

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

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

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

Guatemalan Amphibian Biology, Management and Conservation Training Course

Luis Carrillo, Training Officer, Amphibian Ark

Amphibians are the most endangered group of organisms on the planet, with over one-third of the species threatened with extinction, due to threats ranging from water quality to infectious diseases. Currently Guatemala has more than 145 amphibian species with almost eighty of them threatened, mainly due to habitat lost for timber and habitat modification for crops.

Amphibian Ark and the Universidad del Valle de Guatemala (UVG) have joined forces to offer a training course (in Spanish) at the School of Biology of UVG in 27th November - 1st December 2017.

The Guatemalan Amphibian Biology, Management and Conservation Training Course will build capacity among biologists and other professionals in Guatemala and within the region, with the objectives of:

1. Providing technical skills necessary for long-term management of *ex situ* assurance populations of endangered amphibian species, from species selection to reintroductions, with a focus on husbandry, health, biosecurity and population management.
2. Building a network for practitioners to better work together in taking charge of the conservation of local species.
3. Providing guidance in the establishment of healthy assurance colonies of imperiled amphibian species.

The course will consist of five days of intensive training including lectures, hands-on practical exercises, and case studies. Topics covered during the course will include amphibian biology and management, enclosure design and construction, breeding techniques, biosecurity and disease control, and population management.

In 2010 a Conservation Needs Assessment workshop (www.conservationneeds.org) was organized in Guatemala, where thirty-four species were recommended for *ex situ* rescue (www.amphibianark.org/conservation-programs/rescue-species/); these are species that are in imminent danger of extinction and require *ex situ* management, as part of an integrated program, to ensure their survival. The next logical step is to develop and establish *ex situ* conservation programs within the country for these rescue species, but to do so, there is a need to ensure there are sufficient trained personnel to successfully manage the programs. Amphibian Ark and our partners have a history of delivering successful management and conservation training courses in the past, with sixty *ex situ* conservation training workshops in thirty countries, training almost 2,000 students.

For more information about the course and how to register please contact Luis Carrillo, Training Officer – luis@amphibianark.org.

Cloud Forest Stream Frog (*Ptychohyla euthysanota*). Photo: Alejandra Zamora.

Plectrohyla sagorum. Photo: Alejandra Zamora.

Doflein's Salamander (*Bolitoglossa dofleini*). Photo: Alejandra Zamora.

First-time breeding of frog suggests hope for critically endangered species

Lindsay Renick Mayer, Associate Director of Communications, Global Wildlife Conservation, USA

When researchers discovered the Vanishing Robber Frog (*Craugastor evanesco*) in the rainforests of Panama, they gave it the name Vanishing Robber Frog to signify just how quickly the deadly infectious amphibian disease chytridiomycosis had devastated its population. By the time the researchers had published about the new species in 2010, the Vanishing Robber Frog had already disappeared from the park where they had discovered it.

Now, however, the Vanishing Robber Frog may have a fighting chance at a future thanks to the Panama Amphibian Rescue and Conservation Project, which in December 2016 became the first program to breed the species in human care. After multiple attempts at breeding the species since 2015, a single pair has now produced one offspring—a success that has encouraged a cautious optimism that the rescue project can replicate the effort.

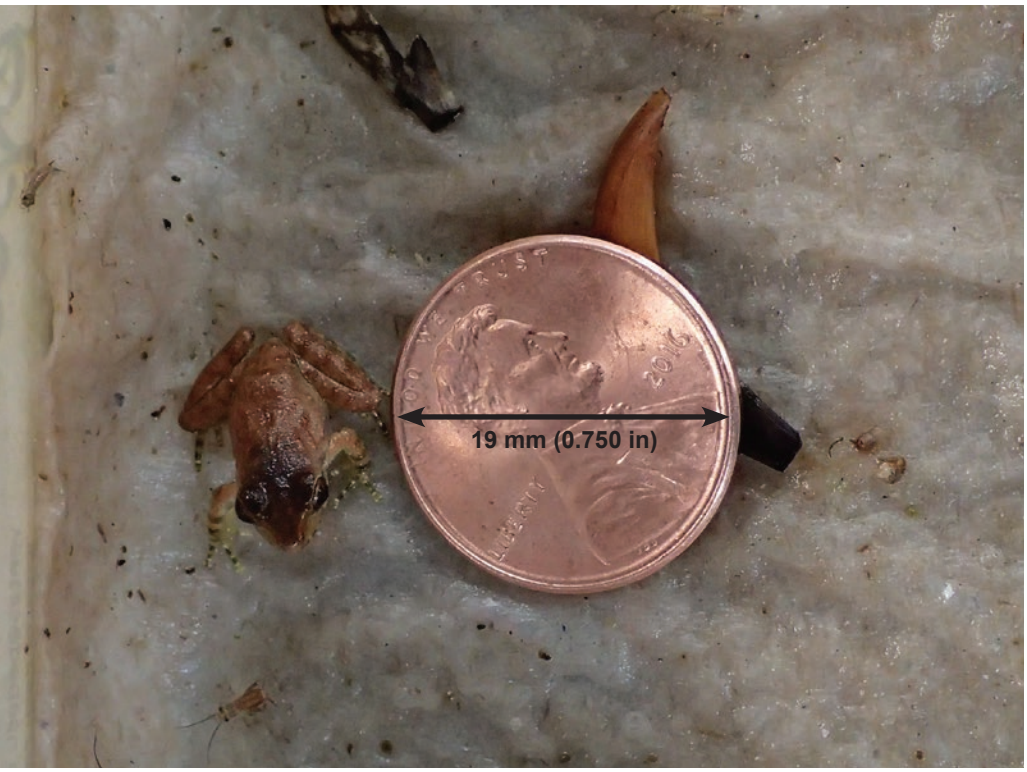
"A single individual doesn't make a successful captive breeding program, but demonstrates that it can be done," says Brian Gratwicke, an amphibian conservation biologist for the Smithsonian Conservation Biology Institute (SCBI) and rescue project international coordinator. "Every journey begins with the first step and this is a critical first step, not just for this species, but potentially for other endangered amphibians with similar reproductive needs."

The rescue project, a world-class amphibian center run by SCBI and the Smithsonian Tropical Research Institute (STRI), currently has a founding population of twenty male and twenty female Vanishing Robber Frogs. Conservationists collected the frogs from a lowland site in central Panama where the rescue project is working with the support of Minera Panamá S.A. to conserve amphibians in the area. But bringing a new and critically endangered species into human care requires learning its own unique husbandry and reproductive needs before it blinks out of existence—sometimes resulting in insurmountable challenges.

"Piecing together a species' natural history with artificial systems, we can recreate to the best of our abilities an environment where the animals feel comfortable enough to breed," said Heidi Ross, STRI's director of the El Valle Amphibian Conservation Center, whose expertise and persistence led to the successful first-time breeding of the species. "If we can get them to this point, to become sexually active in our artificial habitat, then we can simply tweak the system based on what worked, what did not work, and what materials are at our disposal. What we arduously do day in and day out is make sure we are providing the basic needs to the animals so that they help us help them from going extinct in the wild."

The *Craugastor* group of frogs has a unique reproductive system called direct development—they bury eggs in wet sand and fully formed miniature adults hatch from the eggs. Understanding the frogs' reproductive cues, special dietary needs and how to emulate the natural environment is essential to successful breeding, Ross says.

"Given the current difficult situation for amphibians in our region, this project represents scientific and biological hope, not only for this species of frog, but also for the recovery of *Craugastor evanesco* within its distribution range," said Blanca Araúz, biologist and biodiversity superintendent of Minera Panamá. "As one of the species of interest for our project Cobre Panamá, its reproduction in captivity is important. Because the deadly infectious disease acts fast, experienced scientists can control the infection in these frogs and breed them under better conditions."



After multiple attempts at breeding Vanishing Robber Frogs (*Craugastor evanesco*) since 2015, a single pair has now produced one offspring at the Panama Amphibian Rescue and Conservation Project.
Photo: Roberto Ibanez, Smithsonian Tropical Research Institute.

Although scientists are still occasionally finding individual Vanishing Robber Frogs in the field, they have not found a viable, self-sustaining population. Chytridiomycosis has been linked to dramatic population declines of amphibian species worldwide. This particular group of frogs in the *Craugastor rugulosus* series are particularly susceptible to chytridiomycosis with three closely-related species in Panama having disappeared, putting extra pressure on ensuring the survival of *Craugastor evanesco*.

"It's all a learning curve," Gratwicke says. "I'm hopeful that we'll be able to replicate this breeding event to develop a sustainable breeding program. If we can do that, we'll be able to get this species back out in the wild as soon as we figure out how to safely do so. If we can do that, it'll be time to celebrate."

The Panama Amphibian Rescue and Conservation Project is a partnership between the Houston Zoo, Cheyenne Mountain Zoo, Zoo New England, the Smithsonian Conservation Biology Institute and the Smithsonian Tropical Research Institute.

Progress of *ex situ* conservation programs at the Amphibian Conservation Center, Amaru Zoo, Ecuador

Fausto Siavichay Pesántez, Amphibian Conservation Center - Amaru Zoo, Ecuador; Carlos C. Martínez Rivera, Amphibian Conservation Center - Amaru Zoo, Ecuador and Philadelphia Zoo, USA; and Ernesto Arbeláez Ortíz, Amphibian Conservation Center - Amaru Zoo, Ecuador

The Amphibian Conservation Center - AMARU (CCA-AMARU) continues to expand its programs for the conservation of threatened Ecuadorian amphibians. CCA-AMARU's technical staff has worked hard over the past few months on two new projects: one focused on the conservation of endangered amphibians of the Condor Range in the extreme south of Ecuador and another with endangered urban amphibian species from the City of Cuenca .

Both projects have a captive breeding component, which helps us to learn more about these threatened amphibian groups, and to maintain a breeding group and a back-up colony ready for future species release events. For this reason, we have intensified the breeding trials of the threatened species with which we work. Thanks to the support of several public and private institutions we have implemented methodologies and innovative technical processes that have allowed us to breed these species in captivity.

Endangered amphibian project of the Cordillera del Cóndor

The Cordillera del Cóndor is a chain of Amazonian mountains shared by Peru and Ecuador. In Ecuador it occupies the provinces of Morona Santiago and Zamora Chinchipe and it is a relatively remote region, with many inaccessible places that until recently remained mostly unexplored and without much extraction of resources. However mining has become a threat to the biodiversity and human well-being of the region. Large-scale extractive mining activities have eliminated or contaminated the habitats of several species in the region, including the habitat of several species of amphibians. One of these, the Jambue River Glass Frog (*Rulyrana mcdiarmidi*), is a little-known species and although its conservation status has not been officially determined, it is feared that the species faces a high risk of disappearing because of the reduced range and its specific habitat. Another affected species is the Curved Spine Glass Frog (*Espadarana audax*) which is considered threatened due to its distribution in scattered localities of the Amazonian territory of Colombia, Peru and Ecuador.

Thanks to an Amphibian Ark seed grant in 2015, along with the expertise of CCA - AMARU and the Philadelphia Zoo, we were able to complete the necessary adjustments and equipment in our facilities to embark on a new project and receive a group of individuals from both species of glass frogs, which were rescued from a mining concession before a batch of virgin jungle was destroyed in Zamora Chinchipe. So far our population of rescued glass frogs has produced twenty clutches. Although we have not yet succeeded in raising the Jambue River Glass Frog metamorphs to adulthood, we have managed to bring them to Gosner stage 39, with developed limbs and a reduced tail. However we have been more successful with the Curved Spine Glass Frogs and juveniles continue to grow after completing their metamorphosis.

These reproductive events have allowed us to record previously unknown information about the reproduction and larval development of this species: the number of eggs in each mass, embryo development time, the morphometric characteristics of the tadpoles and the conditions of *ex situ* management, such as temperature and humidity, to achieve amplexus and successful spawning. The process has been long though and has required many trials to achieve standardized husbandry protocols for the species, but this has allowed us to learn more about the biology of a species for which very little is known, making it difficult to overcome the problems of *ex situ* management. To date, only the

Metamorph (above) and juvenile (below) Curved Spine Glass Frog (*Espadarana audax*) with legs well developed and in the process of finishing the development process. Photos: Jorge A. Castillo, Tropical Herping.

Jambue River Glass Frog tadpoles in their early stages of development. Foto: Fausto Siavichay.

species description has been worked out, along with evolutionary relationships and some very general data about its natural history.

The presence of saprolegnia in some embryos, as well as the sudden death of the larvae has prevented us from rearing the tadpoles through complete metamorphosis, however the work accomplished so far by biologists and veterinarians at the Amaru Zoo has helped us to overcome practically all of these problems and we are about to take our last batch of tadpoles through the entire development process.

Urban amphibians of the city of Cuenca

The city of Cuenca in Ecuador is in the alluvial plane of several important rivers that descend with waters from the Cajas Massif in the south of the Andes mountain range. This alluvial plane was characterized not only by its fertile lands but by its rivers and cloud forests and other ideal habitats for amphibians. The development of the city and the urban expansion have destroyed almost all of the natural spaces within the city and like other Andean cities, green spaces are dominated by Eucalyptus plantations and rivers populated with trout; two invasive species that have forever altered the ecology of the Andean environment.

The Environmental Management Commission of the Municipality of Cuenca (CGA), together with CCA-AMARU technicians, has created a program for the rescue and management of threatened urban amphibian species from the city of Cuenca. These are endemic species of the region that have been almost or completely extirpated from the city, but still are under a degree of imminent threat in the region. The team is dedicated to saving the following species present in urban environments: *Gastrotheca* aff. *Pseustes*, *Gastrotheca* sp nov. Boulenger's Rocket Frog (*Hyloxalus vertebralis*), Cuenca Nelson Frog (*Ctenophryne aequatorialis*) and Despax's Robber Frog (*Pristimantis riveti*).

This program includes management of natural populations *in situ*, as well as the establishment of rescue populations in permanent

quarantine, which are collected from places which are destined to be destroyed. These rescued populations remain in the CCA-AMARU as an *ex situ* backup population that can be released in the near future as soon as viable habitat within the historical or projected distribution range of the species is identified. At present we have already designated several localities to carry out coordinated releases within the Municipality of Cuenca to guarantee the optimal conditions for the survival of these new populations.

As part of the activities of this project, the CGA and the CCA-AMARU have developed an Urban Amphibian Management Plan for the City of Cuenca, a Manual of Urban Amphibians and a folder of educational material to raise awareness with the public This includes information about amphibian biodiversity in urban areas and a guide to activities that people can carry out to protect them and create the appropriate habitat.

The book can be downloaded free of charge from: http://cga.cuenca.gob.ec/sites/default/files/COMPONENTE%201_%20INVESTIGACION.pdf.

A male Boulenger's Rocket Frog (*Hyloxalus vertebralis*) caring for eggs.
Foto: Fausto Siavichay.

An update from the Amphibian Foundation

Lacey Avery, Communications Coordinator and Mark Mandica, Executive Director, Amphibian Foundation, USA

In January 2017, the Amphibian Foundation traveled to Apalachicola National Forest in Florida's Panhandle (USA) to meet with the Florida Fish and Wildlife Conservation Commission (FFWCC). The Commission had collected hundreds of desiccated Frosted Flatwoods Salamander (*Ambystoma cingulatum*) eggs from breeding sites within the forest. Many of these eggs would stay with FFWC to be included in an assisted-metamorphosis program, but the Foundation brought nearly one hundred eggs back to Atlanta to be hatched, reared, and included in a captive breeding colony.

For those not familiar with this unique amphibian, adult Flatwoods Salamanders are about five inches long, with small heads and fat tails. They have a net-like pattern of light gray or white flecks sprinkled across their dark silver-gray bodies. Only about three percent of their Long Leaf Pine habitat remains, which can be found in the lower Southeastern Coastal Plain of the United States. And they have suffered a ninety percent loss in population since 2000.

Frosted Flatwoods Salamanders (*Ambystoma cingulatum*) have suffered a ninety percent loss in population since 2000. Photo: Mark Mandica.

Each year, the salamanders migrate to breeding ponds in early winter to deposit their eggs in dry basins. The eggs develop for weeks until they are inundated with seasonal rains and their shallow pools fill with water. This year, consistent with recent years affected by shifting climate patterns, there was not enough rain to fill the ponds holding the eggs, so they were drying out. Back in our salamander lab, eighty-nine of the water-stressed eggs from Apalachicola National Forest successfully hatched.

Frosted Flatwoods Salamanders are at imminent risk of extinction, and the Amphibian Foundation holds the world's only captive population. We are working to produce offspring in captivity that can then be released back into protected habitat in the wild.

Rearing endangered salamander species in captivity

In addition to the salamanders we hatched this year from Apalachicola National Forest, we maintain animals collected by our partners at US Geological Survey from Florida's St. Marks National Wildlife Refuge — one of the oldest wildlife refuges in the United States. Additionally, we have field collected five salamanders from Fort Stewart near Georgia's coast. The Georgia flatwoods salamanders appear to be the most imperiled population, with only one degraded wetland remaining known to be reproductively active. They have not been detected in South Carolina in a number of years and are possibly extirpated from the area.

Since we are the only facility with these animals, we've learned to overcome several challenges in our effort to keep them healthy in captivity. For example, many salamander species will eat right in front of you so you know they are doing well; however, frosted flatwoods tend to hide away. This impacts our ability to know what they want to eat and even if they are eating at all.

We've worked hard for the past five years to learn more about what they like to eat. The past few months we've been stuffing these salamanders three times a week with three types of worm and other invertebrates to help them get healthy and ready for metamorphosis. We also work to provide hospitable habitats in our biosecure lab. Their enclosures include grasses and water from where they were collected, which also provided their first meals of aquatic invertebrates, and we take special precautions when entering the lab or handling the animals by using gloves and dedicated footwear.

The ultimate goal of this work is that the flatwood salamanders will no longer need the protection of the Endangered Species Act. But for now, the salamanders will move into our outdoor field research center for breeding when they are older, and their offspring will be released back into protected habitat in the wild.

The Amphibian Foundation brought nearly one hundred Frosted Flatwoods Salamander eggs back to Atlanta to be hatched, reared, and included in a captive breeding colony. This is one of the juveniles. Photo: Mark Mandica.

Amphibian Foundation addresses the global extinction crisis

For twenty years, staff at the Amphibian Foundation have worked with partners like the Amphibian Ark, US Fish and Wildlife Service and the FFWCC to save amphibians from extinction by raising awareness and leading one-of-a-kind conservation and research activities. We are a non-profit organization, and a large part of our work is focused on Frosted Flatwoods Salamanders and other Long Leaf Pine endemic amphibians.

In addition to conservation and research, the Amphibian Foundation has a strong educational component to our mission. We maintain active internship programs with universities and host summer Critter Camps for elementary through middle school students.

We also provide an array of opportunities for interested people to learn more or even get involved in conservation in their own backyard. We maintain an Atlanta Urban Ecologists program for grades 7 through 12 in collaboration with local Atlanta-based non-profits, and organized a comprehensive citizen science amphibian monitoring program — the Metro Atlanta Amphibian Monitoring Program (www.maamp.us). We train volunteers how to monitor frogs and salamanders in their neighborhoods, and currently more than thirty sites are being monitored each month.

Though we develop many research and educational programs to achieve our mission, our top priority is the conservation of imperiled amphibian species from the US southeastern coastal plain, such as the Frosted Flatwoods Salamander and the Gopher Frog (*Lithobates capito*).

More information about the Amphibian Foundation can be found on our web site, www.amphibianfoundation.org.

Recent animal husbandry documents on the AArk web site

The Husbandry Document library on the AArk web site (www.amphibianark.org/husbandry-documents/) currently has over 160 articles in it, with additional articles being added regularly. Six new documents have been added recently:

Manual for Control of Infectious Diseases in Amphibian Survival Assurance Colonies and Reintroduction Programs, Pessier, A.P. and J.R. Mendelson (eds.)

The major contributing factor of the most drastic amphibian population declines is the disease chytridiomycosis caused by the chytrid fungus *Batrachochytrium dendrobatidis*. This fungus, disseminated worldwide by anthropogenic means, can reduce amphibian biodiversity at new locations in alarmingly short periods of time. Thus, understanding and controlling infectious diseases such as chytridiomycosis have become a major focus of both *in situ* and *ex situ* amphibian conservation efforts worldwide. Proceedings from a workshop held 16-18 February 2009, Zoological Society of San Diego. Updated March 2017.

Version: CBSG March 2017; Language: English
www.amphibianark.org/?wpfb_dl=93

Biosecurity and Permanent Isolation of* Ex Situ *Conservation Populations, Pessier, A.P. and J.R. Mendelson (eds.)

Implementation of biosecurity practices that reduce the potential for introduction of amphibian infectious diseases to new locations are the responsibility of all institutions that maintain or move captive amphibians. In addition, good biosecurity practices help to reduce the risk posed by infectious diseases on the success and sustainability of captive amphibian programs. This is an extract from the *Manual for Control of Infectious Diseases in Amphibian Survival Assurance Colonies and Reintroduction Programs*.

Version: CBSG March 2017; Language: English
www.amphibianark.org/?wpfb_dl=224

***Species Action Plan for* Aromobates meridensis**, Osmary Leal Peroza and Enrique La Marca

Version: May 2017; Language: Spanish
www.amphibianark.org/?wpfb_dl=226

Species Action Plan for* Leptodactylus *sp. (Merida's Whistling Frog), Enrique La Marca

Version: May 2017; Language: Spanish
www.amphibianark.org/?wpfb_dl=225

***Husbandry Guidelines for* Aromobates meridensis**, Osmary Leal and Enrique La Marca

Version: May 2017; Language: Spanish
www.amphibianark.org/?wpfb_dl=228

Husbandry Guidelines for* Leptodactylus *sp. (Merida's Whistling Frog), Enrique La Marca

Version: June 2017; Language: Spanish
www.amphibianark.org/?wpfb_dl=227

Amphibian Ark donors, January 2016 - May 2017

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Eric Johnson
Richard Mosko
Meghan Parsley
Daniel Pomfret
Jeremy Rothman-Shore
George Sommer
Elizabeth Tysor

Up to $10

McKay Caruthers
Brayden Diehl
Stephen C. Durand
Rafael Pardo Espejel
David W. Livingston
Tam Ly
In memory of Shirley Jean Weirich Martin
Raymond Provost
Joseph Rouleau
Don Smith
Ryan Toso
Meghan Tuten