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FrogLog

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Promoting Conservation, Research and
Education for the World's Amphibians

**REGIONAL EDITION:
AFRICA, WEST ASIA, MADAGASCAR,
MEDITERRANEAN AND EUROPE**

**An Island of Marvels:
Adventures in Andasibe**

**A Digital Approach to
Frogging**

**Sniffing out one of South
Africa's Rarest Toads**

Recent Publications

And Much More!

Hyperolius tuberilinguis. Photo: Louis Du Preez.

FrogLog

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Editorial

Dear FrogLoggers,

Welcome to another exciting edition of *FrogLog*. With so many updates and stories crammed into the following pages you will want to read this entire edition from front to back in one sitting!

Since the April edition, the Amphibian Survival Alliance joined forces with the Singapore Zoo, the Animal Welfare Institute and Defenders of Wildlife to host two international amphibian trade workshops. Teams of amphibian and trade specialists from academia, government and non-governmental organizations gathered at parallel workshops in Singapore and Washington, DC, species impacted by trade and measures, if any, might prove beneficial to their longterm survival in the wild. Details can be found on page 4.

The Amphibian Specialist Group's strategic plan is now available. The plan aims to act as a road map to guide amphibian conservation science at the global level, as well as providing guidance for the development of regional groups. You are encouraged to read through this strategic plan and consider how you can become involved in your region's activities. Flip to page 5 for an overview and details on how to access the plan.

Also, be sure to check out the latest update from the IUCN SSC Amphibian Red List Authority, which published 61 extinction risk assessments in the Spring 2015 update of the IUCN Red List of Threatened Species. Find out which species were removed from the threatened categories and which ones were moved to higher threat categories. Stay tuned to our website and social media channels for updates on how each *FrogLog* reader can contribute to the Red Listing process.

And without further delay, let's turn the page and dive right into this edition of *FrogLog* which features highlights from Africa—including Madagascar—and Europe. From citizen science to a digital approach to frogging and from establishing amphibian monitoring programs to dogs sniffing out rare toads, this edition has it all!

Candace M. Hansen-Hendrikkx
Editor-in-Chief



Photo: Robin Moore.

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Workshop attendees. Photo: Alejandra Goyenechea.

Amphibian Trade Workshop: Identifying the Threats, Species Most at Risk and Next Steps

The Singapore Zoo, the Animal Welfare Institute, Defenders of Wildlife and the Amphibian Survival Alliance joined forces in March 2015 to host two international amphibian trade workshops. On March 12th and 13th two teams of amphibian and trade specialists from academia, government and non-governmental organizations gathered at parallel workshops in Singapore and Washington, DC.

Starting with a list of amphibian species prepared for the workshops, the specialists identified the species most at risk from trade (domestic and international), habitat loss, or due to disease. The species requiring the highest priority actions were selected and needed conservation actions were assigned to each species. The original species list was created using data from the IUCN Red List, CITES trade database and input from the IUCN SSC Amphibian Specialist Group regional chairs.

Predictably, a number of “priority species” are traded locally, regionally and internationally for consumption as bushmeat or in the frog leg trade. Other species of priority concern including a wide range of salamanders, frogs and toads are traded internationally for the pet trade. Amphibian exploitation for both the bushmeat and the pet trade involve offtake that is depleting wild populations.

The specialists identified conservation actions for priority species or entire taxa. These included stronger national laws and regula-

tions, improved law enforcement efforts, listing or up-listing in CITES Appendices, improved compliance with international trade standards for CITES-listed species and ongoing monitoring of trade trends and impacts.

Another threat posed by widely traded amphibian species is disease. Such threats include both *Batrachochytrium dendrobatidis* (*Bd*) and *Batrachochytrium salamandrivorans* (*Bsal*) fungal infections, Ranavirus, and other viral diseases. Such diseases affect not just amphibians but also some fish and reptiles. While vector amphibian species (including Bullfrogs, *Xenopus* frogs, Korean Fire-Bellied toads and African Dwarf Clawed Frogs) may not be threatened by trade, their trade exposes other animal populations to potentially devastating emerging infectious diseases. To reduce such risks, actions must be taken to improve implementation of existing veterinary health protocols to identify diseased animals prior to export and stricter measures such as quarantine and disease monitoring of import amphibians must be implemented.

Workshop organizers and participants have initiated efforts to implement some of the recommended conservation actions and intend to collaborate with additional experts from across the amphibian conservation community to achieve meaningful progress for amphibian conservation.

Launch of the New ASG Strategic Plan (2015-2016)

By Ariadne Angulo, Phil Bishop, Sally Wren, Leida dos Santos, Helen Meredith & Jos Kielgast

The Amphibian Specialist Group (ASG) is a global network of volunteer amphibian scientists and other experts focused on providing the best possible science to inform amphibian conservation. The ASG has over 500 members distributed across 42 regions or countries covering over 7400 species of amphibians. Given the breadth of ASG's reach, as well as the multiple and complex challenges faced by amphibians worldwide, priority-setting, coordination and communication of the group's activities is of fundamental importance to increase synergies and efficiencies in our joint efforts towards amphibian conservation. To this end, the ASG Secretariat has developed a strategic plan for 2015-2016 (the end of the current IUCN period). Our ambition is that the ASG Strategic Plan may act as a road map to guide amphibian conservation science at the global level, as well as providing guidance for the development of regional groups. We also describe the various components of ASG, and how they fit and operate within the group. Most importantly, we fully recognize that for the strategic plan to work we need a committed and proactive membership. It is therefore important that ASG members are in agreement with and committed to this new approach, which would lead us to make significant progress towards our goals.

The strategic plan has now been made public and can be accessed [here](#). We are in the process of approaching regional chairs regarding their willingness to actively promote the aims of the strategic plan as appropriate, as well as discussing development of their respective groups. We are hoping that groups may become more engaged and coordinated and, where there is opportunity, to also increase ASG's membership with new, committed and proactive members. Once this process is finalized, we will be updating the [ASG membership page](#) accordingly.

If you are an ASG member, we invite you to read through the ASG Strategic Plan and consider how you can become involved in your region's activities. If you are not an ASG member but are interested in becoming one, we would also encourage you to peruse the strategic plan and let us know if you are willing to become a proactive ASG member.

We look forward to working with the ASG working groups, regional chairs and membership at large in the months ahead to implement the ASG Strategic Plan and increase efficiencies in our quest to provide the best science to conserve amphibians worldwide.

Amphibians in the Spring 2015 update of the IUCN Red List of Threatened Species

By Duncan Sharp, Louise Hobin & Jennifer Luedtke

The IUCN SSC Amphibian Red List Authority published 61 extinction risk assessments in the Spring 2015 update of the IUCN Red List of Threatened Species.

In this update, 48 are reassessments and 13 are brand new additions to the IUCN Red List. We are pleased to see that 6 species were removed from the threatened categories (Vulnerable, Endangered or Critically Endangered) thanks to the availability of new information. However, over half are threatened with extinction and 7 moved to a higher threat category.

There is good news for *Raorchestes travancoricus*. Assessed as Extinct in 2004, it was rediscovered in Kerala, India later in the same year. It has been assessed as Endangered because of its restricted area of occupancy and ongoing habitat loss in Vandiperiyar and Vagaman due to extensive tea cultivation and emerging tourism activity, such as resort construction in the forested areas of Vagaman.

Of note are the criteria behind the threatened assessments. Severely fragmented populations experiencing continuing declines in either the extent or quality of their habitats were the overwhelm-

ingly common theme. In fact, these threats were the basis for all the Vulnerable, Endangered and Critically Endangered listings.

So all in all it is a mixed bag in terms of news, but we are pressing on towards our goal of updating all amphibians on the IUCN Red List by the end of the IUCN Quadrennium in December 2016.

Thank you to everyone who is working so hard towards this goal and to our generous donors!



Region	Published	First-time assessment	Threatened	Moved to higher IUCN threat category
Mainland Africa	43	5	29	7
Mainland Southeast Asia	7	6	5	-
North America	6	-	-	-
South America	4	2	4	-
South Asia	1	-	1	-
Totals	61	13	39	7

Construction of the Honduras Amphibian Rescue and Conservation Center (HARCC)

By ^{1,2}Jonathan E. Kolby & ³Brandon L. Greaves



The shipping containers finally arrive at the Henry Doorly Zoo & Aquarium! Time to get to work! Photo by: Brandon Greaves.

The endangered amphibians of Honduras are experiencing a storm of assaults from habitat destruction, climate change, and emerging infectious diseases. A growing number of species face an uncertain future unless *ex situ* management efforts are soon implemented to ensure long-term survival. Cusuco National Park (CNP) is a biodiversity hotspot recognized by the Alliance for Zero Extinction for the Honduran endemic amphibians found only in this one location. Despite its relatively small size (approximately 120 square miles), CNP provides refuge for 16 amphibian species listed as Endangered or Critically Endangered on the IUCN Red List of Threatened Species.

To combat amphibian biodiversity loss, the Honduras Amphibian Rescue and Conservation Center (HARCC) is now in construction, and was made possible by funding from an ASA Seed Grant, Amphibian Ark Seed Grant, the Chicago Zoological Society-Chicago Board of Trade Endangered Species Fund, Rufford Small Grants for Nature Conservation, and a generous donation from the Omaha Zoo Foundation. Our long-term surveys have shown that amphibians in Honduras remain in jeopardy from diseases and our efforts aim to ensure the long-term survival of three Critically Endangered species in CNP: two endemic Spike-thumb Frogs, *Plectrohyla dasyopus* and *Plectrohyla exquisita*, and the Red-eyed Treefrog *Duellmanohyla soralia*. Illegal deforestation and chytridiomycosis are negatively impacting each life stage of these species, pushing them closer towards extinction. The rescue efforts of this project will tackle both short and long-term threats by performing a head-start program to quickly produce healthy adult animals for supplementation of wild populations while simultaneously building captive assurance populations for long-term protection and reintroduction.

We are now in the process of transforming two 20-foot insulated shipping containers into our biosecure amphibian laboratories. Amphibians will be treated for disease and raised inside these clean spaces, protected from outside threats. After construction has been completed at Omaha's Henry Doorly Zoo & Aquarium in the USA, they will be shipped to Honduras and installed onsite at Lancetilla.

You can now see HARCC amphibian rescue updates as they happen by following our new Facebook page! Simply click here and request notifications: [HARCC-Honduras Amphibian Rescue and Conservation Center](#)

For more information about HARCC or to inquire about opportunities for involvement or to make a donation, please contact us at Hondurasarcc@gmail.com



Interior doors are being installed. Photo by: Brandon Greaves.



Adult female *Duellmanohyla soralia* with a highly reticulated pattern to blend into a background of colorful moss and lichens. Photo: Jonathan Kolby.

¹IUCN SSC Amphibian Specialist Group, Regional Co-Chair (Honduras)
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Subadult female *Plectrohyla exquisita* displaying the brown color morph of this species. Photo: Jonathan Kolby.



Subadult *Plectrohyla dasyus* displaying characteristic black and neon metallic green markings. Photo: Jonathan Kolby.



Glass aquarium tanks are modified for assembly on our rack system. Photo by: Nathan O'Brate.



The containers are inspected by an electrician in preparation for hook-up to a power supply. Photo by: Brandon Greaves.

Amphibian Survival Alliance Seed Grant Recipient Project: Assessing the Status of Amphibians on Mount Kupe and Mount Nlonako in the Wake of Declines in the Highlands of Cameroon

By ¹Thomas Doherty-Bone, ¹Ndeme Solomon Echalle & ³Gonwouo Nono LeGrand

The Highlands of Cameroon hold a vast diversity of amphibians, many of which have small ranges on one or a handful of mountaintops (1,2,3). These species are typically designated as vulnerable or even extinct as the result of a myriad of threats including habitat loss and climate change (4). In recent years, researchers have monitored enigmatic disappearances of amphibian species on particular mountains, such as Mt. Oku (unpublished data submitted for publication). We don't fully understand the causes of these declines or whether they are occurring on a local or regional scale. If they're occurring on a regional scale, it may be that factors such as changing climate or deployment of some particular land use practise are at play. Action would then have to address the causes and consequences of these factors. If declines are occurring because of more localised factors (point-source chemical pollution, introduction of pathogens, habitat destruction), then this provides an opportunity to prevent these factors from becoming a problem elsewhere. In order to understand the scale of these changes, we must sample additional mountains with pre-existing baselines on the amphibian community.

Mt. Kupe (2,064 m asl) and Mt. Nlonako (1,825 m asl) are close to one another in western Cameroon, in the middle of the Cameroon Volcanic Line. Both of these mountains are still covered predominantly by forest and still have many species of large mammals, in contrast to other mountains in Cameroon. Both these mountains have amphibian communities better understood than most other mountains in the country. Mt. Kupe has approximately 46 known amphibian species (possibly an underestimate) while Mt. Nlonako has 91. Between these two mountains, there are 27 amphibians that the IUCN has listed as Near Threatened to Critically Endangered. Examples of threatened species in Kupe and Nlonako include the Night Frog (*Astylosternus fallax*), Endangered; Long-fingered Frog (*Cardioglossa venusta*), Endangered; Ranid Tree Frog (*Hylarana asperima*), Endangered; Wild's Egg Frog (*Leptodactylodon wildi*), Endangered; and Merten's Toad (*Werneria mertensiana*), Endangered. Mt. Kupe has been surveyed for frogs on numerous occasions, with one detailed nine-month survey led by Ulrich Hofer in 1994 (5), with subsequent, brief surveys by other herpetologists (6). Mt. Nlonako was surveyed regularly from 1998–2005 by Herrmann et al (7), but apparently seldom surveyed thereafter.

The aim of this project is to assess whether amphibian declines have occurred at Mt. Kupe and Mt. Nlonako. The first objective is to assess the status of the amphibian species pool at representative elevations on the two mountains and to compare this to the historical baseline. The second objective is to assess the status of potential threats that might cause declines, such as forest degradation or chytrid fungus (*Batrachochytrium dendrobatidis*). There are no particular

target species: the current decline of anurans in the Highlands of Cameroon has introduced a high level of uncertainty into the vulnerability of particular species. Species originally assessed to be a lower risk of extinction have disappeared on other mountains (unpublished data in review for publication).

Cameroonian field biologist Solomon Echalle is leading the field campaign. Echalle, who lives at the foot of Mt. Kupe, has worked extensively on herpetological surveys in Cameroon and assisted with the survey of Nlonako. Work will include surveys during the wet season at representative elevations on both mountains. Survey techniques will be similar to Hofer *et al* (5), searching along transects set along the contour of the mountain, both day and night, to observe the most complete inventory possible. Amphibians will be



Mt. Kupe, Cameroon. Photo: T. Doherty-Bone.



Montane forest on Mt. Kupe. Photo: T. Doherty-Bone.

¹ Conservation Research and Action for Amphibians of Cameroon (CRAAC) Project, Royal Zoological Society of Scotland, Edinburgh Zoo, Edinburgh, UK, Contact email: tommy_dbone@yahoo.com ² School of Geography & School of Biology, University of Leeds, Leeds, UK. ³ Cameroon Herpetology-Conservation Biology Foundation, Yaoundé, Cameroon.

sampled for the presence and parasite load of the chytrid fungus. Human use of each sample site will also be recorded.

This project will help understand the causes of declines elsewhere in Cameroon, and to determine the appropriate action in response to those declines. Depending on the results, conservationists can draft management plans to prepare for or manage the declines, as well as further research to determine consequences of these declines across Cameroon. This study will serve as a cornerstone for future research on these declines.



Solomon Echalle by a stream at Mt. Kupe. Photo: T. Doherty-Bone.

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Tree Frog (*Leptopelis rufus*) metamorph at lower Mt. Kupe, April 2015. Photo: T. Doherty-Bone.



ACRS

Amphibian Conservation Research Symposium

*Sharing research and strategies to empower
the future of amphibian conservation*

Potchefstroom, South Africa
18th – 21st January 2016

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Rough-skinned Newt, *Taricha granulosa*. Photo: Elke Wind, BC, Canada.



Batrachochytrium salamandrivorans: North America Call to Action

By Dede Olson

A new amphibian fungal pathogen *Batrachochytrium salamandrivorans* (*Bsal*) was identified in 2013 from a wild salamander die-off in Europe. Studies show that *Bsal* kills North American salamanders. *Batrachochytrium salamandrivorans* is not known to occur in North America currently, but pathways for its entry do exist. Interagency and international collaboration and action will be essential to prevent or reduce risk of *Bsal* introduction to the United States, Canada, and Mexico.

Batrachochytrium salamandrivorans is native to Asia, and Asian salamanders carry the fungus without showing signs of disease. Asian salamanders are held in international captive collections, and are common pets; of the nearly 3 million salamanders imported to the U.S. over the past decade, >85% were Asian salamanders. First detected and identified in the Netherlands, in the last year *Bsal* has been detected in captive salamanders in the United Kingdom. This pathogen has proved to be lethal to multiple species in both captive and wild situations. It is an emerging infectious disease that is at an early stage of global transmission. Wildlife scientists and managers aim to contain or treat infected animals in captive situations, and preempt the pathogen's introduction to wild populations outside its Asian range.

North America is a global hotspot for salamander diversity, home to nearly 50% of all species. Salamanders play key ecosystem roles, as they are centrally nested in food webs and occur both in

water and on land. We use salamanders as metrics of environmental change, and they are critical to biomedical research that seeks human health benefits. Numerous threats affect amphibians, and despite the potentially dramatic impacts of the *Bsal* threat, it is controllable at this time.

PARC's Disease Task Team will develop a Strategic Action Plan that will outline approaches to protect our North American natural heritage, our native species, and ecological functions, as well as ecosystem services for human goods and services that these species provide.

The *Bsal* Strategic Action Plan components are as follows:

1. Identify *Bsal* entry routes into the United States, Canada and Mexico.
2. Develop strategies to prevent the risk of *Bsal* entry to North America, and specifically its introduction into wild populations.
3. Develop continental surveillance strategies for wild and captive populations.
4. Develop and improve response and intervention strategies (containment, treatment) if *Bsal* is detected.
5. Identify education and outreach strategies to enhance public awareness and biosecurity compliance.

For more information visit the [PARC Disease Task Team, Information Portal](#).

Call for Submissions: Have You Monitored the Effects of a Conservation Intervention on Amphibians?

By Rebecca Smith

The journal *Conservation Evidence* needs your help—it is currently producing a Special Issue on amphibian conservation. So if you have monitored the effects of a conservation intervention on amphibians they encourage you to submit a paper describing the intervention and monitoring results.

The journal *Conservation Evidence* publishes research, monitoring results and case studies on the effects of conservation actions. The aim of the journal is to provide a format for those at the front line of conservation practice to share their experience of the effectiveness (or not) of conservation interventions. The journal is free to publish in and all papers are open access. This allows the research to be freely and easily available and exchanged within the practitioner community.

Case studies on all aspects of species and habitat management are welcomed, such as habitat creation, habitat restoration, translocations, reintroductions, invasive species control, integrated conservation development programmes, changing attitudes and education. Studies can be from anywhere around the world.

So far over 250 papers have been published in the journal. These have included 439 conservation actions in 35 countries, and over 70% of the authors have been practitioners (Spooner *et al.* 2015 *Conservation Evidence*). However, the majority of papers submitted to and published in *Conservation Evidence* have focussed on plants and

birds (59%). **Only 2% of studies focussed on amphibians.** It is for this reason that *Conservation Evidence* has decided to publish a Special Issue on amphibians.

All papers must include a detailed description of the conservation intervention with appropriate monitoring to evaluate the consequences on amphibians, but simple, concise papers are welcomed. Papers should be written by, or in partnership with, those who did the conservation work. As well as publishing the results of successful interventions, the journal encourages authors to report interventions that were unsuccessful as these results also provide valuable information to practitioners.

For information about style and how to submit manuscripts please read the Guidance for Authors available from the [journal page of Conservation Evidence](#).

The deadline for submissions is 31st August.

The website, www.ConservationEvidence.com, summarizes and brings together evidence about the effects of conservation management for both habitats and species. It is a reliable information resource designed to support decisions about how to maintain and restore global biodiversity. Evidence is freely available through a [searchable database](#), the [open access journal](#) and a series of synopses including [Amphibian Conservation](#), which summarizes over 400 studies that monitored the effects of conservation actions.

calling all
bloggers!
want to write for
amphibians.org?



Online Conservation Needs Assessments

By Kevin Johnson

Amphibian Ark is very excited to announce the launch of our online Amphibian Conservation Needs Assessment program at www.ConservationNeeds.org. Since 2007, AArk staff and our partners have worked with our colleagues from the IUCN Amphibian Specialist Group (ASG), the international *ex situ* amphibian conservation community and other stakeholders to evaluate the conservation needs of 3,490 amphibian species. With the move to an online format, we are now able to continue these assessments in a more inclusive environment, with assessments for multiple countries being undertaken at the same time.

BACKGROUND

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. The decision tree has subsequently been reviewed and refined, and has now evolved into the [Amphibian Ark Conservation Needs Assessment process](#), which generates prioritized recommendations for both *in situ* 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, Amphibian Ark staff facilitated 26 national or regional workshops to assess the conservation needs of 3,375 (46%) of the world's amphibian species. With funding for physical workshops becoming more difficult to obtain, the decision was made to build an online version of the assessment process as a solution for ensuring assessments could continue. In late 2014, thanks to the financial support of the Association of Zoos and Aquariums (AZA) the European Association of Zoos and Aquaria (EAZA), and the Zoo and Aquarium Association (ZAA) we began development of an online assessment program, and all previous assessments have now been migrated into the new system. Assessments from previous workshops can be reviewed and updated using the online program.

The information provided in the assessments is then used to prioritize each species for one or more recommended conservation actions. These recommendations are then used to guide the next steps required for the conservation of each species. At the national level, this is most often the development of a National Action Plan for the

group of species being assessed (*e.g.*, Amphibians). Conservation practitioners are then able to focus their efforts and resources on the species and environments that are most in need of help, and are likely to benefit the most from those efforts. National action plans generally contain detailed and prioritized conservation actions for both *in situ* and *ex situ* programs, and often contain species-level actions for all threatened species.

Conservation resources are limited, and with thousands of threatened species in need of help, the Conservation Needs Assessment process seeks to objectively and consistently identify priority species and their immediate conservation needs.

WHO MAKES THE ASSESSMENTS?

During the past seven years, around 350 ASG members, scientists, field biologists and researchers, animal husbandry experts and other stakeholders have contributed their expertise as assessors during 26 Amphibian Conservation Needs Assessment workshops. Combining and sharing the expertise and experiences of all of these people is vital to enhance the assessments, ensuring that appropriate recommendations for priority national and global conservation actions are delivered. Collectively, they have determined the best course of conservation action to help prevent the extinctions of threatened amphibian species in the wild.

Anyone who has the appropriate expertise is welcome to contribute to the online assessments. Since the bulk of the information required for the assessments relates to the current status of species in the wild, and the threats they face, the primary source of information comes from people with recent knowledge of species in the field. The assessments also contain some details of past *ex situ* experiences for each species, so input from the *ex situ* amphibian conservation community is also required to ensure complete and thorough assessments.

Requests to become an assessor can be made by completing the short registration form or by clicking the "Signup to get started!" button on the Home page. Requests will be verified and approved by the appropriate National Facilitator - normally ASG Chairs, or Amphibian Ark staff - and email notification will be sent as soon as the request has been approved. This approval process ensures that all assessors have appropriate expertise, resulting in assessments and the conservation actions recommended by those assessments that are of the highest possible quality.



CONSERVATION NEEDS ASSESSMENTS

The new Conservation Needs Assessment logo, "Endless Horizon," created by Danny Beckwith. The logo represents the sunset (potential species extinction), and the horizon represents the assessment process, that will help prolong species' existence.



Participants at an amphibian Conservation Needs Assessment workshop in São Paulo, Brazil. The new online assessment program allows these assessments to continue in a more inclusive environment, with assessments for multiple countries being undertaken at the same time. Photo: Kevin Johnson.

FACILITATING NATIONAL ASSESSMENTS

Prioritizing species for their conservation actions has most often been done at the national level, since conservation actions are usually also undertaken at the national level. To help facilitate a complete assessment of a country's amphibians, the National Facilitator will work with other local ASG members to determine who the most appropriate assessors are, and to allocate species to each of the assessors. If more than one assessor has expertise in each species, separate assessments can be made by each of the assessors, and the assessments are then automatically consolidated to generate a single set of recommended conservation actions for the species.

All assessments must be reviewed and endorsed by the appropriate National Facilitator before they are included in reports such as National Recommended Conservation Actions, and before those assessments can be viewed by users of the assessment data. This approval process ensures that all assessments have been made using the most current information known for each species; that vital components of an assessment have not been overlooked; and that those assessments and the recommended conservation actions are of the highest possible quality. This review and approval process can be done by a small group of people.

PLANNING FOR A NATIONAL ASSESSMENT

One of the key components of the Conservation Needs Assessment process is to organize assessments for all amphibian species in a country, as the first step in the development of a national amphibian conservation action plan. As well as using the new online application, national assessments can still be undertaken during a physical workshop if that is the preferred option.

Workshop-based assessments bring together the leading amphibian experts for the country's amphibians, along with other

relevant stakeholders, for a multi-day workshop. The length of the workshop depends on the number of species to be assessed, but on average, 40–60 species can be assessed each day during a workshop. The workshop ends with the discussion of recommendations and of the next steps needed for implementing those conservation actions. Using the online process, assessors generally work in isolation from each other, and undertake their assessments online, in their own time. The combined assessments from multiple individual assessors are consolidated into a single set of assessments for each country.

An online assessment for all species in a particular country requires considerable planning and monitoring by the host (usually the ASG Chair). It involves the following activities:

- Determine the list of assessors required to assess all species in the country, and ensure they have all registered online.
- Actively encourage assessors to complete their assessments according to a pre-determined timeframe.
- Encourage assessors to review species in that country which have been added by other assessors, and to contact those assessors if they have concerns with their data.
- Consider a physical or web-based meeting (such as Skype) once or twice during the assessment timeframe to help with any questions, keep the momentum going, and to ensure that no one is falling behind. AArk staff are happy to join these Skype calls if we can be of help - we have English and Spanish-speaking facilitators who can provide help and support.
- ASG Chair(s) or National Facilitator reviews and approves all assessments.
- Review species that have not yet been assessed, and encourage assessors to add data for those species.

Moving forward, we plan to work closer with the ASG to advance other *ex situ*-related issues within the ASG, and to focus na-



Amphibian Conservation Needs Assessments

Identifying priority species for conservation actions



tional ASG members on a wider range of *ex situ* activities during and after the assessments.

The online program is currently available in both English and Spanish, with a French version to be made available soon. Other languages may be added in the future as the need arises and as funding is available for translation.

LINKS TO OTHER AMPHIBIAN CONSERVATION DATA

The online assessment program includes links to Red List assessments and distribution maps, AmphibiaWeb species accounts and photos from the CalPhotos photo database, where these exist. Having access to these additional data sources can be very helpful when completing assessments, or as an additional reference, and we hope that over time, additional connections will be made with other databases. We hope that eventually all relevant amphibian conservation databases will be accessible from a single data portal.

We would also like to create additional linkages with the IUCN Red List so that Red List categories in our assessments can be automatically updated, and our assessments can be incorporated into the Conservation Actions section of Red List assessments. We also plan to continue discussions with the Amphibian Red List Authority regarding increased links between our respective data, and readily available access to both Conservation Needs Assessments and Red List assessments from the same location, making it easier for assessors to contribute to both types of assessments at the same time.

Amphibian Ark has partnered with AmphibiaWeb to share and provide access to each others' data, and in the coming months, completed Conservation Needs Assessment data will be available from within AmphibiaWeb species accounts.

CHALLENGES AND EVALUATION

The migration of the workshop-based Conservation Needs Assessment process to an online format has many advantages, including cost-effectiveness, ability for multiple countries to hold concurrent assessments, more inclusive access and immediate updating of and access to data, but this format also brings new challenges. Some of these challenges include access to the internet; assessors finding time to make their assessments; working in isolation, as compared to working in a workshop-based environment; and less stakeholder involvement.

We will continue to work with national ASG Chairs to help plan the assessments for their respective countries, and will continue to facilitate the process itself, albeit remotely in most cases. Sharing

the AArk staff's experience and expertise in the assessment process will provide expert guidance with online assessments.

Evaluation of the success of migration to an online format will be based on how well the application is received and used by assessors and national facilitators, the number of new assessments made, and the solutions to the challenges mentioned above. AArk staff will document the progress of the application every three months during the next year to evaluate how effective this new format has been, and the results of this will help guide how conservation needs assessments are made over the coming years.

SHORT-TERM PLANS

We have a target of completing approximately 1,200 species in Madagascar, Colombia and Europe before the end of 2015, using both the English and Spanish versions of the program. As each of these national/regional assessments are complete, we will survey all assessors and national facilitators involved with them and solicit their feedback on using the program, the resulting recommended conservation actions, the content in the help pages, and the review and approval process. We will also ask for any suggested additions and improvements. We are planning to increase the number of national assessments after the end of this year, and will work with national ASG chairs to plan assessments for their countries and regions. If you are interested in planning for a national amphibian assessment, please contact us at info@conservationneeds.org.

The online program and databases have been developed in such a way that the basic structure can be readily modified to suit other classes of animals apart from amphibians. We hope to work with other IUCN taxonomic specialist groups to determine if the assessment program meets their needs, and we hope that in the future this assessment process will be adopted by other specialist groups.

Amphibian Ark would like to thank the European Association of Zoos and Aquaria, the Zoo and Aquarium Association and the Association of Zoos and Aquariums for their generous and ongoing support of the development costs of the online assessments program. In addition, the following volunteers have generously given their free time to help with the development of the extensive help pages, translation into Spanish and French and creating the new Conservation Needs Assessments logo: Danny Beckwith, Manuel Beterams, Luis Carrillo, Olivier Marquis, Belén Proaño and Karin Schwartz.

Please visit the new online assessment program at www.ConservationNeeds.org and if you have any questions about Conservation Needs Assessments, please contact info@conservationneeds.org.

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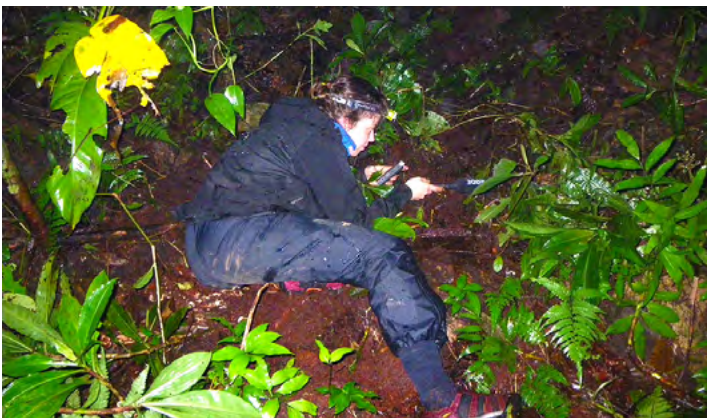
Leptolalax diversity. Image modified from Rowley et al (2015).



Gone Before We Know they Exist?

By Jodi Rowley

One of the first steps in biodiversity conservation prioritization is to measure and map biodiversity, but our understanding of species richness, and how it varies across space, is limited. My colleagues and I examined a group of tiny (<30 mm body size) forest-dependent frogs from Vietnam and Cambodia and discovered that there's likely to be three times the number of species in the group than are currently named. While the group of frogs is predicted to have occurred throughout large areas of forest in the region, most of this forest has been lost due to deforestation.



Jodi Rowley recording *Leptolalax*. Photo: Jodi Rowley, Australian Museum.

Indeed, it is likely that undescribed species in the group have also been lost—driven to extinction before we even knew they existed.

A major obstacle in prioritizing the conservation of species or habitats is the degree of unrecognized diversity “hidden” within morphologically similar (or “cryptic”) species. Put simply, sometimes looks alone are not enough to identify species. For example, if you're a small brown frog living in the leaf-litter on the forest floor, sometimes it pays to stay small and brown—even if you look a lot like related species (after all, frogs attract mates with a call, so as long as the calls are different among species there shouldn't be any confusion when it comes to breeding). As a result, when we look at advertisement calls and DNA in conjunction with morphology, we are realizing that what we thought was one species is actually a group of species that look nearly identical (a great example being Asian Cascade Frogs in the *Odorrana livida* group).

Given that frogs are one of the most threatened groups of organisms on the planet, our inability to figure out who's who and how many species there really are has significant conservation consequences. This is particularly true in areas undergoing rapid deforestation, such as Southeast Asia.

We examined a small-bodied and similar-looking group of frogs that inhabit the forest floor in Southeast Asia (the *Leptolalax applebyi* group). By examining their body size and shape, along with DNA and male advertisement calls, we discovered that at



least two-thirds of the species diversity in the group is likely to be undescribed: while we currently recognize three species in the group, there's likely to be up to six more species that we know of (and other species from unsurveyed forests in other areas that we haven't found yet). Due to their small body size and limited movement, each species or potential species was found in relatively small areas, with some restricted to single watershed basins.

These small frogs are predicted to have historically occurred over a large area of the Central Highlands of Vietnam, but a considerable portion of this habitat has been deforested. In addition, less than a quarter of this habitat falls within protected areas, which is a huge concern given continuing deforestation.

Even more concerning is that the predicted distribution of the group extends into forests that have not been surveyed for this group of frogs, but may contain undescribed species in the group. Some of these watersheds have little remaining forest and five of

the seven watershed basins where the group is predicted to occur have less than 1% protected forest. If these frogs do exist in these areas, they may not do so for long, or they may have already been lost.

Acknowledgements

This project was a collaboration between the Australian Museum Research Institute and the University of Science-Ho Chi Minh City, along with colleagues at the Institute of Ecology and Biological Resources (Hanoi) and Federation University (Ballarat).

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Undescribed *Leptotalax* species. Photo: Jodi Rowley, Australian Museum.



Undescribed *Leptotalax* species. Photo: Jodi Rowley, Australian Museum.

Amphibian Ark Seed Grant Recipients

By Kevin Johnson

Amphibian Ark's \$5,000 competitive seed grants are designed to fund small start-up **rescue** projects for species that cannot currently be saved in the wild, and which reflect AArk values. Projects that are successful seed grant recipients must focus on species whose threats cannot be mitigated in nature in time to prevent their extinction and who therefore require *ex situ* intervention to persist; involve range-country biologists and be based within the range country; must adhere to recommended biosecurity standards for *ex situ* programs; and linking *ex situ* programs to *in situ* conservation.

This year we are very pleased to provide funding for three great programs: Rescuing the endangered Merida's Collared Frog (*Mannophryne collaris*) at the University of Los Andes at Merida in Venezuela; Establishing a breeding laboratory specializing in *Pristimantis* species, at Fundación Zoológico Santacruz in Colombia; and Saving endangered frogs from Cordillera del Condor at the Amphibian Conservation Center, Zoo Amaru, Ecuador.

RESCUING THE ENDANGERED MERIDA'S COLLARED FROG (*MANNOPHRYNE COLLARIS*)

ENRIQUE LA MARCA, LABORATORY OF BIOGEOGRAPHY OF THE UNIVERSITY OF LOS ANDES AT MERIDA, VENEZUELA

This project aims to rescue populations of the Merida's Collared Frog (*Mannophryne collaris*), an endangered Venezuelan amphibian with a very restricted distribution. The species is already listed as Endangered within the current IUCN Red List, and under the upcoming updated Venezuelan Red List. No special measurements have been taken to protect the species, nor is there official protection for the habitat where it lives.

Funding for this project will help with establishing optimum conditions for *ex situ* captive husbandry, building appropriate enclosures for the animals, including filters, lights, water pumps, and other equipment. Funds will also help in providing for training for amphibian keepers.

The conservation of Merida's Collared Frog is mandatory! There is a high risk of extinction in the wild due to massive habitat destruction as a result of increased urbanization. In the short term we

plan to create the right conditions to maintain the frogs, obtain the parental stocks and subject them to strict initial quarantine measures, and to consolidate an already established room to raise a varied source of food items. In the medium time we will maintain the frogs in captivity in the *ex situ* facilities, and finally, in the long term we plan to release the offspring in the wild under a supervised protocol.

The complete project proposal can be viewed here: www.amphibianark.org/seed_grants/Mannophryne-Proposal-Venezuela.pdf.

ESTABLISHING A BREEDING LABORATORY SPECIALIZING IN *PRISTIMANTIS* SPECIES

HAYDY MONSALVE AND SANDRA GÓMEZ, FUNDACIÓN ZOOLOGÍCO SANTA-CRUZ, COLOMBIA

Fundación Zoológico Santacruz has been working for about five years in both *in situ* and *ex situ* amphibian research programs. The *in situ* component has taken place at the Natural Reserve of Peñas Blancas located in San Antonio del Tequendama in Colombia - a location in a privileged geographical position in the middle of the high Andean mountains in a cloud forest ecosystem. This ecosystem has highly anthropic intervention, transforming forest areas into agricultural spaces and deforestation for wood trade. *Ex situ* projects have been focused on developing husbandry protocols for three principal species: *Rheobates palmatus*, *Dendropsophus padreluna*, and *Pristimantis renjiforum*. Progress of these two components of the amphibian conservation project includes a species catalog with ecological information, with nine species found. Results include successful reproduction of *Dendropsophus padreluna*, *Rheobates palmatus*, running reproductive observations and oval development observations and nutritional studies. In 2014 reproduction of *Pristimantis renjiforum* was achieved for first time in captivity, and we were able to document behavioral, reproductive and development tracking of the offspring for an average period of three months.

Pristimantis is a genus that we don't have a great deal of information for and is important for conservation programs. During the *in situ* research other species from the *Pristimantis* genus, *P. bogotensis* and *P. susaguae* were found at the study area.



Adult male Merida's Collared Frog (*Mannophryne collaris*), an endangered Venezuelan amphibian with a very restricted distribution. Photo: Enrique La Marca.



The *ex situ* amphibian lab at Fundación Zoológico Santacruz will be a conservation center for *Pristimantis* species. Photo: Luis Carrillo.

The *ex situ* amphibian lab will be a conservation center for *Pristimantis* species, establishing parameters for *ex situ* management and *in situ* studies of basic ecology, achieving reproduction events, and maintaining viable captive populations. The three species selected have different distribution ranges, require different environmental conditions that needs to be provided in captivity and special equipment will needed to guarantee perfect conditions for the captive population and continued research studies of species. By providing this the conservation program will continue to contribute to and improve our knowledge of the genus, helping us to develop a local conservation plan.

The complete project proposal can be viewed here: www.amphibianark.org/seed_grants/Pristimantis-project-proposal-for-Santacruz-Zoo.pdf.

SAVING ENDANGERED FROGS FROM CORDILLERA DEL CONDOR

FAUSTO SIAVICHAY, AMPHIBIAN CONSERVATION CENTER-ZOO AMARU AND CARLOS C. MARTÍNEZ RIVERA, PHILADELPHIA ZOO

The Amphibian Conservation Center (ACC)–Zoo Amaru is a well-established holistic conservation program for Critically Endangered amphibians from southern Ecuador. Formed in 2009 by Zoo Amaru and the Philadelphia Zoo, it began as ACC-Mazán, one of the few in-country breeding facilities located in the same habitat where the frogs are found within Cajas National Park and Mazán Forest, Ecuador. Today the facility is located at Zoo Amaru in the nearby city of Cuenca.

This year we will establish assurance populations of the yet-to-be-described wampukrum toad, *Atelopus* sp nov. *wampukrum* (IUCN Critically Endangered) and newly-discovered Ecuadorian populations of glass frogs, *Rulyrana* aff. *erminea* and *Rulyrana mcdiarmidi* (IUCN Data Deficient), all from Cordillera del Condor in the

Ecuadorian Amazon. This new project arose as a means to save endangered populations at risk of disappearing due to direct effects of legal and illegal mining at Cordillera del Condor. We propose to build new housing facilities for these threatened Amazonian amphibians at ACC-Zoo Amaru to accommodate the parent animals, which are already housed at our facilities, and to rescue new individuals in order to establish assurance populations of these species while learning more about their ecology and conservation status in the field. We don't foresee the immediate reintroduction of these species, but will try to find adjacent, protected habitats where they might be introduced.

The complete project proposal can be viewed here: www.amphibianark.org/seed_grants/Saving-endangered-frogs-Zoo-Amaru.pdf.



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The yet-to-be-described Wampukrum Toad, *Atelopus* sp nov. *wampukrum* from Cordillera del Condor in the Ecuadorian Amazon. This species is at risk of disappearing due to the direct effects of legal and illegal mining. Photo: Carlos Martínez Rivera.

A Political-Oriented Framework for Protecting Data Deficient Amphibians

By ¹Rafael Loyola & ²Javier Nori

One in four living amphibians are considered by the IUCN Red List of Threatened Species as Data Deficient (DD) (1). Population declines for this particular group of species are so high (2) that over the last years different authors have drawn attention on the worrying fate of many DD amphibian species (3-7).

However, decision and policy makers often ignore DD species in conservation planning and environmental policy. The main reason for that is the importance they give to the IUCN classification system. According to the IUCN Red List Guidelines, DD species are those species for which “there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status.” Based on this definition, policy makers usually blame uncertainty as the main reason for not including DD species in conservation policy. Ultimately, this approach means we could lose numerous species only because we have not acquired sufficient information to flag them as threatened based on a particular methodology.

While the methods used for red listing species are robust, the IUCN also acknowledges that it is important to make positive use of whatever data are available. For taking action, information should be weighted on the basis of needs and priorities. Unfortunately, “weighting” the relative conservation importance of DD species it is not a simple task (3,4). Many DD amphibians are known only from few, even a single locality, and their distribution is often incomplete. But the bottom line is that if we apply just the IUCN criteria to understand the likely extinction risk of DD species, we will not learn anything new. This is because these species have been classified as DD by these very same criteria. What if we use different criteria, not to dispute the IUCN classification, but to supply decision and policy makers with a new piece of information?

Recently, we published a paper that provides a new perspective regarding the global context of DD species, using information of their known ranges along with other available information (7). For this, we estimated the socio-political trend of each country of the world harboring DD species. This trend was represented by observed changes both in the total area protected over the last decade in the country as well as the country’s Human Development Index (HDI). We also evaluated land-use change through habitat modification inside the known range of each species (provided by IUCN) and quantified the percentage of known range overlapping with established protected areas to assess species conservation status (7).

Our results emphasize an existing pattern: the fate of DD amphibians is extremely worrying and uncertain. Most countries holding a large number of DD species show a sociopolitical trend illustrated by substantial recent increase in HDI and low increase in the establishment of protected areas. Further, the percentage of overlap between species’ distribution and human-modified landscapes is high (nearly 58%). More than half of DD species have less than 1% of their known distribution represented inside protected



The Data Deficient amphibian *Telmatobius pinguiculus*. This is a rare species from northwest Argentina, only known for a couple of localities and with unknown population trends. Most species of this genus are facing important threats and some of them have become extinct over the last years. Potential threats within the species’ distribution include the introduction of predatory fishes, water pollution owing to mining activities, land-use changes along watersheds, and degradation of high mountain swamps by cattle. *Telmatobius* species living at high altitudes might be particularly prone to becoming infected with chytridiomycosis, and exposed to the effects of global climate change. Photo: Diego Baldo.



Melanophryniscus krauczuki. This Data Deficient species has a small known geographic distribution and occurs in the northeast of Argentina and marginally in Paraguay. Within such small area, the species is threatened by intensive human activities like pine and eucalyptus plantations and the rapid ever-growing spread of urbanization in the region. In addition, some of *M. krauczuki* known populations will likely suffer from the establishment of a large binational (Brazil and Argentina) hydroelectric dam in the Uruguay river named Garambí-Panambí. Photo: Diego Baldo.

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areas. Most countries in this situation are in Africa. Other countries with similar socio-political trends are in Southeast Asia, Central America and in the northern region of South America. Although we are aware that part of our results carries uncertainties (because we used the known distribution of species which are likely incomplete), we can suggest that DD amphibians cannot continue to be ignored or weighted as least concern species in conservation decisions. The message is clear: we should not turn our back to these species when it comes to policy making.

Our work provides additional evidence to previous studies highlighting the delicate situation of DD amphibians worldwide (3-5). We should stress that our analysis does not dispute the IUCN criteria; instead it allows us to look at the same problem from a different perspective, which includes the use of readily accessible GIS layers and puts the issue of DD species into a more political-oriented framework. Evidently, the best way to solve the problems is through scientific research. Research is essential to increase our knowledge on many biological aspects of these species such as taxonomy, systematics, demography, ecology, natural history and threats, in order to support adequate conservation decision. In the meanwhile, we should be cautious. Many of us can remember a handful of DD amphibians at presumably low risk, as well as some others, which might be facing severe threats. But please bear in mind that these DD species are now more than two thousand! Along with other authors we looked closely at the worrying fate of DD species (3-5), and we argue that strategies aiming to minimize species' extinction risks require both reliable data, but also the courage to foster conservation actions despite uncertainties (7).

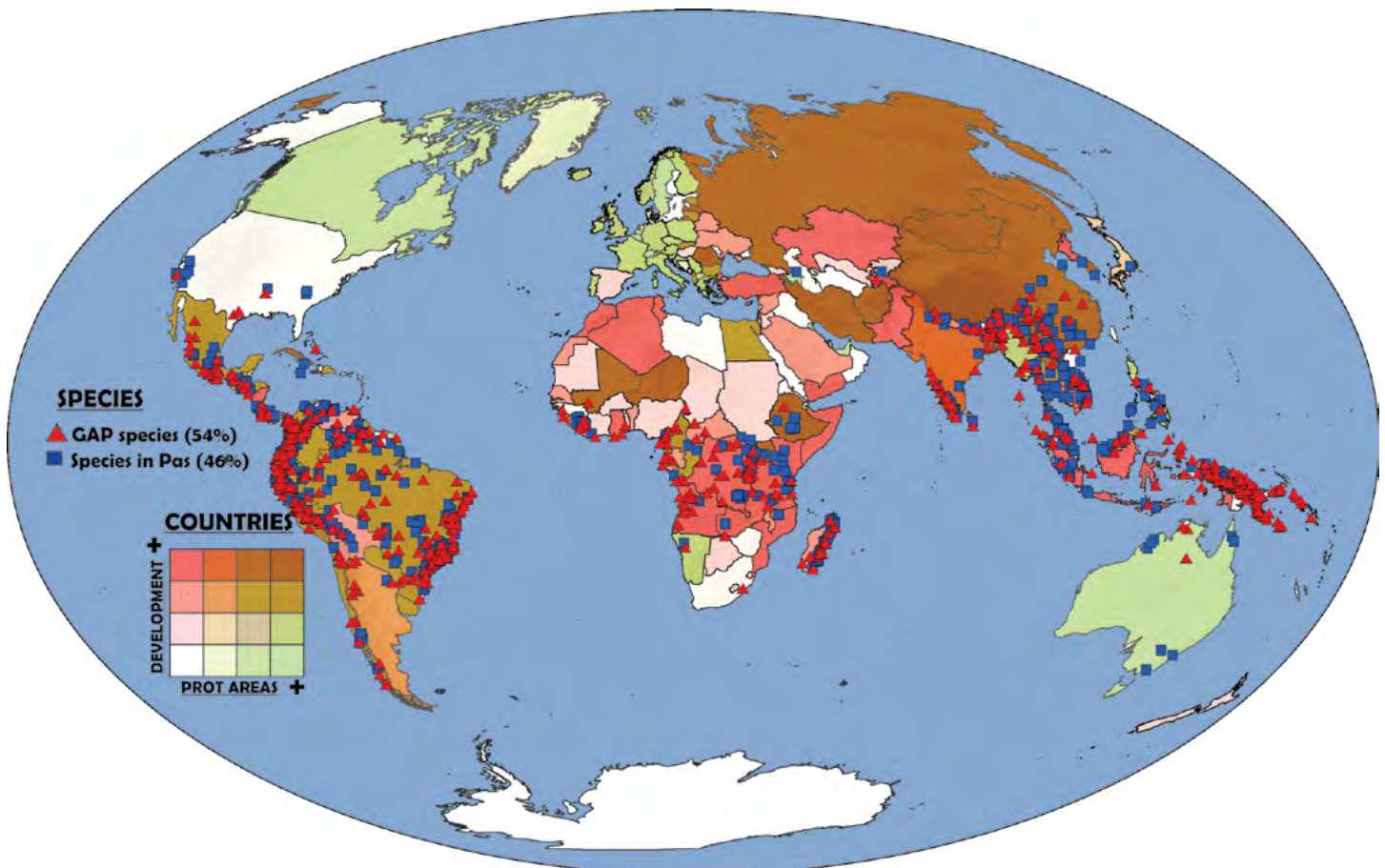
These strategies would allow us to better understand the causes of extinction with research while we do on-the-ground conservation, like in adaptive management strategies.

Acknowledgements

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The gap in the protection of Data Deficient species in relation to current socio-political trends in different countries. Map shows the geographic centroid and degree of protection (shown in two categories: gap species and those found in protected areas) for Data Deficient amphibian species; and the variation in Human Development Index and protected area surface in each country of the world, from 2002 to 2012.

National Conservation Status Assessment of Brazilian Amphibian Species

By ¹Yeda Bataus & ²Luis Fernando Marin da Fonte



Fig. 1: Workshop in 2012. Photo: RAN/ICMBio Collection.

Brazil is signatory to the Convention on Biological Diversity (CBD), a global agreement on sustainable use, conservation and equitable sharing of the benefits derived from biodiversity. One of the commitments made by the parties was to assess the conservation status of their biodiversity until 2014 and, following that, to establish conservation policies, especially regarding Threatened species.

Therefore, in 2009, in association with the International Union for Conservation of Nature (IUCN), the Brazilian government initiated the national assessment process of its fauna through its environmental agency *Instituto Chico Mendes de Conservação da Biodiversidade* (ICMBio). For amphibians, coordination of extinction risk assessment was led by *Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios* (RAN), with Yeda Bataus (ICMBio amphibian and reptile coordinator) and Dr. Célio F.B. Haddad (taxon coordinator, Universidade Estadual Paulista, UNESP) linking researchers and RAN, and helping directly in the development of activities.

The assessment process followed these steps: (i) online public consultation, allowing feedback from scientists on topics such as species habits and habitats; (ii) workshops with invited experts, to assess the conservation status of the species (Fig. 1); and (iii) validation process, with the collaboration of specialists in the IUCN Red List methodology. In total, 973 Brazilian amphibian species were assessed, with the participation of 46 assessors (representing 29 research and/or educational Brazilian institutions) at five workshops (mean of 20 experts/meeting).

As a result of the biodiversity assessment process, at the end of 2014 two national regulations were published by the Ministry of Environment (Administrative Directives MMA 444/2014 and 445/2014), listing Threatened terrestrial and aquatic Brazilian fauna.

The current national process differs from that conducted in the early 2000s (resulting in the Normative Ruling MMA 03/2003), when presumably just Threatened species were assessed and 627 species (including 16 amphibians) were considered to be Threatened or Extinct (1). This time, all Brazilian vertebrate species (and some selectively chosen invertebrates) known to date (June 2014) were assessed. From 12,256 assessed taxa, 1,173 (9.57%) were considered to be Threatened (2, 3).

¹Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios (RAN), Instituto Chico Mendes de Conservação da Biodiversidade (ICMBio), Ministério do Meio Ambiente (MMA), Brasília, Brazil (yeda.bataus@icmbio.gov.br). ²Universität Trier, Department of Biogeography, Germany.

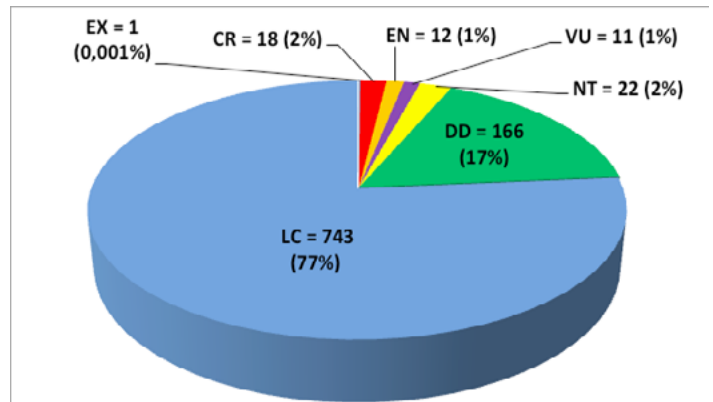


Fig. 2: Number (and percentage) of nationally Threatened amphibian species by category, according to the National List of Brazilian Threatened Fauna (Administrative Directives MMA 444/2014) (CR = Critically Endangered, EN = Endangered, VU = Vulnerable, EX = Extinct, NT = Near Threatened, DD = Data Deficient, LC = Least Concern).

Of those 973 assessed amphibian species, 41 (40 Anura and one Caudata) were considered to be nationally Threatened [18 Critically Endangered (CR), 12 Endangered (EN), 11 Vulnerable (VU)] and one (*Phrynomedusa fimbriata*) Extinct (EX). Furthermore, 22 species were listed as Near Threatened (NT), 166 as Data Deficient (DD) and 743 as Least Concern (LC) (Fig. 2).

Although the number of amphibians recorded in Brazil has increased substantially between 2004 and 2014 (from 751 to 1026 species) (4, 5), this fact alone cannot explain the growth of 176% in the number of Threatened species in the country. Indeed, the observed increment might be explained by both improvements in application of the assessment methodology and the rise of environmental disturbances.

It is noteworthy that most of the Threatened species occur in the Atlantic Forest biome (Fig. 3), mainly in the southeastern region, one of the most deforested areas of Brazil and where about 70% of the country's population lives. These species are threatened especially due to the ongoing loss and fragmentation of habitat, decrease of habitat quality and genetic isolation caused by disturbances such as conversion of natural areas into pastures for livestock and monoculture plantations, construction of dams, etc.

Another commitment made by Brazil as signatory of the CBD is to carry out Action Plans that encompass all the Threatened species, aiming at their protection and improvement of their conservation status. Of the 41 Threatened amphibians, 37 (90%) are covered by

National Action Plans (like *Melanophryniscus admirabilis*, Fig. 4) developed jointly with the participation of civil, public and private institutions and coordinated by RAN/ICMBio. Future challenges for the Brazilian government and society include maintaining the assessment process, including these in Action Plans and, above all, implementing the actions defined in those plans.

The results of the national Brazilian assessment process will inform the update of global amphibian assessments in The IUCN Red List of Threatened Species, where currently 834 Brazilian amphibian species have been assessed (against 973 in the Brazilian process).

Acknowledgements

To avoid forgetting anyone, no names will be cited, but Yeda Bataus would like to thank all the researchers (directly or indirectly) involved in the amphibian assessment process; IUCN staff for help during some workshops; to the “Diretoria de pesquisa, avaliação e monitoramento da biodiversidade” (DIBIO/ICMBio), for financial support and guidance; and to the interns, consultants and civil servants of the “Centro Nacional de Pesquisa e Conservação de Répteis e Anfíbios” (RAN/ICMBio), for all their support and trust in the process. Luis Fernando Fonte would like to thank Ariadne Angulo (Amphibian Specialist Group, ASG) for comments and suggestions to the original text.

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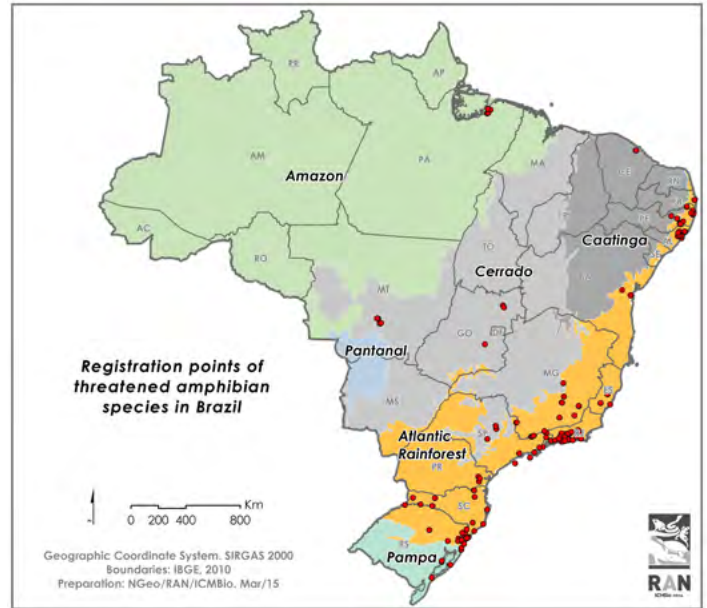


Fig. 3: Distribution map of nationally Threatened amphibians in Brazil, by biome and federal unit.



Fig. 4: *Melanophryniscus admirabilis*, Critically Endangered (CR). Photo: Luis Fernando Marin da Fonte.

The Vulnerability of Amphibian Populations Also Depends on Their Biogeographic Histories

By Christophe Dufresnes

Amphibians are among the most threatened group of animals worldwide, mainly due to human-related activities (e.g., habitat destruction and pollution, global warming, etc.). It is well known that genetic diversity is crucial to resist and adapt to these stresses. Nevertheless, the levels of genetic diversity may strongly differ between geographic regions, as a result of biogeographic processes linked to past climatic fluctuations. Could the level of vulnerability of populations thus be linked to their biogeographic history? This question was recently addressed by two researchers of the University of Lausanne (Switzerland), who analyzed regional and national red lists of European amphibians, in the light of the evolutionary history of populations. The results have just been published in the scientific journal *Conservation Biology*.

WHY IS GENETIC DIVERSITY SO IMPORTANT?

Genetic diversity can condition the long-term viability of populations. It correlates with individual fitness in many animals and plants. Moreover, it constitutes an adaptive potential to cope with sudden environmental changes. In amphibians, genetically-depressed populations face poor survival, larval performance and competitive potential, propensity for physical abnormalities, as well as susceptibility to pathogens and UV-B radiation. Accordingly, several comparative studies reported that genetically-rich species were on average less threatened than their genetically-poor counterparts.

BIOGEOGRAPHIC LOSS OF GENETIC DIVERSITY

It is well known that anthropogenic fragmentation of habitats is an undeniable cause of local genetic bottlenecks. Disconnected populations face increased rates of inbreeding (as individuals are

isolated with relatives), eventually contributing to their decline, which in turns causes even more inbreeding (the “extinction vortex”). At a larger scale however, patterns of genetic variability were essentially shaped by biogeographic events resulting from past climate changes, like Quaternary glaciations. During glacial periods, amphibians, like most animals and plants, could only persist in restricted areas with milder conditions, called “glacial refugia.” In Europe, these refugia were usually located in southern Peninsulas, depending on the species. After the end of the last glaciation (<15,000 years ago), populations expanded to recolonize formerly inhospitable areas (Figure 1a). These processes left strong genetic signatures: old populations that survived in refugia had the time to accumulate large amounts of genetic diversity, whereas populations now found in post-glacially recolonized regions were bottlenecked during their recent expansions. Consequently, genetic variability tends to decrease with distance from refugial regions, as revealed by molecular studies (Figure 1b).

LINKING BIOGEOGRAPHIC HISTORY TO AMPHIBIAN DECLINES

To understand how the history of amphibian populations during the glaciations might have affected their vulnerability, it was first important to map the conservation statuses of species throughout their ranges. Thanks to an international network of researchers and conservation biologists, 37 national and 91 regional amphibian red data books could be put together. Second, it was also necessary to know the impact of the glaciations on each species, and especially the location of their glacial refugia. Fortunately, this was the focus of numerous molecular and ecological studies over the last 20 years, and the general picture was already established for most

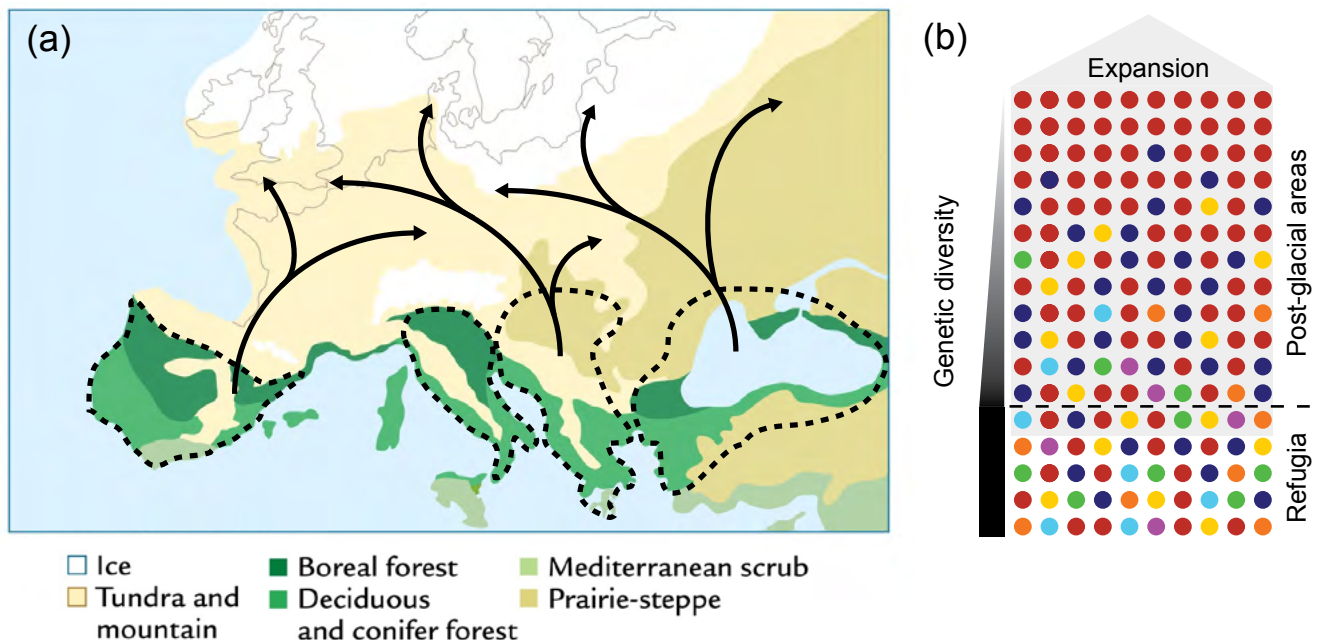


Fig. 1: (a) Continental Europe was widely covered with unsuitable conditions for amphibians during the last glaciation, and species sheltered in glacial refugia (dashed lines). These populations recently expanded to recolonize the rest of Europe after the deglaciations (arrows). Large mountain chains, i.e., the Alps, the Pyreneans and the Carpathians were major barriers shaping the current distribution of species. (b) Schematization of the loss of genetic diversity due to post-glacial expansions. Genetic diversity decreases with distance from refugia, as only a subset of the refugial diversity reaches post-glacial ranges.

European species. In total, 18 widespread amphibians (12 anurans, 6 urodeles) could be analyzed.

AMPHIBIANS ARE MORE THREATENED OUTSIDE THEIR GLACIAL REFUGIA

The statistical analyses of this large dataset were unequivocal: the biogeographic history of populations significantly influences their vulnerability. Threatened populations are mostly found in post-glacial than refugial ranges (Figure 2). The pattern is very clear for most species including *e.g.*, European green toads and tree frogs, yellow- and fire-bellied toads, alpine and marbled newts, fire salamanders, etc (see examples in Figure 3). For Christophe Dufresnes and Nicolas Perrin, who conducted the study, several hypotheses can explain this phenomenon. First, ectothermic animals like amphibians are possibly better adapted in refugial Mediterranean regions than in northern, colder, post-glacial ranges. Second, it is known that expanding populations accumulate a higher proportion of deleterious genetic mutations (*i.e.*, mutations reducing individual fitness), and might thus be intrinsically less fit than demographically stable refugial ones. Third, genetic diversity might interact with human pressures: the analyses also highlighted the negative effects of urbanization and pollution by pesticides, which are known causes of amphibian declines worldwide. Because of their intrinsically poor genetic potential, post-glacial populations thus likely have a harder time to cope with anthropogenic disturbances.

TOWARDS CONSIDERING BIOGEOGRAPHIC HISTORIES IN CONSERVATION ASSESSMENTS?

Despite their major influence on the distribution of genetic diversity, biogeographic processes are as yet rarely considered in a conservation context. Based on these results however, it seems relevant to consider the vulnerability of post-glacial populations when evaluating their level of threats. Even unthreatened, these populations might collapse very rapidly when disturbed. The authors thus recommend to implement the biogeographic status (refugial versus post-glacial) as an additional criteria for the establishment of regional and national red data books.

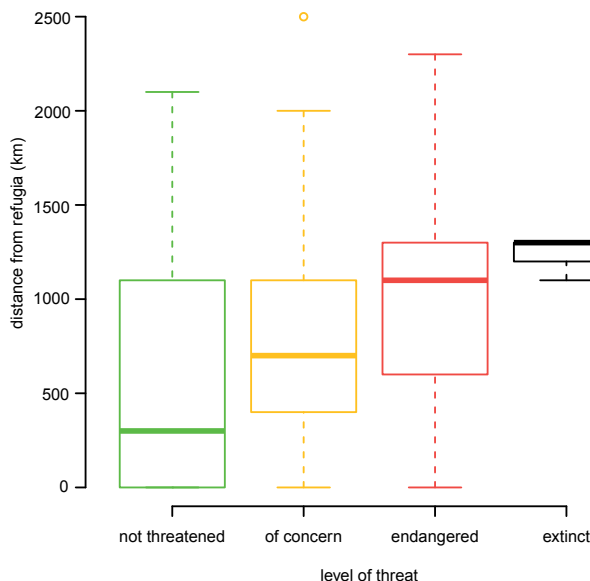


Fig. 2: Conservation statuses significantly worsen as distance from refugia increases, supporting a link between biogeographic history and population vulnerability.

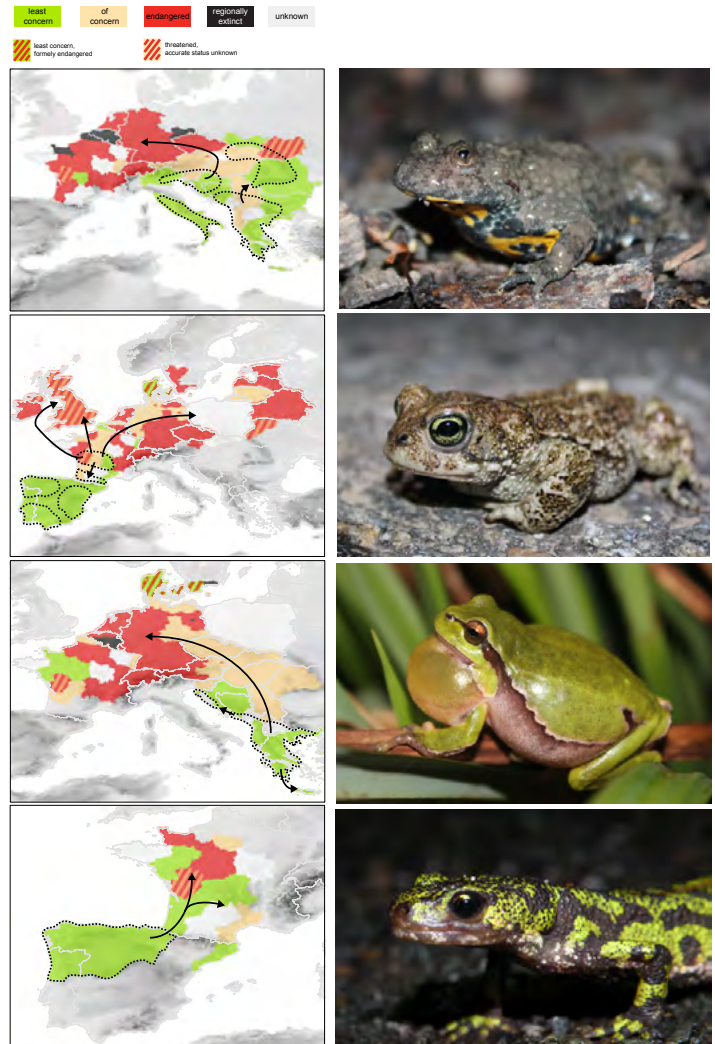


Fig2. 3: Examples of amphibian species that are more threatened far away than within and nearby their glacial refugia (dashed line), where genetic diversity is higher. This pattern is observed in most European amphibians. From top to bottom: Yellow-bellied Toad (*Bombina variegata*), Natterjack Toad (*Epidalea calamita*), European Tree Frog (*Hyla arborea*), Marbled Newt (*Triturus marmoratus*). Photos: C. Dufresnes.

Mandookavani: An Acoustic Guide to Frogs and Toads of the Western Ghats

By Gururaja 'KV, 'Ramya B, 'Seshadri KS and Ramit S

Amphibians are the first animals with a backbone to have set foot on earth. There are close to 7,500 species of amphibians on earth today, comprising frogs, toads, salamanders and caecilians (1). Western Ghats of India is one of biodiversity hotspot in the world and at present harbours 218 species of amphibians of which 192 are frogs and toads. This about half of the overall amphibian diversity in India.

It is during the rainy season (monsoon) that the presence of frogs and toads become striking, thanks to their characteristic non-stop croaks. Frogs and toads vocalize by vibrating vocal chords as air is pushed over them through their lungs. A balloon-like vocal sac amplifies this sound further. Each of these species has its own distinctive call and one can identify a frog or toad by listening to these calls.

In a first-of-its-kind initiative in India, a group of researchers interested in amphibians have put together comprehensive call records of 70 species of frogs and toads from the Western Ghats in the form of an audio CD. Titled "Mandookavani" (Sanskrit: *Mandooka* – Frog, *Vani* – Speech), the CD is a comprehensive acoustic guide to the frogs and toads of the Western Ghats. The audio CD was released on April 19, 2015 by Prof. S. Subramanya, Professor in Entomology, University of Agricultural Sciences, Gandhi Krishi Vigyan Kendra, Bengaluru, at Jaaga Startup in Bengaluru.

A database of anuran vocal call would help not only in identifying individual species, but also in understanding their behavior and habitat requirements. The acoustic guide would be especially helpful in field conditions and at night when it is difficult to spot the animals. Using acoustics as a guide to identify frogs would also serve as a non-intrusive sampling method for documenting and recording anuran species diversity.

Mandookavani is one such attempt to bring to the public a curated anuran call database. This is the first ever acoustic field guide on anurans in India. This version presents call records of 70 anuran species spread over the Western Ghats. This is about a third of total anurans in the region. Some of these recordings were made several years ago in remote and often inaccessible areas where frogs and toads still flourish. The database contains 58 endemic and 12 non-endemic species. Six of them are Critically Endangered species, 11 are Endangered and six belong to Vulnerable category of the IUCN Red List of Threatened Species (2015).

The database was the result of collective effort by researchers Ramya Badrinath, Seshadri KS, Ramit Singal and Gururaja KV, who have independently as well as jointly worked on amphibian behavior and ecology for many years. Gubbi Labs LLP; French Institute, Pondicherry; CLP-SOS; Earthwatch Institute, India and The Ruford Foundation have partially funded this program.

Dr. Ashish Thomas, the first amphibian EDGE fellow, in his review says "A propitious investment for all frog lovers. I got my copy of Mandookavani this week. It is a wonderful compilation of anuran calls that one could most likely encounter in the Western

Ghats. Excellent sound quality. Great tool for frog lovers and researchers who find it difficult to differentiate and identify calls of various frog species. Definitely a must-have in the field. I believe it will also go well in sync with the Frog Watch India <http://india-biodiversity.org/group/frog_watch/userGroup/show> initiative and set a perfect example of amalgamation of science and conservation. Would love to see more calls being added in case of any upcoming versions."

Dr. Doris Preininger, a postdoc at University of Vienna and Scientific Assistant at Vienna Zoo writes about *Mandookavani* as "This is an excellent compilation of anuran calls of the Western Ghats and definitely a must-have for every biologist or frog-interested person visiting the area. It is also a great teaching material that shows the diversity of species specific calls and the species richness of this biodiversity hot spot."

Mandookavani is available on line at <http://www.buyit.cc/5425> for international buyers and at <http://www.amazon.in/MAN-DOOKAVANI-Ramya-Badrinath/dp/819244614X> for buyers in India.

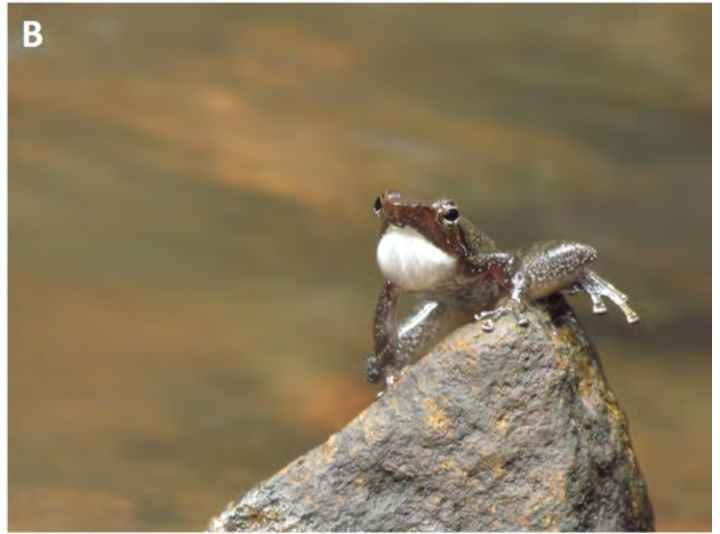
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Mandookavani – CD cover. Photo: Photo: Ramya B.

¹Gubbi Labs LLP, R & D Center, WS-5, Entrepreneurship Center, SID, Indian Institute of Science Campus, Bengaluru, India, Email: gururaja@gubbilabs.in ²Evolutionary Ecology and Conservation Lab, Department of Biological Sciences, National University of Singapore, 14 Science Drive 4, Singapore 117543



Calling males of A. *Pedostibes tuberculosus*, B. *Micrixalus kottigeharensis*, C. *Raorchestes luteolus*, D. *Nyctibatrachus jog*. Photo: Gururaja KV.



Mandookavani – Audio CD release program. From left to right – Gururaja KV, Ramya B, Subramanya S, Ramit S and Seshadri KS. Photo: Priti H.



Fig. 1: Banner announcing the Frog Race and Kubah National Park. Photo: Seshadri K S.

In a Race to Save Frogs: The 4th Bornean Frog Race 2015

By Seshadri K S

So are you all going to line up frogs, get set and shout Jump? Was an often beaten-to-death joke about the frog race. It is true. Most of us would picture a vivid image of big frogs lined up and made to jump upon hearing the word “frog race.”

But in the remote forests of Sarawak in Malaysian Borneo, the picture is different. In this race, it is not the frogs that are competing. It is an excited bunch of nature lovers, herpetologists and photographers. Age being no bar, draws participants from across the globe ranging the spectrum from school kids to a few in their ripe old age. They all set out on foot in search of frogs. In an attempt to spot and identify as many as they can. In a span of two hours. In one night. This is the race. Not frogs jumping.

Field work in the Bornean rainforests is a tough calling as anyone who has travelled to the hot and humid forests of the tropics would know. With sweat breaking into tiny rivulets on the forehead, paying attention to calls and looking for frogs on the floor is an onerous task. More so if one happens to wear spectacles. Such was the situation I found myself. My own participation in the race was more of a happenstance. I was oblivious of such a race until Dr. David Bickford, the veteran tropical herpetologist asked me if I were interested to take part. “I will be delivering a plenary lecture at the event,” he added. I quickly wrote to Professor Indraneil Das, who was organizing the race and got a prompt reply welcoming me to the race. A quick sign up and things looked like a plan. I was to spend a few days in India and head back to Singapore and fly into Sarawak with David, my Ph.D. supervisor.

WHAT'S IN A RACE?

The “race” is elaborate, a daylong event, going well into the early hours of the next day. Like the previous years, the race was being held at Kubah National Park which is a leisurely 40 minute drive from the city of Kuching in Sarawak. The race was being held on 25th of April in conjunction with the “Save the Frogs” Day and was

jointly organized by the Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak and the Sarawak Forestry Corporation.

The key idea of such races is always to shorten the alienation of nature from the hearts and minds of people. This race too was meant to do just that. The line-up of talks and workshops was interesting. There were two dedicated workshops and a series of talks by renowned herpetologists and conservationists from Malaysia and elsewhere.

To add to the excitement, there was a gamut of fun frog aspects thrown in too. A frog exhibition—displaying Indraneil’s notoriously large collection of “froggie” based stuff from ridiculously cute soap dispensers to fancy story books featuring the frog prince tale (Fig. 2); the official release of the Bornean Frog Race 2015 postage stamp and lastly; a live demo of how to paint frogs by creative art students.

BORNEO: WHERE AMPHIBIANS MAKE THEIR LAST STAND

The Island of Borneo, shared between three nations is a rich biodiversity hotspot located smack in the middle of South East Asia (Fig. 3). It has a unique biogeographic history and bioclimatic regime making it one of the most important regions for biodiversity in general. Amphibians are a plenty in this island with over 170 species (1). About three quarters of these frogs are endemic to the region. More than 80 species found here have been listed as threatened. The landscape is rugged in most places and until recently was covered with thick rainforests. In recent times, however, the forests have succumbed to a relentless onslaught of palm oil plantations. Yet, some of the world’s most charismatic species are to be found in these remaining forests. These include the rare and evolutionarily distinct Lungless Frog, *Barbaroula kalimantanensis* that lives in cold streams in the high reaches of Kalimantan (Indonesian Borneo) and

the distinctly miniaturized and well adapted frog described from Kubah itself, *Microhyla nepenthicola* that lives inside liquid filled pitcher plants. Among others are a myriad diversity of tree frogs and a plethora of ground dwelling toads. Such sheer diversity is hard to come by and Borneo is one place on earth that these frogs call home.

KUBAH NATIONAL PARK AND THE LOCALES

Kubah is the nearest mountain range to the city of Kuching in Sarawak. The peak Gunung Serapi is a mere 911 m above sea level and the mountain is clothed with low land rainforests. After having flow into a rainy Kuching, David and I were picked up by Pui Yong early next morning—young and enthusiastic graduate student working on the sound-scape ecology of frogs, the national park was his second home.

Kubah National park is one of the most accessible places in the region. An hour's drive and we reach the cozy setting of chalets and log houses from where one could even see the sea. The reserve is known for the staggering high diversity of frogs—over 60 species have been recorded from the locales. There also was a 'frog pond' where most of the frogs were seen over the last 15 years. While David spent much of his day revisiting his presentation, I had the time to sneak out and watch some birds. A heavy downpour indicated the beginning of the frog race. It was 12 noon and the stage was set.



Fig. 3: Kubah National Park, located in the island of Borneo in S. E. Asia. Image source Google Maps 2015. Photo: Seshadri K S.

FROGS ALL THE WAY

Having spent two years in Singapore gave me an opportunity to get familiar with frogs in SE Asia but nothing could match actually being in the field and learning with the veterans. Apart from Prof Neil (as Indraneil is fondly called); I had the opportunity to meet and interact with Prof Jean Marc Hero, the head of the World Congress of Herpetology. We had met the previous day over lunch and dinner and we all looked forward to the events of the day at Kubah. A couple of brief lectures and welcome addresses from the organizing team and the events began.

As is always the case with such a race, ethical treatment of the animals and their wellbeing is always of paramount concern. Mr. Taha Wahab took over this aspect and dealt with the detailed do's and don'ts at the frog race. This was followed by two parallel photography workshops: one on hands-on frog photography by Mr. Hans Hazebroek who has spent several years in Borneo and the other on the basics of frog and close up photography by Ch'ien Lee a young and aspiring nature documentarian. Both workshops had a full house from the 189 attendees.

Late into the evening, David delivered his address on some of his expeditions in Borneo. His narratives are always exciting and one would listen up with a child like enthusiasm often matching his own disposition. While he only skirted around the misadventures his team experienced in the field, he went at great lengths detailing how they re-discovered the Lungless Frog *Barbaroula kalimantanensis* which was, until then, an enigma. He also talked about revisiting surveys done by two enthusiastic Englishmen when Sabah was a British territory called North Borneo. Dr. Ramlah Zainudin followed up David's talk with her own work on anuran communication and kept the audience on their ears by playing frog calls. Dinner was served and then, we set off for the actual race.

THE RACE

The race was amazingly well managed. Several pointsmen were positioned along a single trail leading to the frog pond. All 189 participants lined up and an official start began at 1900 hrs. The strict rules forbade the participants to step off trails or handle animals. All personnel walked through a trough of Potassium permanganate, a disinfectant to prevent the spread of chytrid fungus. Though I had signed up as a participant, I did not actually go on the race but I thought I'd rather learn more by sticking around the plenary speakers.



Fig. 2: Exhibition of "froggie" stuff. Prof Indraneil's personal collection. Photo: Seshadri K S.

After a short walk on the designated path, we decided to turn back and hit another short trail where Samuel Shonleben, another enthusiastic graduate student works. We headed out and encountered several species of frogs. For me, they were new species and even new genera! Our first encounter was a crested toad *Ingerophrynus divergens*; and then the tiny Mjöberg's Dwarf Frog *Leptobrachella mjobergi*. After this is when things got exciting. We spotted a small

frog on small herbs close to the ground. The frog was about the length of the nail on a human's little finger. It was a microhylid frog and this frog is evidently one of nature's greatest forms of miniaturization. Measuring a mere 11–18 mm in length, this frog lives in liquid filled pitcher plants. The Kubah Narrow Mouthed Frog *Microhyla nepenthicola*.

I had read about this discovery in 2010 (2). Little had I thought I would be seeing one in real life. We encountered a couple more of these tiny frogs and walked along the narrow path in a single file. A small streamlet flowed over a rock face and there we almost stepped on the exquisitely well camouflaged Malayan Horned Frog *Megophrys nasuta*. Leaving it to forage in peace, we moved on only to be stopped by another tiny frog the Near Threatened, Sarawak Slender Litter Frog *Leptolalax gracilis*. Above this was *Philautus tectus*, yet another near threatened frog that was aptly named the Obscure Bush Frog. Slightly further, we encountered the Spiny Slender Frog *Ansonia spinulifer* which is by far the most spiny creature I have ever seen.

The last frog to cross our path as we turned back after one hour was the brightly colored, tree hole breeding frog from SE Asia, the Cinnamon Frog *Nyctixalus pictus*. This bright orange colored frog with fawn colored spots is pretty to say the least. We also encountered several geckos and other critters. But we kept to frogs mostly.

SURVIVAL OF THE EARTH DOES INDEED DEPEND ON FROGS

After the race, all participants turned in their lists and photographs for evaluation and a team set off on deciding who the winners were. It also was the time at which Professor Hero gave his riveting plenary titled "Survival of the Earth depends on frogs." Professor Hero talked about how, over the last three decades he has been fascinated by frogs and has been a constant voice for their conservation (3). Through his talk, he managed to get frogs one leap closer to our hearts. He ended with the fact that as much as survival of the earth depended on frogs, the survival of frogs depends on us too.

A quick prize distribution ceremony followed and prizes went out for the most species seen, the best picture in three categories and a prize for the most enthusiastic participant. By then it was midnight. This is the first ever event and workshop I have been to that has gone into the night.

The event drew to a close with Professor Hero mustering the heart to slice up a big frog made of chocolate, which Samuel had managed to source (Fig. 4, 5). Sadly, this frog ended up in our stomachs but left us with a sweet memory, a generous heart and an all important thought—that survival of frogs does indeed depend on us. Without them, the earth would be a very different and a difficult place to call home article.

Acknowledgements

I thank Samuel Shonleben and Professor Neil for comments and insights into writing this.

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Fig. 4: Sam holding up the frog made of chocolate for a quick round of paparazzi. Photo: Seshadri K S.



Fig. 5: Professor Hero dissecting the frog at the end of a wonderful night of 'frogging.' Photo: Seshadri K S.



Nyctixalus pictus, commonly known as the Cinnamon Spotted Frog is found commonly across SE Asia and known to breed in water filled cavities in fallen trees. Photo: Seshadri K S.



Philautus tectus is a bush frog of the Rhacophoridae family. They live on shrubs in low land forests in SE Asia. Photo: Seshadri K S.



Ingerophrynus divergens or the Crested Toad can be found commonly in forest floor foraging in the leaf litter. Photo: Seshadri K S.



Microhyla nepenthicola or the Bornean Chorus frog was discovered inside pitcher plants *Nepenthes ampullaria* from Kubah National Park. The tadpoles develop within the liquid filled pitcher plants making their life history strategy unique. Photo: Seshadri K S.

Community Conservation: Bringing Together Scientists and Citizens



Malabaricus rhacophorus. Photo: Gururaja KV.

By Ashish GB

Those who have experienced being outdoors with nature have surely felt its peace and beauty and understood that it is a result of hardships and evolution through many different timelines that makes it as wonderful as it is!

The human population is so large, and there are numerous people in different geographies working on many different needs of the society. Many are still connected to our Mother Earth and nature. Many are admirers, some through photography, some through education about natural history, while some just to outdoors for

trekking or relaxing. Few have become conservationists working actively to conserve what is left, and few have become scientists trying to understand nature in a greater detail.

Bamboo Rustles (a Bangalore-based organization that organizes nature education and awareness programs) creates opportunities where scientists and citizens can meet at a single place to share the joy of nature and learn and support each other.

One of Bamboo Rustles' programs is an annual workshop in July guided by Dr. Gururaja KV. Dr. Gururaja KV is a batrachologist with immense knowledge about the amphibians of the Western Ghats and has discovered a few species, including the Giant Wrinkled Frog (*Nyctibatrachus karnatakaensis*), which is classified as Endangered by the IUCN Red List.

This workshop is in its third year where citizens come to learn more about the amphibians from noted scientists. We also understand the techniques, efforts and experiences that the researcher has gone through to bring about additional knowledge about the amphibians for the community and how we as a community can help researchers in their search for more answers and contribute to the conservation of amphibians.

It has always been a great experience for all the participants to learn as well as contribute to the data that has been collected every July from the same location. Hopefully this data will provide insights into our understanding of amphibians and their relationship with the environment.



Photo: Sachin A.



Nyctibatrachus grandis. Photo: Gururaja KV.



Photo: Sachin A.



nyctibatrachus sp. Photo: Gururaja KV.



Photo: Gururaja KV.



The Colours of Gentle Persuasion: Jay Manchand’s “Endangered Frogs Colouring Book”

By Karin Holloway

People can only deal with a problem if they know it exists and then they can only solve the problem if they care enough to work on it. Most of the world’s population has no idea that amphibians are going extinct at least 25,000 times faster than they have been for the last 500,000,000 years. None of these people are even aware that their actions are causing this horror.

I was heartbroken when I discovered the rate of extinction in all of our ecosystems. I couldn’t breathe deeply for a year. Shock isn’t the right way to introduce people to what’s happening to their world. A gentle enticement might encourage humans to help groups who actually are working on this problem, without despair.

My Fat Fox Ltd is Paul’s and my brand new little indie publishing business, a start-up without funds. A month into our new work, I had an inspiration to create coloring books to help people of all ages to fall in love with the animals they colored. I thought that a little bit of information about how interesting each species is would also encourage this. And that if I mention groups who are saving each species, those individuals would express their love with donations. I asked artists to join me in creating a fantastic new kind of coloring

book to help our world and a few, surprisingly, said yes to forgoing an advance to work for a share of the profits instead.

My Fat Fox shares its profits equally with its illustrators and one special organization. Jay Manchand’s beautiful *Endangered Frog Colouring Book* supports “Save the Frogs!” The interior of this coloring book mentions 27 conservation groups and zoos for the 12 species’ illustrations to be colored. You can order your copy [here](#).

Jay’s attendance at the ACRS Conservation Research Symposium 2015 in Cambridge led to us sharing our creation with you, here in the *FrogLog*. We hope that you will help the world learn about this book so they too can then fall in love with frogs and toads.

We wish all of you working to save our world from extinction the best of luck! Thank you for the love you already show through your work.

- Other *Endangered Animal Colouring Books* published by My Fat Fox are available at Amazon and other fantastic booksellers:
- *Endangered Lizards Colouring Book* by Jay Manchand
- *Colour to Save the Ocean - Book #1 - Suitable for Children of All Ages* by Kasia Niemczynska
- *Colour to Save the Ocean - Book #2 - Suitable for Children of All Ages* by Kasia Niemczynska
- *Colour And Save the Ocean - A Colouring Book for All Ages* by Karin Hoppe Holloway
- *Endangered Animal Colouring Book - UK Amphibians and Reptiles* by Cassie Herschel-Shorland





World of

7 Billion



Announcing the Winners of the 2014 – 2015 World of 7 Billion Contest

By Isabelle Rios

Thirteen students from four countries and seven U.S. states earned the top spots in the World of 7 Billion student video contest. The winning videos were announced on May 7th and can be viewed, along with bios of the student filmmakers, online now. The contest name refers to the fact that the growth of the planet's population continues past the seven billion mark reached in 2011 and that people are central to many of the environmental and social issues facing the world today.

The competition challenged students in grades nine to twelve worldwide to create short videos that would connect population growth to one of three global challenges and offer an idea for a sustainable solution to the issue. The videos had to be less than one minute in length and awards were given by topical category.

Winners for the global challenge: "We are in the midst of the sixth mass extinction."

- First place: Katherine Selley and Catherine Knox, Annapolis, MD – Video title: What Will Happen to Us?
- Second place: Michael Kuroda, Piedmont, CA – Video title: The Sixth Mass Extinction
- Honorable mention: Elizabeth Hwang, Pullman, WA – Video title: We Did This to Ourselves
- Honorable mention: Angel Nkwonta, Pullman, WA – Video title: Sixth Mass Extinction
- Honorable mention: Prerana Pai, Sharjah, United Arab Emirates – Video title: Time to Change

Winners for the global challenge: "Most of the world's suitable farmland is already under cultivation."

- First place: Madison Bernier, Virginia Beach, VA – Video title: Our Future Food Demand
- Second place: Dylan Kroft, Kaohsiung, Taiwan – Video title: Save Land, Save Humanity
- Honorable mention: Tim Eddy, Ballina East, NSW, Australia – Video title: Choices
- Honorable mention: Cynthia Zhou, Vancouver, BC, Canada – Video title: Beef Up Sustainable Farming

Winners for the global challenge: "Worldwide, 1 in 10 primary school age children and 1 in 3 secondary age children are not enrolled in school."

- First place: Andrew Schwenn, Coppell, TX – Video title: What Would You Sacrifice for an Education?
- Second place: Hailey Hess, Coppell, TX – Video title: Stop the Cycle
- Honorable mention: Matthew Buxton, Sandy, UT – Video title: Universal Education and How It Gives Everyone a Fair Chance
- Honorable mention: Niquelle Lewis, Idaho Falls, ID – Video title: Would You Make That Difference?

"Video is a powerful and engaging means of communication," said John Seager, president of Population Connection. "We are amazed each year by the quality of submissions and their ability to tell a story and connect to people's emotions in 60 seconds. We had winning entries from 'seasoned' videographers and from novices, and they are all just amazingly talented at exploring these issues and explaining why they matter to them."

Videos were received from 39 US states—plus Washington, DC—and 23 other countries with over 850 video submissions in total. Pam Wasserman, Senior Vice President for Education at Population Connection noted, "this year's videos seemed especially thoughtful given the complexity of topics. And it was exciting to see what solutions the students offered that would impact positive future change."

The contest was promoted throughout the 2014–2015 school year with final submissions due February 19th. A panel of 28 judges, including college and high school educators, filmmakers and professionals working in the topic fields, selected the winners.

Visit the World of 7 Billion website for more information on the contest.

View the winning videos and read bios of the student filmmakers. Want to use the contest in your classroom or share with future students? Sign-up today and you'll receive updates and information on the 2015–2016 contest as it becomes available.



Natal Tree Frog, *Leptopelis natalensis*. Photo: Louis du Preez.

Local and International Research Activities of the African Amphibian Conservation Research Group

By Ché Weldon, Rachael Antwis, David JD Kruger, Jeanne Tarrant & Louis H du Preez

Within the Afrotropical realm, South Africa is the eighth country in terms of proportion of native species in a threatened category (nearly 18%). However, of the 118 species currently reported in the IUCN Red List of Threatened Species for South Africa, 51 are endemics, of which 18 (35%) are in an IUCN Red List Threatened category. To this end, the African Amphibian Conservation Research Group (AACRG), North-West University, Potchefstroom was established in 2002 to address the deficiencies in conservation research of southern African amphibians in an effort to direct innovative research initiatives, often through international collaborative programs. Key focus areas includes: amphibian conservation, citizen science, urban ecology, frog acoustics, parasitology, disease ecology and host-associated microbiomes.

Public support is critical to carrying out conservation actions, especially for frogs which few people realize to be as threatened as they are. We are working in partnership with the Endangered Wildlife Trust to raise awareness about the plight and importance of frogs in the South African context, including through the national frog awareness day: Leap Day for Frogs. Similarly, conservation research is benefited by the input of citizen scientists, and several monitoring projects around the country are now well-established through such contributions.

Since the group was founded 15 books and book chapters and 77 scientific papers have been published (<http://www.nwu.ac.za/content/aacrg-research-outputs>). A children's book, "My first book

on Southern African Frogs" (1) has recently been published and the Complete Guide to Frogs of southern Africa (2) has just been released as a revised eBook. An app based on the children's book and one based on the Complete guide will soon be released. To date, we have developed six regional educational posters (for Durban, Western Cape, Eastern Cape, The Midlands, Zululand and Kruger National Park) with more to follow.

Using Threatened species as flagships, several conservation-focused projects are underway, for example wetland rehabilitation at four sites in the Durban area for the Critically Endangered Pickersgill's Reed Frog will commence in July 2015, facilitating the employment and skills development of local communities.

Urbanization is among the biggest threats to amphibian populations worldwide. However, hardly any studies have been conducted on the effects thereof in developing countries on local and landscape scales. Amphibian distribution and community assemblages are not well understood in aquatic and terrestrial habitats that are rapidly changing due to human modification. This focus area quantifies the effects of urbanization on frog communities in urban and urbanizing cities and is pioneering on the African continent. Accordingly, management practices need to adopt a multi-scale approach if we are to conserve amphibians in African cities.

Bioacoustic research on southern African frogs has received little attention in recent years. The vocal behavior of frogs in combination with advances in passive acoustic recorders enables us to sur-



Raucous Toad
Amietophrynus rangeri



Guttural Toad
Amietophrynus gutturalis



Clicking Stream Frog
Strongylopus grayii



Striped Stream Frog
Strongylopus fasciatus



Poynton's River Frog
Amietia poyntoni



Sharp-nosed Grass Frog
Ptychadena oxyrhynchus



Long-toed Tree Frog
Leptopelis xenodactylus
Endangered



Natal Leaf-folding Frog
Afrixalus spinifrons
Near Threatened



Plaintive Rain Frog
Breviceps verrucosus



Common River Frog
Amietia queckettii



Yellow-striped Reed Frog
Hyperolius semidiscus



Water-lily Reed Frog
Hyperolius pusillus



Bushveld Rain Frog
Breviceps adpersus

THE FROGS OF THE MIDLANDS



Painted Reed Frog
Hyperolius marmoratus



Bilbo's Rain Frog
Breviceps bagginsi



Cascade Frog
Hadromophryne natalensis



Rattling Frog
Semnodactylus wealii



Natal Chirping Frog
Anhydrophryne hewitti



Rhythmic Caco
Cacosternum rhythmum



Boettger's Dainty Frog
Cacosternum boettgeri



Bubbling Kassina
Kassina senegalensis



Dwarf Dainty Frog
Cacosternum nanum



Mistbelt Chirping Frog
Anhydrophryne ngongoniensis
Endangered



Snoring Puddle Frog
Phrynobatrachus natalensis



Bush Squeaker
Arthroleptis walhbergi



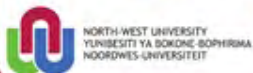
Natal Sand Frog
Tomopterna natalensis



Common Platanna
Xenopus laevis

HABITAT KEY :

- Forest
- Trees
- Woodland
- Grassland
- Farmland
- Gardens
- Wetlands
- Temporary pools
- Bushveld
- Vleis
- Shallow water
- Ponds
- Dams
- Open water
- Streams
- Rocky streams
- Leaf litter
- Soil
- Moss
- Savanna
- Sand Forest
- Mangrove
- Swamps
- Fossorial
- Marshes
- Coastal Woodland



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Proceeds from this poster go to the EWT Threatened Amphibian Programme.

Contact us: jeannet@ewt.org.za / www.ewt.org.za

Photographs kindly provided by: Louis du Preez, Nick Evans, Jeanne Tarrant, Vincent Carnuthers, Greg Tarrant and Clifford & Suretha Dorse.



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ENDANGERED WILDLIFE TRUST
THREATENED AMPHIBIAN PROGRAMME
conservation in action

vey species richness more accurately through increased “listening” time. One of our focus areas is to determine the optimal recording effort for maximum detection of species for the use of community assemblage monitoring. In some species it is also possible to make estimated calculations on the abundance of calling males and the calling intensity. When combined with abiotic data such as light intensity, temperature, humidity, rainfall and wind velocity, we can produce huge amounts of ecologically relevant data. Passive acoustic recorders rapidly produces a considerable amount of data, which can be challenging for the data operator. Furthermore, the acoustic habitat is a rarely recognized niche and under threat from a variety of anthropogenic noise sources that can interfere with vocally active organisms, thus affecting their breeding success. The effect of low-flying airplane noise on the calling behavior of the Critically Endangered Pickersgill’s Reed Frog is a case in study. This species shows both temporal (higher calling rate) and spectral (higher frequency) behavior adaptation in response to airplane noise.

Frogs serve as host for a vast number of different parasites representing all the major parasitic groups. These include protozoans, leeches, mites, roundworms, hookworms, flukes and tapeworms. For some the frog is the definitive host but in many cases frogs play an important role as intermediate host. Parasites co-evolved with their amphibian hosts and therefore provide an informative tool with which to study amphibian evolution and dispersal. We focus on the taxonomy and phylogeny of a group of monogenetic flatworms belonging to the Polystomatidae. Though the majority of monogeneans are fish parasites, polystomes radiated onto the tetrapods and are known from the Australian lungfish, frogs, salamanders, caecilians, freshwater turtles and the hippopotamus. Another group that we focus on is the intra and intercellular blood parasites. In collaboration with several teams abroad we study invasive amphibians and document how their parasites spread to native species through spill over or spill back events.

Global and regional conservation strategies identify, amongst others, the monitoring of disease in wild amphibian populations as particularly significant for ensuring the future wellbeing of amphibians, given the scale and rapidity of animal translocation and the associated rise in the emergence of diseases. To address the global spread of the amphibian pathogen *Batrachochytrium dendrobatidis* (*Bd*) a dedicated online community-focussed resource (www.bd-maps.net) was developed to collect, map and model the prevalence of infection to aid control measures directed against the fungus. These opportunities set the pretext for extensive cataloging and monitoring of *Bd* in Africa and Madagascar, of which virtually nothing was known a decade ago.

Our sampling over the past 10 years on the South African sub-continent demonstrated a lack of observed negative impacts of *Bd* on wild threatened populations, thus supporting the endemic pathogen hypothesis for southern Africa. We proposed that *Bd* emerged out of Africa and underwent mitotic recombination leading to increased virulence. We set out to test these hypotheses using *Bd* genomics and by performing reciprocal challenge experiments of European and African amphibian hosts using a panel of European and South African *Bd* isolates. Combining the cataloging with isolate culturing and sequencing allows insight into the relationship among lineages and the epidemiology of the native and invasive ranges of *Bd*. The discovery of these diverse lineages of *Bd* opens the door to using high-throughput genomic approaches to analyse the spatial epidemiology of amphibian-infecting chytrids

and in so doing, understand how this pathogen has conquered the enormous diversity of hosts and biomes that it now infests worldwide. A decade of research has shown that the occurrence of chytridiomycosis and host extirpation/extinction can be influenced by a complex suite of variables that include environmental factors, host/pathogen genetics, host community and host associated microbiomes. The role of amphibian microbiomes in disease resistance has garnered much excitement in the last nine years, particularly through the potential to use symbiotic bacteria from the skin of frogs as a probiotic prophylactic or treatment for *Bd*. We are particularly interested in how inhibitory properties of such bacteria varies between different isolates and lineages of *Bd*. We are also looking at environmental and genetic determinants of microbiome composition of amphibians.

The majority of our projects are centered in South Africa, but some of our current research activities take place in Botswana, England, France, French Guiana, Madagascar, Namibia, Nigeria, Tanzania and the United States. Through public presentations, special events, participation in scientific conferences, popular literature, posters, field guides and an electronic application, the AACRG impacts amphibian awareness and conservation both locally and internationally.

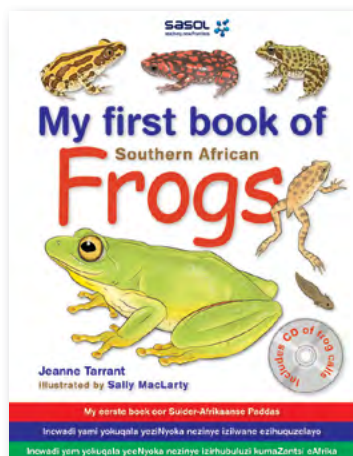
<http://www.nwu.ac.za/aacrg>

<https://www.facebook.com/pages/African-Amphibian-Conservation-Research-Group/245279618990387>

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1. J. Tarrant. My First Book of Southern African Frogs. Struik Nature (2015).
2. L. du Preez and V. Carruthers. A complete guide to the frogs of southern Africa. Struik Nature (2009).





My first book of Southern African Frogs

Jeanne Tarrant
Illustrated by Sally MacLarty

THE BOOK

Frogs are appealing and colourful creatures. Children may be familiar with stages of the frog's curious life cycle, and see their eggs or tadpoles in local streams; and everyone has heard their calls.

My first book of Southern African Frogs introduces 55 different types of frog and includes a CD of their calls. A short introduction outlines key features and includes an illustration detailing their life cycle.

For each species featured, the book provides:

- A short description in four languages, including key features and habits.
- A full-colour illustration of the frog and a visual size comparison with a human hand or matchstick.
- A distribution map, illustration of the type of eggs the frog lays and an indication of each frog's conservation status.
- An illustrated habitat bar with an arrow to indicate where each creature is found.

This simple and charming introduction to frogs will keep children happily absorbed for hours. The text in four languages expands the readership and promotes multilingualism.

THE AUTHOR

Dr Jeanne Tarrant is an expert on frogs and heads up the Threatened Amphibian Programme at the Endangered Wildlife Trust. She spends most of her time implementing conservation policies, and raising public awareness about frogs through educational outreach initiatives.

Sally MacLarty is a freelance illustrator specialising in the fields of education and natural history.

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 Natural History (WN); Wildlife
 (Children's/Teenage) (YNNR)

SAPnet code: Children's General
 Non-Fiction (Y4.0)



SALES POINTS

- Part of the hugely popular *My first book of series*.
- Bright full-colour illustrations throughout.
- Clear, simple text ideal for early readers.
- Parallel text in Afrikaans, Xhosa and Zulu.
- Includes CD of frog calls.
- **SUITABLE FOR AGES 3–7**

**Includes
 CD of frog
 calls**

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My first book of Southern African Frogs



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Text in 4 languages

English

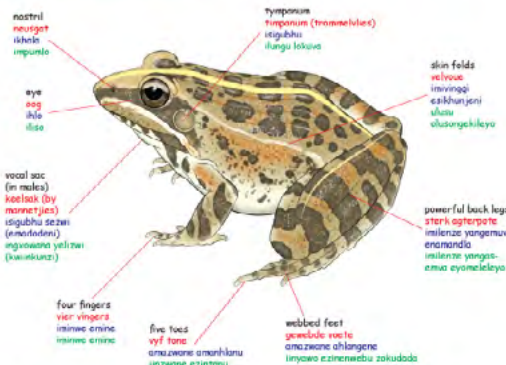
Afrikaans

Xhosa

Zulu

Parts of a frog

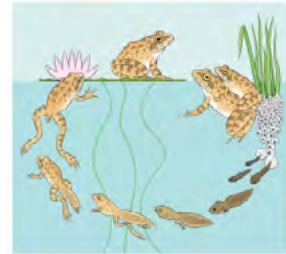
Liggaamsdele van 'n padda Izitho zomzimba zeselesele Amalungu omzimba wesele



Life cycle of frogs

Lewensiklus van paddas Isiyingi sempilo samaxoxo Umjikelo wobomi bamasele

Most frogs have three stages in their life: egg, tadpole and adult. The female frog lays her eggs in clumps or strings in water, or close to it. The eggs are fertilised by the male frog and grow into fish-like tadpoles that live in water. Tadpoles have a long tail, and usually eat algae. They grow arms and legs, and lose their tail, as they change into young frogs or toads that can live on land.



Die meeste paddas het drie lewensstadie: eier, paddavous en volwasse. Die wyfies lê haar eiers in klompies of stringe in of naby water. Die mannetjies bevrug die eiers met dan ontwikkel tot paddavousies wat in die water leef. Paddavousies het lang sterle en eet gewoonlik alge. Hulle kry later arms en bene, verloor hul sterle en verander in paddas of skurwepaddas wat op land kan leef.

Amaselesele amonzi adula ezigabeni ezintathu emphewi yayo: iganda, ushobishobisho neselesele elidula. Tselesese lesifazane izakhele amaganda alo abe izikhlelele noma abe imicu amanzini, noma eduze kwawo. Amaganda avundiswa iselesele lesilisa bese ekhula abe ashobishobisho abafana ne-zinhlanzi abahlala emanzini. Oshobishobisho banemiso emide, futhi bajaweyele ukudla izithombo. Baphuma izandla kanye nemilenze, bese kusuka imisila yabo, ngesikhathi beshintsha beba amaselesele amancane noma izinzwa ezingqhalala ngaphesheya kombhobo.

Amaselele amanzini amananqanaba amathathu ebomni bawo: iganda, isobonkolo kunye nesilisa elidula. Inzazi yesilisa ibeka amaganda abe zizicuku okanye imitya amanzini okanye kufutshane nawo. Amaganda ayachutyusiswa isilele ebyinyaneni aze ekhula abe ngathi ngosongubhalala abahlali emanzini. Oshobishobisho banemiso emide kwaye badla ngokurya ukhulu kwase emanzini. Bakhula ingalo nemilenze baze baluhlalelele yimisila, ngaphesheya bekhantsha besilisa ngomsele okanye amaxovo ahlela emhlabeni.

Where frogs live

Waar paddas leef Lapho kuhlala khona amaselesele Apho ahlala khona amaselele



4

5



Golden Leaf-folding Frog

Usually golden or yellow in colour, this little frog has small, dark 'horseshoe' patches on its back. It lives in wetland areas in the northeast of South Africa, including the Kruger National Park.

Goue blaarvoupadda

Hierdie paddatjie is gewoonlik geel of goudkleurig en het klein, donker hoefystervlekke op sy rug. Dit leef in veldgebiede in die noordooste van Suid-Afrika, onder meer in die Krugerwildtuin.



Iseselese Eligoga Amahlamvu Elisagolide

Livamise ukuba nombala osagolide noma ophuzi; leli selesele elincane linombala amancane, amnyama amse ukwesicathulo sehazhi emhlabeni. Lihlala ezindaweni ezinogxaphozo enyukatho ngumalunga yeNingizimu Afrika, kuhlalanganisa nase-Kruger National Park.

Usongamagqabi obugolide

Lidla ngokuba bugolide okanye libe tyheli ngebela, eli sele linzane linzibaxhu ezimile ngathi zizihlangi zehashu ezindaka emqolo. Lihlala kwimimandla yemiqobhobo kwimilampuma woMzantsi Afrika, kuquka umyozo wezilwanyana iKruger National Park.



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Painted Reed Frog

You can find these brightly coloured frogs in reeds around ponds, dams and wetlands. They can be many different colours, and can have stripes or spots. The toes and fingers and inside of the legs are bright pink, perhaps to frighten predators.



Skilderbontriet-padda

Jy kan hierdie helderkleurige paddas in rietse om damme'tjies, damme en veldende rietloop. Hulle kan talle verskillende kleure wees en strepe of kolle hê. Die tone, vingers en binnekant van die bene is helderpienk, dalk om roofdiere af te skrik.



Iseselese Lasemhlangeni Elipendiwe

Ungathola leli selesele elinemibala egqamile emhlangeni eseduze neziziba, amadamu kanye namagqabi. Angaba yimbala eminingi ehlukene, futhi angama nemidwa noma amobala. Amazwane, iminwe kanye ngaphakathi nemilenze kusombola ophinki oqamile, inhlwumbi lokhu kwenzela ukwethusa izilwane ezidla ezinye.

Isele leengcongolo elimabalabala

Ungawufumana lu masele enemibala eqaqambileyo ezingcongolweni, ezingqongwe amadanyano, amadama kunye namagqabi. Anemibala eminingi eyohlukeneyo, kwaye angaboneminye okanye amochekozo. Tinzwane, iminwe kanye ngaphakathi nemilenze zipinki ngokupambileyo ukuze zoyikise izilwanyana ezizawngalayo.



31



An Island of Marvels: Adventures in Andasibe, Central-Eastern Madagascar

By Joshua Ralph



Boophis viridis specimen. Photo: Joshua Ralph.

Around 88 million years ago, after the prehistoric supercontinent known as Gondwanaland had begun to separate into pieces, a small chunk of land measuring 592,848sq km (228,900 sq ml) in area started to drift away from what is now India. This ultimately formed the island of Madagascar, which is positioned off the southwest coast of Africa.

Today, Madagascar is regarded as one of the largest and oldest islands on earth, and has had more than enough time to create an amazing array of beautiful landscapes. The diversity that exists on the island today is partly the result of its massive spine, formed by a range of mountains that extend along the island's entire length, splitting it into two. The result is a diverse range of unique environments. Eastern and northern parts of the island consist mainly of lush rainforests and swamps, while the west and south is comprised of a mixture of arid woodlands and forests, contrasting with parched deserts. With this unique combination of extended isolation and a varied landscape, life on Madagascar has evolved in a truly unique fashion, unparalleled elsewhere on the planet. However, over the course of our planet's history, countless species of fauna and flora have existed, and subsequently died out for a wide variety of reasons.

Most people are familiar with the mass extinction at the end of the Cretaceous Period that heralded the end of the dinosaurs and

the rise of mammals about 65 million years ago. But this is only one of five recognised “mass extinctions” that have occurred on Earth over the past 540 million years, as defined by more than half of the species on the planet being wiped out over a narrow window of time.

Now however, scientists are talking about a sixth extinction event of this type, and have even coined a name for it: the Anthropocene, meaning ‘man-made. It is a sobering thought that today, there are an estimated 44,815 species of fauna and flora featured on the IUCN Red List of Threatened Species. While a few species such as the Giant Panda grab the headlines, there are countless others that most people have never heard of; such is the scale of the problem. Amongst these are many amphibians, whose numbers have been particularly affected over recent years by the spread of the deadly Chytridiomycosis fungal disease, *Batrachochytrium dendrobatidis* (Bd), which is capable of wiping out entire populations of Anura in a terrifyingly short space of time.

ASSOCIATION MITSINJO AND THREATS

In an attempt to slow down the stresses and threats on local wild-life populations, facilities have been or are currently being created to defend them. One organization is already well established, executing projects with already incredible results for the species in question. This organisation is Association Mitsinjo, a community-run conservation project that is situated in and around the small village of Andasibe, located within Eastern-central Madagascar. It is home to a vast number of Anura, with approximately 100 species within a 30-km radius of the town. Six of these species are part of the Mantella genus.

As part of the Mitsinjo Amphibian Conservation Programme and



Swabbing for Chytridiomycosis in the Andasibe area, which is performed on an annual basis. Photo: Joshua Ralph.

Andasibe National Park, a Breeding Center was launched in April 2011 to allow the captive breeding of certain species to safeguard against extinction and to record information for both behaviour and husbandry research. The facility itself is incredibly impressive, measuring 185 square meters, with completely biosecure rooms for various captive frog species; live food culturing; research facilities; and even quarantine and isolation facilities to prevent any potential risks to the already captive populations at Mitsinjo.

Support for the project has been provided by numerous zoological institutions and conservation organizations, and is coordinated in an effort with the Malagasy Government and the IUCN SSC Amphibian Specialist Group.

Conservation, however, doesn't necessarily have to involve



Guibemantis pulcher spawn under attack by a Queen Ant species. Photo: Joshua Ralph.

breeding animals, it can also involve the simplest gesture: awareness raising and education. The Mitsinjo facility is developing a public environmental outreach centre, a process that has been four years in the making, where the local community can learn more



As well as cleaning exhibits, each and every specimen at the facility is health checked on a daily basis. Photo: Joshua Ralph.



Making sure the terrariums are clean is a daily job for the Mitsinjo Team. Photo: Joshua Ralph.

about the work performed at the facility, the species found within the Andasibe Reserves and finally threats that affect all wildlife within the Nature Reserve.

Raising awareness for these small and fascinating frogs has even involved mascots and festivals dedicated to them. Last year, on May 25, the NGO Madagasikara Voakajy held the Mangabe Festival to raise awareness of the Golden Mantella (*Mantella aurantiaca*) at the protected site of Ranomena-Sahasarotra and has proved successful at getting the local communities around the reserve to engage with and contribute to both the habitats and the species that dwell in them. In this instance the community organizations involved were rewarded for the efforts they carried out for the conservation of Mangabe's forests from April 2012 to March 2013. This did include regular monitoring of the Golden Mantella breeding areas, the reporting of illegal activities to the relevant authorities and even restoring areas degraded by slash-and-burn agriculture or gold mining.

Across most of the Eastern coast of Madagascar, slash-and-burn agriculture has been in practice for many, many years causing a drastic decline in the *Mantella* natural habitats. This method is known as "Tavy" or more commonly as slash-and-burn cultivation. This technique involves the cutting down of trees and smaller brush and bushes, then leaving them to dry out over the course of the winter period when precipitation is at an all-time low. They are eventually burnt just before the first rains arrive to allow the



Even though new non-indigenous tree species have been introduced to Madagascar for sustainable lumber, people still cut down native trees. Photo: Joshua Ralph.



Gold mining still occurs within protected sites in the Torotorofotsy. Photo: Joshua Ralph.



Golden Mantella (*Mantella aurantiaca*) at the Menalamba locality in the Torotorofotsy Wetlands. Photo: Joshua Ralph.

cultivation of rice or corn crops within the regions felled. After only a few years of growing the crops, the people will move on and seek another area to cultivate whilst the previous area is left to fallow.

Due to the incredible damage this method of agriculture can cause, such as soil erosion and destruction of a vast amount of vegetation, this practice was in fact made illegal in an attempt to slow the decline of rainforest within these regions. However this method is still practiced by local peoples to this day as the result of economic necessity, cultural tradition, and a lack of understanding of long-term ecological consequences. A primary aim for a majority of conservation organisations working in Madagascar is to promote more sustainable agricultural methods.

However, Tavy is not the only cause of habitat destruction. Simple mining for gold or nickel and logging of hardwoods has definitely played a major role in the disappearance of major and vital biotopes, which, in some cases, has severely fragmented certain *Mantella* populations.

SMALL FROG WITH BIG PROBLEMS

Like a majority of the unique fauna and flora on Madagascar, *Mantella* Poison Frogs are highly threatened with extinction. Currently, there are 16 members of the genus (with potentially more locality colourations to be discovered) and shockingly, all of them are already listed on the IUCN Red List of Threatened Species, covering all five of the Threatened categories (excluding the two extinct categories) that are used by the assessors of each of the species. However, the most iconic species within the genus is the famous and highly beautiful Golden Mantella (*Mantella aurantiaca*), which is the main focus at Association Mitsinjo. Although a highly common species within captivity, this species is classified as Criti-



Photo: Joshua Ralph.

cally Endangered by the IUCN Red List of Threatened Species. The species that can be found at the Mitsinjo facility are even more important than many people realise, being wild-caught founders for the F1 captive-bred bloodline. The wild-caught founders were once found in the Ambatovy locality within the North-western part of the Torotorofotsy Wetland reserve, but a few years earlier, it was discovered that this particular area had a vast amount of Nickel within it. So the Ambatovy Nickel Mining Company got permission to destroy the habitats as long as they contributed and removed the specimens of Golden Mantella from the remaining four ponds and give them to Association Mitsinjo.

AMPHIBIA IN THE ANDASIBE REGION

During my time at the Mitsinjo Amphibian Conservation Facility and within the Andasibe area, I encountered approximately 140 fauna and flora from a wide range of species that the area has to offer, but of that great total I encountered a huge number of Amphibia: approximately 33, some of which are currently undescribed or have not been seen before.

- *Aglyptodactylus madagascariensis*
- *Mantidactylus grandidieri*
- *Mantidactylus melanopleura*
- *Mantidactylus zipperi*
- *Mantidactylus opiparis*
- *Mantidactylus betsileanus*
- *Boophis madagascariensis*
- *Boophis tasymena*
- *Boophis idae*
- *Boophis bottae*
- *Boophis rappiodes*
- *Boophis luteus*
- *Scaphiophyrne marmorata*
- *Boophis viridis*
- *Boophis pyrrhus*
- *Heterixalus punctatus*
- *Guibemantis pulcher*
- *Guibemantis liber*
- *Guibemantis* sp. nov.
- *Guibemantis* sp. nov.
- *Guibemantis* sp. nov.
- *Guibemantis* sp. nov.

- *Guibemantis albolineatus*
- *Gephyromantis boulengeri*
- *Spinomantis aglavei*
- *Boophis boehmei*
- *Mantella crocea*
- *Mantella aurantiaca*
- *Mantidactylus femoralis*
- *Mantidactylus depressiceps*
- *Paradoxohyla palmate*
- *Blommersia blommersae*
- *Plethodontohyla mihanika*
- *Guibemantis* sp. nov.
- *Platypelis barbouri*
- *Anodonthyla pollicaris*

When I went out on my research and work trip to Madagascar, I went during Autumn (end of February to the beginning of May), when many species had begun their period of brumation, preparing for winter. However, there was still an abundance of Anura to see, many of which are possibly new species of *Guibemantis*.

Acknowledgements

I would like to thank the entire team at the Mitsinjo Amphibian Conservation Facility and at the forest reserve for both providing me their daily experiences working at the facility and for allowing me to contribute time to be able to help conserve some of Madagascar's most important species.



Photo: Joshua Ralph.



Boophis luteus specimen. Photo: Joshua Ralph.



Heterixalus punctatus specimen. Photo: Joshua Ralph.



Boophis pyrrhus male specimen. Photo: Joshua Ralph.



Boophis boehmei specimen. Photo: Joshua Ralph.



Blommersia blommersae specimen. Photo: Joshua Ralph.



Heterixalus punctatus specimen. Photo: Joshua Ralph.



Mantidactylus grandidieri male specimen. Photo: Joshua Ralph.



Yellow Mantella (*Mantella crocea*). Photo: Joshua Ralph.

Counting Eggs Before They Hatch: Citizen Science Contributions to Monitoring of an Endangered Frog in KwaZulu-Natal, South Africa

By Jeanne Tarrant & Adrian Armstrong

The Kloof Frog, *Natalobatrachus bonebergi* (1), is an Endangered species restricted to coastal and riparian forest patches in KwaZulu-Natal and the Eastern Cape provinces. It is a habitat specialist, inhabiting cool riverine forest streams to which it is perfectly adapted. This monotypic species is an agile jumper and strong swimmer, well-camouflaged for the leafy, muddy substrate. Expanded adhesive 't'-shaped toe-tips aid climbing and allow for easy movement over even slippery rock surfaces. The species has a protracted breeding season lasting from October to June (2), and any given search will usually reveal all life stages including egg clumps, tadpoles, females and calling males, which are also active diurnally. The female attaches her unique egg clutch to rock or plant surfaces above slow-flowing sections of the stream (Fig. 1). She remains in the vicinity of the eggs until they develop into tadpoles drop into the water below, usually after about a week. During this time she guards the eggs and keeps them moist.

Given how conspicuous the egg clumps are, counting them was considered the best means of monitoring the species (3). The method has been rolled out at Vernon Crookes Nature Reserve on the South Coast, possibly one of the best sites for the Kloof Frog in the province. Ezemvelo KZN Wildlife Honorary Officers Lesley and Mike Bentley (Fig. 2), and Brenda and Stuart Angus, have been carrying out the monitoring on a monthly basis since December 2013. The egg count is conducted along a 270 m stretch of the Hlatikulu stream and each egg clump is documented, including GPS coordinates and details such as the number of eggs or tadpoles in the mass, the developmental stage of the tadpoles (Fig. 3), height of the egg mass above water, the attachment surface (*i.e.*, rock or plant species) and activity of any adult or juvenile frogs in the vicinity of the egg clump.



Fig. 1: Female Kloof Frog above egg mass. Photo: Adrian Armstrong.

The data from the long-term monitoring program will be used to reveal trends in breeding behavior, such as peak breeding period, preferred attachment surface, spatial utilization and correlation with light/shade conditions and breeding biology, including average eggs per mass. Beyond this, this work has allowed for training visits from other potential monitors and research groups and also played an important role in identifying potential threats, such as alien invasive plants. The way forward is to roll out the method at other known sites, both in and outside of protected areas to start col-

lecting data on population trends, abundance and ultimately population size.

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Fig. 2: Mike and Lesley Bentley with their "frog work in progress" sign. Photo: Jeanne Tarrant.



Fig. 3: Tadpoles in egg mass. Photo: Nick Evans.



Hyperolius tuberilinguis. Photo: Louis du Preez.

A Complete Guide to the Frogs of Southern Africa Mobile Application: Digital Approach to Frogging in Southern Africa

By Louis du Preez

The way in which we practice wildlife monitoring has undergone dramatic changes. Frogging will never be the same again, and it promises to be even better with the launch of a forthcoming mobile application on the frogs of southern Africa. The authors and publisher of the book and ebook, “A Complete Guide to the Frogs of Southern Africa,” have taken a leap into the digital realm with the development of an exciting interactive app that aims to help with quick and accurate identification of frogs. The app will be available for both Android and iOS devices (smartphones and tablets).

A great aid for naturalists and scientists—especially while out in the field—the app includes full descriptions of all 160 species



Ptychadena mossambica. Photo: Louis du Preez.

found in the region, covering scientific and common names, distribution, conservation status, key identification points, descriptions of habitats, habits and reproduction and tadpole biology. To aid identification, multiple photographs per species

(including regional color variations) as well as calls and short videos have been incorporated into the app.

A Smart Search option function will ensure that search results are as accurate as possible. There are two aspects to this feature: firstly, the app draws on the on-board GPS of the device to determine the user’s location and then secondly, it uses four key identification questions about the frog’s morphology to narrow down the search.

Users will be able to make a scientific contribution by uploading images or calls of frogs to the FrogMAP database hosted by the Animal Demography Unit, based at the University of Cape Town. This function will allow them to share photographs, call-recordings and observations with a panel of scientists who will assist in confirming species identifications. Location data derived from these contributions will be incorporated in the next Frog Atlas Project for southern Africa. The app will be available from late August 2015 from iTunes (Apple App Store) and Google Play.

An Amphibian on the EDGE: Saving South Africa's Mistbelt Chirping Frog

By Mea Trenor, Ché Weldon & Jeanne Tarrant

A new project funded by the Zoological Society of London's EDGE program will aim to develop a survival blueprint and fortify conservation actions for the Endangered Mistbelt Chirping Frog (*Anhydrophryne ngongoniensis*). The project will form part of the Endangered Wildlife Trust's Threatened Amphibian Programme (EWT-TAP) in conjunction with the North-West University's (NWU) African Amphibian Conservation Research Group (AACRG) in fulfilment of a Masters degree in Environmental Science at NWU.

This inconspicuous direct developing amphibian slides in at number 100 on the EDGE Top 100 Amphibians list. The EDGE program aims to support the conservation of species that are evolutionarily distinct and globally Threatened by offering two-year fellowship grants to early career conservation biologists. "*A. ngongoniensis* is within the top 100 most evolutionarily distinct and Threatened amphibians but, sadly, since its discovery in 1993 it has received very little conservation attention. This EDGE Fellowship project hopes to gain new insight into the species and apply conservation actions to save this tiny amphibian," says Olivia Couchman, coordinator of ZSL's EDGE program. With the Mistbelt Chirping Frog having numbers estimated to be around 3000 (1) and occupying a mere 9 km² (2), the Endangered listing (3) comes as no surprise. The frog is part of the Pyxicephalidae family, which diverged over 70 million years ago. This means

that a whole lot of evolutionary history ends with this frog should it go extinct. The decline of *A. ngongoniensis* can mainly be attributed to two factors: afforestation and agriculture combined contributing to a 50% reduction in habitat in just 50 years (4).

Mistbelt Chirping Frogs are small, with males reaching 19 mm and females 22 mm in size and are restricted to the remaining high altitude (above 1,000m) mistbelt grasslands and indigenous montane forest of the KwaZulu-Natal Province in south-eastern South Africa. The area is home to large forestry concessions and thus habitat is incredibly fragmented. The size of the frog and its inconspicuous nature can make it hard to locate visually. Our team hopes to successfully employ passive acoustic monitoring and eventually deploy a long term monitoring strategy including training for prospective local monitors. It is great to be able to expand conservation efforts to include this unique species. It shares its habitat with other highly Threatened species, such as the Critically Endangered Blue Swallow, and this collaborative approach will go a long way to ensuring habitat protection and management in an area that is currently receiving limited attention.

EDGE has encouraged a holistic approach to EDGE species conservation encompassing sound science, environmental education and the involvement of stakeholders including industry. While we are excited about the empirical science and research, we also place a high premium on environmental education since it is important for



The Mistbelt Chirping frog is also known as the Natal Bandit Frog. Photo: Clifford Dorse.

us as conservation biologists to ensure that the message of conservation reaches the people who share their environment with species in need of conservation attention.

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Typical grassland habitat of *Anhydrophryne ngongoniensis* with plantations in the background. Photo: Jeanne Tarrant.



Typical grassland habitat of *Anhydrophryne ngongoniensis* with plantations in the background. Photo: Jeanne Tarrant.

Training Budongo Field Station field surveyors on amphibian identification. Photo: Budongo Conservation Field Station.



Establishing an Amphibian Monitoring Program at the Budongo Forest Conservation Field Station, Uganda

By 'T. Doherty-Bone

In recent years, detailed information on the status of amphibian populations and communities has been gathered across Africa (1,2,3,4,5). In the past this information was patchy, out of date or non-existent (6). Field teams of amphibian biologists are now improving spatial coverage within many African countries, even making repeated trips within one or more years. However, studies on detailed, within year fluctuations of amphibian communities within Africa are still rare, making assertions of decline over normal fluctuations difficult (7). Consistent sampling of amphibians that spans seasonal fluctuations enables understanding timing of breeding and periods of activity. This information can help contextualise more short term observations on amphibians in the same region and form baselines on breeding phenology that can underpin assessments of changing climates. Africa has also suffered from a limited capacity of home-grown amphibian conservationists to act on the crisis affecting this animal group. This is changing but still has a ways to go.

Since 2012, an amphibian monitoring program has been established at the Budongo Conservation Field Station (BCFS) in Uganda. The Budongo Forest Reserve in north-west Uganda, between Masindi, Lake Albert and the Murchinson Falls National Park, consists of approximately 412 km² of moist semi-deciduous forest, with savanna making up the remainder of its 825 km² (8). It was historically managed as a colonial forest reserve for the production of timber, with a saw mill on what is now the field station. The forest was managed scientifically in early attempts to increase

the long-term, sustainable production of timber through rotational harvesting and applications of arboricides to suppress competition of less productive timber species (8). This has produced an array of well-documented management accounts across the forest. Upon independence, the forest reserve became property of the Ugandan National Forestry Authority, and timber harvesting stopped in the 1970s.

In 1990 the Budongo Conservation Field Station was founded, initially for research on the chimpanzee population inhabiting the forest. Researchers set up a network of monitoring transects throughout the forest, making it easier for researchers to access. The Royal



Puddle Frog, *Phrynobatrachus auritus*, photographed by Budongo Conservation Field Station amphibian monitoring team. Photo: Budongo Conservation Field Station.

¹ Royal Zoological Society of Scotland, Edinburgh Zoo, Edinburgh, Scotland, UK and School of Geography & School of Biology, University of Leeds, Leeds, West Yorkshire, UK Email: tommy_dbone@yahoo.com

Zoological Society of Scotland (RZSS) based at Edinburgh Zoo has supported the BCFS since 2005. Research at the field station has predominately focused on primates, tree phenology and managing hunting through snare removal and engagement with communities (9,10). The BCFS receives many foreign researchers per year, and has a supporting staff of c. 25 locally recruited field assistants who are involved with numerous activities such as snare removal and assisting with surveys in the forest. In recent years, there has been interest in expanding the capacity for broader ecological studies. Because the RZSS has been supporting an amphibian project in Cameroon since 2006, it was an obvious choice to complement the expanding scope of work of BCFS to amphibians.

In 2012, an amphibian research project was established for the BCFS. The project aimed to train the field station field technicians on amphibian survey techniques to undertake regular surveys and monitoring in the forest. In the shorter term, the project aimed to measure amphibian community structure across the different land management techniques (unlogged, selectively logged, and subsistence agriculture). The longer-term goals were to measure the seasonal variation of amphibians in each of these land uses. Ultimate objectives, however, are to train field station technicians to survey amphibians (not just at Budongo, but elsewhere in Uganda), and

for Budongo to be a resource for amphibian ecology in Uganda.

Since 2012 the diligent, trained amphibian team of BCFS has surveyed the designated transects nearly every month in three different land use types. The team has counted, measured, photographed and documented various frogs. Species observed in the surveys have complemented the shorter-term species inventory collected by the herpetologist who led the training. Their survey would be typical of most short-term field surveys in Africa that are cut short by a Western scientist having to return home. A useful baseline has already been gathered from three years of routine surveying of amphibians, showing fluctuations in species, abundance and age class.

The Budongo Forest is still facing chronic threats typical of other forests in Uganda. Subsistence farming is the most common land use, with commercial sugar cane production increasing, both of which can encroach into forest (11). Illegal tree harvesting and wood cutting are still a problem for the forest, as is the snaring of larger animals, which may have repercussions for forest structure (12). Researchers don't fully understand the impacts of climate change and invasive species. The results from this work will thus form part of a broader base of knowledge that will help successfully conserve not only amphibians, but forest in Budongo, as well as elsewhere in Uganda, and other African forests.

Acknowledgements

The Royal Zoological Society of Scotland enabled this field work training to take place, with particular gratitude to Sarah Robinson, Fred Babweteera, Geoffrey Muhanguzi, Godwin Asimwe and Moses Businge.

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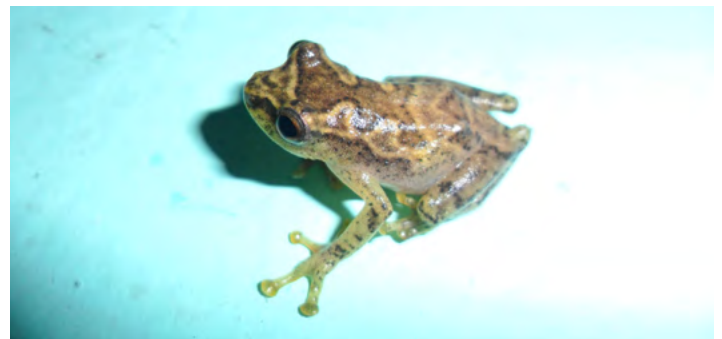
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Nighttime surveys by the Budongo amphibian survey team. Photo: T. Doherty-Bone.



Field station technicians have been equipped with digital cameras to record the amphibians during surveys. Photo: Budongo Conservation Field Station.



Hyperolis kuligae photographed by the Budongo Conservation Field Station amphibian team as part of routine monitoring. Photo: Budongo Conservation Field Station.



Leap Day for Frogs 2015

By Jeanne Tarrant

The third official awareness day for frogs, “Leap Day for Frogs” took place on 28th of February in South Africa, coordinated by the Endangered Wildlife Trust, but open to the public to devise their own events. The event serves as a national awareness day to highlight the challenges that our threatened frogs face, but also to celebrate everything unique and fun about them. The theme ties together Leap Year (and so will be held on the 29th of February when appropriate), leaping frogs and taking a leap of action to get involved with amphibian conservation and education. This year saw approximately 30 independently organized events, reaching hundreds of people, taking place around the country, 2015 also saw the introduction of a children’s *Frogs are Green* art competition. This initiative really expanded the reach of the campaign and resulted not just in hundreds of submissions of fun froggy art, but also encouraged lessons about frogs at participating schools and opened dialogue with teachers and educators around South Africa. The art work was displayed and a prize giving was hosted by the Longmynd Art Gallery in Hillcrest, Durban in April.

A fun social media campaign [Frog Call Translator](#) was developed on behalf of the Endangered Wildlife Trust by advertising agency, Ireland Davenport, to link to Valentine’s Day to frogs and Leap Day and to draw traffic to the website and facebook page. The Leap Day for Frogs [Facebook](#) page also serves as a platform for participants to upload images of their events and to keep up to date with associ-

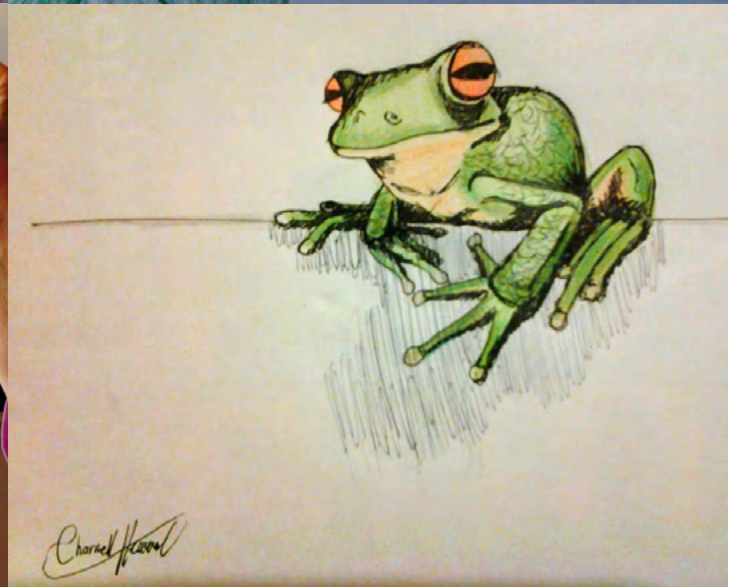
ated events. Events included the “Amazing Frog Race” organized and hosted by North-West University’s African Amphibian Conservation Research Group at the Potchefstroom Campus. Groups of children raced around between ten educational stations, each one explaining an aspect of frog biology and ecology. Great fun was had by all who attended and similar events have been in demand at schools around Potchefstroom ever since. Several events took place in KwaZulu-Natal including in collaboration with Kloof Conservancy at Memorial Park, where interactive games were followed by a talk and frog walk. UShaka Marine World once again hosted a



Winners of the frog art competition with Jeanne Tarrant. Photo: Harry Lock.

Manager: Endangered Wildlife Trust, Threatened Amphibian Programme.
Post-Doctoral Fellowship: North-West University.

table with live frogs on display and had their frog princesses inviting aquarium visitors to make their pledge to helping frogs. In the Western Cape, the ToadNUTS (Noordhoek Unpaid Toad Savers) once again organized an event to highlight the Endangered Western Leopard Toad. The campaign is growing in popularity and is one that we hope to see repeated on an annual basis.



Selection of frog art submitted for Leap Day for Frogs art competition. Photos: Jeanne Tarrant.



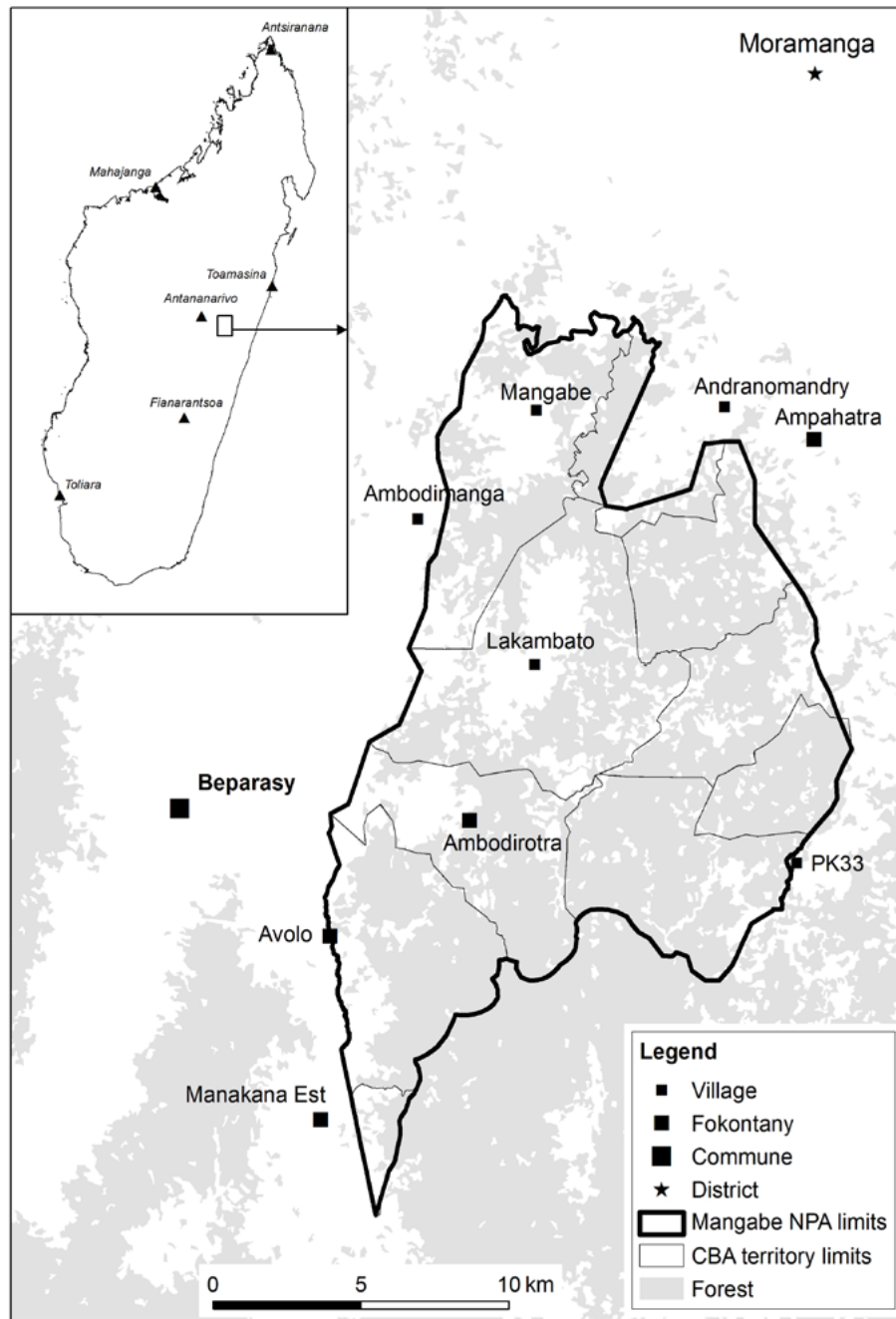
Frog monitoring in the Western Cape as part of an educational outreach program for "Leap Day for Frogs." Photo: Sheraine van Wyk.



Participants at the "Amazing frog race" in Potchefstroom. Photo: Este Matthews.

Mangabe-Ranomena-Sahasarotra: A New Protected Area for Amphibian Conservation in Madagascar

By Daudet Andriafidison, Voahirana C. Randriamamonjy, Eddie F. Rakotondrasoa, Sylvain Ralaiarimalala, Roma Randrianelona & Julie H. Razafimanahaka



With a total area of 27,346 ha. Mangabe holds 123 ponds, of which 94 were used by Golden Mantella for breeding (1). Nine other breeding ponds were recorded within five km of the limit of the protected area. Hence, the Mangabe area holds 68% of all currently known Golden Mantella breeding ponds. In addition, three other Critically Endangered species occur in Mangabe: two lemurs (the Indri *Indri indri* and the Diademed Sifaka *Propithecus diadema*) and a gecko (Pronk's Day Gecko *Phelsuma pronki*). These species will also benefit from the conservation initiatives in Mangabe new protected area.

A recently developed management plan for Mangabe aims for its biodiversity to be conserved and sustainably managed by, and for, the benefit of local people. Working with 11 community-based organizations, the local, regional and national authorities, as well as other stakeholders, the challenge now is to implement the actions defined in the management plan. This includes marking the limits of the different management zones (strict conservation and sustainable use), supporting communities to improve their livelihoods while reducing threats to biodiversity, enforcing the local and national regulations, and protecting and restoring key habitats for the target species. Impacts will be measured through assessing the Golden Mantella populations and habitat status, monitoring the quality and extent of the native forest and evaluating human wellbeing.

Acknowledgements:

We are grateful to the Malagasy government, the local communities and all local and regional stakeholders for supporting the creation of Mangabe new protected area. We thank all the donors who contributed to this work: Chester Zoo, Darwin Initiative, Rainforest Trust, Rufford Foundation, Size Of Wales, US Fish and Wildlife Services, Waterloo

The Golden Mantella (*Mantella aurantiaca*) is an endemic and Critically Endangered frog of Madagascar. Its range is restricted to less than 100 km² and its habitat is under severe threat from legal and illegal mining, conversion into agricultural fields and logging. One of the key actions defined in the Species Conservation Strategy for this species was to provide legal habitat protection in the Mangabe area. On 21st April 2015, the Malagasy government approved the definitive creation of the new Mangabe-Ranomena-Sahasarotra (Mangabe) protected area along with other 26 other new protected areas. This is a critical step in implementing the Golden Mantella Frog species conservation strategy.

Foundation and Zoological Society of Wales for supporting the creation of Mangabe new protected area, and to the communities within Mangabe new protected area for their current and future engagement.

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Of Dogs and Frogs: Sniffing Out One of South Africa's Rarest Toads

By Jeanne Tarrant, Ché Weldon, Esté Matthew & Christine Coppinger

The elusive Amatole Toad, *Vandijkophrynus amatolicus*, is very possibly one of South Africa's rarest seen frogs, despite in recent years, multiple and concerted efforts to find it (1). After a thirteen year absence of it being reported, the species was "rediscovered" near Hogsback, Eastern Cape, South Africa in September 2011 (2). This discovery sparked renewed interest in the Amatole Toad and it has since become a focal species for the Endangered Wildlife Trust's (EWT), who are working with farmers and forestry companies in the area to conserve and manage known sites for the species. Active searching during the past five years has turned up just five individual adults of the Amatole Toad, which not surprisingly, is listed by the IUCN as Critically Endangered due to its limited distribution and loss of much of its original grassland habitat.

Pairing up with North-West University's African Amphibian Conservation Research Group and Jessie the frog-finding Border Collie, we set off in early March 2015 to test out a novel method for tracking down the toad. The use of sniffer dogs for conservation is on the increase, including for reptiles and amphibians. Since no Amatole toads were available prior to the survey, the scent of the closely related Karoo Toad, *Vandijkophrynus gariensis*, was used to condition Jessie for two weeks prior to the trip. Based on a probability model developed in 2013, suitable habitat for Amatole Toad was systematically surveyed using scent searches by Jessie and her handler Esté Matthew, while the rest of the team actively searched underneath rocks and logs and around seepage areas for the toads. The signs were promising, with the grasslands lush and green and many seepages (the toad's ideal habitat) spongy with recent rains. We encountered several species of other frogs and tadpoles and after three days finally turned up a small, lumpy toad crossing a path on the Katberg Pass, another historical site of the Amatole Toad. Much excitement from the team, but unfortunately the find was that of a Karoo Toad which shares many features with the Amatole Toad but differs slightly in its ventral and dorsal markings. Unfortunately, this was the sole toad found during the four day search, which can be largely attributed to the time of year. The Amatole Toad is active primarily from September to January and our continued efforts will be focused on that time of year and employ additional methods such as pit-fall traps and automated audio recorders to sample more thoroughly. Greater success can also be expected with the use of the sniffer dog when the dog is conditioned on the Amatole Toad's scent as well as a longer period of conditioning prior to the field trip. This project was made possible thanks to an Amphibian Survival Alliance Seed Grant, which allowed us to survey additional areas of our probability map and identify suitable sites for future searches.

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Landscape of the Hogsback Mountains. Photo: Christine Coppinger.

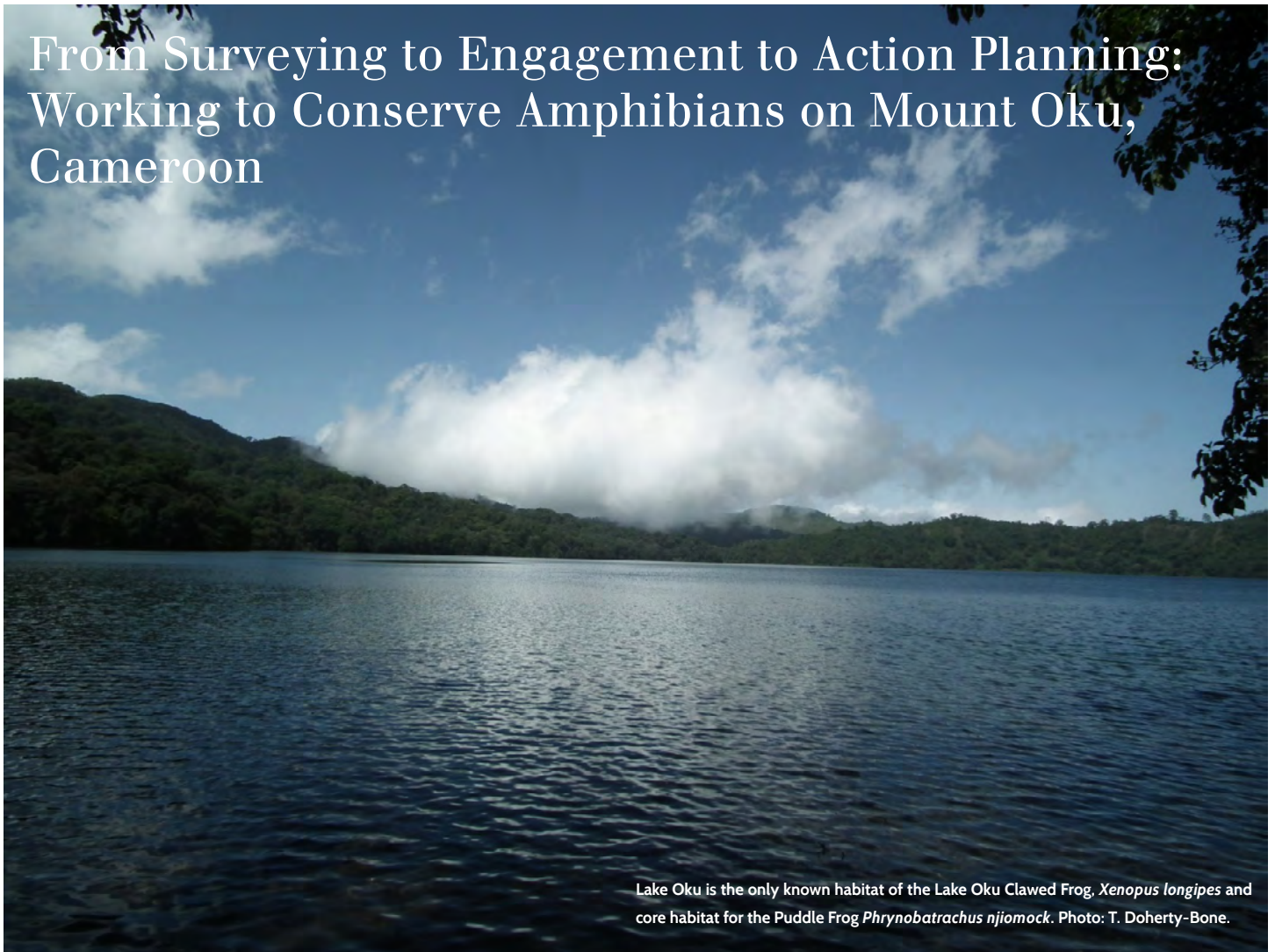


Jessie and Esté in the field. Photo: Jeanne Tarrant.



Searching for toads. Photo: Jeanne Tarrant.

From Surveying to Engagement to Action Planning: Working to Conserve Amphibians on Mount Oku, Cameroon



Lake Oku is the only known habitat of the Lake Oku Clawed Frog, *Xenopus longipes* and core habitat for the Puddle Frog *Phrynobatrachus njiomock*. Photo: T. Doherty-Bone.

By 'T. Doherty-Bone

Mount Oku is the second highest mountain in Cameroon after Mt. Cameroon. It is inhabited from top to bottom by several different ethnic groups, including the Kejeum, Fulani, the Kom and the Oku. It is home to numerous endemic species, including amphibians. There are seven endemic anurans, and one endemic caecilian, with an additional five amphibians with ranges restricted to Oku and less than a handful of other locations. The most secure populations of these species live in Oku's forests, while habitat loss is more certain elsewhere in their range. In total, there are 19 amphibians on Mt. Oku that are classified by the IUCN to be threatened with extinction: three Critically Endangered, seven Endangered, seven Vulnerable, three Near Threatened, with one that is Data Deficient. This number is likely to change as new descriptions and revisions are taken into account by IUCN assessments. The main habitat types are montane forest, montane grassland (hereafter called the Oku summit grasslands) and one crater lake (Lake Oku). Most of the amphibian species utilise the forest, with a smaller number of species (with a high proportion of endemic and threatened species) utilising the lake, and even fewer using the montane grassland. Those that use the montane grassland are primarily Critically Endangered. At the lake, the endemic species are

the Critically Endangered Lake Oku Clawed Frog (*Xenopus longipes*) and the newly described Puddle Frog (*Phrynobatrachus njiomock*). At the summit, the endemic species are the Critically Endangered toad *Wolterstorffina chirioi*, and the Spiny Puddle Frog (*Phrynobatrachus chukuchuku*).



The Oku summit grasslands, a subalpine habitat where records are restricted for the Critically Endangered toad *Wolterstorffina chirioi* and Spiny Puddle Frog *Phrynobatrachus chukuchuku*. Photo: T. Doherty-Bone.

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Mt. Oku's ecosystems (particularly forest) were historically managed by the local communities who had a centralised system of governance, led by a king ("Fon") and council of elders ("Kwifon"). Following colonization and nationalised independence, these forests began to be reduced. This led to an initiative between international conservation organizations and the Cameroon government to attempt to reinstate the traditional management of the forest. This initiative achieved a halt in deforestation, though some degradation of forest continued about a decade after the end of the project. This project attempted protection of other habitats within the official forest boundary, but forest protection was clearly and necessarily the priority. However, Lake Oku remains threatened by interests to introduce fish and land use change in its catchment (such as forest degradation through livestock grazing and tourism developments), while the Oku summit grasslands have become heavily grazed by livestock and have suffered fires used to improve browse.

In general, conservation programs for amphibians (and other targets) progress from initial baseline surveys of threats, to engagement with stakeholders associated with those threats, and finally action planning to mitigate those threats. Since 2006, work has been underway on Oku to make contact with local communities, survey amphibians in various habitats, and identify conservation targets and conservation already in place. This initiative coined the acronym CRAUC—Conservation Research for Amphibians Unique to Cameroon. In 2008 work intensified on particular species and habitats (Lake Oku, Oku summit grasslands). At the same time,

the project increasingly targeted local stakeholders beyond initial introductions.

Work with communities first focused on engaging with higher authorities such as the Fon (king) of Oku, mayor and municipal council of Oku, and the traditional council of elders. This raised awareness at the higher levels of that society, but awareness in the wider population was not raised other than with local field workers. Raising awareness in wider civil society often ensures more sustainable conservation outcomes. Therefore, in 2012 a push was made to increase educational work with people living in Oku, enabled by funding by the Royal Zoological Society of Scotland with an Amphibian Conservation Fund grant from the European Association of Zoos and Aquaria and by the Mohammed bin Zayed Species Conservation Fund.

Before work began on educational programmes, evidence had to be gathered about what the Oku public already knew about amphibians, human use amphibian habitat, as well as information on livelihood and resource use. Thus the project conducted a household survey to assess outcomes of educational work on Oku. The surveys revealed that public awareness of amphibians was low, and that public did not understand the importance of amphibians. For example, few people seemed to know what frogs actually eat. The survey also revealed that local people value or visit Lake Oku for numerous reasons, but mostly for recreational visits.

Following the household survey, two main public information events took place – one at the chief's compound at Kissotin, the closest settlement to Lake Oku; and one at the Fon's palace at Elak, the main settlement in Oku. These events consisted of a presen-



The Lake Oku Clawed Frog (*Xenopus longipes*) showing signs of disease, which researchers have observed since 2006. Photo: T. Doherty-Bone.



The Spiny Puddle Frog, *Phrynobatrachus chukuchuku*, is restricted to the subalpine grasslands around the summit of Mt Oku. Photo: T. Doherty-Bone.



The workshop for conservation action planning for Lake Oku held at the Oku Fon's Palace, 2013. Photo: T. Doherty-Bone.

tation on amphibians, general environmental conservation and the CRAUC Project work. To ensure the local people could follow the talk, it was translated into Oku by local field technician Oscar Nyingchia (who is now addressed by the community as "the scientist"). At the end of the talk, participants took a quiz partly on Oku amphibians, environmental issues and general knowledge, and received prizes of exercise books, pencils and drinks. Leaflets on Lake Oku have been distributed at these events, as well as at the tourist office for Oku, so both visitors and locals can appreciate the value of the amphibian biodiversity of the mountain. Increased awareness of amphibians, particularly the critically endangered Lake Oku Clawed Frog (*Xenopus longipes*), enables members of the community to demonstrate the value of the lake to visitors from outside Oku.



A community outreach event at the settlement next to Lake Oku informed the local community about the value of the lake's biodiversity and the importance of amphibians. Photo: T. Doherty-Bone.

To continue raising awareness, an information board has been installed by the lake near the road that passes it. A smaller information board is being placed near the main tourist access point to make sure exposure is provided to visitors coming from the other side of the mountain. And a scholarship program was set up to support and nurture secondary school students that excel in sciences. This includes taking those pupils on field trips to Lake Oku to see the endemic frogs and other wildlife.

In the field, a monitoring program for the frogs and water quality at Lake Oku has continued since 2008. Another monitoring program for the Oku summit was established in 2013 following several surveys in 2008. Surveys also occur in the montane forest. In 2013, two workshops took place with the Oku community to produce action plans for the conservation of Lake Oku and the Oku summit grasslands. Stakeholders for these two critical amphibian habitats were brought together, with the general acceptance that these are valuable places, especially for amphibian diversity. The group discussed fish introduction and agreed it would harm the frogs and the lake as a whole. They acknowledged that better environment impact assessments should be provided for developments, in light of one rushed development above the lake. It is still early to assess outcomes of these workshops, which will certainly need rebooting in coming years. However, one action was to remove livestock from the forest around Lake Oku, which had been increasing in

number in the past five years. Recent field surveys around the lake have not observed any sheep or goats.

As work has now become more proactive with the conservation of amphibians and their ecosystems on Oku, the CRAUC Project is now being renamed the CRAAC Project—Conservation Research and Action for Amphibians of Cameroon. Work will continue to gather information on the status of Oku's amphibians, relay this to the communities and to take appropriate conservation action as needed.

Acknowledgments

The Royal Zoological Society of Scotland has supported this work from the beginning, with more recent conservation actions funded by the Amphibian Conservation Fund of the European Association of Zoos and Aquaria and the Mohammed bin Zayed Conservation Fund. Assistance was also provided by the Zoological Society of London's EDGE of Existence Program and Herpetology Research Group of the Natural History Museum, London.



Information pamphlets on Lake Oku distributed at community outreach events. Photos: T. Doherty-Bone.



Information board about Lake Oku and its biodiversity by the road that passes the lake. Photo: T. Doherty-Bone.



Local school children from Oku visit Lake Oku in search of the Lake Oku Clawed Frog (*Xenopus longipes*). Photo: T. Doherty-Bone.

Highland Amphibian and Reptile Group

By ^{1,2}David O'Brien & ^{1,2}Jeanette Hall

The Highland Amphibian and Reptile Group is a sub-group of the Highland Biological Recording Group (HBRG – www.hbrg.org.uk), affiliated with Amphibian and Reptile Groups-UK (www.arguk.org). The Highlands is the most northerly part of mainland Britain covering an area roughly equivalent to that of Belgium, slightly larger than Maryland, but with a population of just over 200,000. It only holds five species of amphibians, of which two—Smooth Newt (*Lissotriton vulgaris*) and Great Crested Newt (*Triturus cristatus*) (Fig. 1)—have limited distributions and had been assumed to be introduced until recently. The other species European Common Frog (*Rana temporaria*) (Fig. 2), Common Toad (*Bufo bufo*) and Palmate Newt (*Lissotriton helveticus*) are widespread throughout our region and are found on many of the offshore islands too.

The group is made up of people from a variety of backgrounds including government conservation agencies, students and private citizens. The group is working with the University of Salford, and Amphibian and Reptile Conservation Trust, and with the government agencies Scottish Natural Heritage (SNH), Forestry Commission, Highland Council and Scottish Environmental Protection Agency (SEPA).

SURVEY WORK

Survey work has always been the main activity of the group, beginning with the first systematic surveys of the herpetofauna of the region initiated by Ray Collier and David McAllister in 1993. We now hold over 3,000 amphibian records, all of which are freely available via the [National Biodiversity Network](#). While we recognise there is always some risk in giving out locations, there is no evidence that collection of herps is a problem in our region and making information available is more likely to safeguard sites from development or inappropriate management.

The group was one of the first in Britain to train volunteers to take part in the National Amphibian and Reptile Recording Scheme (NARRS) and the Highlands has become one of the best-surveyed areas of the UK (1). Members have also engaged in surveys to improve our knowledge of the distribution of Great Crested Newts *Triturus cristatus*, increasing the number of known sites from ten to over forty. We have carried out general survey work across the region, including small coastal islands (Fig. 3), and are working in partnership with the University of Salford, to better understand the origins of these island populations. We have also contributed to trialling survey methodologies using eDNA (Fig. 4) and sampling for chytrid which thankfully till appears to be absent from Highland.

ORIGIN OF GREAT CRESTED NEWT *TRITURUS CRISTATUS* IN THE HIGHLANDS

As mentioned above, Great Crested Newt had long been assumed to be an introduction to Highland, because few populations were known, most of these were close to settlements, and because the area is so far removed from the core of the species' range. The most southerly Highland site is 80 km north of the next closest, a distance far in excess of any other gaps in its British range. The intervening land is mountainous and dominated by upland heath,

unsuitable habitat for this species. However, since 2000, increased survey work by group members has discovered many previously unknown populations. The distribution of these finds and their locations—several far from any human population—suggests that introduction is a less plausible explanation of their presence than previously thought. Group members, using information on climate history and past vegetation of the Highlands, developed a theory explaining the presence of Great Crested Newts as a potential relic population, cut off from the core of the species' range at some point in the last 3,000 years (2). While this seemed plausible, we were keen to test our theory by studying the genetics of the populations. Working with Robert Jehle of the University of Salford, and SNH, we have been able to establish that the genetic evidence supports a native origin for these populations (3, 4).

SALINITY TOLERANCE OF PALMATE NEWT *LISSOTRITON HELVETICUS*

The Palmate Newt *Lissotriton helveticus* is the most widely distributed Caudatan in the region, being found from sea-level to montane habitats, and the species is at its world northerly limit in Highland. Cally and Janet Ullman have been studying Palmate Newts in coastal rock pools (Fig. 6) since 2010 when a visitor to the



Fig. 1: Female Great Crested Newt *Triturus cristatus* at one of Britain's most northerly sites. Photo: David O'Brien.



Fig. 2: The Highlands' most abundant species, the Common Frog *Rana temporaria* in amplexus. Photo: David O'Brien.

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Fig. 3: HBRG members visiting the Crowlin Islands near Skye. Photo: David McAllister.



Fig. 4: HBRG member collecting water sample for eDNA analysis. Photo: David O'Brien.



Fig. 5: Removing willows. Part of habitat management for Great Crested Newts *Triturus cristatus*. Photo: David O'Brien.

area, the German herpetologist Guntram Deichsel, noted breeding newts in rock pools near Fort William (5). Cally recently achieved global Internet fame when the story was picked up by the BBC and a number of environmental [websites](#).

AMPHIBIANS IN SUSTAINABLE DRAINAGE SYSTEMS

Inverness is the only sizeable settlement in the region with over 70,000 residents. It has expanded rapidly in the last fifteen years and, as it has grown, Sustainable Drainage Systems (SuDS) or storm-water ponds (Fig. 7) have been created, as required by the Scottish planning system. The group has been studying amphibians in SuDS since 2010. SuDS appear to offer three benefits for amphibians: as breeding sites for amphibians, as a means of connecting isolated populations and as a way in which urban people can come in contact with wildlife and hence learn to appreciate and value it (6). Our studies have shown that SuDS support all three of our wide-spread species: European Common Frog *Rana temporaria*, Common Toad *Bufo bufo* and Palmate Newt *Lissotriton helveticus*, and they appear to offer several advantages compared to other urban ponds.

INVASIVE NON-NATIVE SPECIES

As part of the Highland Biodiversity Partnership, the group became involved in the evaluation of an attempt to eradicate non-native Signal Crayfish *Pacifasticus leniusculus* from a quarry pond in the region, using the natural pyrethrin-based biocide PyBlast (7). Surveys carried out after the eradication programme found that Common toad *Bufo bufo* and Palmate Newt *Lissotriton helveticus* larvae are able to survive levels of PyBlast generally lethal to crustaceans, indicating that amphibian presence at a site should not necessarily halt crayfish eradication programs. Given the impacts of non-native crayfish on amphibians and other wildlife elsewhere in Europe, we are keen to limit their spread in our region.

INTERNATIONAL EXCHANGE

In 2011, some group members went on an international naturalists' exchange to Hungary and Slovakia. During the last evening, memorable for the unexpected effects of (otherwise excellent) mushroom soup made with freshly collected fungi, we developed a plan for further events to exchange herpetological knowledge across Europe. This was later fleshed out in the local hospital, while one member of the group waited to find out whether another was going to recover sufficiently to be allowed to fly home the next day. Fortunately, all survived, and with a lot of work on the part of colleagues in Hungary, Slovakia, Romania, Slovenia and Poland, we managed to obtain funding from Grundtvig (a European Union educational program) to run a series of trips to bring together herpetologists and other naturalists from across Europe, to share expertise and experience.

We have now participated in excellent visits to Hungary, Romania, Slovenia and Poland, and had the pleasure of welcoming our partners to Scotland in June 2014.

SITE MANAGEMENT PLANS

Group members have been asked to devise management plans for amphibian habitat conservation and enhancement at five sites including two community-owned woodlands. As well as being an opportunity to protect all five Highland amphibian species, this has been an excellent chance to work with local communities and get them involved in practical conservation (Fig. 5).

Fig. 6: Surveying coastal rock-pool for Palmate Newts *Lissotriton helveticus*. Photo: David O'Brien.



AWARENESS RAISING

As a community-based group, we have always been keen to encourage others to take an interest in reptiles and amphibians. This has included taking primary school children (5 to 11 years of age) to look for amphibians, holding community group events and giving talks to retirement community members. Over the years, two of our members, David McAllister and Ray Collier, have written

regular wildlife columns in local newspapers and have been able to give much needed exposure to the importance of our local herps.

FUTURE

We like to think that as a volunteer group, we punch above our weight in terms of both hands-on conservation and research. We're working to grow the group and strengthen our links with others who share our passion for amphibians.

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Fig. 7: Sustainable Drainage System (SuDS) ponds in Inverness support up to three of our five amphibian species, as well as surprising variety of animals and plants. Photo: David O'Brien.

Conservation and Ecology

On the worrying fate of data deficient amphibians

Javier Nori & Rafael Loyola

The “Data Deficient” (DD) category of the IUCN Red List assembles species that cannot be placed in another category due to insufficient information. This process generates uncertainty about whether these species are safe or actually in danger. Here, we give a global overview on the current situation of DD amphibian species (almost a quarter of living amphibians) considering land-use change through habitat modification, the degree of protection of each species and the socio-political context of each country harboring DD species. We found that DD amphibians have, on average, 81% of their ranges totally outside protected areas. Worryingly, more than half of DD species have less than 1% of their distribution represented in protected areas. Furthermore, the percentage of overlap between species’ range and human-modified landscapes is high, at approximately 58%. Many countries harboring a large number of DD species show a worrying socio-political trend illustrated by substantial, recent incremental increases in the Human Development Index and lower incremental increases in the establishment of protected areas. Most of these are African countries, which are located mainly in the central and southern regions of the continent. Other countries with similar socio-political trends are in southeastern Asia, Central America and in the northern region of South America. This situation is concerning, but it also creates a huge opportunity for considering DD amphibians in future conservation assessments, planning and policy at different levels of government administration.

J. Nori, R. Loyola, *PLoS ONE*, **10**, e0125055 (2015).

Limited gene flow and high genetic diversity in the threatened Betic Midwife Toad (*Alytes dickhilleni*): Evolutionary and conservation implications

Guilherme Dias, Juan Francisco Beltrán, Miguel Tejedo, Maribel Benítez, Emilio González Miras, Nuno Ferrand & Helena Gonçalves

Habitat fragmentation may involve a loss of genetic diversity and increments the vulnerability to species persistence. It could be a particular issue when coupled with other negative factors as the predicted climatic changes and the emergence of infectious diseases. In Southern Iberian

Peninsula several endemic amphibian species have confined and fragmented distributions, including the Betic Midwife Toad *Alytes dickhilleni*. Herein, we present the first range-wide assessment of genetic diversity and structure in this species, using mitochondrial and microsatellite data. A mitochondrial fragment of the ND4 gene was amplified for 65 individuals and a set of 20 microsatellite loci, specifically developed for this species, was genotyped for 490 individuals from several sampling sites distributed across the species entire range. While both markers revealed high genetic diversity, only for microsatellites a marked genetic substructure was apparent. Our results evidence low levels of gene flow, suggesting the persistence of the species in fragmented habitats for several generations and a very limited connectivity between most of mountain ranges. The high diversity within *A. dickhilleni* populations could help to respond to the emergence of new diseases and to the predicted effects of climatic changes in Southeastern Iberian Peninsula. We hypothesize that the lack of gene flow is due to the absence of available breeding habitats and recommend that future management efforts of *A. dickhilleni* include the creation and maintenance of aquatic breeding habitats in a way that most of genetic diversity is preserved.

G. Dias *et al.*, *Conserv. Genet.* **16**, 459–476 (2015).



Bombina variegata and its breeding habitat in woodland. Photo: Matthieu Berroneau.

Highlighting the effects of land-use change on a threatened amphibian in a human-dominated landscape

Hugo Cayuela, Julie Lambrey, Jean-Pierre Vacher & Claude Miaud

In Western Europe habitat loss and landscape fragmentation has led to significant population decline in various animal groups, including amphibians. The extinction of the last natural populations of the yellow-bellied toad in Belgium, Luxembourg and several regions of southern and western France suggests a widespread decline. By using site-occupancy models and adding covariates corresponding

to the human-influenced features of the landscape, we tried to identify the relative effects of different land-use types on the species’ distribution pattern in a man-made environment (the Alsatian Rhine floodplain in France). We recorded presence-absence data in 150 forest sample plots (300 × 300 m) and then modeled species distribution while taking into account detection errors in the field. Land-use was recorded on two spatial scales: within the forest sample plots and in a 1500 m radius buffer area around the forest plots. In the forest plots, toad occurrence was negatively correlated with loss of forest cover to agricultural land. In contrast, occurrence was positively correlated with the density of human-made rutted dirt paths and tracks, which provide semi-natural breeding sites. In the 1500 m radius buffer zones around forest plots, toad occurrence was negatively correlated with the density of urbanization and road networks. These results can be used to plan conservation strategies for amphibians in human-dominated landscapes.

H. Cayuela, J. Lambrey, J. P. Vacher, C. Miaud, *Popul. Ecol.* In Press (2015).



Environments: A) permanent (river), B) semipermanent (cement pools in a park), C) semitemporal (road shoulder) and D) temporal (wasteland). Photo: Maria Selene Babini.

Implications of urbanization on the presence, distribution and reproductive ecology of anuran fauna of a city of central area of Argentina

M. Selene Babini, Nancy E. Salas, Clarisa L. Bionda & Adolfo L. Martino

Urbanization disrupts the natural ecosystem and causes the decline of amphibian populations. We did an inventory of anuran species that are present in a city in the central area of Argentina and we analyzed their reproductive aspects associated with urban environments. Rio Cuarto city has a population size of 180,000 inhabitants and the area is 64,25km². The total built-up area, less than 2% are public green spaces, while 17% are wasteland. We divide the city into five areas: North, South, East, West and Central. In each area, we determined between 3-4 sampling sites. In total there

were 18 sites and then, we classified them depending on the stability of the water body, in four different environments: permanent, semipermanent, semitemporal and temporal. To determine the reproductive activity, the acoustic emissions and the presence of larval stages were recorded. The indexes of alpha and beta diversity, relative importance (IIR) and permanence (IP) were calculated. To compare the diversity among environments a Hutcheson's t-test was performed. Eight species of anuran of four families were recorded: *Odontophrynidae*, *Odontophrynus americanus*; *Bufo*idae, *Rhinella arenarum*; *Leptodactylidae*, *Leptodactylus gracilis*, *L. mystacinus*, *L. latinasus*, *L. latrans*, *Physalaemus biligonigerus*; *Hylidae*, *Hypsiboas pulchellus*. Three species lay their eggs directly on the water, while the others have more advanced strategies that indicate a tendency to prefer terrestrial environments. Amphibian species of terrestrial habits would be more tolerant to changes in environmental conditions. *Rhinella arenarum*, *L. gracilis*, *L. latinasus* and *P. biligonigerus* were found in a greater proportion of sites and in the 4 types of environments, so they could be considered "urban adapted." On the other hand, *L. mystacinus*, *L. latrans*, *O. americanus* and *H. pulchellus* were found in fewer sites and with a low abundance of tadpoles, so could be considered as "urban sensitive." The Shannon and Evenness index indicated to the environment semitemporal such as maximum diversity and less variation in abundance among species. The lowest diversity was recorded in permanent environment. Due to the special requirements of the species, the diversity of environments with different hydroperiods, mainly with semitemporal and temporary water body, is a key factor for the preservation of a community of urban frogs.

M. S. Babini, N. E. Salas, C. L. Bionda, A. E. Martino, *Rev. Mex. Biodivers.* 8, 1–8 (2015).

A basin-scale application of environmental DNA assessment for rare endemic species and closely related exotic species in rivers: A case study of giant salamanders in Japan

Sou Fukumoto, Atushi Ushimaru & Toshifumi Minamoto

To prevent the invasion of exotic species causing a decline in an endangered endemic species, it is important to determine the distribution of both species at an early stage, when the density of the exotic species is still low, and to manage the invasion immediately. However, distinguishing between closely related species is difficult because they share similar characteristics. The identification of DNA fragments sampled from a body of water (environmental DNA) has become a popular

technique for rapidly determining the distribution of a target species. In this study, we analyzed environmental DNA in water samples from 37 sites across the Katsura River basin in Japan. We used TaqMan real-time PCR to distinguish the Japanese Giant Salamander *Andrias japonicus* from the closely related Chinese Giant Salamander *Andrias davidianus*, which is known to invade Japanese rivers and hybridize with the Japanese species.

In environmental samples, we detected mtDNA of the endemic species at 25 sites and mtDNA of the exotic species at nine sites. The DNA detection sites were concentrated in the upstream region. The exotic species DNA was found beyond the limits of an earlier capturing survey.

Using environmental DNA to monitor the two salamander species requires less time and effort than traditional surveys, so a wide-ranging survey can be conducted rapidly. Our results showed that performing three environmental DNA surveys for each site between autumn and winter is desirable for giant salamanders. Further collection of environmental DNA, in combination with conventional population surveys, will provide valuable information that can help protect rare endemic species in a variety of aquatic ecosystems and can help monitor the invasion of exotic species.

S. Fukumoto, A. Ushimaru, T. Minamoto, *J. Appl. Ecol.* 52, 358–265 (2015).



Natterjack Toad (*Epidalea calamita*). This species illustrates well the decline of most European amphibians, which is even more pronounced in post-glacial ranges than glacial refugia. The biogeographic loss of genetic diversity associated with post-glacial expansions may have aggravated the susceptibility of populations to current anthropogenic threats. Photo: Christophe Dufresnes.

Effect of biogeographic history on population vulnerability in European amphibians

Christophe Dufresnes & Nicolas Perrin

The genetic diversity of populations, which contributes greatly to their adaptive potential, is negatively affected by anthropogenic habitat fragmentation and destruction. However, continental-scale losses of genetic diversity also resulted from

the population expansions that followed the end of the last glaciation; an element that is rarely considered in a conservation context. We addressed this issue in a meta-analysis in which we compared the spatial patterns of vulnerability of 18 widespread European amphibians in light of phylogeographic histories (glacial refugia and postglacial routes) and anthropogenic disturbances. Conservation statuses significantly worsened with distances from refugia, particularly in the context of industrial agriculture; human population density also had a negative effect. These findings suggest that features associated with the loss of genetic diversity in post-glacial amphibian populations (such as enhanced fixation load or depressed adaptive potential) may increase their susceptibility to current threats (e.g., habitat fragmentation and pesticide use). We propose that the phylogeographic status of populations (i.e., refugial vs. post-glacial) should be considered in conservation assessments for regional and national red lists.

C. Dufresnes, N. Perrin, *Conserv. Biol.* In Press. doi: 10.1111/cobi.12490



Columbia Spotted Frog, *Rana luteiventris*. Photo: David Pilliod.

Managing habitat to slow or reverse population declines of the Columbia Spotted Frog in the Northern Great Basin

David S. Pilliod & Rick D. Scherer

Evaluating the effectiveness of habitat management actions is critical to adaptive management strategies for conservation of imperiled species. We quantified the response of a Great Basin population of the Columbia Spotted Frog (*Rana luteiventris*) to multiple habitat improvement actions aimed to reduce threats and reverse population declines. We used mark-recapture data for 1,394 adult frogs that had been marked by state, federal and university biologists in nine ponds representing a single population over a 16-year period from 1997 to 2012. With the use of demographic models, we assessed population-level effects of 1) a grazing enclosure constructed arounds ix stock

ponds that had been used to water livestock for decades before being fully fenced in 2003, and 2) the construction of three new stock ponds in 2003 to provide alternative water sources for livestock and, secondarily, to provide additional frog habitat. These management actions were implemented in response to a decline of more than 80% in population size from 1997 to 2002. We found evidence that excluding cattle from ponds and surrounding riparian habitats resulted in higher levels of frog production (more egg masses), higher adult frog recruitment and survival, and higher population growth rate. We also found that frogs colonized the newly constructed stock ponds within three years and frogs began breeding in two of them after five years. The positive effects of the cattle enclosure and additional production from the new ponds, although notable, did not result in full recovery of the population even nine years later. This slow recovery may be partly explained by the effects of weather on recruitment rates, particularly the negative effects of harsher winters with late springs and higher fall temperatures. Although our findings point to potential successes of habitat management aimed at slowing or reversing rapidly declining frog populations, our study also suggests that recovering from severe population declines can take many years because of demographic and environmental processes.

D. S. Pilliod, R. D. Scherer, *J. of Wildl. Manag.*, 79, 579–590 (2015).

Seasonal differences in extinction and colonization drive occupancy dynamics of an imperiled amphibian

Lea A. Randall, Des H. V. Smith, Breana L. Jones, David R. C. Prescott & Axel Moehrenschlager

A detailed understanding of the population dynamics of many amphibian species is lacking despite concerns about declining amphibian biodiversity and abundance. This paper explores temporal patterns of occupancy and underlying extinction and colonization dynamics in a regionally imperiled amphibian species, the Northern Leopard Frog (*Lithobates pipiens*) in Alberta, Canada. Our study contributes to elucidating regional occupancy dynamics at northern latitudes, where climate extremes likely have a profound effect on seasonal occupancy. The primary advantage of our study is its wide geographic scale (60,000 km²) and the use of repeat visual surveys each spring and summer from 2009–2013. We find that occupancy varied more dramatically between seasons than years, with low spring and higher summer occupancy. Between spring and summer, colonization was high and extinction low; inversely, colonization was low and extinction high

over the winter. The dynamics of extinction and colonization are complex, making conservation management challenging. Our results reveal that Northern Leopard Frog occupancy was constant over the last five years and thus there is no evidence of decline or recovery within our study area. Changes to equilibrium occupancy are most sensitive to increasing colonization in the spring or declining extinction in the summer. Therefore, conservation and management efforts should target actions that are likely to increase spring colonization; this could be achieved through translocations or improving the quality or access to breeding habitat. Because summer occupancy is already high, it may be difficult to improve further. Nevertheless, summer extinction could be reduced by predator control, increasing water quality or hydroperiod of wetlands, or increasing the quality or quantity of summer habitat.

L. A. Randall, D. H. V. Smith, B. L. Jones, D. R. C. Prescott, A. Moehrenschlager, *PLoS ONE*, 10, 5 (2015).



Some threatened amphibian species inhabiting cloud forest fragments sampled in the mountainous region of central Veracruz, Mexico. a) *Pseudoeurycea lynchi*; b) *Plectrohyla arborescandens*; c) *Incilius cristatus*; and d) *Craugastor decoratus*. Photos: J. L. Aguilar-López.

Amphibian diversity and threatened species in a severely transformed neotropical region in Mexico

Yocoyani Meza-Parral & Eduardo Pineda

Several places around the world are home to a large number of highly endangered species, the distribution of which is very restricted. These sites, mainly located in tropical forest, on islands or in mountainous areas, are of particular concern because most of them are located in regions that are severely impacted by human activities and only one-third are protected by law. The mountainous region of central Veracruz, Mexico is considered a priority area for amphibian conservation, because of its high level of endemism and since half of the species that have been recorded there are threatened according to the IUCN, and this exceeds the world average. The original tropical montane cloud forest in the region

has been intensely reduced and fragmented, and is now mainly confined to ravines and hillsides. In this study we evaluated the current situation of the amphibian diversity in the cloud forest fragments of this region by analyzing species richness and abundance, comparing assemblage structure and species composition, examining the distribution and abundance of threatened species, and identifying local and landscape variables associated with the observed amphibian diversity. From June to October 2012 we sampled ten forest fragments investing 944 person-hours of sampling effort. A total of 895 amphibians belonging to 16 species were recorded. Remarkable differences in species richness, abundance and assemblage structure between forest fragments were detected. Species composition between pairs of fragments differed by an average of 53%, with the majority (58%) resulting from species replacement and the rest explained by differences in species richness. Half of the species detected are under threat of extinction, and although their distribution and abundance varied markedly, there were also ubiquitous and abundant species, along with rare species of restricted distribution. Fragment area, elevation and tree height were variables related to species richness and abundance; while differences in elevation, fragment area and geographical distance between forest fragments were related to dissimilarity in species composition (beta diversity). The evident heterogeneity of the ten study sites indicates that to maintain amphibians in a mountainous region such as this one it is necessary to protect groups of fragments which represent the variability of the system. The conservation value of forest fragments in a region as severely transformed as our study area is highlighted at both the individual and the collective level, because each remnant is inhabited by several threatened species, some of them at imminent risk of extinction.

Y. Meza-Parral, E. Pineda, *PLoS ONE*, 10 e0121652 (2015). doi:10.1371/journal.pone.0121652

Instituto de Ecología, A.C. México



Photo: Robin Moore.



Forest remnant in the Tucuui Dam reservoir in Para State, northern Brazil. This artificial lake was formed in 1984 and 1985, and it flooded an area of upland forest of approximately 2.918 km² and created more than 2.200 islands of different sizes, shapes and degrees of isolation. Photo: S. Neckel-Oliveira.

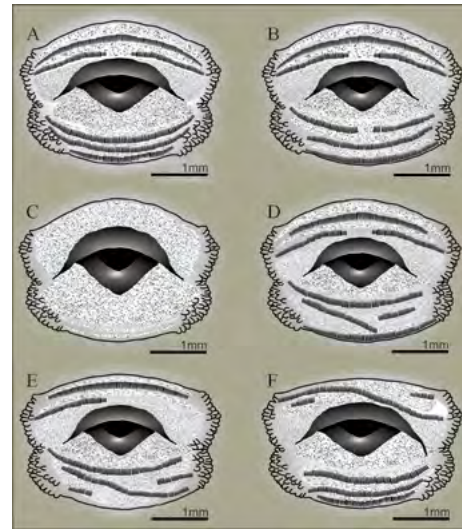
Amphibians on Amazonian land-bridge islands are affected more by area than isolation

Janaina R. Lima, Ulisses Galatti, Crisalda J. Lima, Sarita B. Faveri, Heraldo L. Vasconcelos & Selvino Neckel-Oliveira

The river damming has contributed substantially to the reduction of forested areas in tropical regions, with concomitant losses in animal and plant diversity. Islands created by river damming have already become a prominent feature of the landscape of Amazon Basin. If large areas of habitat are needed to guarantee the presence of certain specific types of breeding sites, then the decrease in forest area caused by river damming can have a direct effect on amphibian species. Here we describe the anuran assemblages of islands that were created by the damming of the Tocantins River in the eastern Amazon basin. We surveyed 10 undisturbed islands varying in size from 3 to 2,140 ha, and located at distances of up to 6.7 km from the margin. We found 32 frog species, of which 15 have aquatic development, 14 have semi-aquatic development, and three, terrestrial development. The number of frog species increased significantly with island area but was not affected by the distance of the island from the margin of the reservoir. Species with aquatic or semi-aquatic development tended not to be found on the smaller islands, regardless of their degree of isolation from the mainland. We discovered that nine species that originally occurred in the region were not found on any of the islands we studied. These include five species (*Dendrophryniscus minutus*, *Atelopus spumarius*, *Rhaebo guttatus*, *Hypsiboas geographicus* and *H. multifasciatus*) associated with the gallery forests, which were probably flooded as the reservoir was formed, three species (*Allophryne ruthveni*, *Osteocephalus lepriouri*, *Phyllomedusa vaillanti*) that require temporary ponds in primary forest for reproduction, and one species (*Pseudopaludicola* sp.) that require temporary ponds in open areas. The decreased of

species perhaps as a result of edge effects and /or due to a shortage of the habitats (e.g., gallery forests, permanent and temporary ponds) required by species with aquatic and semi-aquatic development on the smaller islands, thus causing their local extinction.

J. R. Lima, U. Galatti, C. J. Lima, S. B. Faveri, H. L. Vasconcelos, S. Neckel-Oliveira, *Biotropica*, 47, 369 (2015).



Labial tooth row formula (LTRF) recorded. Normal LTRF of *Rhinella arenarum*: A) 2(2)/3 and B) 2(2)/3(1). Abnormal LTRF recorded in agroecosystems: C) without labial teeth (0/0); D) abnormality in 2nd lower labial tooth row; E) abnormality in 2nd upper and lower labial tooth row; F) abnormality in 1st upper labial tooth row. Photo: Maria Selene Babini.

Health status of tadpoles and metamorphs of *Rhinella arenarum* (Anura, Bufonidae) that inhabit agroecosystems and its implications for land use

M. Selene Babini, Clarisa L. Bionda, Nancy E. Salas & Adolfo L. Martino

The central region of Argentina has been greatly affected by agricultural expansion and many of aquatic habitats in this area have been altered. Perturbations of ponds near agricultural and livestock systems reduce survival and affect parameters such as growth and development to tadpoles and increase frequency of malformations. Due to fundamental role of tadpoles in regulation of adult phase and total dependency of tadpoles on aquatic systems, we analyzed body growth, abnormalities in oral disc and genetic damage in erythrocytes of early stages of development of *Rhinella arenarum* to establish the impact of agroecosystems on local populations of amphibians. Tadpoles and metamorphs were collected in three agroecosystems (namely, C1, C2, C3) and in a site without agricultural and livestock activities (SM) from central Argentina. Clutches of C1 were extracted

for breeding tadpoles under laboratory conditions. In this way, we would discard a genetic effect, because that tadpoles reared in the Lab had different characteristics of to the tadpoles and metamorphs collected *in situ* in C1 site. In SM and Lab, biggest organisms were recorded, with normal LTRF (labial tooth row formula) and low micronucleus and nuclear abnormalities frequencies. Of agroecosystems, C1, with a pond near of crops and intense trampling by livestock in and around the pond, could be considered as the agroecosystem with highest anthropic perturbation and with less healthy tadpoles. Levels of conductivity, TDS and salinity showed high values. Tadpoles and metamorphs were smaller and had a higher amount of abnormalities in the oral disc and cells. On the other hand, C3 could be considered as the less disturbed agroecosystem, with crops far from the pond and discontinuous presence of cattle. Tadpoles in this site were bigger and had a lower frequency of abnormalities in the oral disc and in erythrocytes than in C1 and C2, being able to be classified as healthier. These results allow us to think that the environmental degradation caused by agricultural and livestock activities in the central region of Argentina would have an impact on development of early stages of *R. arenarum*. However, livestock practices such as alternating cattle between parcel and keeping a buffer between crops and ponds, would allow a better development of first aquatic stages, essential for conservation of anuran populations.

M. S. Babini, C. L. Bionda, N. E. Salas, A. E. Martino, *Ecotox. Environ. Safe.* 118, 118–125 (2015).

Diseases and Toxicology

Larval exposure to polychlorinated biphenyl 126 (PCB-126) causes persistent alteration of the amphibian gut microbiota

Kevin D. Kohl, Tawnya L. Cary, William H. Karasov & M. Denise Dearing

Animals maintain complex relationships with a diverse community of microbes living within their guts. These symbiotic relationships have been understudied in amphibians, an especially important group due to their rapid extinction rates. One possible cause of increased extinction rates may be exposure to environmental toxins. Interactions between gut microbes and anthropogenic pollutants have not been studied in ecologically relevant systems. Here, we compared gut microbial inventories of control tadpoles and frogs of the Northern Leopard Frog (*Lithobates pipiens*) to individuals that underwent larval

exposure to polychlorinated biphenyl 126 (PCB-126). This allowed us to investigate the effects of toxin exposure on both an immediate (in tadpoles) and permanent (in frogs) timescales. Interestingly, the effects of PCB-126 were more pronounced in adult frogs than in tadpoles, suggesting a persistent effect of pollutants on these symbiotic relationships. PCB-treated frogs exhibited increased species richness in the gut, and harbored communities significantly enriched in Fusobacteria, a potentially pathogenic group of microbes. These results highlight that the field of ecotoxicology should include the gut microbial community as a potential site of toxicity, and investigate the mechanisms and consequences of altered symbioses.

K. D. Kohl, T. L. Cary, W. H. Karasov, M. D. Dearing, *Environ. Toxicol. Chem.* **34**, 1113 (2015).



A Common Mistfrog (*Litoria rheocola*) perches on a fern above a rainforest stream in Queensland, Australia. Photo: Elizabeth A. Roznik.

Seasonal ecology and behavior of an endangered rainforest frog (*Litoria rheocola*) threatened by disease

Elizabeth A. Roznik & Ross A. Alford

One of the most devastating wildlife diseases ever recorded is chytridiomycosis, a recently emerged amphibian disease that is caused by the chytrid fungus *Batrachochytrium dendrobatidis*. Understanding, predicting, and managing the impacts of chytridiomycosis on any amphibian species will require detailed information on its ecology and behavior because this pathogen is transmitted by contact with water or other individuals, and pathogen growth rates are thermally sensitive. The Common Mistfrog (*Litoria rheocola*) is an endangered tropical rainforest frog that has declined due to chytridiomycosis. We tracked *L. rheocola* during the winter (cool/dry) and summer (warm/wet) seasons at a low- and high-elevation site. We found that seasonal differences in environmental temperatures and frog behavior should render this species most vulnerable to *B. dendrobatidis* during

cooler months and at higher elevations, which matches observed patterns of infection prevalence in this species. During winter, frogs moved shorter distances than during summer, and they spent less time in vegetation and more time in the stream, which should increase exposure to aquatic *B. dendrobatidis* zoospores. At a low-elevation site (40 m asl), estimated body temperatures were within the optimal range for *B. dendrobatidis* growth (15–25 °C) most of the time during winter, but they reached temperatures above this threshold frequently in summer. At a higher elevation (750 m asl), estimated body temperatures were within the range most favorable for *B. dendrobatidis* year-round, and did not exceed 25 °C, even during summer. Our study provides the first detailed information on the ecology and behavior of *L. rheocola* and suggests ecological mechanisms for infection dynamics that have been observed in this endangered species.

E. A. Roznik, R. A. Alford, *PLoS ONE*, **10**, e0127851 (2015).



Boophis williamsi is Critically Endangered and one of the most threatened amphibian species in Madagascar. This particular frog was negative for *Bd* and ranavirus, but other ranavirus-positive amphibians were detected nearby. Photo: Jonathan Kolby.

Rapid response to evaluate the presence of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*) and ranavirus in wild amphibian populations in Madagascar

Jonathan E. Kolby, Kristine M. Smith, Sara D. Ramirez, Falitiana Rabemananjara, Allan P. Pessier, Jesse L. Brunner, Caren S. Goldberg, Lee Berger & Lee F. Skerratt

We performed a rapid response investigation to evaluate the presence and distribution of amphibian pathogens in Madagascar following our identification of amphibian chytrid fungus (*Batrachochytrium dendrobatidis*, *Bd*) and ranavirus in commercially exported amphibians. This targeted risk-based field surveillance program was conducted from February to April 2014 encompassing 12 regions and 47 survey sites. We simultaneously collected amphibian and environmental samples to

increase survey sensitivity and performed sampling both in wilderness areas and at commercial amphibian trade facilities. *Bd* was not detected in any of the 508 amphibian skin swabs nor 68 water filter samples, suggesting overall pathogen prevalence was below 0.8%, with 95% confidence during our visit. Ranavirus was detected in 5 of 97 amphibians tested, one adult *Mantidactylus cowanii* and three unidentified larvae from Ranomafana National Park, and one adult *Mantidactylus mocquardi* from Ankaratra, indicating a prevalence of 5.2%, with a 95% confidence interval of 2.2–11.5%. Ranavirus was also detected in water samples collected from two commercial amphibian export facilities, whereas water collected from 43 other locations tested negative. We also provide the first report of an amphibian mass-mortality event observed in wild amphibians in Madagascar. While it appears that neither *Bd* nor ranavirus was widespread in Madagascar at the time of our sampling, additional health surveys are needed to disentangle potential seasonal variations in pathogen abundance and detectability from actual changes in pathogen distribution and rates of spread. Accordingly, our results should be conservatively interpreted until a comparable survey effort during winter months has been performed. It is likewise imperative that biosecurity practices be immediately adopted to limit the unintentional increased spread of disease through the movement contaminated equipment or by the direct disposal of contaminated material from wildlife trade facilities. The presence of potentially introduced strains of ranaviruses in Madagascar suggests the country's reptile species might also be threatened by disease. Standardized population monitoring of key amphibian and reptile populations should be established with urgency to enable early detection of potential impacts of disease emergence in this global biodiversity hotspot.

J. E. Kolby, K. M. Smith, S. D. Ramirez, F. Rabemananjara, A. P. Pessier, *et al.* *PLoS ONE* **10** (6), e0125330. doi:10.1371/journal.pone.0125330 (2015).

General Announcements

Events

The following information can be found at:
<http://www.amphibians.org/meetings>

July 2014

13–16 The Association for Tropical Biology and Conservation International, Honolulu, Hawaii

August 2014

2–6 The Society for Conservation Biology (and the International Congress for Conservation Biology), Montepelier, France

11–15 Innovative Approaches to Wildlife Course - Sagehen Creek Field Station, Berkeley, CA

13–15 Northeast PARC Annual Meeting - Allegany State Park, Salamanca, NY

22–24 Midwest PARC Annual Meeting – Camp Iduhapi, near Loretto, MN.

27–29 Michigan Wetlands Association's 2014 Conference - Grand Rapids, MI

September 2014

7–12 Brazilian Herpetological Congress 2015, Fundacao de apoio da Universidade do Rio Grande Do Sul

Internships & Employment

Department Head - Department of Fisheries and Wildlife - Oregon State University

Corvallis, OR. (Posted to PARC 05/21/15, Apply by 8/31/15 for full consideration)

Brown Tree Snake Biologist

Guam, U.S.A. (Posted to PARC 04/28/15, Open Until Filled)

Salamander Field Technician

Ohio - Vinton County: Vinton Furnace Experimental Forest and Zaleski State Forest (Posted to PARC 03/13/15, Open Until Filled)

Penn State Academic Assistants, Desert Tortoise, Mojave Desert

Henderson, NV / Barstow, CA (Posted to PARC 01/18/15, No Closing Date Provided)

Rock Iguana Volunteer Field Assistants

Hispaniola (Posted to PARC 03/01/15, Open Until Filled)

Full-Time Amphibian Department Zookeeper

Detroit, MI (Posted to PARC 12/02/14, No Closing Date Provided)

Chief of the Grand Canyon Monitoring and Research Center

Flagstaff, AZ (Posted to PARC 11/17/14, 12/3/14)

Graduate Assistantship on Bog Turtle Conservation Planning, Virginia Tech Department of Fisheries and Wildlife Sciences

Blacksburg, VA (Posted to PARC 11/10/14, No Closing Date Provided)

Ph.D. graduate assistantship available in population dynamics, ecology, and behavior of amphibians in a fire-dependent system

Blacksburg, VA (Posted to PARC 11/10/14, No Closing Date Provided)

Research Manager, Davidson College Herpetology Laboratory

Davidson, NC (Posted to PARC 11/10/14, Open Until Filled)

Zilla Marketing Brand Manager

Franklin, WI (Posted to PARC 11/04/14, Open Until Filled)

M.S. Assistantship, Amphibian Genetics

Western Kentucky University, Bowling Green, KY (Posted to PARC 10/03/14, Open Until Filled)

Research Manager, Brown Treesnake Research Project

Guam, Mariana Islands (Posted to PARC 06/05/14, Open Until Filled)

MS Graduate Opportunity: SUNY-ESF

Syracuse, NY (Posted to PARC 11/17/14, 12/15/14)

Graduate Assistantship on Bog Turtle Conservation Planning, Virginia Tech Department of Fisheries and Wildlife Sciences

Blacksburg, VA (Posted to PARC 11/10/14, No Closing Date Provided)

Funding Opportunities

The Amphibian Survival Alliance is pleased to announce an open call for seed grant applications. Seed grants are normally provided in amounts ranging from USD \$500-\$1,000 and are designed to help kick start projects or allow teams to try new innovative approaches to address conservation, research and education challenges. [Link](#)

The Leapfrog Conservation Fund has been created specifically to support the creation of new reserves for important amphibian habitat, or the expansion of existing reserves through local organizations. If your organization is working toward the protection of critical habitat for threatened amphibian species, we would love to hear from you. [Link](#)

The following information is kindly provided by the Terra Viva Grants Directory, for more information please visit: <http://www.terravivagrants.org/>

July

Indo-French Centre for the Promotion of Advanced Research (CEFIPRA) -- Water Research. The French Embassy in India and the Indian Department of Science & Technology co-sponsor the Indo-French Scientific Networking Programme in the field of water. Priority research areas are wastewater treatment, and natural water treatment systems. Proposals should include two to five Indian partners, and two to five French partners. At least one industrial partner and one academic partner must be included in each project. The deadline for proposals is 01 July 2015. [Link](#)

Monarch Butterfly Fund -- Small Grants Program. The Monarch Butterfly Fund supports activities to protect the Oyamel fir forests in which monarch butterflies overwinter in central Mexico. Most grants are awarded to Mexican organizations and individuals. Additionally, the Fund supports a small number of projects in the USA and Canada. Most grants are a maximum of US\$2,500. The application deadlines are 05 January and 05 July. [Link](#)

Korea Green Foundation -- Green Asia Grants 2015. The Korea Green Foundation makes grants to civil society organizations in the Asia-Pacific region that work on projects related to biodiversity, climate disasters, renewable energy and other environmental issues in local areas. Grants support education, campaigns and research. Grants are up to US\$5 thousand

for periods of six months. Refer to Notice 236. The application deadline is 08 July 2015. [Link](#)

Italian Cooperation -- Fellowships for Africans in Natural Resources Management. Italian Cooperation will fund up to 16 participants for masters studies at the University of Florence in subjects of natural resources management for tropical rural development. The fellowships are for candidates interested in the Land and Water curriculum. Eligible countries are Burkina Faso, Ethiopia, Kenya, Mozambique, Niger, Senegal, Somalia and Sudan. Women are strongly encouraged to apply. The application deadline is 10 July 2015. [Link](#)

Campus France -- Program SIAM 2016. France and Thailand administer SIAM to promote French-Thai research collaboration in subject areas that include energy, ecology and biodiversity, agriculture and others. SIAM is a program of mobility grants to cover air transportation and related travel expenses. The application deadline is 15 July 2015. [Link](#)

Seeding Labs -- Scientific Equipment for Research and Education 2015. Seeding Labs requests applications to participate in Instrumental Access, a program that makes high-quality laboratory equipment and supplies more affordable to university departments in low- and middle-income countries. Seeding Labs receives donated equipment from a variety of sources, including research institutions and manufacturers. Applicants submit online requests for items included in the Seeding Labs equipment inventory. The average value of the items included in a shipment, if purchased new, would cost up to US\$212 thousand. The recipient organizations are charged a sliding fee (based on the country's income level) for program administration, equipment warehousing, equipment packing, and ocean freight. The application deadline is 15 July 2015. [Link](#)

World Academy of Sciences (TWAS) -- C.N.R. Rao Prize for Research. The C.N.R. Rao Prize honors TWAS Fellows from the developing world, especially scientists from the world's scientifically lagging and least developed countries, who have made significant contributions to global science. The amount of the prize is US\$4 thousand. The application deadline is 15 July 2015. [Link](#)

Agropolis Foundation -- Open Science Training and Higher Education. The Agropolis Foundation (France) promotes interdisciplinary and integrated plant biology, ecology, and sustainable

agriculture addressing development issues in the global North and South. The call for Open Science "Training and Higher Education" will fund projects that contribute to the diversity, quality, and innovation of capacity building offered by the Labex Agro scientific community and its partners. The deadline for applications (*French, English*) is 17 July 2015. [Link](#)

French Institute for Development Research (IRD) -- Support for International Research Teams 2015. The IRD announces funding to support multidisciplinary international teams (laboratoires mixtes internationaux, LMI) to undertake research that corresponds to IRD's thematic priorities. These priorities include societies and environment; risks, climate, and environment; biodiversity, natural resources, and food security; and several others. The maximum funding in the first year of an LMI is €50 thousand. The deadline for preliminary proposals is 27 July 2015. [Link](#)

Acumen Fund -- East Africa Fellows Program 2016. The Acumen East Africa Fellows Program is a one-year leadership development program that gives 20 individuals from East Africa the training they need to accelerate their social impact and leadership potential. Eligible countries are Burundi, Ethiopia, Kenya, Rwanda, South Sudan, Uganda and Tanzania. Past fellows have included several in smallholder agriculture, renewable energy, waste management, fair trade and other areas. Acumen covers all program expenses related to travel and accommodations, but it does not offer scholarships, stipends or other funding. The application deadline is 31 July 2015. [Link](#)

Climate Technology Initiative (CTI PFAN) -- Clean Energy in CIS and Central Asia. CTI PFAN invites entrepreneurs, start-up and existing companies, project teams, and consortia with environmentally beneficial business to submit business plans for the development of clean energy and related technologies for eligible countries in CIS and Central Asia. The competition is open to projects or companies located in Armenia, Azerbaijan, Georgia, Kazakhstan, Moldova and Ukraine. Short-listed projects will receive coaching from professional experts to improve the business plans in preparation for a financing forum. The closing date is 31 July 2015. [Link](#)

New Zealand Aid Program -- Development Scholarships 2016. New Zealand's government provides a variety of opportunities for training and

university study through the New Zealand Aid Program, Ministry of Foreign Affairs and Trade. The priorities often include agriculture, renewable energy, fisheries, disaster risk management, and other areas related to natural resources and environment. Application deadlines are specific to each country/regional program. The deadline for applicants from Africa, Latin America, the Caribbean, and several Asian countries is 31 July 2015. [Link](#)

August

World Wildlife Fund -- Conservation Funding for Myanmar. WWF-US is offering special grants over the next four years to build capacity for conservation leadership in Myanmar. WWF will train and educate individuals at top universities and training centers in Myanmar, the Greater Mekong region and around the world. Training grants for individuals are up to US\$6,500. In addition, the program will support registered non-profit organizations in Myanmar to conduct conservation workshops. Organizations may request up to US\$7,500 for conservation workshops. Guidelines are available in English and Burmese. The remaining deadlines in 2015 for grants in support of conservation workshops are 01 August and 01 November. [Link](#)

Rainforest Trust -- Rainforest Ark Initiative. The Rainforest Ark Initiative provides partnership and funding opportunities to local conservation NGOs across the tropics. Funded projects aim to establish and/or expand protected areas for Critically Endangered and Endangered wildlife and birds. The Initiative invites applications for conservation partnerships from nonprofit entities and NGOs for projects in tropical Latin America, Africa and Asia. Applying organizations may submit proposals for either a land purchase or a protected area designation. The application deadline is 15 August 2015. [Link](#)

World Academy of Sciences (TWAS) -- Postdoctoral Programs in India. TWAS collaborates with research institutions in the developing world to offer postdoctoral fellowships for early-career scientists who want to expand their experiences. In India, the host institutions include the Council of Scientific and Industrial Research; the Department of Biotechnology (Ministry of Science and Technology); the S.N. Bose National Centre for Basic Sciences; and the Indian Association for the Cultivation of Science. The application deadline for each of these programs is 15 August 2015. Note: Researchers should review other sub-programs for postdoctoral opportunities

in Brazil, Kenya, Malaysia, Mexico and Pakistan. [Link](#)

U.S. Department of State -- Training to Combat Wildlife Trafficking in Latin America and Asia. The U.S. Department of State will make grants to train government law enforcement officials in Latin America and Asia to combat wildlife trafficking. Training will include detection, enforcement and investigation of wildlife crimes. Additional training will assist in strengthening legislative frameworks, prosecuting wildlife crimes, and reforming legal systems. Eligibility for funding extends to non-profit organizations and institutions of higher education that are based in or working in relevant source or transit countries in wildlife trafficking. The application deadline is 04 August 2015. [Link](#)

Texas State Aquarium -- Marine and Wildlife Conservation in the Gulf of Mexico 2015. The Texas (USA) State Aquarium administers the Wildlife Care, Conservation, and Research Fund (WCCR). The Fund makes grants up to US\$15 thousand for research and conservation that focus on species and/or habitats interpreted at the Aquarium, with emphasis on conservation in the Gulf of Mexico. The application deadline is 10 August 2015. [Link](#)

United Nations Framework Convention on Climate Change (UNFCCC) -- Youth Video Competition on Climate Change. The UNFCCC announces a global competition for individuals aged 18–30 who submit video examples of inspiring actions to combat climate change. The winners will be funded to participate in COP 21 in Paris (November-December 2015) as youth reporters. The deadline for submissions is 17 August 2015. [Link](#)

Margaret McNamara Memorial Fund -- Support for Women's University Education in Latin America 2015-2016. The Margaret McNamara Memorial Fund (MMMMF) awards grants to women from developing and middle-income countries to further their education and strengthen the professional and leadership skills they need to improve the lives of women and children. The MMMF currently calls for applications from Latin America. Applicants need to be enrolled at any of the following institutions: Universidad Austral, Argentina; Universidad Iberoamericana, México; Universidad Católica del Perú, Perú; Universidad Nacional, Colombia; Universidad Rafael Landívar, Guatemala; or FLACSO (multiple countries). Past grantees include some whose focus has been environmental

studies. The application deadline is 30 August 2015. [Link](#)

Pacific Asia Travel Foundation -- Grants for Sustainable Tourism. The Pacific Asia Travel Association (PATA) makes grants for projects in environmental and cultural heritage that contribute to sustainable tourism in the Asia-Pacific region. The grants support environmental protection, heritage conservation, and education and awareness. The majority of grants are to organizations based in the region's developing countries and territories. Grants are a maximum of US\$10 thousand. Each application requires references, one of which must be a PATA chapter. Applications are submitted in July and August. [Link](#)

September

Elsevier Foundation -- Awards for Early-Career Women Scientists 2016. The Elsevier Awards for Early-Career Women Scientists in the Developing World honor scientific and career achievements by women from developing countries in five regions: Latin America and the Caribbean; the Arab region; Sub-Saharan Africa; Central and South Asia; and East and Southeast Asia and the Pacific. The 2016 awards will be in the biological sciences covering agriculture, biology and medicine. The five winners will each receive a cash prize of US\$5 thousand in addition to paid travel and expenses to attend the next meeting of the American Association for the Advancement of Science (AAAS). The deadline for nominations is 01 September 2015. [Link](#)

Japan Foundation Center for Global Partnership -- Abe Fellowships 2015. The Abe Fellowship encourages international research in the social sciences and related disciplines on topics of pressing global concern—including climate change, sustainable urbanization, environmental degradation and other cross-cutting issues that advance global problem solving from a transnational perspective. The fellowship program is open to citizens of Japan and the USA, as well as to nationals of other countries who can demonstrate serious long-term affiliations with research communities in Japan or the USA. The closing date for applications is 01 September 2015. [Link](#)

Toyota Foundation -- Research Grants 2015. The Toyota Foundation supports a Research Grants Program on the general theme of "Exploring New Values for Society." Grants are made to organizations (joint research projects) as well as to individuals. The Foundation solicits ambitious projects that are founded on

creative concepts reflecting a youthful perspective and whose results can help change people's ways of thinking, leading to actions that bring about solutions to the issues faced. There are no restrictions by nationality, affiliation, academic background or area of residence. Past grants in this program include several in areas related to agriculture, environment, and natural resources. The application deadline is 04 September 2015. [Link](#)

Research Council of Norway -- Environmental Research for a Green Transition. The Research Council of Norway announces its first call for proposals issued by the MILJØFORSK program (2016-2025) to generate new knowledge about biodiversity, cultural environments, ecosystem services, hazardous substances and pollution. It will also study pressures on the environment and the relationships between social drivers/measures and natural drivers/responses. The MILJØFORSK program will cooperate with the Norway – Global Partner program (NORGLOBAL) to incorporate partners from the developing world into the grant proposals. The priority partner countries for 2015 are Afghanistan; Ethiopia; Haiti; Malawi; Mali; Mozambique; Myanmar; Nepal; Palestine; Somalia; South Sudan; and Tanzania—see the announcement for other developing countries which are also eligible. The deadline for applications is 09 September 2015. [Link](#)

French Ministry of Foreign Affairs and International Development -- Environmental Research in the Mediterranean Basin. The program ENVI-Med is a French initiative associated with MISTRALS to support international and inter-disciplinary research on environmental issues in the Mediterranean Basin. Research topics include Mediterranean climate change; the polluting effects of aerosols; water resources; human impacts on ecosystems and coastal zones; and climatic and geological risks. Proposals should bring together at least one French research team with research teams in at least two other Mediterranean countries, including at least one non-EU country. The application deadline is 15 September 2015. [Link](#)

Future for Nature Foundation -- Future for Nature Award 2016. The Future for Nature Award aims to stimulate a new generation of nature conservation leaders. The award is made to candidates of any nationality or residence, not older than age 35, who have achieved substantial and long-term benefit to the conservation status of one or more animal and/or plant

species, or that of a specific population. Work related to the conservation and protection of endangered species is a priority. The award is made to individuals, not organizations. Each of three award winners will be given a cash prize and a sculpture. The winners are expected to invest their prize in a conservation project of their own choice. The application deadline is 15 September 2015. [Link](#)

Stockholm International Water Institute -- Stockholm Water Prize 2016. The Stockholm Water Prize is awarded annually for outstanding achievements supporting the availability, conservation and protection of the world's water resources. The award is open to individuals and organizations of any nationality whose work contributes broadly to the conservation and protection of water resources. The Stockholm Water Prize consists of an award of US\$150 thousand and a crystal sculpture. The deadline for nominations is 25 September 2015. [Link](#)

Swedish International Development Agency (Sida) -- International Training Programs 2016. Sida funds short-term training in selected development topics for participants from developing countries. The Africa regional program includes a courses in strategic environmental assessment, with submission deadline of 30 September 2015. Information about course content and eligibility are included with the course description. Note: Interested individuals should follow the website for additional courses that may be announced, including at global and regional levels. [Link](#)

Yves Rocher Foundation -- Terre des Femmes 2015. The Foundation annually sponsors "Women of the Earth" to honor women in France and selected other countries for their achievements in environmental awareness, conservation and solidarity. Past awards include several for project work in the developing

countries. Prizes range from €3 thousand to €10 thousand. The closing date for applications in France is 30 September 2015 (*candidates in other countries should check their closing dates*). [Link](#)

October

World Academy of Sciences (TWAS) -- Visiting Researchers 2015. TWAS helps support researchers from the developing world to travel to other countries in order to pursue collaborative research for up to one year. Costs are shared between TWAS and the host institutions. Among several sub-programs are the "TWAS Fellowships for Research and Advanced Training" (with an application deadline of 01 October 2015) and the "TWAS-UNESCO Associate Scheme" (with a deadline of 01 December 2015). Researchers should review other sub-programs for opportunities in Kenya, Malaysia, and Pakistan. [Link](#)

World Academy of Sciences (TWAS) -- Visiting Professors 2015. TWAS collaborates with institutions and research groups in developing countries to enable distinguished visiting professors to teach and build capacity at these institutions. The focus is least-developed countries and institutions that are most separated from outside contacts. Requests are made by host institutions in the developing countries. The host institutions cover local expenses, while TWAS covers the international travel costs. The application deadline for the Visiting Expert Program is 01 October 2015; the deadline for Research Professors in Least-Developed Countries is 31 October 2015. [Link](#)

January – Special Topical Edition

April – The Americas

July – Africa, West Asia, Madagascar, Mediterranean and Europe

October – Asia, Russia and Oceania



INSTRUCTIONS TO AUTHORS

Background

FrogLog has been one of the leading amphibian conservation community newsletters since the early 1990's. Over the years it has been affiliated with different groups but has always strived to help inform the community. In 2005 *FrogLog* became the official newsletter of the IUCN SSC Amphibian Specialist Group and is produced on a quarterly basis.

As the ASG's newsletter members are encouraged to contribute to *FrogLog*'s content and direction. To aid in this process each edition of *FrogLog* focuses on one of the six broad geographical zones identified by the ASG. The publication schedule is as follows:

- January—Special Topical Edition
- April—The Americas
- July—Africa, West Asia, Madagascar, Mediterranean and Europe
- October—Asia, Russia and Oceania

FrogLog invites contributions of research, reviews on current management and conservation issues, methods or techniques papers and, editorials. We also actively encourage submissions describing the current activities relating to projects and academic institutions in order to help inform the community as to the general state of current research and conservation activities.

PUBLICATION

FrogLog is published online at: www.amphibians.org and is Open Access.

REVIEW

All contributions should ideally be channeled through Regional ASG Chairs, the details for which can be found at <http://www.amphibians.org/asg/members/>. If for some reason this cannot be done, contributions will be reviewed by at least one individual within the ASG. *FrogLog* is not a peer-reviewed publication and the onus for submitting accurate information remains with the authors.

PRODUCTION EDITOR

Candace M. Hansen-Hendrikk: cmhansen@amphibians.org

EDITORIAL COMMITTEE

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SUBMISSION OF MANUSCRIPTS

Manuscripts can only be received as electronic files. Text should be submitted in MS Word format and may contain tables, but figures should be sent as a separate attachment where possible. All documents should be sent to froglog@amphibians.org. Each file should be labeled in a style that illustrates clear association, i.e., authors_name_ms and authors_name_figure1.

GUIDELINES FOR AUTHORS

All manuscripts must be written in Standard US English. For example, "colour" should be spelled "color."

TITLE

Titles should ideally be no more than 15 words.

AUTHORS

Authors names should be written in full as follows: By James P. Lewis & Robin D. Moore

MAIN BODY OF TEXT

Use Georgia 11-point font. Genus and species names should be in italics as should the abbreviation for *Batrachochytrium dendrobatidis*, *Bd*. Suggested headings include Acknowledgements, Author Details and References and Notes.

AUTHOR DETAILS

Author details may be provided, including affiliations and contact details.

FIGURES

Figures should be numbered and include brief, concise legends. Where photographs or illustrations are used please state whom the image should be credited to, e.g., Photo: James P. Lewis. Graphics should preferably be submitted in tiff or jpeg format in the highest possible quality. Resolution should be at least 300 dpi at the final size.

TABLES

Tables may be included within the text file and should be numbered and include brief, precise legends.

CITATION OF LITERATURE

FrogLog uses a numbering system for references and notes. This allows explanatory or more detailed notes to be included with the references. Journal names are abbreviated using common abbreviations to save space.

Journals/Periodicals

1. E. Recuero, J. Cruzado-Cortés, G. Parra-Olea, K. R. Zamundio, *Ann. Zool. Fenn.* 47, 223 (2010).

Books

2. J. Gupta, N. van der Grijp, Eds., *Mainstreaming Climate Change in Development Cooperation* (Cambridge Univ. Press, Cambridge, UK, 2010).

Technical reports

3. G.B. Shaw, *Practical uses of litmus paper in Möbius strips* (Tech. Rep. CUCS-29-82, Columbia Univ., New York, 1982).

Paper presented at a meeting

4. M. Konishi, paper presented at the 14th Annual Meeting of the Society for Neuroscience, Anaheim, CA, 10 October 1984.

Published Online Only

5. N. H. Sleep, *Geochem. Geophys. Geosyst.*, 10, Q11010 (2009); DOI:10.1029/2009GC002702.

Web site

6. National Oceanic and Atmospheric Administration, Beaufort Wind Scale, <http://www.spc.noaa.gov/faq/tornado/beaufort.html> (2012).

SPECIAL NOTE: Use only one space after all punctuation marks (this includes only one space after "periods" at the end of sentences).

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