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

FrogLog

ASG
IUCN SSC
Amphibian
Specialist Group

Seventeen years of amphibian pods at Chester Zoo

Agalychnis dacnicolor spawn © Chester Zoo

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FrogLog is produced by the IUCN SSC Amphibian Specialist Group (ASG) to serve as the amphibian conservation community's news publication.

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Dear Readers,

Last month members of the ASG team attended the IUCN World Conservation Congress (WCC) in Abu Dhabi, with Amaël Borzée and Sally Wren supported by Synchronicity Earth to attend, and Janice Chanson and Louise Hobin supported by Re:wild. Held every four years, the WCC provides a forum for nature conservation experts, leaders, and decision-makers to come together. This year there were more than 10,000 participants and over 1,000 events including plenaries, pavilions, posters, a learning zone and knowledge hub in addition to the Members' Assembly. ASG co-led two events, an in-person training session and an online forum discussion, both in collaboration with Amphibian Ark, the Amphibian Survival Alliance, the Conservation Planning Specialist Group, Synchronicity Earth and Re:wild, where we highlighted methods for multi-species planning, and the need to amplify species conservation measures to address the amphibian extinction crisis and meet global targets. During the Members Assembly, 148 motions were adopted including one focused on scaling up efforts for amphibian conservation (see p 5). The congress concluded with the Abu Dhabi Call to Action, which outlines priorities for translating intentions into tangible actions and calls on the international community to significantly strengthen its commitment and collective efforts to implement transformative solutions that benefit both nature and humanity. At the WCC, Dr Vivek Menon was elected as the new Chair of the Species Survival Commission. We look forward to collaborating with him to strengthen amphibian conservation efforts, and we thank outgoing Chair Dr Jon Paul Rodriguez for his leadership over the past two quadrennial terms.

The need for scaling up efforts was a recurring theme throughout the WCC, including in the events organised and attended by ASG. While the amphibian conservation community is full of people and organisations doing excellent work for threatened species, there is a pressing need for increased funding and support for those on-the-ground practitioners and grassroots NGOs, enabling them to expand their efforts and achieve greater conservation impact. We often see the efforts of these dedicated individuals on display in FrogLog, and this issue is no exception. In the following pages we learn about some of the people and projects making a positive impact for amphibians. These stories include the Ultu Project in Peru, implemented by the Pro Fauna Silvestre Ayacucho Association, which integrates conservation with local economic and cultural practices to promote sustainable coexistence between people and amphibians in the Central Andes (p 29); the work of Voice of Nature in Cameroon fostering environmental stewardship by engaging children in amphibian education and positive experiences with local frogs (p 26); and the collaborative efforts of researchers, land managers and other stakeholders to improve the conservation status of *Ranoidea raniformis* in southeastern Australia (p 32). We also have our regular updates from the Global Amphibian Assessment and ASG groups. We hope this issue of FrogLog provides inspiration and renewed determination to continue our efforts for amphibian conservation – because with commitment and collaboration, together we can turn the tide on the amphibian extinction crisis.



Amaël Borzée, Sally Wren and Franco Andreone
FrogLog Editors

ASG News

Introducing Dr. Bela Barata as ASG Deputy Chair

Dr Izabela Barata has dedicated her career to amphibian conservation in the Brazilian Cerrado and the Atlantic Forest. Bela is a skilled conservation scientist who is using her knowledge to save overlooked, highly threatened amphibian species in the Espinhaço Mountain Range of Brazil. With a PhD in Biodiversity Management from the University of Kent, she is interested in the ecology and conservation of species and their habitats, with a special focus on rare and threatened montane tropical species.

Combining innovative research methods with meticulous field work and dedicated community engagement, she has discovered and described rare *Crossodactylodes* frog species and made significant advances in protecting their unique bromeliad habitats. After having developed novel occupancy models and eDNA-based methods to better understand the frogs' ecology, she led multiple expeditions to find undiscovered populations in remote mountains of Brazil. Her enthusiasm, focus and dedication to working with local communities on species that are historically under-appreciated is inspiring and shows how even the smallest of creatures can become flagships for their ecosystems. Bela has engaged communities in fire management approaches – safeguarding the frog's habitat and the communities' livelihoods.

For six years as Amphibian Programme Manager at a Brazilian NGO (Instituto Biotrópicos), she implemented long-term projects, including projects awarded with national and international conservation prizes, including the UN Development Goals Award. Bela currently coordinates the Save Amphibians From Extinction (SAFE) Programme, a global agenda by the Durrell Wildlife Conservation Trust, delivering evidence-based knowledge, and strengthening conservation policy for threatened species and their habitats worldwide. In the past year, she has leveraged her role in the IUCN Species Survival Commission Amphibian Specialist Group to connect amphibian researchers and conservationists in the Neotropics, building networks for knowledge exchange and cooperation.

Bela will continue as the contact point for ASG in the Americas and will be building on that work strengthening the ASG as a global network, facilitating collaborations between and among the different thematic and regional leaders, and encouraging engagement and interaction with members globally.

Figure 1: Bela Barata, the new ASG Deputy Chair. Photo: Michel Becheleni/Rupestre Imagens.

GAA3: updates on the Third Global Amphibian Assessment, May-October 2025

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A key objective of the Third Global Amphibian Assessment (GAA3) is to strengthen regional capacity for IUCN Red List assessments and to better integrate amphibians into national processes for species evaluation, planning, and conservation action. This will help ensure that assessment data more effectively guides conservation efforts and improves outcomes for species. Since our last update, our team has been busy with Red List and GAA training across multiple regions, including Indonesia, Australia, India, the Philippines, Mesoamerica (in both English and Spanish), Nepal, and multiple countries in South America. Before the end of the year, additional training is planned for our networks in Bhutan, Pakistan, Melanesia and West and Central Africa. Strengthening and refreshing Red Listing expertise is essential within our network given the pivotal role it plays in the long-term sustainability of the GAA work.

Indonesian Assessment Workshop

This training has already been put into action. In August, the IUCN SSC Indonesia Species Specialist Group (IdSSG) which is co-chaired by Mirza Kusrini (who is also the ASG Regional Chair) and Sunarto Sunarto, hosted an expert consultation workshop for Indonesian amphibians at Bogor University on Java Island, Indonesia. Between 18-20 August, 37 amphibian researchers gathered to update and assess roughly 300 species for both the national Red List and the global IUCN Red List (Fig. 1). Species occurring in Papua were excluded and will be updated and assessed at a later date. The workshop was carried out in Bahasa, and 150 species had assessments either updated or created for the first time at the workshop. The remaining assessments will be completed through another in-person consultation in Bogor and via online consultation.

Figure 1: Indonesia Assessment Workshop for the Third Global Amphibian Assessment in August 2025 in Bogor, Indonesia. Photo: IdSSG.

Planning workshops for *Telmatobius* and *Atelopus*

Among the most threatened amphibian genera worldwide are *Telmatobius* and *Atelopus*, with 96% and 93% of their species, respectively, classified as threatened - making them top priorities for global conservation planning and action (Re:Wild et al. 2023). In response, the IUCN ASG *Telmatobius* Task Force, was established earlier this year aimed at uniting experts and coordinating science-based conservation efforts for the genus (Mendoza-Miranda et al. 2025). Partnering with Amphibian Ark and the IUCN SSC Conservation Planning Specialist Group (CPSG), the Taskforce led an international workshop hosted by GAA regional Partner Universidad Andrés Bello in Chile, in mid-October aimed at developing a *Conservation Plan for Andean Telmatobius Frogs* (Fig. 2, also see p 9).

Figure 2: Telmatobius Conservation Planning Workshop in October 2025 in Santiago, Chile. Photo: Luis Marin Da Fonte.

The following week, the IUCN ASG Atelopus Task Force, together with the Colombian Regional Group of the Amphibian Specialist Group (ASG Colombia), the Atelopus Survival Initiative, Amphibian Ark and IUCN SSC Conservation Planning Specialist Group, convened to design a *National Action Plan for the Conservation of*

Harlequin Toads in Colombia (Fig. 3). To ensure both action plans are grounded in the most current data, Red List assessments for the two groups were updated collaboratively by experts between August and October.

Figure 3: Colombian *Atelopus* Planning Workshop in October 2025 in Colombia. Photo: Luis Marin Da Foznte.

IUCN Red List October update

The first GAA3 assessments have now been published on the global IUCN Red List in the October update. A total of 139 assessments from Madagascar, southern Africa, the Eastern Arc Mountains in Tanzania, the Seychelles, and South America were submitted, reflecting the incredible effort and collaboration of our global network. More assessments are already being submitted for the first update of next year.

Regional GAA Partnerships

Our regional partnerships have continued to grow, most recently with the addition of the IdSSG. Other prospective partnerships are in the process of being finalised and we look forward to officially expanding this even further in the near future. We continue to welcome anyone interested in contributing to the GAA3 to reach out to the relevant ASG Regional Chairs/ARLA Regional Coordinators or contact the ARLA team. The current ARLA Regional Coordinators are listed on the ASG website: https://www.iucn-amphibians.org/arla-regional-partnership/.

We look forward to closing the year with the same enthusiasm and momentum for the new strategy that we continue to be greeted with in each region, and providing more GAA3 updates in 2026!

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Figure 1: Motion 75 at the IUCN WCC 2025 in Abu Dhabi. Full information at https://iucncongress2025.org/assembly/motions/motion/075. Media: IUCN congress.

IUCN World Conservation Congress 2025 resolution asking for specific actions for the conservation of amphibians

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Summary

At the 2025 World Conservation Congress, the IUCN adopted a new resolution for urgent amphibian conservation. It calls for scaled-up investment and action to address escalating extinction risks, now primarily driven by habitat loss, disease and climate change, urging governments and donors to implement specific conservation measures.

Adoption of a new resolution

The International Union for the Conservation of Nature (IUCN) has adopted the Motion 075 "Urgent scaling up of investment in amphibian conservation needed to prevent further extinctions" (Fig. 1) into a resolution at the World Conservation Congress 2025 in Abu Dhabi, United Arab Emirates. As this resolution is anchored on the recent findings about amphibian conservation reported in the second Global Amphibian Assessment (Luedtke *et al.* 2023), it supersedes the Resolution 5.020 issued at the WCC in Jeju in 2012. However, it is complemented by the Resolution 4.017 "Stopping the amphibian crisis" (Barcelona, 2008). This new resolution hopes to help resolve the global amphibian extinction crisis (Borzée *et al.* 2025a).

This new resolution was required because actions undertaken to protect amphibian globally have not managed to derail the increasing rate of extinction risk and population declines despite advances and success in conservation actions (Borzée *et al.* 2025b; Fig. 2). This situation is partly related to the comparatively lower funds currently available for amphibian conservation, compared to other species (Angulo *et al.* 2024). However, the high number of possibly extinct species (187 species currently) and the rise in the impact of climate change between GAA1 and GAA2, supplementing the impact of the chytrid fungus and habitat loss, have also increased the extinction risk for amphibians (Luedtke, *et al.* 2023). In addition, recent

Figure 2: *Gegeneophis goaensis* is one of the thousands of threatened amphibians for which we need us to scale up action to avoid extinction. Photo: Amael Borzee.

findings have highlighted that around 25% of threatened amphibians require *ex situ* conservation (www.amphibianark.org). Finally, it is critical to highlight that amphibian conservation guidelines have been published in the "Amphibian Conservation Action Plan" (IUCN SSC Amphibian Specialist Group 2024), and conservation of the order is made comparatively easier by the fact that threatened species typically have restricted geographic ranges, and protection is easier to implement if the populations are located within the 1,200 Key Biodiversity Areas (KBAs) for amphibians, and the 50 Threatened Amphibian Landscapes.

The resolution requests several actions from the Species Survival Commission (SSC), including the development of IUCN guidelines for amphibian conservation reflecting updates in conservation science, with a specific focus on conservation measures for species impacted by climate change, the management of disease in the wild, and the development of appropriately sized reserves. The resolution also requests from the SSC to review the existing IUCN Guidelines for amphibian reintroductions and other conservation translocations (Linhoff et al., 2021) and other conservation translocations and update these if necessary.

The resolution also calls on governments to prevent amphibian extinctions and support their recovery through long-term investment at the national level following the assess-plan-act framework of the IUCN; to prioritise the protection of KBAs for amphibians when planning and implementing Targets of the KM-GBF; to develop and maintain adequate biosecure captive-breeding programmes and biobanking for amphibians at risk from threats that cannot be remediated in the wild (especially disease and climate change); to implement head-starting programmes to ensure greater survival rates of eggs and larvae where necessary; to ensure the protection and restoration of both the terrestrial and freshwater habitats on which amphibians depend; to continue to promote the regulation and monitoring of species involved in amphibian trade, including through established mechanisms such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); to establish biosecurity protocols to control the spread of disease; and to adopt measures including trade restrictions to reduce and mitigate the impacts of invasive species on amphibians.

Further, the Resolution calls upon the IUCN Director General, the Species Survival Commission, non-governmental organisations, donors and the scientific community to support governments in exercising their full responsibilities as outlined above. It also calls specifically on donors to provide sustainable support and funding to the amphibian conservation partners of the SSC to enable them to: develop mechanisms for collaboration to support country-led programmes and thematic projects; to assess the conservation status of species (completing GAA3 by 2028), including identifying KBAs for all amphibians, and completing Green Status assessments for priority species; to develop conservation plans and needs assessments; and to support amphibian conservation efforts worldwide. Finally, the resolution urges the scientific community to develop practical and realistic measures to address amphibian disease in the wild, and to mitigate the impacts of climate change on amphibians.

Conclusion

In conclusion, this new resolution represents a critical and unified call to action, providing a potential pivotal step in global biodiversity conservation. By urgently calling for a scaling up in investment and collaboration, the Resolution intend to mobilise governments, NGOs, and the scientific community to implement a comprehensive strategy. The change that this resolution can spark could become paramount for amphibian survival, as preventing further amphibian extinctions is not only a conservation imperative but also essential for maintaining the health and stability of ecosystems worldwide upon which human well-being also depends.

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Revitalising ASG for the new quadrennium – 2025-2029

The IUCN follows a four-year governance cycle, known as a quadrennium. The recent IUCN World Conservation Congress, held in Abu Dhabi from 9th–15th October 2025, marked the end of the 2021–2025 quadrennium and initiated preparations for the next cycle.

At the conclusion of each quadrennium, all positions are subject to reappointment. This process ensures that leadership and membership continue to reflect the organisation's shifting priorities as a new cycle begins. New SSC Chair Vivek Menon has confirmed that he will reappoint Amaël Borzée and Sally Wren as ASG Co-Chairs. Accordingly, the Amphibian Specialist Group will soon begin reappointing Regional Group Co-Chairs, as well as leaders of Thematic Working Groups and Task Forces. For Regional Groups, we aim to appoint two Co-Chairs per group, ensuring expertise in both academic knowledge and practical conservation. We will also use this opportunity to review and, where appropriate, update the geographic boundaries of the Regional Groups.

To ensure alignment with the IUCN Species Strategic Plan (2025-2029), each ASG group will be asked to set specific targets for the 2025–2029 quadrennium following the established Species Conservation Cycle and associated Key Species Results (see table below). We will support groups in developing these objectives. While most groups already undertake activities that contribute to Key Species Results, formalising these targets should help reinvigorate the groups and provide focus for the coming quadrennium.

Species Conservation Cycle	Key Species Results (KSR)
Network: Enhance and support our immediate network and alliances to achieve our biodiversity targets.	*KSR1.* Develop new and strengthen existing partnerships and sustainable funding mechanisms.
	KSR2. Enhance the capacity of the SSC network and its partnerships.
	KSR3. Enhance collaborations across and beyond IUCN to accomplish species conservation results.
	KSR4. Collaborate with governments, IUCN members and other stakeholders to achieve the 2022 Kunming-Montreal Global Biodiversity Framework targets.
Assess: Understand and inform the world about the status and trends of biodiversity.	*KSR5*. Improve biodiversity and conservation knowledge.
	KSR6. Expand the coverage, quality and content of biodiversity assessments: IUCN Red List of Threatened Species, Environmental Impact Classification for Alien Taxa, Climate Change Vulnerability, Assess to Plan, Green Status of Species, Species-focused Key Biodiversity Areas, Ex-situ Conservation Assessments and other assessments undertaken by the SSC network.
	KSR7. Strengthen the Red List Index as a biodiversity indicator, at global and national scales.
Plan: Develop collaborative, inclusive and science-based conservation strategies, plans and policies.	*KSR8*. Strengthen and expand species conservation planning efforts at local, national, regional and global scales.
	KSR9. Strengthen species conservation in national, regional and global policies.
Act: Convene and mobilise conservation actions to improve the status of biodiversity.	*KSR10*. Enhance biodiversity conservation action through the implementation of effective, collaborative and practical approaches.
	KSR11. Catalyse sustainable use practices to improve governance for people and nature.
Communicate: Drive strategic and targeted communications to enhance our conservation impact.	*KSR12*. Strengthen IUCN's species theme as a strong and credible source of biodiversity information for target audiences.
	KSR13. Increase the visibility of different taxa and species conservation through strategic and innovative communications that attract new audiences.

Guardians of the Andes: bringing people together to take conservation action through the Telmatobius Task Force

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Figure 1: High Andean habitat. Photo: Mendoza-Miranda.

The Telmatobius Task Force (TTF) was established from a coordinated effort that started in 2023 aiming at integrating people interested in the conservation of this Highly Threatened Genus. There are more than 60 species of Andean water frogs that inhabit the high Andes of Chile, Argentina, Bolivia, Peru and Ecuador (Fig. 1), of which 85% are threatened, placing them at the forefront of the biodiversity extinction crisis.

Earlier this year, the Amphibian Red List Authority facilitated a series of online and in person workshops to reassess all of the species within the genus to update their Red List category (Fig. 2) defining threat category and identifying current threats. Alongside this task,

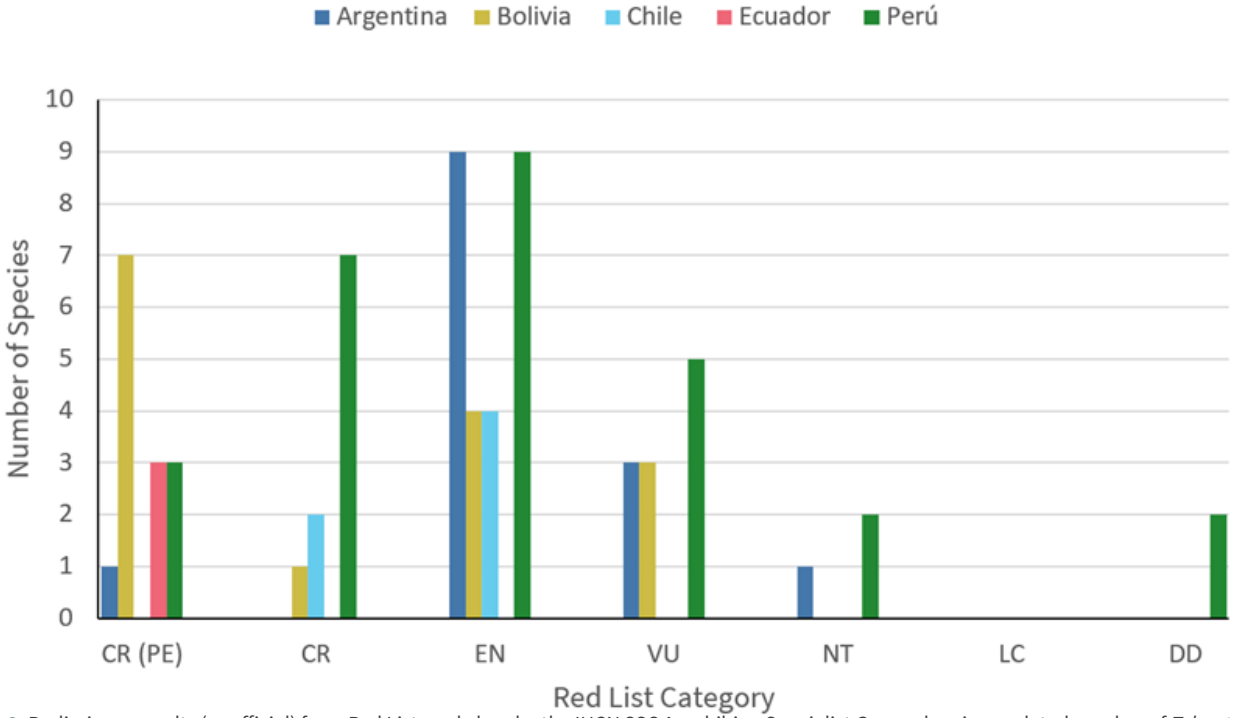

Figure 2: Preliminary results (unofficial) from Red List workshop by the IUCN SSC Amphibian Specialist Group showing updated number of *Telmatobius* species for all threat categories per country. Legend: CR(PE) - Critically Endangered (Possibly Extinct); CR - Critically Endangered; EN - Endangered; VU - Vulnerable; NT - Near Threatened; LC - Least Concern; DD - Data Deficient.

Figure 3: *Telmatobius pefauri* was again classified as Critically Endangered in the new Red List assessments. Photo: Nicolas Revolledo.

Amphibian Ark carried out Conservation Needs Assessments and identified 35 species requiring ex-situ rescue.

The updated assessments of all *Telmatobius* species (Fig. 3) were crucial to the following step towards species conservation: the development of the *Telmatobius* Action Plan. To foster collaborations and bring together institutions, researchers, communities and naturalists in person, the *Telmatobius* TF organised alongside Universidad Andrés Bello, a 3-day planning workshop held at Santiago de Chile from 15-17 October 2025. The workshop was facilitated by the IUCN SSC Conservation Planning Specialist Group (CPSG), and financially supported by Synchronicity Earth, Re:Wild, Universidad Andrés Belllo-UNAB, Stiftung Artenschutz, Centro de Ecología Aplicada-CEA, Corporación Nacional del Cobre-Chuquicamata-CODELCO, Amphibian Ark, IUCN CPSG, Denver Zoo Conservation Alliance, Zoológico Nacional de Chile, and the Amphibian Survival Alliance.

Representatives from nine countries, Argentina, Bolivia, Chile, Ecuador, Peru, Brazil, Spain, Canada and Mexico were united to fulfil one of the first objectives for the genus: to develop an international, participatory and multi-stakeholder action plan that guarantees the persistence of Andean *Telmatobius* species across their whole range and promotes the sustainable development of local communities in the highlands of South America.

The workshop was attended by 47 individuals and different groups of people, capturing a broad overview of species needs and conservation perspectives (Fig. 4). Now under revision, the *Telmatobius* Action Plan was developed by splitting attendees into six working groups, each detailing conservation actions for major threats to species. The highlight of the planning process was getting in the same room experts, private sector, NGOs, academia, government and communities thinking together across cultural barriers to deliver a multi-species and multi-country plan with a single goal of saving the Andean water frogs. Collaborations will be key to delivering high-impact conservation actions for these threatened *Telmatobius* species in the future.

We need them. We have to protect our guardians of the Andes!

Figure 4: The Telmatobius Task Force. Photo: Rene Monsalve.

Strategic amphibian conservation plans: mid-cycle monitoring and advances for *Nyctimantis pomba* and *Pithecopus rusticus*, two threatened Brazilian species

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Faced with accelerating biodiversity loss, conservation efforts for threatened species demand well-structured, collaborative strategies grounded in scientific evidence. In this context, the Brazilian Regional Group of the Amphibian Specialist Group (ASG Brazil) initiated the development of Strategic Amphibian Conservation Plans (PECAns) in 2023 to safeguard Brazil's threatened amphibian species (Vaz et al. 2024). The primary goal of PECAns is to consolidate all available information on the target species into a single document, including their geographic distribution, ecological characteristics, conservation status, and current threats. Furthermore, each plan outlines a set of strategic and prioritised actions, collaboratively developed by specialists from diverse fields, to guide coordinated efforts to prevent species extinction. Integrating comprehensive data and engaging multiple stakeholders in the planning process is crucial to ensuring that conservation actions are thoughtfully designed and effectively implemented, thereby maximising preservation impact. Ultimately, PECAns serve as essential tools for informing technical and political decision-making, supporting future scientific research, and facilitating fundraising initiatives.

The species selected for the initial PECAns were drawn from a group of 14 amphibian species identified as "high priority" by the Conservation Needs Assessment (CNA) conducted in 2020 (Lisboa et al., 2021; Johnson and Carrillo, 2022). This prioritisation was based on the urgent need for both in situ and ex situ actions. Specifically, *Nyctimantis pomba* and *Pithecopus rusticus* (Fig. 1) were chosen from this high-priority list for the first two plans, and their respective PECAns were published in 2023 (Lisboa et al., 2023a,b). Set for a duration of five years, each plan provides a structured timeframe for implementing and evaluating conservation efforts. Each document outlines a set of actions designed to achieve three core objectives:

1- Reduce knowledge gaps about the species and its habitat.

2- Identify, characterise, and mitigate direct threats to the species and its habitat.

3- Establish communication and awareness strategies to promote species conservation.

Beyond the preparation and publication of PECAns, monitoring the proposed actions is equally essential. This process verifies whether implementation is progressing as planned and identifies necessary adjustments to enhance effectiveness. The monitoring workshop, a key element of this process, emerges as a strategic opportunity to exchange experiences, gather suggestions, and generate new ideas to refine ongoing actions. It also serves as a space to reassess priorities and establish new partnerships, thus reinforcing the collaborative nature of the PECAn initiative. By

Figure 1: Top: *Nyctimantis pomba*, photo: Pedro Peloso, and bottom: *Pithecopus rusticus*, photo: Elaine Lucas.

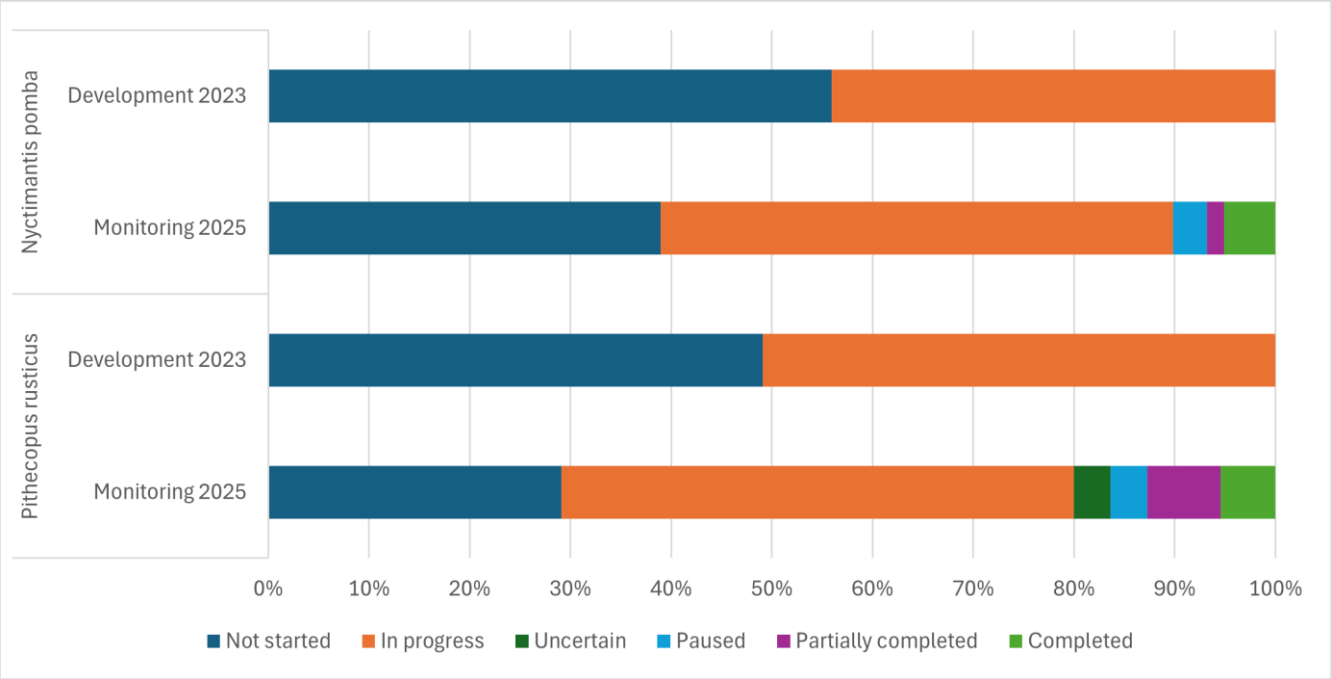

Figure 2: Proportion of ongoing and uninitiated actions at the time of PECAns development, and progress of actions during the 2025 monitoring.

promoting dialogue and reflection among stakeholders, this process strengthens the collective commitment to the objectives outlined in each PECAn. It contributes directly to the effective conservation of the target species.

Monitoring for both PECAns was conducted in two phases. The first involved ASG Brazil and the researchers Elaine Lucas and Clodoaldo Assis, who met to assess the progress of activities. Although some actions had not yet been initiated (Fig. 2), primarily due to a lack of collaborators, important results were achieved. This progress is reflected in specific actions that have been either completed or partially completed for both species. For example, for *N. pomba*, a Protected Area was established within the species' known range, with specific measures to prevent motorcyclists and domestic animals from accessing the area. Reporting channels and tools to control deforestation and fires were implemented and have shown effective results. Furthermore, a breeding protocol under human care was successfully developed and implemented, and biological knowledge gaps were reduced through the description of its advertisement call. For *P. rusticus*, significant gaps in biological knowledge were addressed through studies on habitat use, longevity, population census, genomic characterisation, and tadpole thermal tolerance. Additionally, a technical note was produced in partnership with the Federal Agency to guide environmental licensing for new projects in the region.

The second phase involved a broader group of stakeholders to share the progress, inspire engagement and expand the network of support for the target species conservation. Held in June 2025, this meeting took place midway through the PECAn's five-year cycle. During the event, researchers responsible for ongoing or completed actions shared their results and indicators achieved to date. Dr. Camila Moura (for *N. pomba*) and Dr. Elaine Lucas (for *P. rusticus*) led a general status update covering the initiated, ongoing, and completed PECAn actions for both species. Additional presentations focused on specific initiatives:

1- For *N. pomba*, topics included Scientific Outreach (Dr. Camila Moura), the Acoustic Monitoring and Thermal Ecology project (master's student Isabela A. Reis and Professor Dr. Cinthia Brasileiro), and advances in ex situ conservation (Biologist Cauê Monticelli).

2- For *P. rusticus*, presentations addressed the current state of knowledge and future perspectives (Dr. Veluma Bastiani), longevity estimation studies (Dr. Tiago Gomes), and progress in ex situ management (Biologist Richarlyston Brandt and Veterinarian Márcio André Silva).

Each presentation lasted approximately 15 minutes, followed by a 30-minute discussion period. Each species-specific block totalled around 1.5 hours, allowing for in-depth exchange and collaborative

Figure 3: Audience of the monitoring meeting in June 2025, including researchers, conservation professionals, government representatives, and students.

reflection among all participants. The audience totalled approximately 50 participants (Fig. 3). This diverse group included experts directly involved in planned or ongoing PECAns activities, researchers interested in developing new plans, conservation professionals, environmental analysts from federal and state government agencies, representatives of the Brazilian Association of Zoos and Aquariums, and undergraduate and graduate students focused on conservation and amphibians.

The event featured meaningful exchanges among researchers and participants, which fostered the development of collaborative proposals for the next stages of the projects. A key highlight was the formalisation of a new partnership between the ASG Brazil outreach team and the outreach teams for the *N. pomba* and *P. rusticus* projects. This collaboration aims to strengthen scientific outreach and promote broader public engagement in amphibian conservation.

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Contributed Articles

Alarming habitat loss in the westernmost range of *Tylototriton himalayanus* in Nepal

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The Himalayan salamander (*Tylototriton himalayanus*), listed as Vulnerable on the IUCN Red List, occurs across the eastern Himalayas, including Nepal and the Darjeeling–Sikkim region of India (Khatiwada et al., 2021). It inhabits cool, shaded mid-hill wetlands, marshes, and forest ponds at elevations of 1,500–3,000 m (Khatiwada et al., 2015). Breeding takes place in clean, slow-flowing or still water with abundant aquatic vegetation, while adjacent moist forests and grasslands provide essential foraging and shelter habitats (Bedi et al., 2021).

The species faces increasing threats from habitat loss, wetland conversion, and anthropogenic disturbance, factors that have driven its Vulnerable status (ASG, 2021). In Nepal, these pressures are particularly severe, as wetlands are frequently drained for agriculture, infrastructure expansion, and tourism development, resulting in the direct loss of breeding sites and fragmentation of remaining habitats.

Within Nepal, *T. himalayanus* is restricted to the eastern mid-hills, particularly in Ilam, Panchthar, and Dhankuta. On our finding, the Chaubise area (1,200–1,800 m) of Dhankuta marks its westernmost known distribution limit. This landscape, characterized by scattered wetlands and remnant forest patches, also harbors a high diversity of amphibians. The patchy network of wetlands such as Budhabare Wetland, Kangada Lake, Dhapad Lake, Raja Lake, and Rani Lake, once formed a crucial habitat corridor for amphibians. However, these sites have undergone extensive

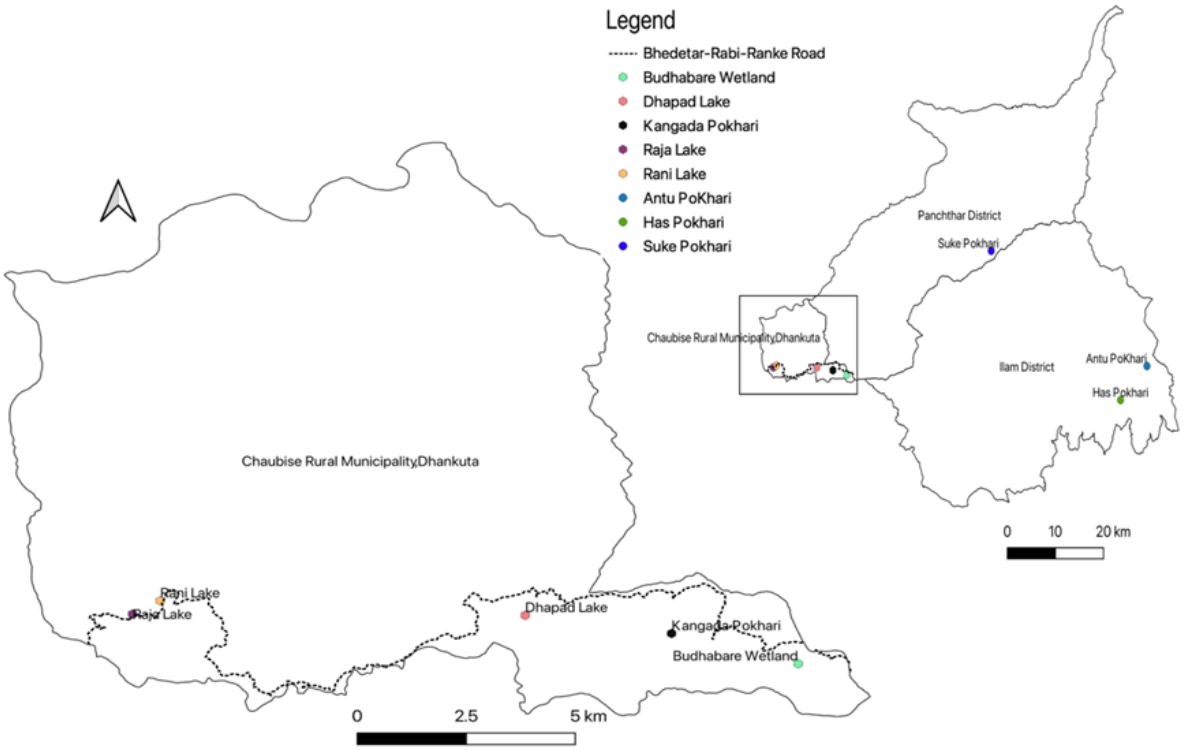

Figure 1: Chaubise wetland cluster and destructed wetland of Ilam and Panchthar district as vanishing habitat for *Tylototriton himalayanus*.

Figure 2: After construction of a large man-made pond with concrete dam (b), Rani Lake has started manual and motor boat facilities in 2024 (a). Photos: Bivek Gautam.

degradation and land-use change, significantly diminishing their ecological value.

Raja-Rani Lake, Dhankuta: From salamander refuge to recreation zone

The Raja and Rani Lakes, two adjacent water bodies collectively referred to as the Raja–Rani Lake, represent the westernmost distribution limit of the Himalayan salamander. The wetland's marshy habitat, which is rich in aquatic vegetation, provides ideal breeding conditions for the species. However, over the past decade, Raja-Rani Lake has undergone extensive land-use change.

Historically, Rani Lake functioned as a swampy wetland covered with aquatic vegetation and retaining water nearly year-round until 2006. However, under the banner of "wetland conservation," the government constructed a large artificial pond (~8 ha) by damming and adding concrete embankments, fundamentally altering the natural habitat (Ekantipur, 2025; Shrestha et al., 2017). This transformation shifted the site from a marshy amphibian habitat to a recreational area. Subsequent introduction of exotic fish and the development of boating facilities further compromised habitat suitability. Salamanders were still recorded in this location until around 2019, but surveys between 2020 and 2024 have failed to detect the species at Rani Lake.

Raja Lake has experienced similar degradation. Parts of the wetland have been encroached for material storage, the construction of a hospital and school, and even converted into a football ground (Fig. 3b). Additionally, the Bhedetar –Rabi– Ranke highway was built along the eastern margin of the Lake, with road contractors depositing construction materials on-site. This activity caused significant siltation in the eastern section and further reduced suitable salamander habitat (Fig. 3a).

In May 2025, the Koshi Provincial Investment Authority invited investors to develop tourism infrastructure at Raja Lake, with projects valued at Rs. 2000 million (Reporters Nepal, 2025). Although details remain unclear, the local municipality appears prepared to lease the wetland for tourism-oriented construction. While *T. himalayanus* persists in some parts of Raja Lake, ongoing disturbance and impending large-scale development projects place the population at high risk of local extinction.

A further complication is the land tenure system. The Raja–Rani Lake wetland complex (~30 ha) is under private ownership, situated amidst residential areas, local markets, and government facilities (Shrestha et al., 2017; Fig. 2b). This fragmented ownership, combined with limited government attention to salamander conservation and competing infrastructure priorities, poses major challenges to safeguarding this species.

Dhapad Lake: A vanishing habitat

Dhapad Lake, though referred to as a Lake, no longer retains an open waterbody; according to older villagers, it historically existed as a Lake but has since

Figure 3: Eastern edge of Raja Lake is degraded from heavy siltation resulting from Bhedetar-Rabi-Ranke Road construction (a), western part of wetland is degraded due to construction material deposition, urban encroachment and playground construction (b). Pictures tables in 2024. Photos: Bivek Gautam.

transformed into a marshy landscape. The site, situated in the headwater zone of the Chisang/Khadam River, is comprised of marshland at the center, surrounded by rangelands and bordered by dense Castanopsis forest to the east, south, and west. The Bhedetar–Rabi–Ranke Road passes to the north of the site. During the first survey in 2020, Dhapad Lake was observed as a natural marshy ground with a flowing stream, reflecting its wetland character despite the absence of a standing Lake (Fig. 4).

Figure 4: Natural landscape of Dhapad Lake in 2019. Photo: Bivek Gautam.

In 2022, the local municipality identified Dhapad Lake as a priority tourism development site, launching one of its largest municipal projects (Sangalokhabar, 2022). The natural marshland was converted into a set of artificial ponds (~3 ha) through damming of the stream (Sangalokhabar, 2022; Fig. 5b). By March 2025, additional infrastructure (including concrete walkways, a temple, a community hall, parking space, and a traditional-style shelter, falaicha) had been constructed (Figure 5a). During field surveys, sand and gravel extraction and stockpiling were also observed near salamander habitat, a practice funded by both the Koshi Province and the local government (Sangalokhabar, 2025; Fig. 5a). These developments have significantly disrupted the ecological function of the wetland.

Furthermore, ongoing sand mining and deposition threaten to increase siltation in the wetland and downstream aquatic habitats. Local residents reported future plans for fish farming and boating at newly constructed Dhapad Lake, echoing interventions previously documented at Rani Lake. This broader pattern of converting natural wetlands into artificial ponds for recreation and commerce is also evident at other salamander habitats in Ilam and Panchthar, including Suke Pokhari, Antu Pokhari, and Has Pokhari (Fig. 1).

Conclusion

Since 2019, on our regular herpetological surveys conducted across the Chaubise Raja Rani Landscape we have observed a consistent decline in abundance of *Tylototriton himalayanus*. These findings indicate a rapidly deteriorating situation of the population dynamics across the whole range of the species, and underscoring the increasing urgency for conservation action. The transformation of critical amphibian habitats in eastern Nepal, particularly those supporting

Figure 5: Recent infrastructure development including paved walkways, temple, community hall and sand mining at Dhapad Lake (a), manmade pond structure (~3 ha) (b). Pictures tables in 2025. Photos: Bivek Gautam and Hari Lamjel.

Tylototriton himalayanus, highlights a broader trend of wetland loss due to regulated development and land-use change. Without urgent conservation action, such as community sensitization, stronger wetland policies, and habitat restoration, these populations may soon be extirpated. Documenting these changes and raising awareness is a crucial step in advocating support for the protection of Nepal's only salamander species and other unique amphibian species.

Figure 6: Himalayan salamander (*Tylototriton himalayanus*) observed in 2023 on a sand-dominated substratum near a stream close to Dhapad Lake. This shift from muddy to sandy substrate is likely due to ongoing siltation caused by infrastructure constructions and sand mining activities. Photo: Bivek Gautam.

Acknowledgments

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Amphibians, One Health, and conservation: where do veterinarians fit in?

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Figure 1: One Health approach and amphibian conservation integration. Image: AI generated image (Creative Commons Licensed).

Amphibians are the most threatened vertebrate group worldwide, with more than 41% of known species currently at risk of extinction (Borzée et al., 2025). These declines are driven by habitat loss, pollution, emerging infectious diseases, climate change, and invasive species (Luedtke et al., 2023). In such a scenario, the One Health approach (which recognises the interdependence of human, animal, and environmental health) becomes an essential framework for understanding and mitigating threats to amphibians, the ecosystems they inhabit and finally the threats to human society that may be caused by amphibian declines, such as outbreaks of arbovirus diseases (Fig. 1). Frogs are amongst the main vector controllers for a wide variety of human diseases, from dengue to trypanosomiasis and yellow fever (Raghavendra et al., 20082). Veterinarians have a unique and strategic role to play in this context, bringing together skills in diagnostics, epidemiology, wildlife medicine, and public health. Their contributions range from pathogen surveillance and biosafety protocols to clinical care, *ex situ* management, the development of environmental education and citizen science initiatives. Yet, worldwide, amphibian health is mostly absent from veterinary curricula, and the number of veterinarians working directly with amphibian conservation and medicine remains very limited.

Figure 2: Male Alcatraz-Treefrog (*Ololygon alcatraz*) with sclerotic disease and swelling on the right eye, before surgery. Photo: Iago Junqueira.

This lack of engagement has real consequences. For instance, the absence of veterinary input in anatomy, physiology, pathology, and sample collection contributed to a 20-year delay in recognising the chytrid fungus (*Batrachochytrium dendrobatidis*) during its first outbreaks in Central America (Whitfield et al., 2016; WOAH 2019). That delay resulted in catastrophic biodiversity loss, with declines of up to 70% in local anuran richness and the extinction of numerous endemic species (not only regionally, but globally). Today, however, proper clinical examination, adequate sample collection and processing, along with epidemiological assessment of diseases inform strategic conservation actions across different biomes, as an attempt to prevent similar tragedies (Whitfield et al., 2016; Gray et al., 2023).

Veterinary expertise is also indispensable in ex situ conservation programs. Preventive medicine ensures quarantine protocols and disease control, while long-term care allows genetically valuable animals to remain healthy and reproductively active. Veterinary medicine can even extend lifespans and enable assisted

reproduction, ensuring that assurance colonies retain their genetic diversity (Pessier and Johnson, 2018; Paula et al., 2025).

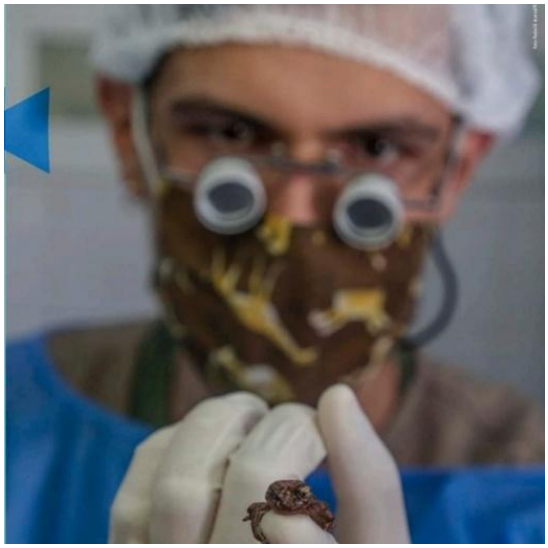

Figure 3: DVM Iago Junqueira at the immediate post-surgery moment after the enucleation of the eye on a male Alcatraz Treefrog (*Ololygon alcatraz*). Photo: Paulo Gil.

A case from my own professional experience illustrates this point. During my clinical residency at São Paulo Zoo, I worked with the Alcatraz treefrog (*Ololygon alcatraz*), a Critically Endangered species at the time (CR; IBECF and ASG, 2023). Some individuals had lived well beyond their expected natural lifespan of 2–3 years, surviving over a decade in human care. Despite geriatric conditions, they remained reproductively important. One frog developed a severe hyperplastic corneal plaque, which enlarged the eye and caused pain, anorexia, and weight loss (Fig. 2).

Figure 4: Male Alcatraz Treefrog (*Ololygon alcatraz*) two weeks post-surgery, after enucleation and with stiches removed. Photo: Paulo Gil.

After unsuccessful systemic and ophthalmic treatments, I developed a surgical technique for enucleation of the impaired eye. The procedure (carried out on an animal only 2 cm long and weighing 0.1 g) succeeded (Fig. 3). Within weeks, the frog recovered, resumed feeding, regained weight, and rejoined the breeding colony (Fig. 4). This intervention not only saved one individual but preserved valuable genetic material of a species on the brink of extinction to be passed on in future generations of Treefrogs by then. As a result of the conservation breeding project, the species has even been downlisted on the IUCN Red List from CR to Vulnerable (VU; IBECF and ASG, 2023).

Figure 5: DVM Iago Junqueira under lecture of amphibian medicine for veterinary training and continued education purposes. Photo: Paulo Gil.

These examples show that veterinary medicine is not merely supportive, but often decisive in amphibian conservation. By contributing to disease detection, clinical care, and population management, veterinarians bridge science, health, and conservation. In a world facing ecological and health crises, expanding veterinary involvement in amphibian conservation is not only urgent, it is essential for building a more balanced and sustainable future (WCS, 2020; Junqueira, 2025). But the question still remains as "How to get more veterinarians involved?". My answer to that lays on not only showcasing the urge, the need for them, the potential of our engagement and action, but also taking the lead to adequately train new and old generations of vets to care for such patients (Fig. 5). Building veterinary capacity in amphibian health and medicine is critical. Without professionals equipped

with the knowledge to do proper specialized care, conservation actions and programs remain vulnerable to failure in the face of emerging – or new – amphibian diseases and population declines. Preparing veterinarians to work with amphibians is not only an investment in animal health, but also a safeguard for biodiversity, ecosystem balance, and ultimately, human well-being, which for sure will not be the same in a world that would be sicker without frogs.

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Amphibian pods at Chester Zoo: a brief history and look to the future

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Summary

For the past seventeen years, an unassuming collection of converted shipping containers in Cheshire have been a hub of amphibian conservation efforts. Initially designed as an ark for two Central American taxa highly threatened by chytridiomycosis, the role of these 'Amphibian Pods' and the amphibian team at Chester zoo managing them, has changed and diversified significantly in the subsequent years. This article is a brief summary of the history of the pods, focusing on key project species, and discussing how their role has changed to present, and will continue to change into the future.

Conservation breeding activities

Since 2008, Chester Zoo have been conducting conservation projects from the amphibian pods, several shipping containers converted for housing amphibians (Fig. 1). First holding two species pushed to the brink of extinction by chytridiomycosis (chytrid), the role of the pods and the amphibian team have expanded over the subsequent eighteen years, from maintaining biosecure populations of species for reintroduction, to managing breeding groups for restocking exhibits, carrying out conservation research, and succeeding at first-in-Europe breeding of species to disseminate offspring and knowledge to other institutions within the European Association of Zoos & Aquaria (EAZA). This article is a summary of these projects, past, present, and future.

The amphibian pods at Chester Zoo initially housed two frog species from Central America, both believed to be on the brink of extinction in the wild at the time of the initial programme start. The black-eyed leaf frog (*Agalychnis moreletii*; LC, ASG 2017a) and the green-eyed frog or Rancho Redondo frog (*Lithobates vibicarius*, EN, ASG 2020a) had both undergone severe and rapid declines in the 1990s to early 2000s, victims

Figure 1: General layout of one of the Amphibian pods at Chester Zoo, housing several different amphibian species. Photo: Chester Zoo.

of the wave of chytrid across Central America, which had already driven several amphibian species extinct and caused huge declines in many others (Lötters et al., 2009). Both species arrived in 2008 as tadpoles, a mixture of wild-collected and F1 stock. The plan at the time was to maintain populations of both species in biosecure facilities at the zoo, barrier managed from other amphibian species, to preserve genetic diversity and allow future reintroductions back into the wild once a solution was found to the chytrid crisis.

The two species fared very differently at Chester. While *L. vibicarius* did not reproduce sufficiently to sustain the population and is no longer maintained *ex-situ* in Europe, *A. moreletii* bred well for several generations, and Chester managed a European studbook (ESB) for the species for a number of years. Many offspring were distributed to other EAZA zoos, and several members of the team contributed significantly to the Best Practice Guidelines for this species (Marquis et al., 2023). At the time, *A. moreletii* was listed on the IUCN red list as Critically Endangered (Santos-Barrera et al., 2004), due to ongoing and projected declines caused by chytrid. However, the species proved less susceptible than many other amphibians in the region, and some populations quickly recovered, resulting in its downlisting to Least Concern in 2017 (ASG, 2017a). While regular breeding success continued, it was decided to focus on other more pressing conservation priorities and the coordination of the ESB was passed on to Paris Zoo in 2021, with the final *A. moreletii* leaving Chester for Paris in 2022.

In 2009 a rescue operation was launched to collect 50 mountain chickens (*Leptodactylus fallax;* CR, ASG 2017b) (Fig. 2) from the wild in Montserrat and transfer

them to European zoos. This followed the arrival of chytridiomycosis on the island after evidence showed the population was rapidly collapsing (Hudson et al., 2016). The species was already present in European zoos, following an earlier rescue effort due to the 1999 eruption of the Soufriere Hills volcano, and was already listed as Critically Endangered following a similar chytrid-driven population crash on Dominica (Fa, 2004). These newly imported animals were kept separate from the previous population, in biosecure facilities, to allow reintroduction of offspring back into the wild in the future. The first of these biosecure frogs arrived at Chester in 2011, following the construction of an additional pod specifically for this species. Chester also coordinate the EAZA *ex-situ* programme (EEP) for this species, managing the breeding and transfers of both the biosecure and non-biosecure populations to ensure long-term genetic diversity is maintained, and contributing significantly to the EAZA Best Practice Guidelines (Jameson et al., 2019), which detail proper care and husbandry for these large frogs. Overall, although ongoing, this project has been a success so far, with frogs bred at several participating zoos returned to Montserrat where they now live in a semi-wild state. Current efforts with this species are focused on enabling semi-wild frogs on Montserrat to breed through sending additional genetically diverse stock from EAZA zoos back to the island, and taking action to protect remnant populations (<50 individuals as of 2024) on Dominica with possible chytrid resilience (Jameson et al., 2019) These efforts are undertaken under the umbrella of the Mountain Chicken Recovery Programme, a collection of organisations including Montserrat's Department of Environment, Dominica's Forestry, Wildlife & Parks Division, WildDominique, Durrell, ZSL, Nordens Ark, Re:Wild and Fauna & Flora, all working together to prevent this species' extinction.

Figure 2: Mountain chicken frog (*Leptodactylus fallax*). Photo: Gerardo Garcia.

Figure 3: Golden mantella (*Mantella aurantiaca*). Photo: Chester Zoo.

Alongside maintaining biosecure populations of highly threatened amphibians for reintroduction, the pods began to take on other purposes. These include the maintenance of backup breeding colonies for species exhibited in the zoo and enabling crucial conservation research to be carried out. A prime example of this is the golden mantella (*Mantella aurantiaca;* EN, ASG 2020b, Fig. 3). This Endangered species is threatened by habitat loss and fragmentation and is emblematic of the Mangabe Protected Area managed by Chester's *in-situ* partner, Madagasikara Voakajy, and is displayed in a mixed species exhibit in the zoo's Tropical Realm. For ten years backup breeding groups have been maintained behind the scenes in the pods, with hundreds of mantellas being bred, and several members of our amphibian team have been involved with fieldwork for this species alongside Madagasikara Voakajy. All this experience has informed the EAZA Best Practice Guidelines for the species, which will be published soon. Research projects have included studies of skin microbiota in the species (Passos et al., 2018) and ongoing work looking into the differences in calls between captive and wild populations, the impact this has on mating success for reintroduced frogs and if any negative impacts can be mitigated (Passos et al., 2021). All this crucial research is guiding current and future conservation actions for this Endangered, range-restricted amphibian.

In 2015 Chester began working with the Lake Pátzcuaro salamander (*Ambystoma dumerilii;* CR, ASG 2020c), known locally as the achoque (Fig. 4). This is a neotenic caudate restricted to a high-altitude lake in central Mexico, closely related to the better- known axolotl (*A. mexicanum*). The achoque is endemic to Lake Pátzcuaro in Mexico's transvolcanic belt, in Michoacán. The species faces a multitude of threats, including competition with invasive fish, diminishing water

Figure 4: Achoque, or Lake Pátzcuaro salamander (*Ambystoma dumerilii*). Photo: Chester Zoo.

quality due to pollution, and overharvesting for use in a local traditional remedy. This has resulted in a very marked decline since the 1980s (ASG, 2020c), and the wild population is now estimated at <100 individuals. Chester work with several local research and breeding facilities for this species in Mexico, including Universidad Michoacana de San Nicolas de Hidalgo, Centro Regional de Investigaciones Pesqueras Pátzcuaro and perhaps surprisingly, a convent of nuns (Garcia, 2018), The Sisters of Immaculate Health of Pátzcuaro. This has led to the development of an important knowledge-sharing network for the species and the development of husbandry and veterinary techniques, now outlined in Best Practice Guidelines for the species (Bland et al., 2021a). Chester coordinate the EEP for *A. dumerilii* and are planning the import of fresh bloodlines from Mexican facilities to bolster the European safety net population and provide opportunities to promote the work being done both *in-* and *ex-situ* by participating institutions.

Another Critically Endangered (ASG, 2022) salamander species arrived at the amphibian pods in 2017, namely the Montseny brook newt (*Calotriton arnoldi*). This newt was only recognised as a distinct species around 20 years ago (Carranza & Amat, 2005), and subsequent work has shown it to be comprised of two subspecies (*C. a. arnoldi* and *C. a. laietanus*; Talavera et al., 2024). It is restricted to a few montane streams in the Montseny massif in Catalonia, Spain, making it the most range-restricted amphibian in Europe and the only endemic vertebrate species of Catalonia. Facing threats including water abstraction for bottling and agriculture, deforestation, drought, climate change, and the looming threat of the pathogenic chytrid fungus *Batrachochytrium salamandrivorans* (Bsal), to which this species is highly susceptible (ASG, 2022), it is one of the most threatened amphibians in Europe. Chester hold the only animals outside of Spain and collaborating with Barcelona Zoo, Torreferrussa Wildlife Recovery Center and Calafell Environmental Research and Education Centre (CREAC), participate in the EEP for the species. Research into behaviour and development of husbandry techniques has been carried out at Chester, and in 2024 more than 30 newts bred here were released into the wild in Montseny as part of a project to establish new populations of the species in its native range. This project has been an incredible achievement, especially in the circumstances of additional legislative obstacles to the programme following Brexit and emergent infective diseases such as *Bsal*. This has led to Chester developing the only licensed facilities for tailed amphibian import and quarantine in the UK (Fig. 5). 2025 has been a record year for breeding this species at Chester with over 100 larvae being reared, providing much potential for future reintroductions.

Figure 5: The biosecure Montseny brook newt (*Calotriton arnoldi*) breeding pod at Chester Zoo. Photo: Ellie Bland.

In addition to conservation breeding and research projects, the team at Chester have successfully bred many other amphibian taxa, some of which were European or British zoo first breeding events. Notable examples include the breeding of Mexican giant leaf frogs (*Agalychnis dacnicolor*; LC, ASG 2020d) in 2020 (Bland et al., 2021b; Fig. 6), the first documented captive breeding of the Asian giant river toad (*Phrynoidis asper*; LC, ASG 2021) in 2022 (Bland et al., 2023), and the zoo-first captive breeding of Imababura tree frogs (*Boana picturata*; LC, ASG 2023) in 2023. Notable distributions of species bred at Chester to other collections include *P. asper* to 4 institutions (2023-2024), *A. dacnicolor* to 10 institutions (2020-2022), *Nyctixalus pictus* to 9 institutions (2016-2024),

Figure 6: Adult Mexican giant leaf frog (*Agalychnis dacnicolor;* left) and developing spawn (right). Photos: Chester Zoo.

Excidobates mysteriosus to 9 institutions (2016-2024) and *M. aurantiaca* to 25 institutions (2017-2025) (Species360, 2025). These exports support efforts to ensure global zoo populations are sustainable and the wider community has the knowledge to continue breeding amphibians themselves.

The past 18 years have seen many significant conservation and husbandry projects for amphibians being developed and carried out by the team at Chester, utilising the amphibian pods. This shows no sign of slowing, with several exciting projects in development. Breeding and reintroduction of Montseny brook newts is ongoing, and new and upcoming animal moves offer much hope for the breeding and *ex-situ* population management of both the achoque and the mountain chicken frog. Increasingly, many projects are moving away from Chester breeding animals here at the zoo directly, and instead shifting towards a more capacity building focus, with conservationists from across the world coming to see our facilities and learn from our team, in order to be able to deliver conservation for the threatened amphibians in their countries. One recent example has involved Indonesia's bleeding toad (*Leptophryne cruentata;* CR, ASG 2019). A WhatsApp chat between the team at Chester and partners in Indonesia at Taman Safari Indonesia (TSI) helped facilitate the rapid dissemination of knowledge and advice, contributing to TSI's success in breeding this Critically Endangered species. This kind of training role is likely to be increasingly significant in Chester's amphibian work going forwards.

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Empowering the next generation to conserve the world's largest frog

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Children are powerful agents of change. They learn quickly, influence household behaviour, and embody the future of conservation. Early environmental education fosters lifelong stewardship and pro-nature behaviour (Ballouard et al., 2011). By offering children direct experiences, for example, listening to frog calls at night, observing eggs, and exploring streams, they develop lasting emotional connections to the natural world. Amphibians are the most threatened vertebrate group globally, with about 41% of species at risk of extinction. Their decline also signals wider environmental distress and the urgent need for local-to-global conservation action. Protecting amphibians, therefore, is not only a biological challenge but a deeply social task. It requires engaging communities, fostering empathy for nature, and connecting conservation to everyday life, starting with the youngest members of society.

In Cameroon, Voice of Nature (VoNat) is putting this vision into action. With support from the British Ecological Society and the National Geographic Society, VoNat launched the Young Amphibian Conservation Stewards initiative in the amphibian-rich Mount Nlonako area, home to over 90 frog species, including the Endangered Goliath frog (*Conraua goliath*), the world's largest frog (ASG, 2019). This initiative empowers children as active participants in conservation. Through classroom lessons, creative arts, and fieldwork, students learn about amphibian ecology, threats, and the importance of wetlands and forests. The initiative draws on local culture, traditional storytelling, and songs to make science accessible and exciting.

Many families in the Mount Nlonako region depend on farming, fishing, and forest products for their livelihoods. This dependency can create tension between development and conservation. Engaging children bridges that gap. As they share what they learn about frogs' roles in pest control and disease mitigation, they help shift perceptions, showing their parents that conserving amphibians supports both biodiversity and human well-being.

Learning through experience

Education in the field complements classroom activities. During "Frog Discovery" excursions, children visit nearby streams with teachers and VoNat biologists, observing different species and documenting threats such as pollution, and deforestation (Fig. 1).

Figure 1: Children from local communities in the Mount Nlonako Area record a Goliath frog under the stone. The first time for many to see it in its natural habitat. Photo: Ndimuh B. S. (VoNat).

"This is my first time seeing the Goliath frog and other species in their natural habitat. We identified frogs using iNaturalist. I am so happy because not everyone is given this opportunity", said Ebude Christabel from Ntolo community during a field visit.

Teachers also play a key role as facilitators. VoNat provides them with amphibian education material and guidance. These tools ensure that conservation lessons continue in classrooms even after VoNat's field teams leave. "We believe that educating and engaging children to fight against the depletion of the Goliath frog will ensure sustainability. They are the leaders of tomorrow and will take the conservation message to their parents", says Henry Nkede, teacher in the Mount Nlonako area.

Cultural expressions are woven into learning. Students create songs, drawings, and poems inspired by frogs and their habitats. These materials are showcased on local radio and at community events, transforming environmental education into public advocacy. "It is our responsibility to conserve the Goliath frog for future generations", says Elapenda Sidonie of Ntolo. "People must stop water pollution, deforestation, trapping, and indiscriminate hunting", adds Bothcou Marie Therese from Nkongnine.

Three songs produced by the children now play on Nlonako FM and Home TV during annual events like World Frog Day. Each broadcast helps reinforce conservation awareness among thousands of listeners. Poems and drawings are also displayed in schools and public events (Fig. 2), including the National Day celebrations, turning children's art into conservation messages for entire communities.

Figure 2: A drawing by a Young Amphibian Conservation Stewards in the Mount Nlonako Area, showing threats to amphibians with key conservation messages.

Community ripple effects

The impact of the Young Amphibian Conservation Stewards program extends beyond classrooms. Since its pilot in 2021, it has engaged over 300 children from 10 communities, reaching more than 5,000 people through outreach events, radio programs, and exhibitions. VoNat's monitoring shows visible behavioural shifts. Children now report frog sightings to VoNat teams using simple mobile tools. Some hunters are exploring alternative livelihoods such as small-scale aquaculture and poultry farming, while traditional leaders are considering bylaws to protect breeding streams. "We will take measures, including traditional injunctions, to prevent their extinction" says Chief Roland Essengue Mbonda of Mangamba.

These ripple effects underscore that conservation education can inspire grassroots action. When children act as nature ambassadors, they influence household choices and community norms. Parents who once saw frogs merely as bushmeat now view them as crop pest control and disease mitigation 'agents", and indicators of environmental health. VoNat reinforces this change through partnerships with local councils and the Cameroon Ministry of Forestry and Wildlife. This initiative contributes directly to national environmental education goals (Nsangong, 2019) and the Amphibian Conservation Action Plan (ASG, 2024).

Challenges and lessons learned

Implementing community-based education projects in remote areas presents practical challenges. Some villages are accessible only by footpaths through dense forest or across rivers. Night excursions, essential for observing amphibians, are often restricted by safety concerns or lack of lighting equipment. Parental consent occasionally limited participation, as some families initially misunderstood the project's objectives. Others feared that conservation might restrict access to natural resources.

Sustaining enthusiasm among children also requires continuous engagement. Without periodic visits or structured follow-ups, interest can fade. To address this, VoNat established eco-clubs where volunteers visit intermittently for continuous conservation education sessions. VoNat also learned that conservation must demonstrate tangible benefits. By linking amphibian protection to clean water, disease reduction, and better farming outcomes, communities began to see how biodiversity conservation aligns with daily life (Hocking and Babbitt, 2014)

The initiative now includes short awareness talks on how frogs help control mosquito populations, thereby reducing malaria and yellow fever risk, and how forest protection ensures clean, reliable water sources for crops and domestic use. These connections increase community buy-in and make conservation messages more relatable.

Looking into the future

Building on its success at Mount Nlonako, VoNat is expanding its kids and youth-led amphibian conservation model to Mount Muanengouba, Mount Cameroon, and Mount Mbam, key biodiversity hotspots facing habitat loss and unsustainable resource use. The initiative's long-term goal is to establish a national network of "Frog Conservation Warriors", young leaders trained in amphibian ecology, environmental storytelling, and advocacy (Fig. 3). These youth ambassadors will promote conservation in their communities, organise clean-up campaigns, and inspire peers across Cameroon. VoNat also plans to develop short videos and illustrated guides in English, French and local languages to make amphibian education more accessible to non-literate audiences. Partnerships with councils, schools, and local media will ensure wide distribution. The organisation is also engaged in participatory mapping of amphibian threats and conservation solutions, combining local ecological knowledge with GIS-based tools. This will culminate in the development of a community amphibian conservation action plan.

As Cameroon's amphibian populations continue to face pressures from habitat degradation, overharvesting, and climate change, empowering children, and communities offers a hopeful and sustainable path forward. Education builds empathy, and empathy builds stewardship. The children of Mount Nlonako have shown that when given knowledge, voice, and opportunity, they become the most passionate defenders of their ecosystems

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Figure 3: Children from communities in the Mount Nlonako Area pose after an amphibian conservation sensitization outreach in Ebone. Photo: Muleng (VoNat).

Weaving conservation: amphibians, agroecology, and Andean wisdom in Tircos, Peru

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Conservation in the Central Andes of Peru is facing major challenges that are being exacerbated by climate change (Herzog et al., 2012). Pro Fauna Silvestre Ayacucho Association (PFAUNA) is implementing innovative strategies in the Ayacucho region, an area of high biological diversity (Gobierno Regional de Ayacucho., 2012), to combat these challenges and incorporating the local community while doing so, through the Ultu Project, which focuses on the "conservation of threatened amphibians in the Central Andes" and is funded by Synchronicity Earth (Synchronicity Earth., 2025), part of the work focuses on protecting species vulnerable to habitat loss and disease in the humid puna ecosystems (a high mountain Andean ecoregion characterized by grasslands, shrubs and high Andean wetlands, located between 3,800 and 4,800 meters).

A prominent case study is the conservation alliance with the Tircos Quechua Community (Comunidad quechua de Tircos), located in the province of Huanta, Ayacucho, in southern Peru. Tircos is situated in a valuable transitional ecosystem between the humid puna and the montane forest (Fig. 1). The Ultu model demonstrates that the most effective conservation is one that is integrated directly into the local economy and the community's cultural practices.

Figure 1: The Tircos Peasant Community, a puna ecosystem transitioning to a cloud forest, Ayacucho. Photo: Nancy Quispe.

Agroecology: a clean habitat for amphibians

Field research in the Tircos Quechua Community has revealed the presence of six amphibian species (Table 1), including potential new species for science. This significant discovery highlights the urgent need to protect these delicate ecosystems (due to threats such as new road construction, climate change, wildfires, and agricultural expansion). To immediately address this urgency, the community is developing training initiatives focused on good ecological potato farming practices. The overarching goal is to foster a sustainable coexistence between agricultural production and the conservation of amphibians.

Agriculture is a fundamental economic activity in Tircos. The area has a documented high diversity of crops, with 68 varieties of native potato (*Solanum tuberosum*), 24 varieties of mashua (*Tropaeolum tuberosum*), and 3 varieties of olluco (*Ullucus tuberosus*; Fig. 2). However, food insecurity is a latent threat that could lead to agricultural intensification and the use of agrochemicals (Lozano-Povis et al., 2021; Quispe et al., 2022). This practice poses a direct risk to amphibians

Table 1: Diversity of amphibian species recorded within the Tircos peasant community.

Order	Family	Species	Global Assessment (IUCN)
Anura	Hemiphractidae	*Gastrotheca marsupiata*	LC
Anura	Bufonidae	*Truebella tothastes*	EN
Anura	Leptodactylidae	*Pleurodema marmoratum*	VU
Anura	Strabomantidae	*Oreobates sp1*	-
Anura	Strabomantidae	*Oreobates sp2*	-
Anura	Strabomantidae	*Phrynopus sp*	-

Figure 2: Varieties of native potato crops and agroecological practices in the Tircos community, Ayacucho. Photo: Nancy Quispe.

due to their sensitivity to contamination from pesticides and synthetic fertilizers, which can affect both larvae and adults.

The Ultu Project addresses this issue by strengthening agroecological practices, focusing on the use of organic fertilizers, such as compost, which improve the soil's water retention capacity. This sustainable management of native crops not only ensures traditional agricultural productivity but also guarantees the existence of microhabitats for terrestrial amphibians in the area. Additionally, prevents the contamination of crucial bodies of water that are essential for survival and reproduction of high-Andean amphibians like the marsupial frog *Gastrotheca marsupiata* (LC, ASG, 2020) and the microendemic *Truebella tothastes* (EN; ASG, 2018).

Furthermore, we are requesting a commitment from farmers to secure microhabitats for terrestrial species by leaving mounds of stones around and within the fences of agricultural fields. We also provide information them about the biological control role of these species and their importance for crops (Fig. 3).

Figure 3: Community workshops held within the Tircos community, focusing on the coexistence between agriculture and amphibian conservation. Photo: Nancy Quispe.

Traditional weavings: women weavers of conservation

Weaving is an ancestral tradition and a vital source of livelihood for families in the community. The Ultu Project has integrated this cultural practice by creating and training a group of women weavers in the Tircos Peasant Community. The initiative is based on artisans incorporating representations of local fauna (including amphibians alongside other emblematic animals like birds, pumas, or spectacled bears) into their weavings (Fig 4).

Figure 4: Training on weavings linked to amphibian conservation, and presentation at local fairs. Photo: Nancy Quispe.

This practice generates a double positive impact:

1- *Cultural Awareness:* Historically, amphibians have often been stigmatized in local knowledge. By turning them into a symbol of aesthetic and economic value in their crafts, the weavers are transforming this perception. They are elevating amphibians into icons that drive the local economy. Each woven piece becomes a vehicle for environmental awareness that travels with the product.

2- *Female Empowerment:* The sale of these textiles, which tell the story of local biodiversity, offers women new income opportunities. This contributes to their family's livelihood, strengthening their economic autonomy, self-esteem, and participation in community decision-making a clear example of individual and relational empowerment.

Conclusion: a sustainable Andean model

As a direct result of this integration between science and culture, amphibians have been incorporated as a community symbol, transforming a historically negative perception. The presence of these animals is now seen in cultural elements like banners and at community

Figure 5: The Tircos community adopts amphibians as a symbol, promoting their importance in cultural parades. Photo: Nancy Quispe.

events. This perceptual shift is a key indicator of the project's success (Fig. 5).

The work of the Pro Fauna Silvestre Association in the Tircos Peasant Community is a paradigm for global conservation. By validating and optimizing ancestral practices (the high agrobiodiversity of potato, mashua, and olluco) and leveraging cultural traditions (weaving), a virtuous cycle has been created.

The health of the community's agricultural and natural ecosystems ensures the presence of species whose representation in art, in turn, generates income and empowerment for the women of the community. In the Tircos Peasant Community, the frog or toad has gone from being a potential victim of development to becoming a catalyst for community sustainability.

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Recent advances in the classification and conservation of the growling grass frog (*Ranoidea raniformis*) in south-eastern Australia

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Discovery of two subspecies, revision of the genus *Litoria*, and confirmation of *Ranoidea castanea*

Bell frogs are well known for having been introduced from their native range in Australia to New Zealand and a number of Pacific islands. The green and golden bell frog *Ranoidea aurea* and growling grass frog (or southern bell frog) *R. raniformis* are both introductions to New Zealand, although listed as nationally threatened in Australia and as Vulnerable on the IUCN Red List (ASG, 2023).

Some may have noticed a recent name change for the bell frog group that used to be classified in the very large genus *Litoria*. Following Wells and Wellington (1985) and Duellman et al. (2016), Donnellan et al. (2025) recently provided the most comprehensive revision of the Pelodryadidae as a distinct family of Australo-Papuan "tree frogs", recognising 35 genera using detailed assessments of adult and larval morphology, molecular and phylogenetic relationships, and advertisement calls. This resulted in resurrecting a genus name long forgotten by most, *Ranoidea*, for it. The new classification highlights the distant

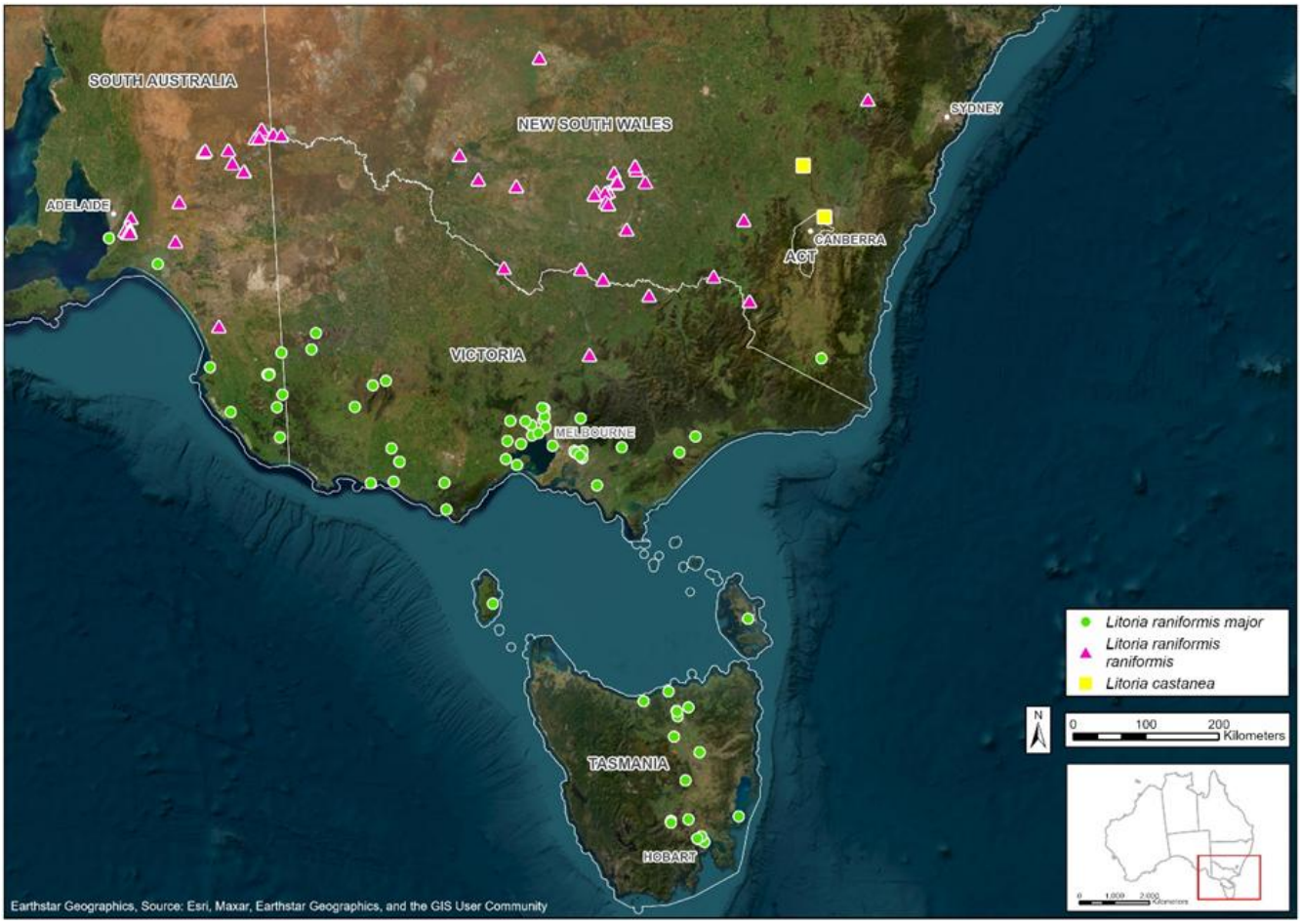

Figure 1: Sampled distributions of *Ranoidea raniformis raniformis* (triangles), *R. r. major* (circles) and *R. castanea* (squares). Image: Donnellan unpublished data (2023).

relationship that *Ranoidea* has with other genera in the family Pelodryadidae. The growling grass frog most recently treated as *Litoria raniformis* is therefore now *Ranoidea raniformis*.

To pursue the introduction history of bell frogs in New Zealand, J. Vörös travelled there from Hungary in 2004 to use genetic techniques to track down where they had originated from in Australia. To our surprise, the analyses identified two very distinct genetic groups of *R. raniformis*. Four years later, a grant was obtained to further investigate these differences at the South Australian Museum.

With the help of Skye Wassens from Charles Sturt University, Luke Price from the University of Adelaide and other researchers in New South Wales, Victoria and Tasmania, we were able to map the distribution of the two genetic groups, finding a northern group in the southern Murray Darling Basin, and a southern group in south-eastern South Australia, southern Victoria and Tasmania (Fig. 1). The northern subspecies is *R. r. raniformis* (Fig. 2a), while the southern subspecies has been named *R. r. major* (Fig. 2b; Vörös et al., 2023).

Our results also called into question the taxonomic status of another member of the bell frog group, the yellow-spotted bell frog *R. castanea* (Critically Endangered on the IUCN Red List, ASG, 2022), from the tablelands of New South Wales. This species was thought to be extinct, but in 2010 a population was discovered near Yass by David Hunter. Specimens were sent to Taronga Zoo for captive breeding and skin swabs were obtained to try and confirm their identity using genetic methods. Our genetic data at that time suggested that they might be a Southern Tablelands population of the Murray Darling Basin group of *R. raniformis*.

Kyle Armstrong from the University of Adelaide used ancient DNA to analyse bell frog specimens from the South Australian and Victorian Museums from locations where the species had disappeared. The goal was to try and fill in gaps between the two *R. raniformis* groups and the frogs from Yass. The results showed that the Yass frogs were genetically inseparable from specimens collected near Canberra in the 1970s, confirming that they were yellow-spotted bell frogs (Fig. 3). He also found that both the northern and southern groups of *R. raniformis* had been in South Australia's Mount Lofty Ranges in the 1970s, but had not been seen or heard in the area since, likely having been introduced there through the very active pet trade at the time.

However, we still needed to determine if the northern and southern groups of *R. raniformis* were different species or just recently isolated populations. Examining nuclear DNA enabled us to test if the two groups were interbreeding. Again, we had some surprising outcomes, finding that frogs at Frances in eastern South Australia and in northern Tasmania were hybrids of the two groups. We did not expect hybrids in Tasmania as all the other frogs we examined from there belong to a genetically distinct sub-group of the southern mainland group. What was even more revealing about how this could have happened is that one of the parents was from northern mainland group. The northern parent would have been introduced there quite recently. So what started out as an investigation of where the bell

Figure 2: A. Northern subspecies of growling grass frog *Ranoidea raniformis raniformis*; B. Southern subspecies of growling grass frog *R. r. major*. Photos: Judit Vörös.

Figure 3: Yellow-spotted bell frog *Ranoidea castanea*. Photo: David Hunter.

frogs in New Zealand had come from in Australia has shown that bell frogs are still being moved around by people, and given that these species are not usually accidental passengers in the agricultural trade, the movement of these frogs may be intentional or through the trade in aquatic plants (e.g. as is likely to have occurred on multiple occasions in Victoria).

Now we had almost enough information to describe the two groups of *R. raniformis* as separate subspecies (rather than separate species due to the extent that they are able to hybridise). The final piece of the puzzle was to compare the calls of the frogs to see if we could tell them apart and thus provide a handy way for anybody to recognise them. Jodi Rowley at the Australian Museum made hundreds of calls from the FrogID program available for our colleague Michael Mahony to analyse. FrogID is a remarkable resource that can substantially speed up the description of new Australian frog taxa and demonstrates the valuable contribution of citizen science.

After more than decade of investigations, the findings were published in 2023. Scientists, consultants and land managers can now treat the two subspecies independently when assessing various threats to their persistence, providing for a more informed situation with clearer conservation outcomes.

Monitoring and decline of the southern subspecies

In November 2001, one of us (G. Heard) along with Peter Robertson and Michael Scroggie started work on what has become a two-decade long effort to monitor the southern subspecies across the northern suburbs of Melbourne, Victoria, Australia. Our start was in response to a crisis, with the Victorian Government committing to a gas-fired electricity plant on the western side of the Merri Creek, necessitating a pipeline be dug from the suburbs of Epping across to Somerton. The alignment went through prime *R. raniformis* habitat, and after protests by Friends of the Merri Creek and the Friends of the Earth, the Victorian Government agreed to fund research on the populations along the Merri Creek and in surrounding catchments.

At that time, the status of *R. raniformis* across the region was uncertain. Our task was to complete surveys to clarify the subspecies' regional distribution and habitat requirements. In that season, with the assistance of a small team of volunteers, we completed surveys at 136 sites. We identified key metapopulations in the suburbs of Bundoora and Wollert (Darebin Creek), Campbellfield, Somerton, Donnybrook and Merriang (Merri Creek), and Broadmeadows (Yuroke Creek).

Since that initial season, we have continued our work on the subspecies across northern Melbourne under various guises. We have monitored key sites intensively in some years, and returned to attempt a full re-survey every five years. The 2021-2022 season represented the fourth re-survey, 20 years after the initial work. Backed by funding from the Victorian Department of Energy, Environment and Climate Action, Melbourne Water and the City of Whittlesea, we sent a dedicated team of froggers once again into the breach and what we discovered was something of a shock.

Our long-term work revealed that *R. raniformis* has been declining steadily in the region since our initial surveys. In 2021-2022 however, estimated occupancy rates among the 118 sites we could survey in both 2001-2002 and 2021-2022 were only 21%, down from the initial figure of 53%. That was a decline of 60% in two decades among this set of sites (Fig. 4), a much more drastic decline than we had expected.

There are likely to be various reasons for the observed decline, although urbanisation and the ongoing impacts of chytridiomycosis are key. Since 2001-2002, the region has been transformed by the construction of entire new suburbs and industrial precincts, with associated freeways and major road duplications. All of this has led to significant habitat change. Filling of significant quarry refuges has led to the loss of entire metapopulations, and much instream habitat is no longer suitable as urban runoff has transformed clear, languid pools supporting rich aquatic vegetation (Fig. 5a) into turbid, polluted reaches in which invasive fish thrive. Livestock grazing has also been removed from key locations, leading to the choking of terrestrial habitat by weeds and invasive emergent plants, for example *Phragmites australis* (Fig. 5b).

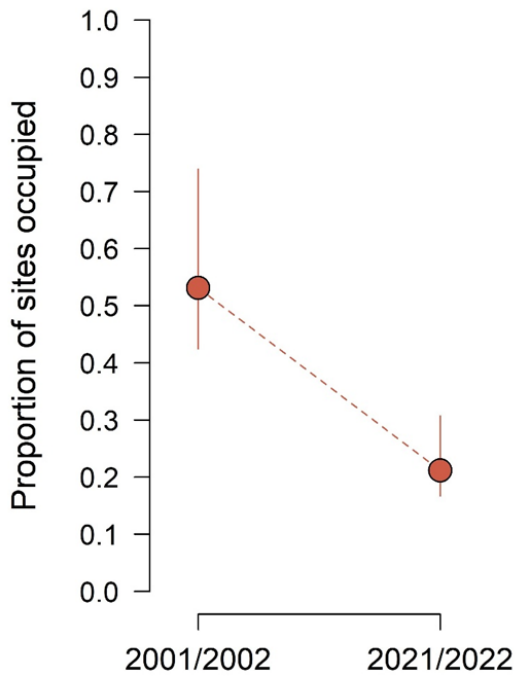

Figure 4: Estimated occupancy rates for *Ranoidea raniformis major* among 118 sites across northern Melbourne during the 2001-2002 and 2021-2022 survey seasons. Dots are median estimates and vertical lines 95 % credible intervals.

Turning to chytrid, we have long known that *R. raniformis* remains susceptible to the pathogen. Swabbing of the northern Melbourne populations revealed that infection prevalence can be high, with important effects on survival rates. The particularly low occupancy rate during 2021-2022 was likely influenced by chytrid, being the second La Niña year in a row. Chytrid displays maximum killing power during cool conditions, and we have little doubt that there was increased mortality in those years. These spikes in mortality can be fatal for instream populations in La Niña years, as high flows lead to recruitment failure as well. It was among instream sites that occupancy rates were particularly low in 2021-2022.

Although *R. raniformis* populations have been declining steeply across northern Melbourne to the extent that they are at risk of regional collapse, the good news is that after two decades of work, we now have a solid understanding of the species' conservation requirements, and know that we can create wetland networks with the right characteristics to preserve metapopulations long-term. We are buoyed that the Victorian Government has committed to habitat design standards for *R. raniformis* that are informed by this work, and used our metapopulation model to guide significant investment in wetland construction in dedicated conservation corridors across Melbourne. Our modelling tells us that these programs have a good chance of conserving the species around Melbourne if implemented in full and with ongoing management of its habitat. The key is ensuring that conservation efforts are not outpaced by the dual impacts of urbanisation and chytridiomycosis. Our long-term monitoring across northern Melbourne suggests this is a clear risk, particularly under an increasingly volatile climate.

Reintroduction program for the northern subspecies

The northern subspecies was once present across northern Victoria, southern New South Wales and South Australia. Isolated populations still exist but remain under threat. As a major prey item for some wetland birds and other aquatic fauna, but also a predator of other frogs as well as invertebrates, the species is functionally different from most other local frog species and is therefore an important one in local

Figure 5: A. A pool along the Merri Creek in Somerton supporting rich aquatic herbfield in 2001-2002. Photo: Geoffrey Heard. B. The same pool in 2021-2022. Aquatic vegetation has been reduced by urban runoff, and terrestrial habitat along the banks is now choked by overshading vegetation following the cessation of cattle grazing. Photo: Geoffrey Heard.

ecosystems. Ultimately, rewilding of *R. raniformis* will help secure the species, increase biodiversity, and restore critical ecological functions and processes to the areas where this is done.

At a 2016 science forum, two of us, L. Farnsworth and L. Lloyd examined the potential of reintroducing various species that had been lost from the Winton Wetlands in northern Victoria. This was done as a component of the actions we were taking in our environmental restoration program for the Wetlands, especially for those species struggling to recolonise the site due to their patchy and distant distribution, such as *R. raniformis*. We assessed the feasibility of rewilding the northern subspecies based on habitat suitability and disease risk assessments in an initial project, funded by Wettenhall Environment Trust. We monitored the wetlands using audio recorders to be more confident of the species' absence and completed translocation risk assessments and designed infrastructure to allow for successful reintroduction and breeding. All of this confirmed that translocation of *R. raniformis* onto the site was a feasible restoration action.

In 2023 Winton Wetlands established a custom-built quarantine and laboratory facility to receive frogs (Fig. 6a), as well as outdoor breeding pods which will allow for the production of tadpoles and metamorphs for stocking onsite (Fig. 6b). In order to gain permission to move frogs, we also had to prepare extensive documentation around the project which included facility licenses, ethics approvals and applications for the translocation of threatened fauna at both the state and federal government levels.

Shortly after, we successfully translocated our first cohort of *R. raniformis* from the Bendigo Water Reclamation Plant in central Victoria (Fig. 7a) to our quarantine facility at Winton Wetlands (Fig. 7b). The translocated frogs did well in quarantine and were subsequently moved into the outdoor breeding facility.

We also established "Taskforce Growler" alongside our translocation, breeding and release program, to provide a region-wide initiative to support the work at Winton Wetlands, broaden region-wide education on frogs and wetland ecosystem restoration, and expand the work regionally with various partners such as catchment management authorities and other land and water managers.

"Growing Grub for Growlers" was developed as a community-based program forming part of Taskforce Growler, involving community volunteers raising wood roaches for the captive frogs.

Another subset of Taskforce Growler is the Growling Grass Frog Practitioners Network, where partners of the Winton Wetlands project facilitate an online forum 3-4 times a year bringing experts on the species together from across South Australia, New South Wales and Victoria. The group shares information on our respective projects and research, and considers additional actions needed to secure the status of both subspecies.

The project will continue to focus on integrating community participation with that of researchers, land managers and other stakeholders to enhance the status and conservation outcomes for *R. raniformis* in northern Victoria. Our plans have involved three main elements which build on the work previously undertaken:

Figure 6: A. Growling grass frog quarantine facility at Winton Wetlands. B. Outdoor breeding enclosure at Winton Wetlands. Photo: Lisa Farnsworth.

Figure 7: A. Lisa Farnsworth with a growling grass frog in the Winton Wetlands quarantine facility. Photo: Lance Lloyd. B. Lance Lloyd with a growling grass frog caught at the Bendigo Water Reclamation Plant. Photo: Lisa Farnsworth.

1- Enhance breeding through the establishment of a genetically diverse, viable and sustained wild population of *R. raniformis* at Winton Wetlands. We hope our future population can be used as a source for translocations to other suitable areas in northern Victoria.
2- Identify other freshwater wetlands in northern Victoria that may support *R. raniformis* and are within its previous known distribution, as well as potential areas suitable to translocate the species to.
3- Engage the regional community in the project through citizen science and involvement in recovery actions. The team will collaborate with the organisation Swamps, Rivers and Ranges (SRR) and other partners to continue hosting the Growling Grass Frog Practitioners Network and review the national recovery strategy for the species. The team will engage the community through information sessions, press articles, and grant applications, establishing a donations program, and upskilling volunteers in habitat assessment and frog identification skills, including school programs held at Winton Wetlands and incursions across northern Victoria. The team will provide training materials and send regular updates to keep supporters informed.

With the dissolution of the Winton Wetlands Committee of Management in July 2025, the Growling Grass Frog project was transitioned to SRR who have continued the program in a modified form, with the original experts and project leaders still closely involved. The current phase focuses on the continued husbandry of frogs in the breeding facility through brumation, followed by at least one further translocation of individuals from the Bendigo Water Reclamation Plant to the Winton Wetlands quarantine facility. Once these newly arrived frogs are confirmed to be chytrid-free, they will be released, together with the existing captive population, into a specially prepared release pond featuring enhanced habitat structures such as rocky groynes and floating vegetation islands for basking and refuge. Prior to release, carp and other exotic fish will be reduced in the pond (mainly by electrofishing) with assistance from Nature Glenelg Trust. Monitoring of the frogs will be undertaken until at least March 2026.

The continuation of this important conservation initiative has been made possible through funding from the Wettenhall Environment Trust, Goulburn Broken Catchment Management Authority, Foundation for National Parks and Wildlife, and the Victorian Department of Energy, Environment and Climate Action.

Conclusion

The renewed taxonomic focus and conservations efforts directed at *R. raniformis* are hoped to benefit both subspecies, although it is evident that factors such as adverse climatic events, chytrid outbreaks, and habitat impacts from urban, industrial and agricultural development continue to pose a threat to their recovery. Such threats are also of heightened concern with the recognition of the two subspecies, supporting their management as units having unique genetic diversity.

Acknowledgements

Rob Barker, Emma Burns, Matt Clancy, Barry Crisp, Mikaeylah Davidson, Danielle Eastick, Sally Edwards, Nick Gale, Jules Farquhar, Graeme Gillespie, Jacinta Humphrey, Claire Keely, Rohan Khot, Joe Leman, Gerry Marantelli, Ema Newton, David Obendorf, Annie Philips, Luke Price, Angus Robertson, Lucy Robertson, Peter Robertson, Candice Sexton, Angela Simms, Ben Smith, Regan Terry, Rob Valentic, Danielle Wallace, Glen Weisner, Nicole Wilson and Matt West assisted with recent occupancy surveys for the Growling Grass Frog and/or sampling to inform the current taxonomic work on the species. David Hunter and Peter Harlow provided genetic samples for the Yellow-spotted Bell Frog. Kyle Armstrong, Andrezj Killian, Steven Myers, Luke Price and DART contributed to molecular work. Wolfgang Böhme, Glen Shea and Sky Wassens provided taxonomic assistance. Jodi Rowley contributed frog call data from FrogID, and Michael Mahony carried out the call analyses. Ádám Darvas, Orsolya Márton and Michael Scroggie assisted with statistical analyses

across the various projects. Additional staff from the Australian Museum, Melbourne Museum, South Australian Museum, and Tasmanian Museum and Art Gallery provided access to their collections and specimen data. Resurveying sites north of Melbourne was largely funded by the Victorian Department of Energy, Environment and Climate Action through the Melbourne Strategic Assessment (MSA) program and the Port Phillip Regional Office, with co-funding provided by Melbourne Water and the City of Whittlesea. The former Winton Wetlands Committee of Management, Wettenhall Environment Trust, Ross Trust, Goulburn Broken Catchment Management Authority and Murray Darling Basin Authority provided funding for stages 1-3 of the Winton Wetlands project. Sophie Enders and colleagues from Swamps, Rivers and Ranges provided support in delivering the community engagement aspects and took over responsibility for managing the reintroduction project. Matt West provided support with most aspects of the translocation and monitoring. Joe Price compiled the map for Figure 1, and Skye Wassens reviewed an earlier version of the text.

Much of the content in this article originally appeared in the February and July 2023 editions of the Frogs Victoria newsletter "Pobblebonk" (Donnellan, 2023a,b; Farnsworth and Lloyd, 2023; Heard, 2023)

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Protecting Anji small salamander: the first amphibian-triggered Key Biodiversity Area in China

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Hynobius amjiensis (Anji small salamander) is an amphibian belonging to the family Hynobiidae and the genus *Hynobius*. In 1987, Professor Gu Huiqing from Hangzhou Normal University discovered amphibian eggs in a marshy area on the mountaintop depression at an altitude of 1,300 meters during an investigation on Longwang Mountain in Anji. In 1988, he climbed to the top of the mountain again and brought back adults and eggs from the swamp waters. In 1990, he officially described this newly discovered amphibian as Anji small salamander (Gu, 1992; Fig. 1). In 2002, Fu Cuichang and others discovered another population in Qingliangfeng Nature Reserve, Lin'an City, Zhejiang Province, located in a swamp at an altitude of 1,600 meters. In 2013, Li Yongmin and others discovered a new distribution site, also in the Qingliangfeng Nature Reserve, but in Jixi, Anhui, located in the alpine meadow of the core area at an altitude of 1,480 meters.

The Anji small salamander is a species endemic to China, only found in Anji Small Salamander National Nature Reserve and Qingliangfeng National Nature Reserve. The species is listed as a first-class nationally protected species in "the list for wild animals under key state-protection", as Endangered (EN) by the IUCN Red List of Threatened Species because of its small extent of occurrence and the continuing decline in the quality of its habitat (ASG, 2021), and as Critically Endangered (CR) by China Red List of Biodiversity – Vertebrates Volume (Jiang et al., 2015). At present, there are about 600 mature individuals, with about 500 individuals restricted to Anji Small Salamander National Nature Reserve.

In order to promote the application of Key Biodiversity Areas in China, the IUCN China Representative Office, in collaboration with the KBA China Expert Group,

Figure 1: *Hynobius amjiensis* (Anji small salamander), a threatened species endemic to China. Photo: Wu J.

launched the first batch of KBA applications and nominations in 2023, resulting in the additions of three KBAs, among which was the first Chinese amphibian-triggered KBA: Zhejiang Anji small salamander National Nature Reserve.

The decision to establish the KBA was made on 14-15 August 2024 at a meeting of the IUCN China Representative Office in collaboration with the Nanjing Institute of Environmental Science of the Ministry of Ecology and Environment, in Anji, Zhejiang, China. The meeting was attended by more than 30 representatives from protected areas, non-governmental organisations, and research institutions from across the country. It resulted in the release of the Chinese version of the Guidelines for the Application of Global Standards for the Identification of Key Biodiversity Areas. The designation of Anji Nature Reserve as KBA will greatly promote the protection of Anji small salamander, and highlight the need to consider other amphibian-triggered KBAs in China, and especially for salamanders.

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Figure 1: A. Archey's frog (*Leiopelma archeyi*) and B. Hochstetter's frog *(Leiopelma hochstetteri*) at Mahakirau Forest Sanctuary. Archey's frogs are classified as Critically Endangered, and Hochstetter's frogs are classified as Least Concern on the Red List (www.iucnredlist.org). Photos: Sara Smerdon.

Revealing the unseen: how community science is protecting Aotearoa New Zealand's frogs

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Summary
In the cloud forests of Aotearoa New Zealand, at Mahakirau Forest Sanctuary, eDNA from feral pig, ferret and stoat guts turns whispers into evidence: native frogs are on the menu, guiding when and where we act.

Uncovering predator impacts

Mahakirau Forest Sanctuary sits high in the Coromandel ranges, a mosaic of private land protected by a community who long suspected that what happens in the leaf litter after dark does not stay in the leaf litter. We have known for decades that predators threaten Aotearoa's endemic frogs (*Leiopelma* spp.), yet 'who eats whom, and when?' remained a charged question in a landscape where evidence is hard won, nocturnal, and easily missed.

The devastating effect of introduced mammalian predators on Aotearoa's native fauna is well documented (King, 1984; Towns et al., 2001), with native frogs proving no exception. Aotearoa is home to three endemic species of frog: *Leiopelma archeyi* (Fig. 1A), *L. hochstetteri* (Fig. 2B) *and L. hamiltoni*, classified on the Red List as Critically Endangered (ASG, 2017), Least Concern (ASG, 2015a) and Vulnerable (ASG, 2015b), respectively. By remaining motionless and blending into the habitat with their cryptic colouration, the frogs often avoid capture from native predators that rely on sight. However, these tactics do not work when avoiding introduced mammals driven by scent.

Earlier this year we published a synthesis from across Aotearoa showing that feral pigs (*Sus scrofa*), stoats (*Mustela erminea*) and ferrets (*M. furo*) sometimes feed intensively on native frogs (Hotham et al., 2025). That picture came from field encounters, direct gut inspections and forensic crumbs of data. At Mahakirau, we wanted to move beyond chance encounters of predation and instead, measure patterns with the resolution that DNA can offer.

Working with laboratory partners, we used environmental DNA (eDNA) metabarcoding of intestine and stomach contents from pigs, ferrets and stoats removed through predator trapping and professional culling. For frogs - soft bodied, rapidly digested, often

swallowed whole - eDNA turns a fading trace into a readable sentence.

What did the forest say?

First, the uncomfortable part. Our preliminary, ongoing analysis currently indicates over 80% of ferrets sampled across the Coromandel had fed on native frogs as a recent meal (Fig. 2). This includes animals from neighbouring projects we have supported - catching ferrets, dissecting and extracting alongside local teams as part of upskilling others. We also found that over 70% of feral pigs sampled during the peak frog emergence season (October- May) contained frog DNA (Fig. 3). These are not curiosities; they are signals strong enough to change how we plan seasonal predator control operations.

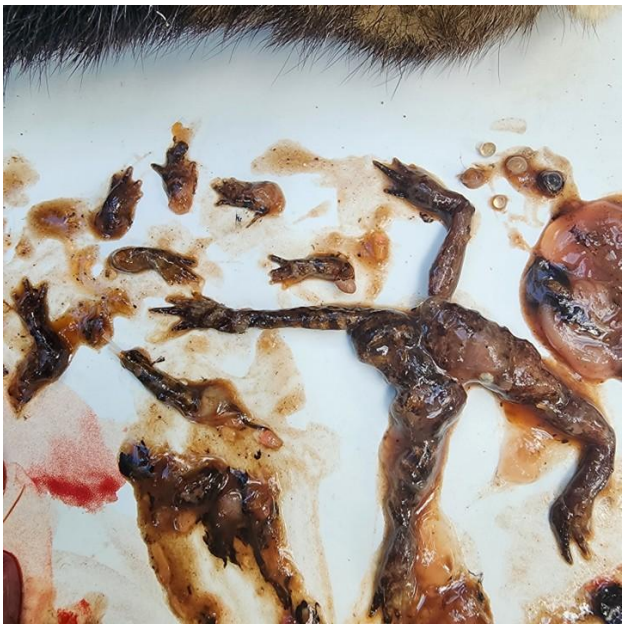

Figure 2: Archey's frogs (*Leiopelma archeyi*) and Hochstetter's frogs (*Leiopelma hochstetteri*), and frog eggs, in ferret (*Mustela furo*) gut. Photo: Sara Smerdon.

Stoats and cats (*Felis catus*) also featured as predators. While frog detections were less frequent in our current dataset, stoat results repeatedly showed native lizard DNA (for example copper skink, *Oligosoma aeneum*, and ornate skink, *O. ornatum*) year-round. Native lizard species are also known prey for feral cats, and visually, we have seen the destruction cats have on our native species. However, with the use of eDNA analysis we have also confirmed that Hochstetter's frog are among the species preyed upon by cats. These results underscore why reptile and amphibian strongholds need sustained predator suppression year-round.

Figure 3: Unidentified native Frog species found in feral pig (*Sus scrofa*) stomach. Photo: Mike Kuypers.

Now for the constructive part. Evidence converts suspicion into action. With the eDNA results in hand (Fig. 4), we have adjusted our predator control programme in two immediate ways:

1- *Seasonality matters*. Feral pig control now intensifies ahead of and throughout frog emergence windows. It is a practical shift, moving contractors and community effort into the months when it counts most for frogs.
2- *Spatial focus*. Sites with repeated ferret positives for frog DNA now anchor denser mustelid trapping and rapid-response trap service and gut checks.

However, Mahakirau's story sits within a wider national picture. Our eDNA data echoes historical diet analyses that reported reptiles and introduced amphibians as prey for mustelids (Roser and Lavers, 1976; Smith et al., 1995; Strang et al., 2018). For conservation managers, the advantage is therefore local resolution: fewer debates about 'if' and more planning around 'where' and 'when'.

This work has also sparked unlikely collaborations. Hunters and cullers (first hands on the carcass) now see themselves as essential data collectors. Local landowners provide access and logistics. Laboratory partners translate invisible traces into species names. Volunteers absorb the story and keep servicing traps when the weather turns. In a small sanctuary, that web of trust is the real engine of persistence.

We have been sharing these findings across regional and national conservation forums, which is building interest in eDNA gut analysis as a practical tool and strengthening advocacy for our frogs. One of the next presentations on the agenda is the biennial SRARNZ conference in January (the Society for Research on Amphibians and Reptiles of New Zealand), a national gathering of herpetologists, academics, field ecologists, conservation practitioners and policy-makers focused on Aotearoa's native reptiles and amphibians. We would love to connect there and compare notes. The more projects that collect and process samples coherently, the faster we can map risk across landscapes and seasons.

Two reflections from the Mahakirau vantage point:

1) *Frogs are telling us where the system frays.* High ferret-on-frog predation events often align with edges of habitats, property boundaries, and seasons. Strengthening those seams may deliver more for frogs than chasing a perfect model.
2) *Evidence creates courage*. In community conservation, people give their evenings and weekends to a task that can feel never-ending. Sharing clear, locally relevant results has a motivational power beyond the *p* value: it says "this matters here, now".

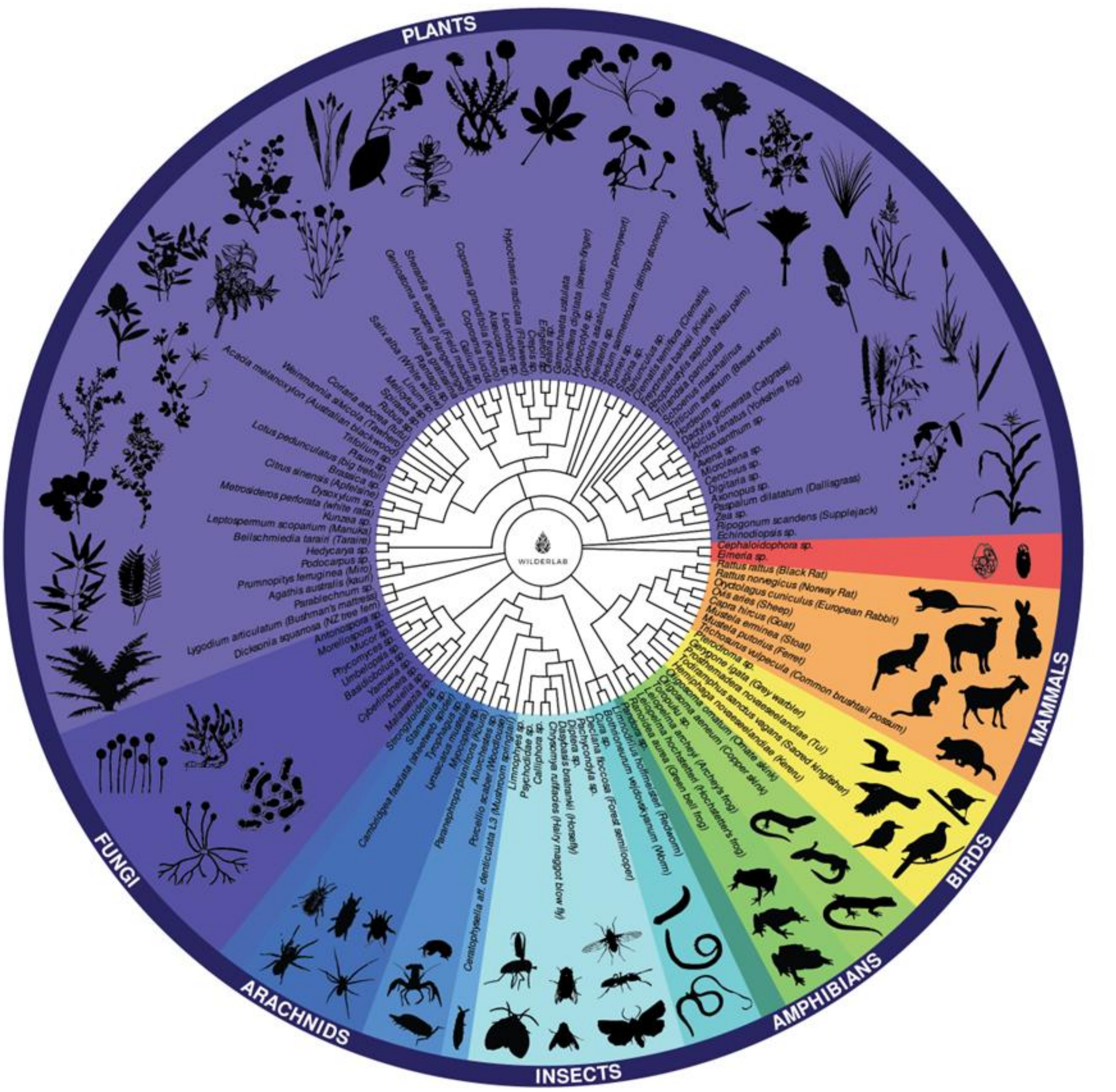

Image 4: eDNA (environmental DNA) Wheel of Death; mustelid meals. Image: Wilderlab.

Our paper (Hotham et al., 2025) laid the groundwork; Mahakirau's eDNA extends it with site specific, operationally useful evidence. We are continuing to analyse samples and define timing, but already the frogs have refined our priorities and amplified our intent.

Acknowledgements

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Advancing amphibian conservation in Nigeria through capacity building and collaborative action

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Background

Biodiversity is disproportionately concentrated in tropical regions, where stable climates, high primary productivity, and complex habitats promote high species richness and endemism (Barlow et al., 2018; Myers et al., 2000; Schemske and Mittelbach, 2017). Amphibians, in particular, show peak diversity in tropical forests, for example studies from Nigeria's rainforests revealing significantly higher species richness in intact forest and swamp habitats compared to disturbed landscapes (Rahman et al., 2020). Yet the scientific expertise, financial resources, and institutional support necessary for conservation are often concentrated in temperate, higher-latitude countries, a challenge known as the biodiversity paradox (Rodríguez et al., 2022). A little over 500 of all assessed species on the global IUCN Red List that occur in Nigeria are currently threatened, representing about 10% of the more than 5,000 species assessed for the country (IUCN, 2025). Among these, amphibians account for roughly 3% of threatened taxa (14 of the 132 amphibian species known to occur in Nigeria) underscoring the urgent need for focused conservation action for this group (Danmallam et al., 2024; IUCN, 2025). This reflects major data gaps, including limited surveys and gaps in taxonomic resolution, highlighting the need for coordinated, locally led efforts to document and conserve amphibians. To address this biodiversity paradox, the IUCN Species Survival Commission (SSC) is decentralizing expertise and resources through a global network of Specialist Groups, National Species Specialist Groups (NSSGs), and Centres for Species Survival (CSS), thereby strengthening national capacity and fostering in-country leadership in biodiversity conservation.

Strengthening amphibian conservation in Nigeria

Between 16 and 17 September 2025, the IUCN SSC Centre for Species Survival Nigeria (CSS Nigeria), hosted at the A.P. Leventis Ornithological Research Institute (APLORI), Centre of Excellence, convened a landmark Amphibian Conservation Workshop in Jos, Nigeria and online. Organised in collaboration with the IUCN SSC Amphibian Specialist Group (ASG) and IUCN SSC Nigeria Species Specialist Group (NgSSG), the workshop featured Prof. Amaël Borzée, Co-chair of the ASG. It brought together researchers, practitioners, and students from across Africa.

Figure 1: Scenes from the Amphibian Conservation Workshop held at A.P. Leventis Ornithological Research Institute (APLORI), showing (A) a workshop session, (B) group photo with in-person and virtual participants, (C) the final day of the workshop, and (D) a field session on amphibian survey in Amurum Forest Reserve.

The workshop addressed key topics in amphibian conservation science and practice. Participants learned from introductory sessions on IUCN Red List and Green Status assessment methodologies, engaged with the global Amphibian Conservation Action Plan (IUCN SSC Amphibian Specialist Group, 2024), and gained practical skills in amphibian identification, survey design, and population monitoring techniques (Textbox 1; Fig. 1). Emphasis was placed on leveraging citizen science platforms such as iNaturalist (inaturalist.org) and GBIF-mediated data to complement conventional field data, expand spatial coverage and inform conservation decision-making. The workshop also provided guidance on the structure and functions of the Nigeria Species Specialist Group and highlighted pathways for early-career scientists to contribute to the group (Text Box 1).

The workshop's field component culminated in a nationwide amphibian Bioblitz, with both in-person and virtual participation, resulting in valuable occurrence records on iNaturalist from across Nigeria. Key observations included the mottled squeaker (*Arthroleptis poecilonotus*; Least Concern LC), natal puddle frog (*Phrynobatrachus natalensis;* LC), Hallowell's toad (*Sclerophrys maculata;* LC), Medine grassland frog (*Ptychadena pumilio;* LC), Egyptian toad (*Sclerophrys regularis;* LC) and African clawed frogs (*Xenopus fischbergi;* LC), among others (Figure 2, Bioblitz: https://www.inaturalist.org/observations?project_id=nigeria-amphibian-bioblitz-2025).

Figure 2: Representative amphibian species recorded during the Amphibian Conservation Workshop and associated field activities.

Toward a national amphibian conservation framework

A major outcome of the workshop was the development of a draft National Amphibian Conservation Framework structured around six strategic pillars:

1- *Research and monitoring*. Addressing data deficiencies through systematic surveys, habitat assessments, long-term population monitoring, and the development of a national Amphibian Red List.
2- *Capacity development*. Strengthening local expertise through sustained training programmes and the production of national identification guides.
3- *Public awareness and education*. Increasing public understanding of amphibian ecological roles, countering negative perceptions, and conducting outreach in local languages to ensure broader engagement.
4- *Collaboration and networking*. Establishing institutional and transboundary partnerships to enhance visibility, knowledge exchange, and conservation outcomes.
5- *Policy integration*. Incorporating amphibian conservation priorities and assessment outcomes into national biodiversity strategies, environmental legislation, and land-use planning processes.

Textbox 1. Participant Reflection (Online Experience; Adebisi Oladapo Akeem).

Participating virtually in the Amphibian Conservation Workshop was an enriching experience that broadened my understanding of amphibian ecology, conservation, and their relevance to wider environmental issues in Nigeria. The sessions exposed me to the critical role amphibians play as bioindicators, reflecting the health of freshwater and terrestrial ecosystems. I found the discussions on habitat degradation, climate change, and pollution particularly striking, as they connected directly with the realities facing biodiversity in my region. Although I joined online, the interactive format made it possible to engage with facilitators and follow key conversations, which created a sense of inclusion despite the distance. The nationwide Bioblitz was another highlight, as it demonstrated the value of citizen science in generating reliable biodiversity data. Observing the updates and species reports shared during the exercise gave me a new appreciation for the collective effort needed to close data gaps on amphibian distribution across Nigeria. It also showed how digital platforms can empower individuals, even those participating remotely, to contribute meaningfully to scientific knowledge and conservation outcomes. As a young researcher working at the intersection of forestry and biodiversity, the workshop encouraged me to think critically about how amphibian conservation can be integrated into broader sustainability and ecosystem management frameworks. Amphibians are often overlooked in conservation discussions, yet their presence or decline can signal urgent environmental changes. The workshop inspired me to see their protection not as an isolated effort, but as part of safeguarding ecosystems that support both wildlife and human communities. I believe continuous engagement, awareness campaigns, and collaboration between scientists, policymakers, and local communities will be key to sustaining the momentum generated by this workshop.

6- *Sustainable financing*. Mobilising long-term funding mechanisms to support research, conservation interventions, and community-based initiatives.

Institutional support and future directions

Amphibian conservation in Nigeria is at a pivotal stage. "The workshop is a crucial step in strengthening amphibian conservation in Nigeria, and the need for evidence-based approaches to identify and designate amphibian-triggered Key Biodiversity Areas (KBAs) is more urgent than ever if we are to protect this ecologically important and highly vulnerable group" says the Director General of the Nigerian Conservation Foundation (NCF), Dr. Onoja Joseph.

Collaborative initiatives involving CSS Nigeria, the NgSSG, the NCF, and the ASG, together with the increasing involvement of early-career researchers and citizen scientists, are beginning to close these knowledge gaps. "APLORI remains committed to advancing research and building national capacity for conservation, and we are deeply grateful for the invaluable contributions of Prof. Borzée and the Amphibian Specialist Group" says Prof. Adams A. Chaskda, Director of APLORI. "Scaling up amphibian conservation is a national priority, and the growing collaboration between local and international partners marks a critical step toward safeguarding these species" adds Prof. Shiiwua A. Manu, Chair of the NgSSG.

The workshop concluded with a shared commitment to establish a national amphibian conservation network, launch the first comprehensive National Amphibian Red List assessment, and scale up amphibian-focused initiatives across the country. The final session featured a public lecture by Prof. Amaël Borzée on *Amphibian Conservation in Agricultural Landscapes*, which explored the complex challenges and emerging opportunities of conserving amphibians in human-modified ecosystems. The talk also inspired deeper research engagement within the University of Jos community, highlighting the role of academic institutions in driving evidence-based conservation.

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Assessing amphibian vulnerability requires knowledge across all life stages

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Amphibians are at the forefront of the biodiversity crisis, with over 40% of species threatened with extinction (Luedtke et al., 2023). Conservation physiology has emerged as a critical, but underappreciated, toolkit that allows us to establish causative links of how amphibians respond to environmental stressors such as climate change, habitat alteration, and emerging diseases (Cooke et al., 2013). Yet, based on our new synthesis (Pottier et al., 2025), we highlight a major blind spot where most studies have examined only one life stage, often adults, while embryos remain underrepresented. This ontogenetic gap threatens our ability to predict amphibian persistence in a rapidly changing world.

We found across 1,200 experimental studies that embryos were the focus of fewer than 10% of investigations, while adults dominated the literature (Pottier et al., 2025). Strikingly, this bias was consistent across the three example journals examined, across taxa, physiological traits, and environmental stressors. Across all the taxonomic groups extracted, amphibians were the least studied group (Fig. 1A), despite their exceptional vulnerability to climate change and environmental stressors.

This underrepresentation matters because sensitivity to environmental stressors often differs across life stages (e.g. Fig. 1B). Embryos, with limited capacity for behavioural and physiological thermoregulation and heightened vulnerability to desiccation and pollutants, may face the most severe risks under climate warming, altered rainfall, or degraded water quality (Ruthsatz et al., 2022). Early exposures can also create long-lasting "carry-over effects," shaping later performance, survival, and reproductive success (Wu et al., 2025). By neglecting these stages, we risk overlooking critical demographic bottlenecks and misjudging conservation priorities, such as determining which life stage is appropriate for translocation or release during specific months of the year to maximise survival.

Encouragingly, new methodological advances such as modified instruments (Cowan et al., 2023), non-invasive

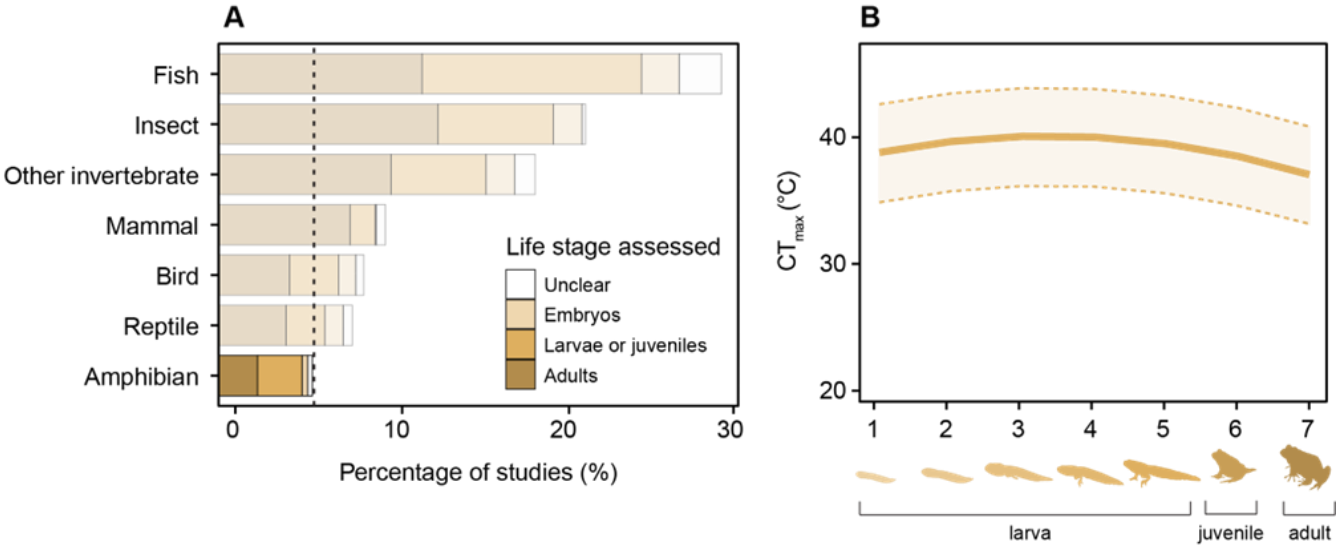

Figure 1: Differences in (A) the relative proportion of life stages assessed by taxonomic group and (B) the predicted critical thermal maximum (CT_{max}) across different amphibian life stages from stage 1 (post-hatch) to stage 7 (adults). Figure 1A was modified from Pottier et al., 2025, and Figure 1B was modified from Kong and Wu 2025.

stress assays (Ruthsatz et al., 2023), and molecular tools (Somero et al., 2010) are making it more feasible to study small and fragile life stages. In addition, embryos often fall outside the strictest ethical regulations governing animal research, offering a unique opportunity to expand life-stage inclusive studies without compromising welfare.

Moving forward, we highlight five areas that urgently needs attention for amphibian conservation:

1- *Life-stage inclusive studies*. Experiments spanning embryos, larvae, and adults are required to identify critical windows of vulnerability and resilience.
2- *Standardised protocols*. Shared methods for studying embryonic physiology will help to improve comparability and reproducibility.
3- *Integration of carry-over effects*. Tracking and documenting individuals across development is important to uncover how early experiences shape long-term outcomes.
4- *Improved reporting*. Clearer descriptions of which life stages are studied, which was a major problem in the literature. Around 6% of amphibian studies failed to specify life stages (Pottier et al., 2025).
5- *Targeted funding*. Support for work on amphibians and their early life stages, such as the non-mobile embryo stage, which remain among the least studied taxa in conservation physiology.

Amphibians' complex life cycles mean that neglecting any stage paints an incomplete picture of their vulnerability. To conserve amphibians effectively, we must embrace the full arc of their development. Closing this life-stage gap will improve our predictions of population persistence, strengthen management strategies, and ensure that amphibians have a fighting chance in the Anthropocene.

Acknowledgments
This article was adapted from Pottier et al. (2025)

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A decade of conservation actions to ensure the recovery of the Valcheta frog, *Pleurodema somuncurense*

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Webinar held 29th August 2025

For the past decade, we have led a comprehensive effort to secure the survival of the Valcheta frog, *Pleurodema somuncurense*, a Critically Endangered amphibian restricted to a single stream system in Patagonia, Argentina. Considered one of the most priority species worldwide based on the EDGE rank, the Valcheta frog, was on the brink of extinction due to habitat fragmentation and invasive predators. In 2012 we started a long-term project framed on classical conservation cycle, focused on the recovery of this species. This project integrated science, management, and community action. We worked in close partnerships with local communities, government agencies, and international conservation organisations like the ASG, the AArK and the ASA. Key achievements include a significant increase in scientific knowledge related to this species ecology and effect of main threats. The establishment of the first ex situ amphibian conservation centre in Argentina, which provides a genetic and demographic safeguard for the species. In situ, we have restored critical habitats through exclusion of livestock and vegetation recovery. A successful reintroduction program allowed us reestablished extinct local populations in these sanctuaries. Also, the removal of invasive fish and the construction of barriers to prevent reinvasion allowed the reconnection of these populations. Long-term monitoring and advanced genetic studies will continue informing adaptive management, ensuring viable populations are maintained. We achieved an increase of almost 15% of the whole population of the Valcheta frog to date and the effective protection of a large area by the establishment of a protected area. However, we are more ambitious, we expect to increase the range of the frogs by 100% by 2030 and to secure at least 85% of their key habitats. This ten-year journey demonstrates that sustained, science-based and collaborative conservation can reverse declines and offer hope for the future of one of Patagonia's most unique amphibians.

Leapfrog into sustainable nature tourism for advocacy of conservation: the story of Anurans (frogs and toads) Tourism

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Webinar held 9th September 2025

Unorthodoxy in contemporary public advocacy for conservation of anurans (frogs and toads) is aptly highlighted in the creation and progression of Anurans Tourism. Anurans Tourism, initiated by the presenter for Sabah, Malaysian Borneo, since 2003, represents a nature-based tourism product that harnesses the diversity and natural history knowledge of anurans to generate uniquely captivating and enriching experiences for tourists (and even local tour operators), directed towards augmented anuran conservation and nature appreciation actionability. The journey of Anurans Tourism spearheaded by the presenter as a Lecturer/Researcher in Batrachology at the Institute for Tropical Biology and Conservation (ITBC), Universiti Malaysia Sabah began with the establishment of the ITBC Frog Museum, that has been incorporated into the present Galeri BORNEENSIS, and significantly followed by acknowledgement of anurans as a nature tourism eco-treasure by Sabah Tourism Board in its pertinent official infographic. Besides tapping into the rich diversity of nearly 120 anuran species representing 7 families and more than 30 genera in Sabah, the potential of Anurans Tourism is rooted in a Nature Tourism Product Prospecting Model of 7 criteria, namely endemism, rarity, reliability of sightings, morphological enticement, behavioural attraction, safety, and linkage to local cultures. Anuran endemism in Sabah is 17-20% with rare species exemplified by *Gastrophrynoides borneensis* (long-snouted frog) and species exhibiting enticing behaviours such as *Kalophrynus heterochirus* (variable sticky frog) that does 13-second handstand in its defence mechanism. Subsequently, Anurans Tourism has been modularised for tourist guide licensing and refresher training courses in Sabah for the last 2 decades. Anurans Tourism concept also has been crystallised into actual facilities, for instance the Tabin’s Frog Home in Tabin Wildlife Resort within Tabin Wildlife Reserve, Lahad Datu, Sabah. Request for internal Anurans Tourism training programmes for in-house staff of premium nature tourism venues sustains, i.e., at Borneo Rainforest Lodge within Danum Valley Conservation Area, Lahad Datu, Sabah, besides Tabin Wildlife Resort. Similar requests for related international events are prevalent too, e.g., International Bornean Frog Races by Institute of Biodiversity and Environmental Conservation, Universiti Malaysia Sarawak. Due to fervent emphasis on carrying capacity and conservation adherence in its concept and communication programmes, Anurans Tourism fulfils the aspiration of sustainable and responsible tourism as stipulated under Sustainable Development Goal (SDG) 8: Decent Work and Economic Growth and 9: Promote Beneficial and Sustainable Tourism. Anurans Tourism is more than a mere branding of nature tourism in Sabah and Borneo, but holds the key to enhanced advocacy for anuran conservation via pragmatic interest and wider buy-in among the communities and industries locally, regionally and globally.

Tips for Applying for a Whitley Award

Lisa Wheeler [1]

[1] Whitley Fund of Nature.

Webinar held 14th October 2025

Join Whitley Fund for Nature's Head of Grants, Lisa Wheeler, as she highlights WFN's flagship Whitley Awards. The Awards seek to find, fund and bolster grassroots leaders from the Global South who are leading locally-led conservation projects. We want to attract applications from leaders working in locations and on topics where funds are hardest to raise, most needed, and have the largest conservation impact. In this webinar, Lisa will go through what the Whitley Awards are, who is eligible to apply, and what projects WFN seeks to fund. She'll also be giving her top tips to writing a strong grant funding application and answering questions from the group. Suitable for anyone writing funding proposals or those interested in applying for a Whitley Award.

A high-quality pond creation programme for great crested newt (*Triturus cristatus*) in England: the NatureSpace compensation schemes

Chris Worgan [1]

[1] Newt Conservation Partnership.

Webinar held 28th October 2025

A presentation giving an overview of the work of the Newt Conservation Partnership, an organisation formed through partnership between two charities (Freshwater Habitats Trust and Amphibian and Reptile Conservation) as the delivery body for the NatureSpace compensation schemes for great crested newt (*Triturus cristatus*) in England. Working in collaboration with a range of landowners, compensation sites are chosen carefully to ensure ponds have a clean water source and the initial creation or restoration work is fully funded. Management agreements are secured and annual payments provided to landowners to ensure newt habitat can be maintained for at least 25 years. Chris explains the approach including best practice principles for practical delivery of the aquatic and terrestrial habitats. With 485 ponds delivered across 149 sites the talk covers examples of delivered and ongoing projects and some of the challenges overcome during project delivery. The NatureSpace compensation schemes also deliver an extensive monitoring programme including annual compliance checks. The results demonstrate how the creation and restoration of high-quality habitat can deliver

measurable conservation benefits while enabling sustainable development.

The true conservation status of Bilbo's rain frog (*Breviceps bagginsi*): consequences or a species worth saving?

Tiaan Botha [1,2]

[1] Affiliation1North-West University,
[2] ASA Future Leader of Amphibian Conservation.

Webinar held 22nd November 2025

Breviceps is a group of cryptic fossorial frogs, widely distributed throughout sub-Saharan Africa and endemic to the region. Twenty-one species of *Breviceps* are currently known, of which 13 are endemic to South Africa. Allopatric isolation of *Breviceps* spp. in KwaZulu-Natal suggests that undescribed members of this genus may be more restricted in geographical ranges than initially thought, with cryptic taxa likely still to be discovered; taxa previously thought to be hybrids of already known species. Confusion regarding species boundaries within the genus arose due to the lack of genetic evidence to support morphological and/or acoustic differences between geographically isolated populations that share similar biogeographic niches. As such, the recent inclusion of molecular biology into species description of *Breviceps* members has shed light on conservation concerns of species previously thought to be widely distributed. Recently, the separation of Boston's rain frog (*Breviceps batrachophiliorum*) from Bilbo's rain frog (*Breviceps bagginsi*) has resulted in a reduction in range size for both of these species. *Breviceps bagginsi* is now known to occupy an area of less than 20 km in diameter and is considered Critically Endangered. This webinar will discuss the true conservation status of *B. bagginsi*, what is needed to save this dying species, and where to go from here.

The Amphibian Conservation Fund of Stiftung Artenschutz

Tobias Kohl[1]

[1] Stiftung Artenschutz, Species Conservation Foundation, Berlin, Germany.

Webinar held 25th July 2025

Hannah Pam photographing *Sclerophrys maculata* © Amaël Borzée