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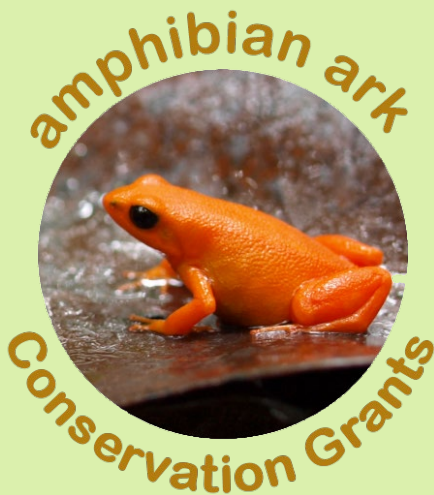
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Amphibian Ark
c/o Conservation Planning Specialist Group
12101 Johnny Cake Ridge Road
Apple Valley MN 55124-8151
USA

www.amphibianark.org

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

www.amphibianark.org



Amphibian Ark Conservation Grants – We're calling for proposals!

AArk has offered grants since 2009 and in the past, these have been predominantly seed grants, for newly created *ex situ* programs for species that have been assessed as in need of urgent *ex situ* rescue.

In 2018 our grants program was expanded, to include a wider range of program types that are eligible for funding, as well as some new guidelines and requirements for grant recipients. Download the complete guidelines from www.amphibianark.org/grants/AArk-Conservation-Grants.pdf.

We will be accepting Project Outline funding applications (see below) for the following types of grants from 1st March 2021:

- **Start-up grants** – initial funding to help newly-launched projects get started at the very beginning of their life, to help them attract larger and/or long-term funding for the duration of the program. We will not fund projects that are already well-established or have significant funding, although we will consider projects with funding in place for complementary components (such as fieldwork or education). One-time grants of up to US\$5,000 are available. Recipients are able to apply for second and third year extension grants.
- **Start-up grant extensions** – additional funds are available to provide continued support for AArk seed or start-up grant projects that a) have met their stated objectives for previous years, and b) can demonstrate that additional supplemental funds have been secured since the original AArk grant was provided. All past recipients of AArk seed or start-up grants are eligible to apply for these extensions however it is expected that husbandry guidelines and a species action plan have been completed. Second-year grants of up to US\$4,000 and third-year grants of up to US\$3,000 are available.
- **Workshop attendance** – partial funding to assist attendance at *ex situ* amphibian conservation-related workshops, especially those which focus on amphibian husbandry, planning and reintroduction. Applicants must have already secured partial funding to attend the workshop. You must already be actively involved in an amphibian conservation project or have well-developed plans and funding in place to implement a new program. Grants of up to US\$750 are available.
- **Mentorship grants** – support for organizations which have previously received an AArk seed or start-up grant, to bring in a designated outside expert to assist with an aspect of their amphibian conservation efforts (e.g. veterinary training, environmental control etc.). Grants up to US\$1,500 are available.

All applicants are required to submit a brief Project Outline, prior to submitting a full application. Your Project Outline should be less than 200 words in length and should contain information under the following headings: Species, Organization, Project Manager, Goals, Proposed Outcomes and Other funding Sources (both requested and received). Project Outlines will be reviewed, and successful applicants will then be invited to submit a full application. Full applications will not be accepted without a Project Outline having been submitted, reviewed and approved by the review committee.

Our grants are intended to support conservation projects for amphibian species that cannot currently be saved in the wild, with a focus on *ex situ* actions, and in partnership with appropriate field activities. Preference will be given to projects for species which



have been assessed as in need of *ex situ* rescue or research work, either as a recommendation from a **Conservation Needs Assessment** or a similar, national assessment process.

Start-up grants and start-up extension grants are **not** intended to fund:

- Workshops
- Educational exhibits
- Project overhead or indirect costs
- Field projects without a strong *ex situ* component.

All applications must reflect AArk values. Please pay careful attention to the **grant guidelines**, and address all of the appropriate items.

Need some help?

AArk staff are available if you need assistance in formulating your proposal. Please do not hesitate to contact us with any questions. Each year several proposals have been rejected due to issues that could have been prevented with a little extra guidance! We also have several past seed grant recipients who are willing to act as mentors, to help with your application – please let us know if you would like us to put you in contact with one of them. Email us at grants@amphibianark.org.

Important dates

- **Project Outline deadline: 12 April 2021**
- Applicants notified about review of Project Outlines: 26 April 2021
- **Grant application deadline: 17 May 2021**
- Grant decision/notification date: 31 May 2021
- Successful applicants must provide bank account details, signed MOU and 3-4 photos of species and/or facilities by: 14 June 2021
- Grant payment date: 21 June 2021
- Initial progress report and species action plan provided by 1 December 2021
- Final progress report, species action plan and husbandry guidelines due 1 June 2022.

We would like to acknowledge the generous support of **AArk funders** and **donors** who have helped to establish and support these grants.

The effects of two calcium supplementation regimens on growth and health traits of juvenile mountain chicken frogs

Christopher J. Michaels, Cheska Servini and Benjamin Tapley, Zoological Society of London, United Kingdom

The mountain chicken frog (*Leptodactylus fallax*) is a Critically Endangered species from the Eastern Caribbean. *Ex situ* populations were first established in European zoos in the 1990s in response to the imminent threat of volcanic eruption on the island of Montserrat. In the early 2000s chytrid fungus (*Batrachochytrium dendrobatidis*) arrived in the Caribbean and decimated populations of these frogs across their range. In response, an additional population was established in European zoos and managed with the explicit goal of future translocation. Unfortunately, many aspects of amphibian captive husbandry are still not fully understood and empirical data are required to inform and refine captive management protocols for each species. Calcium metabolism and homeostasis are areas of particular importance in captive husbandry research and have been previously identified as a challenge in maintaining *ex situ* populations of amphibians, including *L. fallax*.

Previous research has identified that commercially raised invertebrate species are calcium-deficient in both absolute terms and relative to phosphorus content (Barker et al., 1998; Finke et al., 2002; Jayson et al., 2018). Husbandry professionals are often mindful of preventing calcium deficiency for captive amphibians due to the high frequency of nutritional secondary hyperparathyroidism (commonly referred to as nutritional metabolic bone disease) in anurans and in *L. fallax* specifically. The comparison of the wild and captive diets of *L. fallax* as well as the empirical refinement of Ultraviolet B (UVB) provision have demonstrated that the supplementation of diets with calcium, along with appropriate provision of UVB lighting is important to meet the needs of the species in captivity. The potential for over-supplementation of calcium is not known as it has not been well studied. In recent years there have been an increase in reports of gall-stones (choleliths) and cholecystitis in captive *L. fallax*. It is certain that severe cholecystitis is likely associated with the cause of death in affected individuals. The choleliths from *L. fallax* that have been analysed are composed of almost pure calcium carbonate. It has been hypothesised that these choleliths may form as a result of an excess of calcium in the standard captive diet used for this species.

In our study, we quantified the effect of two calcium supplementation regimens on two groups of juvenile *L. fallax*. One group of frogs was fed invertebrates dusted with calcium twice a week and the other group was fed on invertebrates dusted with calcium seven times each week. We measured growth and health effects

through blood and faecal analysis, radiography, ultrasonography and morphometric measurements over a period of 167 days. This was followed by a further 230 days of monitoring on an intermediate diet that was informed by the initial dataset. The intermediate diet meant that the invertebrates were supplemented with calcium four times a week, as opposed to the low calcium diet (twice a week) and high calcium diet (seven times a week).

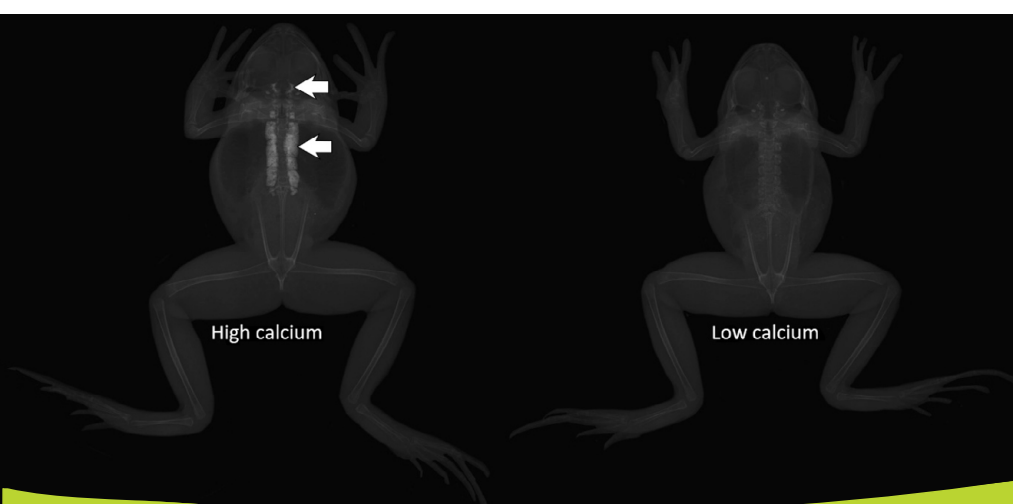
Supplementation treatment did not affect growth or health status as measured through blood analysis, radiography and ultrasonography. More frequent supplementation did result in significantly more radiopaque endolymphatic sacs and broader skulls. Mountain chickens that were fed more calcium excreted twice as much calcium in their faeces. When the frogs that had been supplemented with calcium twice a week were subsequently offered more calcium in the diet they soon approximated the morphometric measurements and calcium stores of the frogs that had been fed the high calcium diet.

We were able to compare radiographs of captive-bred frogs with radiographs of wild-caught frogs. Frogs in both the high and low calcium treatments have narrower skulls than wild animals. Anuran feeding is gape limited and a wider head may facilitate consumption of a broader range of prey (Emerson et al., 1994). This effect may be important for animals translocated to the field from captive breeding facilities. However, the captive frogs were a different age class to the wild-caught frogs and these data should be interpreted with caution due to the mismatch in age class. Our data may be used to inform dietary supplementation of captive *L. fallax* and other amphibians.

References

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Figure 1. Radiographs comparing frogs from the two calcium supplementation treatments.



AArk Husbandry Document library

The Husbandry Document library on the AArk web site (www.amphibianark.org/husbandry-documents) currently has over 260 documents in it, with additional documents being added regularly. A new search engine has recently been installed on the Husbandry Documents page, which can now search for particular words or phrases within all pdf files. This provides much more accurate results when searching the document library for particular topics.

Nine new documents have been added recently:

Mantella cowanii Action Plan (French)

The action plan for *Mantella cowanii* is the logical extension of the first action plan developed ten years ago for a period of five years for the conservation of this species. The experiences and lessons learned from the implementation of this first plan, the gaps in fill and the negative development of the situation from the foreground, require revision of strategy. Thanks to the efforts and dedication of the participating scientists, lovers of Malagasy amphibians, this current action plan for the conservation of this magnificent species is more relevant, refined from the discussions during the 2018 workshop on this species, and from a paramount importance and its implementation is urgent on the scale of a few decades before the complete extinction of the species. It is important to emphasize that this species, which has almost disappeared from its habitat due to abusive commercial exploitation, frequently uses meadows and wooded savannah of the central highlands, an ecosystem previously considered of anthropogenic origin, therefore neglected with regard to integration into the network of areas protected, but it now appears that this is an incorrect generalization.

Editors: Andreone F., Andriantsimanarilafy R.R., Crottini A., Edmonds D., Garcia G., Hansen-Hendrikx C.M., Rakotoarison A., and Razafimanahaka J.H.

Publication: November 2020

www.amphibianark.org/wp-content/uploads/2020/12/Mantella-cowanii-action-plan.pdf

Association of Zoos and Aquariums Amphibian Taxon Advisory Group regional collection plan, 4th edn. (English)

Since the completion of the first edition of the Regional Collection Plan in August 2000, much of the Amphibian Taxon Advisory Group's direction has changed due to increased awareness about the extent and causes behind rapid amphibian population declines and the role zoos and aquariums can aid in this crisis by developing assurance colonies of at-risk species. Current data indicate that the general trend of amphibian extinctions is accelerating at an unprecedented rate and future catastrophic losses are inevitable. Within this context, the Amphibian Taxon Advisory Group's Regional Collection Plan reflects a more tightly defined scope for suggested amphibian programs in AZA institutions that will enable colleagues to utilize their resources to their fullest potential and respond in chorus with the rest of the global amphibian community.

Authors: Barber, D., Marcec-Greaves, R. and Poole, V. (eds)

Publication: Association of Zoos and Aquariums, Maryland, 2020

www.amphibianark.org/wp-content/uploads/2021/02/ATAG-RCP-2020.pdf

Captive management and reproduction of the critically endangered southern Corroboree frog (*Pseudophryne corroboree*) at Taronga and Melbourne Zoos (English)

The southern Corroboree frog (*Pseudophryne corroboree*) is a small myobatrachid frog from south-eastern Australia that has rapidly declined in recent decades largely due to disease, caused by infection with the amphibian chytrid fungus *Batrachochytrium dendrobatidis*. As a key recovery effort to prevent the imminent extinction of this species, an *ex situ* captive breeding program has

been established in a collaborative partnership between Australian zoological institutions and a state wildlife department. Despite initial difficulties, successful captive breeding protocols have been established. Key factors in achieving breeding in this species include providing an adequate pre-breeding cooling period for adult frogs, separation of sexes during the non-breeding period, allowing female mate-choice via the provision of numerous males per enclosure and permitting the females to attain significant mass prior to breeding. Difficulties were experienced with egg and larval mortality in early years, though these issues have since been largely resolved. To date, the success of captive breeding from 2010–2012 has permitted the reintroduction of 1,060 captive-produced eggs and an increasing captive population size that will support conservation research and provide insurance against further declines.

Authors: Michael McFadden, Raelene Hobbs, Gerry Marantelli, Peter Harlow, Chris Banks and David Hunter

Publication: Amphibian & Reptile Conservation 5(3): 70–87

www.researchgate.net/publication/292225599_Captive_management_and_reproduction_of_the_critically_endangered_southern_Corroboree_frog_Pseudophryne_corroboree_at_Taronga_and_Melbourne_Zoos

Best Practice Guidelines for the Sardinian brook salamander *Euproctus platycephalus* (English)

These standards lay down general principles of animal keeping, to which the members of the European Association of Zoos and Aquaria (EAZA) feel themselves committed. Above and beyond this, some countries have defined regulatory minimum standards for the keeping of individual species regarding the size and furnishings of enclosures etc., which, according to the opinion of authors, should definitely be fulfilled before allowing such animals to be kept within the area of the jurisdiction of those countries. These minimum standards are intended to determine the borderline of acceptable animal welfare. It is not permitted to fall short of these standards. How difficult it is to determine the standards, however, can be seen in the fact that minimum standards vary from country to country.

Authors: Benjamin Tapley, Christopher Michaels, Daniele Macale, Leonardo Vignoli, Luke Harding, Zoe Bryant, Iri Gill and Sheila Funnel

Publication: EAZA, 2015

www.eaza.net/assets/Uploads/CCC/2015-Sardinian-brook-salamander-EAZA-Best-Practice-Guidelines-Approved.pdf

Do amphibian conservation breeding programmes target species of immediate and future conservation concern? (English)

With amphibians declining globally, conservation breeding and reintroduction programs are increasingly important management tools. Here we examine whether these conservation initiatives are targeting species at the greatest risk of extinction. We compared conservation needs of species involved in conservation breeding programs to those of their closest relatives not involved in such programs, using eight variables

related to immediate and future extinction risk. We found that species in breeding programs were more likely to be threatened and were equally range-restricted and specialized as their closest relatives not being bred for conservation purposes. This suggests that in contrast to patterns reported for zoo holdings more generally, these conservation initiatives target species of conservation priority in the short and medium term.

Authors: Alannah Biega and Thomas E. Martin

Publication: *Oryx*, 52(4), 723-729 (2018)

www.cambridge.org/core/journals/oryx/article/do-amphibian-conservation-breeding-programmes-target-species-of-immediate-and-future-conservation-concern/3670F9E4BD7E7F97DDD05E95103A8761

Improving zoo's conservation potential through understanding barriers to holding globally threatened amphibians (English)

The global amphibian crisis and current un-mitigatable threats make *ex situ* programs a crucial complementary action for the conservation of many amphibians. Zoos and aquariums are some of the most important and influential groups of institutions to undertake this yet the proportion of globally threatened amphibians in zoos is just 23.9% compared to over 40% in the wild. To identify key barriers to holding globally threatened amphibian species in *ex situ* collections, as well as potential strategies to mitigate such barriers, we surveyed amphibian curators across 107 institutions worldwide. A lack of resources (including budget, staffing and space) was perceived as the most significant barrier (87% of respondents) and the barrier most frequently identified (119 responses), followed by disease/biosecurity concerns (31 responses), and a lack of staff expertise/knowledge (30 responses). Difficulty displaying amphibians due to cryptic behaviour or colouration (65% of respondents) and difficulty attracting visitor interest (60% of respondents) were seen as insignificant barriers. Nine key priority action areas were identified, with increasing interest from zoo leadership and budget allocation identified as the most important (49% of suggested solutions). Increasing visitor interest in amphibians to encourage increased investment and engaging with range country facilities were highlighted as two ways to address barriers. Careful collection planning considering both the need and suitability of a species for captive breeding is also key, whilst critically assessing the role each species will play in a collection will enable a better assessment of the collection's conservation value rather than using global threat status alone.

Authors: Leana Brady, Richard P. Young, Matthias Goetz, and Jeff Dawson

Publication: *Biodiversity and Conservation*, June 2017

www.researchgate.net/publication/318108413_Improving_zoo%27s_conservation_potential_through_understanding_barriers_to_holding_globally_threatened_amphibians

Conservation efforts of Kihansi spray toad *Nectophrynoides asperginis*: its discovery, captive breeding, extinction in the wild and reintroduction (English)

Species conservation depends on the initiatives to restore or retain and sustainably use the environment in which the species live. This paper highlights how development projects can affect biodiversity conservation and the challenges in achieving sustainable development. The paper discusses a case study of the Kihansi spray toad (*Nectophrynoides asperginis*) from its discovery, extinction in the wild, captive breeding and subsequent reintroduction to its native habitat; focusing on events, challenges, approaches in addressing issues, future prospects and achievements in the

conservation of this endemic species.

There has been considerable success in Kihansi spray toad husbandry in captivity and reintroduction trials of the toad to the wild while concurrently the operations of the hydropower plant and the catchment ecosystem services have continued to provide electricity for domestic and industrial development and support human livelihoods respectively. The paper underscores the importance of interdisciplinary approach in addressing conservation problems and the need for serious commitment of participating parties, but also on the need to balance conservation with sustainable development.

Authors: Cuthbert Nahonyo, Ezekiel Goboro, Wilirk Ngalason, Severinus Mutagwaba, Richard Ugomba, Mohammed Nassoro and Emmanuel Nkombe

Publication: *Tanzania Journal of Science*, Vol. 43 No. 1 (2017)

www.ajol.info/index.php/tjs/article/view/155767/145403

Reintroduction of the Kihansi Spray Toad *Nectophrynoides asperginis* Back to its Natural Habitat by Using Acclimatizing Cages (English)

The Kihansi spray toad (*Nectophrynoides asperginis*) is considered to be extinct in the wild. Captive breeding populations exist in the Bronx and Toledo zoos in USA and in two captive breeding facilities in Tanzania. Efforts to reintroduce the species back to its natural habitat at Kihansi Gorge wetlands have become a long process. Both *ex situ* and *in situ* experiments have revealed promising outcomes but when the toads are freely (hard) released in the wetlands they disperse widely and detection becomes difficult. Cages for acclimatizing the toads before hard release have been constructed in two of the Kihansi Gorge spray wetlands. Factors such as density dependence, predators, food availability and diseases have been identified of concern to successful reestablishment of the species in its natural environment. The use of large cages (60 m²), close monitoring and partial control of the factors as a new approach has shown promising results at present and for future reintroduction processes of the Kihansi spray toad.

Authors: Charles Msuya and Nassoro Mohamed

Publication: *Tanzania Journal of Science* Vol. 45 No. 4(2019)

www.ajol.info/index.php/tjs/article/view/192925/182050

Action plan for the conservation of the Valcheta Frog (*Pleurodema somuncurensis*), Somuncura Plateau, Rio Negro (Spanish)

The general objective of this document is to promote actions that ensure the long-term population viability of the Valcheta Frog, (*Pleurodema somuncurensis*) in the wild. In broad terms, this implies: a) the reduction of threats and, therefore, the associated risk on existing local populations; b) restoration of suitable habitats where necessary; c) the reintroduction and establishment of viable local populations in historical distribution sites where the species became extinct and, d) the restoration of threat-free corridors that allow the exchange of individuals between local populations.

Authors: Kacolis, F.P., Velasco, M.A., Arellano, M.L., Martínez-Aguirre, T., Zarini, O., Calvo, R., Berkunsky, I. and Williams, J.D.

Publication: 2018

www.amphibianark.org/wp-content/uploads/2021/02/Plan-de-Acción-para-Pleurodema-somuncurensis.pdf

Developing *ex situ* facilities for the conservation of the Indian caecilian *Gegeneophis tejaswini*

Ramachandran Kotharambath, Central University of Kerala, India

This project received an AArk Start-up Grant in 2020 and aims to establish and develop capacity and expertise for the captive maintenance and breeding of the Indian indotyphlid caecilian, *Gegeneophis tejaswini*. The project is also generating knowledge on the biology of the blind and timid subterranean amphibian species, known only from the type locality, which consists mostly of plantations and home gardens in the low elevation hills. The new *ex situ* facility is being built as per international husbandry standards and specific caecilian requirements and vastly improves the existing rudimentary setup. The project builds new knowledge on the husbandry of Indian caecilians in general and *G. tejaswini* in particular.

The caecilian biology group of the Natural History Museum (NHM), London and the Zoological Society of London (ZSL) are both involved in this project. The ZSL keeps caecilians in captivity and NHM has arguably the best caecilian expertise in the world.

The *G. tejaswini* project will help generate novel data on the behavior, ecology, reproduction and physiological requirements of *G. tejaswini*, which otherwise are very difficult to obtain due to its highly subterranean life. This is the first focused, dedicated captive breeding attempt for any Indian caecilian species.

As per the project time-line, I was hoping to complete the construction of the *ex situ* facility and carry out the fieldwork for collecting the specimens from the wild within the first six months after the grant was awarded. However movement restrictions imposed as a result of the COVID-19 pandemic delayed this. Construction of the facility has just started as pandemic restrictions have been removed and full access to the labs has just been granted. The planned fieldwork was successfully completed, and specimens have been collected from the type locality.

During the first part of this project I have completed all the fieldwork in the holotype locality and adjacent areas, following the pandemic movement restrictions and social distancing guidelines. Extensive fieldwork in the plantations and home gardens in the type locality has resulted in the collection of four adult specimens, one of which died soon after, due to internal injury from digging. The remaining three specimens are doing well and will be moved to the new facility when it is ready, within the next two months. I



An adult *Gegeneophis tejaswini* which was collected from the wild as part of the fieldwork for this project. Photo: Ramachandran Kotharambath.

have also collected environmental data and compiled data on the soil parameters at all the fieldwork localities.

The husbandry facility will be set up within the next two months, and the animals will be moved from the current facility to the new one. The behavior experiments and breeding attempts are planned over the subsequent twelve months, provided no movement or lab entry restrictions are put in place by the authorities.

Full access to the laboratory facility has now been granted and transporting construction materials to the campus is possible as the transportation has returned to normal. I have also been working on procurement of materials for the facility. Until recently, the husbandry facilities could not be developed as the lab was not fully opened due to the COVID-19 restrictions.

I am also preparing for extensive pre-monsoon and monsoon fieldwork in the *G. tejaswini* locality during May-July, 2021.

The type locality of the project species, where fieldwork resulted in four specimens being collected. Photo: Ranjith Vengot.



A leap closer to survival for the Pickersgill's Reed Frog

Ian Du Plessis, Johannesburg Zoo; Dr Adrian Armstrong, Ezemvelo KZN Wildlife; Dr Jeanne Tarrant, Endangered Wildlife Trust; and Piet Lesiba Malepa, Johannesburg Zoo, South Africa

The Endangered Pickersgill's Reed Frog (*Hyperolius pickersgilli*) is restricted to the east coast of the KwaZulu-Natal Province of South Africa and is currently known from about forty sites. In November 2020, a collective effort by the Johannesburg City Parks and Zoo, Ezemvelo KZN Wildlife, the Endangered Wildlife Trust and the South African Biological Institute resulted in the release of 455 captive-bred Pickersgill's Reed Frog (adults, froglets and tadpoles) into natural habitat at two rehabilitated wetlands. The first wetland is situated in the buffer zone of the Buffelsdraai landfill site north of Durban, while the second site is at River Horse Valley also just north of Durban. The release at Buffelsdraai was the first re-introduction of Pickersgill's Reed Frogs there, while the release at River Horse Valley was a reinforcement of previous releases in 2019 and 2020.

On the day of the release, a heavy rainstorm covering most parts of the Durban district poured down but the team continued with the release based on the preparation and conditioning of the specimens to survive in their natural habit. With the specimens successfully released into the two sites, post-release monitoring was the next step to evaluate the success of the release. So far, six monitoring visits have taken place at both sites. The more fully-grown released Pickersgill's Reed Frogs were marked using visible implant elastomers (VIEs) and these are visible in the photographs. Released males have been recorded as present during monitoring, predominantly through hearing their calls, whereas females can only be recorded visually. None were heard or seen on the fifth monitoring occasion ten weeks post-release and one male was seen at Buffelsdraai on 22 February.

The second part of this trip involved capture of new breeding stock from new sites. Here, the Endangered Wildlife Trust led the team to the Golokodo catchment in Adam's Mission – a site the Endangered Wildlife Trust is working with the traditional authority

(Below) Marked adult male (left) and subadult (right) Pickersgill's Reed Frogs (*Hyperolius pickersgilli*), photographed at the Buffelsdraai release site seven weeks after release. Photos: Adrian Armstrong.



to formally declare as a Protected Environment, thereby increasing the formal protected area of this species (only two of its sites are protected). Thirty adult frogs were captured and safely transported back to Joburg Zoo the following day and have now been incorporated into the breeding program, with the first of the juveniles metamorphing in February 2021.

Release of captive-bred frogs into novel sites is the ultimate goal of this project, which aims to reduce the threat status of this Endangered species by increasing the known distribution. When the project commenced in 2012, the species was known from just ten sites. Over the course of the last decade, through the guidance of the Action Plan for this species (the gazetted Biodiversity Management Plan), project partners have made impressive progress in bringing this species to the forefront of amphibian conservation in South Africa.



(Above) A marked female Pickersgill's Reed Frog, two days after release at Buffelsdraai. Photo: Adrian Armstrong.



Managing the Achoque conservation program during pandemic lockdowns

Luis Escalera-Vázquez, Omar Domínguez-Domínguez and Rodolfo Pérez-Rodríguez, Laboratory of Aquatic Biology, Michoacan University, Mexico

The Laboratory of Aquatic Biology at the Michoacan University in Mexico manages a conservation program for the Achoque or Lake Patzcuaro Salamander (*Ambystoma dumerilii*) from Pátzcuaro Lake, which includes both *ex situ* and *in situ* activities. This endemic amphibian species has been facing an accelerated decline in its population since 1980. Its historical importance as food and medicine for local people is significant, along with its ecological role as top aquatic predator in the lake.

We are involved in a program to promote and propose changes in management, reintroduction and conservation plans for this species including:

- health studies of the individuals, both *in situ* and *ex situ*
- geographical information systems to determine hot spots for conservation action
- the status of water characteristics
- ecological responses and distribution of the Achoque in the lake
- Achoque aquaculture technology
- experiments of survivorship and reproduction
- environmental education.

However, as with many activities worldwide, this program has had to deal with various lockdowns as a result of the COVID pandemic, but we need to keep working, for the sake of conservation and science related to the salamanders and also for many other biological groups.

So how is the pandemic affecting this program? First of all, we must mention that this program involves the participation of

many different kinds of people and activities (e.g. fishermen, undergraduate and postgraduate students, researchers, elementary and high school teachers and students, fisheries research centers, etc.). We needed to enhance sanitary regulations, adjust timeframes for the use of common places (e.g. the laboratory and boats), reschedule some activities, and in some cases, we have had to cancel activities.

Some activities related to sampling in the field were rescheduled at the beginning of the pandemic. We followed the modified sanitary regulations with the use of more boats and the split of activities to make obtaining *in situ* environmental and biological data possible. On the other hand, the lockdown resulting from the pandemic has very much reduced physical interaction with people due to public areas no longer being available. If we consider that one of the paradigms in conservation is “You cannot conserve what you do not know” then this has been the major problem at this time in the Achoque conservation program, mainly due to our use of public areas. Before the lockdown interaction with local, national and international people occurred during scientific fairs and exhibitions, increasing the public’s knowledge of the species. During the lockdown we attempted to run environmental education activities online for school students. This reduced interaction with the Achoque is not very successful, as it has relegated the species to a “virtual” animal. Additionally, many local people in towns around the lake do not have access to the internet or per-

Achoque or Lake Patzcuaro Salamander (*Ambystoma dumerilii*) in the Michoacán University in Mexico.
Photo: Laboratory of Aquatic Biology.





Local fishermen installing an artisanal pond for *ex situ* conservation of the Achoque.
 Photo: Laboratory of Aquatic Biology.

sonal computers, making it impossible for us to share information and environmental education with these local people.

Other issues related to the pandemic lockdowns have been restrictions on visiting academic and scientific places of work, such as laboratories, to work on protocols for health screening and diagnosis of diseases. This has made it impossible for us to identify pathogens related to infectious diseases that have appeared in some of the *ex situ* aquacultural facilities (e.g. Jimbani Erandi, Monastery of the Domical Nuns in Patzcuaro town). These facilities are part of the project and have seen high mortality due to the difficulty in determining appropriate treatment. Likewise, this has made it difficult for us to carry out pre-release bioassays *in situ*.

We are continuing to work with the reproductive colony at the Universidad Michoacana, although some restrictions were implemented at the University. We solved those by having staff working in lower numbers, and the colony remains safe and growing. Another aspect that the COVID situation has influenced is the lack of students at the university. The Michoacan University is a national university, with students from all the regions of Michoacan and other states of Mexico studying there, but since the pandemic began, many students have gone back to their original towns and some students who are in social service, professional practices, or writing their theses weren't able to help with the project's activi-

ties. We actively encouraged people to help with the work, and although the activities were managed, the economic resources that are now needed by the project are much higher than before.

Finally, budgets, and the management and acquisition related to them were significantly affected worldwide. National and international conservation organizations have been affected by the social and economic "lack of movement", with international zoos and aquaria being a good example of this. The number of donations were reduced, many of them suffered a steep decline in their income and others had to redirect funding to emergency programs related to the COVID pandemic, affecting not only their conservation programs but maintenance of their own facilities and infrastructure.

In general, the COVID situation forced us to change an entire workflow based on interaction with local people (what a paradox!!) who in most cases do not have the technology to access the information and communication. Also, this situation has forced us to create new activities, develop "hybrids between real and virtual", and to teach ourselves to create new technologies for interaction and so on...did all this work? We still do not know.

Conservation and taxonomy go hand in hand to protect an endangered frog

Enrique La Marca, Venezuelan Amphibian Species Rescue Conservation Center (REVA)

The city of Mérida, in the Andes of Venezuela, is surrounded by high mountains with a predominance of paramo (high Andean moorlands) and cloud forest environments. In the latter there is a variety of amphibians, many of which are threatened with extinction, and the La Culata's Frog (*Aromobates durantei*) is one of them. Common at the beginning of the 1980s, at the end of that decade it was already rare and later not seen again.

In 2018 we located a population of this endemic amphibian, close to the type locality of the species. With the specimens we collected we started an *ex situ* breeding program. All were in good health, with no obvious illnesses. After the quarantine period and the treatments against eventual fungi, bacteria, viruses and intestinal parasites, we proceeded to establish a breeding group, recreating the temperature and humidity conditions of their natural habitat. We simulated the periods of precipitation in their area of origin with artificial rain and reproduced calls of the species recorded in the field. Despite all these considerations, which have been successful with other species of the same family and genus (for example, the Mucuchies' frog, *Aromobates zippeli*), we have not been successful in breeding this species.

We began field research to collect ecological data, determine types of threats and specify places where the species had been present in the past. For this, we made several expeditions in high Andean moorlands and cloud forests in the Mucujún river basin. Additionally, we carried out work with the communities that included personal interviews where we ascertained the perception of the interviewees about the animal (and other amphibians), to collect data and in turn be sure that they did not confuse it with another frog. Then we showed them photos of the La Culata's Frog and reproduced calls of specimens recorded in the field and finished by asking if they had had experience with the species. Locals who knew the frog, who were generally the oldest people in the community, agreed that it was previously abundant until about three decades ago.

Information then emerged from the interviews on a frog population, now disappeared, which is the highest within the range of distribution of the species, being located at 3,150 meters above

A juvenile La Culata's Frog. Note the dorsolateral bands that are always more conspicuous in young specimens. Photo: Enrique La Marca.



sea level at the end of the La Culata Valley, northeast of the city of Mérida. In this place there are remnants of cloud forest almost on the border with the paramo, and there is still evidence of vegetation fires from the past. There, the La Culata's Frog shared the habitat with the Merida Harlequin Frog (*Atelopus oxyrhynchus*), also listed in the IUCN Red List as Critically Endangered. In our expeditions on the southern slopes of the Sierra de La Culata that face the bottom of the Mucujún river valley, we located three more populations. One in the middle of the Mucujún river valley, at 2600 meters above sea level in the La Caña sector, where



Adult La Culata's Frog (Aromobates durantei). Notice the white dots that give the species its name. Photo: Enrique La Marca.

we captured a juvenile specimen, and two isolated within the La Boda stream micro-basin, which constitute the records at the lowest elevation (2080 and 2150 meters above sea level). In the latter we heard calls and saw specimens that evaded capture. With these findings, several more localities have been documented within the range of distribution that we had predicted for the species, incorporating the localities at the highest and lowest elevation, respectively.

The data collected greatly expands our knowledge of its geographical distribution, previously restricted to the type locality and its immediate surroundings. All this recently unveiled distribution area is within cloud forest, although at present this ecological unit has almost completely disappeared at the bottom of the valley, being relegated to steep slopes in the Sierra de La Culata and in the mountainous branch known as El Escorial.

All the new populations are found in forest remnants, which tends to confirm the notion that the species has suffered declines due to the destruction of its habitat. The *in situ* research confirmed that the forest is continuing to disappear in some sectors, despite the fact that the entire area has been declared a Protection Zone as the main measure to guarantee the water supply to the city of Mérida. Additionally, we detected other previously unreported threats, such as burning, the use of agrochemicals that eventually contaminate water, as well as contamination by solid waste and oily waste from motor vehicles.



Destruction of habitat in the region where La Culata's Frog is found. Some marginal cloud forests are relegated to the slopes of mountain ranges. Photo: Enrique La Marca.

At the end of the 1970s in a marginal wooded area of the city of Mérida, we captured a juvenile frog that we associated with *Aromobates alboguttatus* at 1,650 meters above sea level. This frog showed a coloration pattern with a pair of light and dark dorsolateral bands similar to those of the juveniles of *A. durantei*. But the coincidence in coloration between these two species does not end there. Adults of *A. durantei* and *A. alboguttatus* are similar in the pattern of white or bluish-white spots on the sides, ventral surfaces, and occasionally on the back. Rivero (1961) studied specimens of *A. alboguttatus* that had white rounded spots on the sides, throat, chest and front of the abdomen. In synthesis, both species present a similar color pattern.

The only explicit difference between *A. durantei* and *A. alboguttatus*, according to the original description of the former, would be the presence of a basal web in all the toes in *A. durantei* versus only a web between fingers 2 to 4 of the foot in *A. alboguttatus*. However, for the holotype of *A. alboguttatus*, there is mention of "toes with a rudiment of web at the base", which would invalidate this assertion given as a unique differentiating character.

Regarding the geographical distribution, the original description of *A. alboguttatus* by Boulenger (1903) was based on a single specimen from "Merida, 1600 m". Rivero (1961) studied specimens of *A. alboguttatus* from "Mérida", as well as one from "La

Culata, 3,000 m". Later records made by us involve specimens from Monte Zerpa, a cloud forest near and north of the city of Mérida, at elevations above 2000 meters above sea level. The type series of *A. durantei* comes from "Páramo La Culata... 2880 m", with additional specimens reported up to an elevation of 3100 m. In conclusion, the altitudes of localities between the two species overlap in the upper part of a forest continuum. Other species that present a similar pattern of geographic distribution are *Atelopus oxyrhynchus*, *Hyloscirtus jahni* and *Pristimantis vanadisae*.

Now, what does this taxonomic aspect have to do with the conservation of *A. durantei*? The striking similarity in body size (snout-vent length), coloration pattern (pale and dark dorsolateral bands, white dots), foot-web, geographic and altitudinal distribution, as well as biogeographic aspects, suggest that *A. durantei* is a recent synonym for *A. alboguttatus*. From a conservation point of view, that would mean that the valid species, *A. alboguttatus*, which has been missing since the last century, is still present and deserves protection. A more in-depth investigation, comparing the type specimens of both species will be necessary to elucidate the taxonomic status of both names and make the corresponding conservationist considerations of rigor for the recognized species.

This ongoing research has received funding from the Amphibian Ark and the Chessington Conservation Fund for the *ex situ* breeding of *A. durantei*, and from Josh's Frogs for the *in situ* conservation activities with *A. oxyrhynchus*, from which *A. durantei* has benefited. We are very grateful to all of these organizations.

Building capacity for *ex situ* amphibian husbandry at the Uganda Wildlife Conservation Education Centre

Dr. James Musinguzi and Dr. Watuwa James Uganda Wildlife Conservation Education Centre, Uganda; and Ian du Plessis, Johannesburg Zoo, South Africa

Understanding the many facets of amphibian biology is paramount in establishing a successful conservation breeding program. In 2021 the Uganda Wildlife Conservation Education Centre (UWEC Zoo) received an Amphibian Ark mentorship grant for the project “Capacity building of Uganda’s in-country *ex situ* husbandry and captive amphibian breeding expertise”. This project aims to establish the first *ex situ* conservation program for amphibian species in Uganda. The project is being housed at the Uganda Wildlife Conservation Education Centre, with mentorship received from Ian du Plessis, Curator: Reptiles, Fish and Amphibians at the Johannesburg Zoo in South Africa.



Zoo keepers at the Uganda Wildlife Conservation Education Centre are working with *Leptopelis kivuensis* (left), as a surrogate species to develop husbandry protocols which will be applied to *Leptopelis karissimbensis* (right). Photo: Diana N.

The project has offered UWEC the opportunity to implement the first conservation breeding program for amphibians in Uganda. By establishing a successful breeding program, the project will also contribute to actions outlined in the Captive Breeding chapter of the Amphibian Specialist Group (ASG) Amphibian Conservation Action Plan (Gascon et al., 2007; Wren et al., 2015). We have identified the target species for the program as *Leptopelis karissimbensis* which is a priority species for both *in situ* and *ex situ* conservation action, and is therefore an appropriate candidate for the program.

Leptopelis karissimbensis is in the family Arthroleptidae and is currently listed as Vulnerable in the IUCN Red List (IUCN, 2020). The biology of the congener, *Leptopelis kivuensis*, is very similar to that of the *L. karissimbensis*, and in fact the two species are often confused. *L. kivuensis* is locally abundant, and is listed as Least Concern in the IUCN Red List.

The goal of the proposed project is to generate crucial information on the biology of *L. kivuensis* as a surrogate species for *L. karissimbensis* and consequently to develop husbandry and breeding protocols that will be applied to *L. karissimbensis ex situ*.

The first phase of the project was initiated with a stakeholder and inception meeting, which was held at UWEC Zoo, and which introduced the project to participants and stakeholders. The meeting was attended by students from the Makerere University, Conservation Education officers and other participants.

The second phase of the project has led to the development of draft protocols for captive husbandry, biosecurity, handling and breeding, which will eventually be applied to *L. karissimbensis*. We have also acquired basic cricket breeding equipment and established a founder colony of breeding crickets which will be used to feed the frogs.

The third phase of the project will see staff at UWEC ZOO being trained in aspects of live food production, amphibian husbandry, biosecurity and captive breeding, with basic amphibian breeding facilities hoped to be established by July 2021.

Finally, we at UWEC thrive on our mission to save amphibian populations from extinction and have the passion and determination to work together with other stakeholders, governments and the public to secure Uganda amphibian species in their natural environment.

We thus welcome researchers, volunteers, university veterinary and conservation students, and other partners interested in joining our amphibian conservation project. For further information, please contact our team: Dr. James Musinguzi, PhD, Executive Director, UWEC at jamesinguzi@yahoo.co.uk and Dr. James Watuwa Project Coordinator at watuwajames@gmail.com.

The team from the Uganda Wildlife Conservation Education Centre examining *Leptopelis kivuensis*. Photo: Diana N.



A new facility for the conservation of the Sehuencas Water Frog at Centro K'ayra of the Museo D'Orbigny

Teresa Camacho-Badani and Ricardo Zurita, Alcide d'Orbigny Natural History Museum, Centro K'ayra for Research and Conservation of Threatened Amphibians of Bolivia



The genus *Telmatobius* is one of the most threatened in the Neotropical region. According to the International Union for Conservation of Nature (IUCN), 86% of species face some degree of threat. Bolivia has the second largest number of species in this group; of the fifteen known species, two are categorized as Vulnerable, three as Endangered and nine are Critically Endangered, of which four are considered to possibly be Extinct.

Romeo and Julieta, two of the frogs that are part of the breeding stock for the conservation of the Sehuencas Water Frog (*Telmatobius yuracare*). Photo: Teresa Camacho-Badani.

Two of the containers that house frogs of the *Telmatobius* genus in the K'ayra Center of the Alcide d'Orbigny Natural History Museum in Bolivia. Photo: Teresa Camacho-Badani.

The Alcide d'Orbigny Natural History Museum located in the city of Cochabamba, in Bolivia, has been working in the conservation of Bolivian amphibians for more than fourteen years, and thirteen years ago it started a pilot program of *ex situ* management of the *Telmatobius* genus, and was recognized by the Bolivian Ministry of the Environment as the only official Custody Center for Wild Fauna exclusively for amphibians in the country. We are now called "Centro K'ayra". The K'ayra Center is dedicated to the research and conservation of threatened amphibians, with around

500 frogs of five Andean *Telmatobius* species in its captive breeding program – this program houses more species of this group than anywhere else in the world. Among the aquatic frogs in the custody and care of the K'ayra Center are the Sucre Water Frog (*Telmatobius simonsi*), the Valley Water Frog (*Telmatobius hintoni*), the Titicaca Water Frog (*Telmatobius culeus*) and the Sehuencas Water Frog (*Telmatobius yuracare*).

The Sehuencas Water Frog has received special attention in the last two years because after not being found in the wild for ten years, a remnant population was found in the cloud forests of Bolivia. Some individuals of this population were brought into the *ex situ* program at the K'ayra Center, and these will be part of the breeding stock which will hopefully reproduce and in the future, their offspring can be released into their natural habitat. To fulfill this



task, the captive rearing area has been expanded, which provides a space with all the specific requirements of the species. The new facility for the Sehuencas Water Frogs is a shipping container, 11 meters long by 3.5 meters wide, and it is the third at the K'ayra Center. The container has been modified to house forty-four aquariums for reproduction and to house these amphibians. It has a refrigeration system that can maintain the same temperature which is found in its natural habitat - in winter this can be as low as 10° C (50° F). It also has the biosecurity and animal welfare conditions required for successful care of this and other Bolivian cloud forest species that in the future may need to be part of *ex situ* conservation programs.

None of the amphibians in the K'ayra Center can be seen by public visitors to the museum, because access is restricted to staff only, and currently there are no animals on display. This is why it was wanted to show some of the frogs through murals painted by the Bolivian artist "Puriskiri", which show Romeo and Julieta (the Sehuencas Water Frogs) on the new container and giant Titicaca Water Frogs on the container which started the captive breeding program at the Alcide d'Orbigny Museum in 2008.

This is a great step forward for the conservation of amphibians in Bolivia, which despite the challenges and restrictions resulting from the COVID-19 pandemic, has managed to expand. Currently the K'ayra Center has a staff of three managers and twelve research assistants, who take care of the frogs every day. The arrival of this new container is part of the "Action Plan for the Conservation of the Sehuencas Water Frog" that is being implemented thanks to the broad support of the Global Wildlife Conservation organization. In addition, over the past few years, the K'ayra Center has received financial support from the Kansas City Zoo, the Löbbecke Aquazoo Museum, Amphibian Ark and the Chester Zoo for its maintenance.

Inside the new container for the Sehuencas Water Frog in the K'ayra Center.
Photo: Teresa Camacho-Badani.



The new container for the Sehuencas Water Frog in the K'ayra Center of the Alcide d'Orbigny Natural History Museum. Photo: Teresa Camacho-Badani.



Logos of the institutions that have supported the construction and implementation of the new container, as well as the maintenance of the K'ayra Center in recent years.
Photo: Teresa Camacho-Badani.

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