amphibian ark

Rescuing amphibians in crisis

Newsletter
No. 67, September 2024
ISSN 2640-4141

In this issue...

Above: A newly discovered mossy frog species in Vietnam highlights the need for *in situ* and *ex situ* conservation for the genus (pgs. 9-10).
Below: AArk conducts CNAs on 98 threatened amphibian species from Guatemala, many of which are salamander species (pgs 2-3).

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AArk conducts Conservation Needs Assessments for Guatemalan amphibians

Luis Carrillo | Training Director, Amphibian Ark

According to the International Union for Conservation of Nature (IUCN), 162 amphibian species have been described in Guatemala; unfortunately, 60% of these are threatened (about 20% more than the global average), which means Guatemala is in second place for the most threatened number of species in the Neotropics. Unfortunately, two species are already considered extinct in the country: *Craugastor myllomyllon* and *Pseudoeurycea exspectata.* Many others have not been seen since the 1980s.

The Conservation Needs Assessment (CNA) process developed by AArk uses expert knowledge of species to determine which need the most urgent conservation needs. This provides a basis for the development of holistic conservation action plans, which include *ex situ* actions, as appropriate.

Between July 1-3 of this year, a group of Guatemalan amphibian experts met to carry out Conservation Needs Assessments for the 98 threatened species in Guatemala, facilitated by Luis Carrillo, Amphibian Ark's Training Director. Ideally, an *ex situ* initiative should be temporary in nature and viewed as only one of the tools that can assist in the overall conservation of a species. It therefore follows that strong links between *ex situ* and *in situ* components are critical to the long-term success of species conservation.

The following species were identified by the CNA tool as needing *ex situ* rescue (with enough wild founders and habitat for reintroduction):

Species	Distribution	Protected area
Craugastor inachus	From the middle of the Motagua Valley and associated areas in central and eastern Guatemala.	Reserva Privada Heloderma para la Conservación del Bosque Seco
Bolitoglossa daryorum	Endemic to the Sierra de las Minas in Guatemala.	Reserva de la Biosfera Sierra de las Minas y Refugio Universitario Mario Dary Rivera para la conservación del Quetzal
Bolitoglossa engelhardti	From the southeastern tip of Chiapas, Mexico, along the Pacific slope to Volcano Atitlán, southwest of Guatemala.	Parque Regional Municipal San Rafael Pie de La Cuesta
Bolitoglossa flavimembris	Slopes of the Tacaná Volcano in Chiapas, Mexico, and in the mountains along the southwestern plateau of Guatemala (particularly the Atitlán, Tajumulco, and Tacana volcanoes).	Parque Regional Municipal San Rafael Pie de La Cuesta y Zonas de Veda Definitiva de los Volcanes Tajumulco y Lacandón
Bolitoglossa kaqchikelorum	Eastern end of the Guatemalan plateau, including the highlands bordering the western side of Guatemala City and near Antigua.	Reserva Forestal Protectora de Manantiales Cordillera Alux y Zona de Veda Definitiva del Volcán de Agua
Bradytriton silus	Vicinity of the type locality (Finca Chiblac), on the eastern slopes of the Sierra de los Cuchumatanes and Finca Ixcansan near Yalambojoch.	Reserva Natural Privada Yal Unin Yul Witz
Bolitoglossa franklini	In Guatemala, it has been recorded in the Tajumulco Volcano National Park and in the Quetzal San Marcos Refuge, Guatemala.	Reserva Natural Privada Estación Científica Refugio del Quetzal - Volcán Atitlán y Reserva Natural Privada Finca El Vergel
Bolitoglossa morio	Highlands of southwestern and southeastern Guatemala. It is known from much of the plateau region of Guatemala, from several of the Pacific volcanoes, and from the Las Nubes mountain block.	Reserva Natural Privada El Espinero
Bolitoglossa salvinii	Upper coastal plain on the Pacific slope of southern Guatemala.	Reserva Natural Privada Finca Patrocinio, El Palmar, Quetzaltenango y Reserva Natural Privada Oná, El Quetzal, San Marcos
Pseudoeurycea rex	Sierra de los Cuchumatanes and the southwestern highlands.	Bosque Regional Municipal Todos Santos, Cuchumantanes

Amphibian experts from Guatemala gathered to assess 98 threatened amphibian species through AArk's Conservation Needs Assessment process, lead by Luis Carrillo.

Some species, although not declared extinct, have not been seen in more than two decades.
This is likely due to habitat destruction or disease. We believe it is important to make a collective effort to find the species on this list and work together for their conservation:

Species	IUCN Status	Distribution	Not seen since
Ptychohyla dendrophasma	CR	Quebrada Sancapech, Finca San Francisco, Huehuetenango.	1998
Pseudoeurycea goebeli	CR	Volcán Tajomulco, San Marcos; Volcán Chicabal, Quetzaltenango ; Volcán de Agua, Sacatepéquez.	2005
Pseudoeurycea brunnata	CR	Volcán Chicabal, Quetzaltenango	1980s
Nototriton brodiei	EN	Sierra Caral, Izabal	2007
Incilius tacanensis	EN	Volcán Tacaná, San Marcos y Volcán Zunil, Quetzaltenango	1984
Dryophytes bocourti	CR	Zonas altas de Baja Verapaz y el sur de Alta Verapaz.	1990s
Cryptotriton nasalis	EN	Cerro Pozo de Agua, en la Sierra de Caral, Izabal	1990s
Craugastor trachydermus	CR	Sierra de Santa Cruz, Izabal	1989
Craugastor adamastus	CR	Sierra de las Minas, San Pedro Sacatepequez	1981
Bolitoglossa tzultacaj	CR	Vertiente sur de la Sierra de las Minas, cerca del cruce de los departamentos de Zacapa, Izabal y Alta Verapaz	1992
Bolitoglossa nussbaumi	CR	Todos Santos, Sierra de los Cuchumatanes, Huehuetenango	1998

The results of the workshop and the conservation actions generated for each species are the basis for developing a holistic conservation action plan for the threatened amphibian species of Guatemala.

Many of the threatened amphibian species in Guatemala are salamanders, including the Endangered Holy-mountain salamander, *Bolitoglossa heiroreias.* This species occurs in Chiquimula, Volcan Quetzaltepeque. Photo by Manuel Acevedo

AArk attends the World Congress of Herpetology in Malaysian Borneo

Jonathan Wilcken | Executive Director, Amphibian Ark

Amphibian Ark attended the 10th World Congress of Herpetology in early August, held in Kuching, Sarawak. This is the peak global forum that brings together the world's leading herpetologists to promote herpetological research, education and conservation. It occurs every 3-4 years.

This was a huge event, with over 1,000 delegates attending in person and several hundred delegates remotely. The Congress staged 15 parallel sessions throughout the week, allowing a sustained focus on key areas of specialization within such a broad field.

Sessions of particular importance for amphibian conservation included the 2nd Global Amphibian and Reptile Disease 2024 Conference. In fact, disease stalked many amphibian conservation discussions, usually constituting further bad news. There were, however, some positive notes. Alongside the most up-to-date news of disease occurrence and impact, there was also focus on results from experimental mitigation efforts. These ranged from targeted genetic interventions to develop Bd resistance in frog species, the potential for vaccination and strategies for managing chytridiomycosis *in situ*. Indeed, a Congress keynote address from Prof Matthew Gray (from the Centre for Wildlife Health at Tennessee University) reported early positive results on treatment options for reducing BSal loads in the environment. This research hinted, also, at the potential application also for Bd.

Climate change remained a recurring theme, with clear and disturbing evidence of impacts on amphibians, particularly on micro-endemics. Declining high altitude species and species with highly specialized plant associations are sounding early warnings of the pending impact of climate shifts in the years to come.

The Amphibian Survival Alliance ran a day-long session highlighting advances in amphibian biobanking and artificial reproduction technologies.

The Congress also provided an opportunity for a face-to-face meeting between the heads of Amphibian Ark, the Amphibian Survival Alliance and the IUCN SSC Amphibian Specialist Group, along with the ASG's Amphibian Red List Authority lead. This was the first such meeting in a number of years, with discussions setting the stage for more integrated planning between the three organizations, alongside the IUCN SSC Conservation Planning Specialist Group, leading to more effective, end-to-end amphibian conservation initiatives.

One of many presentations attended by over 1,000 delegates at the 10th World Congress of Herpetology in Malaysian Borneo.
Photo: Jonathan Wilcken

Passion from the next generation: Inspiring girls raise awareness and funds for AArk

Becca Brunner | Program Director, Amphibian Ark

Amphibian Ark has received almost $1,000 in donations thanks to the recent efforts of girls passionate about our cause. Read about two of the most inspiring efforts below. Thank you Samantha, Rigan, Raya, Olivia, and Leona! You give us hope for the future.

Samantha at her craft stand, where she raised awareness about amphibians and sold many of her creations, including plushies, keychains, and coloring books. She donated her sales to AArk.

From left to right: Leona, Olivia, Rigan, and Raya founded the The Axolotl Club for Ever (ACE) to research and discuss endangered amphibians. They recently held a bake sale to raise money and awareness for AArk.

Samantha has always wanted to be a scientist, from a paleontologist to a biologist to a naturalist. Now, at 11 years old, she is exploring becoming a herpetologist. Her love for amphibians started when she was nine and first researched axolotls. Once she discovered they were endangered in the wild, she devised the idea to create a craft stand to raise awareness and raise money for the Xochimilco wetlands that house the wild axolotls. Since then, her love for amphibians and their habitats has grown, especially for frogs. In her research, she realized frogs are very important because they can warn scientists about possible polluted or toxic habitats.

Earlier this year, she knew she wanted to create another craft stand, this time to raise awareness and money for frogs. She was looking for a non-profit organization that helped save amphibians, and luckily, she came across Amphibian Ark.

In early September, Samantha held her stand at a local farmer's market, raising awareness of the importance of amphibians and why they need help. Her craft stand featured homemade crafts that she spent all summer creating. She made plushies, bracelets featuring four species of poison dart frogs, an Alphabet coloring book highlighting an amphibian fact for each letter of the alphabet, keychains of frogs made of felt and hand-drawn stickers with frog puns.

Samantha hopes to create more products for a craft stand in a bigger market next year. She hopes that by spreading the word through crafts she can help the conservation of amphibians.

In 2023, Rigan, Raya, Olivia, and Leona founded ACE (Axolotl Club for Ever) in Calgary, Alberta, Canada. ACE was created out of their friendship and a shared love of animals, particularly axolotls. The girls usually meet weekly to research and discuss amphibians, and other animals or issues of interest. ACE members are very concerned about the critically endangered status of so many amphibians, including their beloved axolotls.

In early 2024, Rigan, Raya, Olivia, and Leona decided to hold a bake sale to raise funds for amphibian conservation. After weeks of careful research, they chose Amphibian Ark as their non-profit organization of choice. They appreciated the wealth of information available on Amphibian Ark's website about amphibians and conservation efforts, and felt that their fundraising efforts would help save amphibians at risk.

In August, 2024 they held their first fundraising bake sale. The girls made their lemonade, cookies, cupcakes, and Rice Krispy squares with a love of animals and a hope that their efforts would help. They advertised the sale around their neighborhood, and in addition to their treats, they educated all of their donors and neighbors about endangered amphibians.

With the success of their bake sale, Raya, Rigan, Leona, and Olivia now look forward to future efforts to continue helping amphibians and other animals at risk.

Conservation of *Telmatobius macrostomus*: Advances and challenges of an *ex situ* breeding center

Milagros Gertrudes Rojas Lock, Deysi Ricapa Morales, Kamila Solangel García Alvarado, Katherine Celica Taramona Zevallos | GRUPO RANA, Peru
Luis Castillo Roque | GRUPO RANA, Peru & Denver Zoological Foundation, USA
Henry Tinoco Vega & Roberto Elias Piperis | Denver Zoological Foundation, USA
Delcy Uscuchagua Carhuaricra | Caserío Oxapampa, Peru

***Telmatobius macrostomus* metamorph feeding on earthworms at the *ex situ* and conservation center in Peru.** Photo: Henry Tinoco

Telmatobius macrostomus, the giant frog of Lake Chinchaycocha, is a species of amphibian endemic to the Junín and Pasco regions in central Peru, with completely aquatic habits (Alzamora, et al. 2020). This amphibian can be found in the central Andes, but most are found in the Junín National Reserve, a natural area protected by the Peruvian State for its ecosystem services. However, *T. macrostomus* faces several threats such as the degradation and loss of its habitat, the introduction of invasive rainbow trout, wildlife trafficking for consumption and sale as traditional medicine, and water pollution in its habitat. This species has been categorized as Endangered by the IUCN and the Peruvian legislation (D.S. N°004-2014-MINAGRI).

In the mid-20th century, about 120 frogs were captured by rural communities per day, since it was considered a highly valued economic resource; however, around 1996, the capture decreased considerably to 32 frogs per day (Camacho, 2021). Between 2022 and 2023, the annual census of high Andean frogs was carried out, focusing on 15 localities located around the Junín National Reserve, the Huayllay National Sanctuary and the Chacamarca Historical Sanctuary. A density of one adult frog per and 25 tadpoles per 1000 m² has been estimated in 2022; the 2023 census found almost two frogs and more than 35 tadpoles per 1000 m².

In response to this problem, an *ex situ* breeding and conservation center for *T. macrostomus* began in 2022, using a low-cost, artisanal greenhouse-type structure. The goal of this project is repopulation and population reinforcement in the medium term, as well as potentially commercial use in the long term. This center, located in the community of Caserío de Oxapampa, Peru is the result of the collaboration between: Grupo RANA, Caserío de Oxapampa, Denver Zoological Foundation, Junín National Reserve, Amphibian Survival Alliance, Electroperú, and Amphibian Ark.

An *ex situ* program began on August 2, 2023, with the capture and transport of three tadpoles to the center. We monitored physicochemical and biological parameters, including ambient temperature, pH, dissolved oxygen, and dissolved oxygen saturation percentage. After 30 days, the collection of ammonium data corresponding to the decomposition of organic matter involving proteins and other nitrogenous organic compounds began (Williams et al., 1987). The tadpoles were physically evaluated (body size and weight, abnormalities) and aged according to Gosner stage.

During the rearing period, from August 2023 to June 2024, temperature ranges between 11.68 and 12.32 and ph between 8.13 to 8.23 were observed. At the beginning of the project, high temperatures were recorded inside the Center, which led to technical improvements in the facilities. The roof was modified by installing 0.50 mm x 0.50 mm rashell mesh; mesh was also placed on the windows to improve ventilation. These changes lowered the water temperature in the aquariums, creating a more suitable environment for the tadpoles.

Monitoring of the three tadpoles showed the following:

- Tadpole 1: Between August and December 2023, it showed a gradual decrease in weight and length, with a slight recovery in January 2024; Gosner developmental stage increased from 39 to 45 throughout the study period. In October, its oral disc became smaller and colorless. It eventually died.
- Tadpole 2: It showed a steady increase in weight and length throughout the study period; Gosner developmental stage increased from 33 to 38-39.
- Tadpole 3: It showed an irregular increase in weight and length, with a significant increase in January; Gosner developmental stage increased from 34 to 38-39.

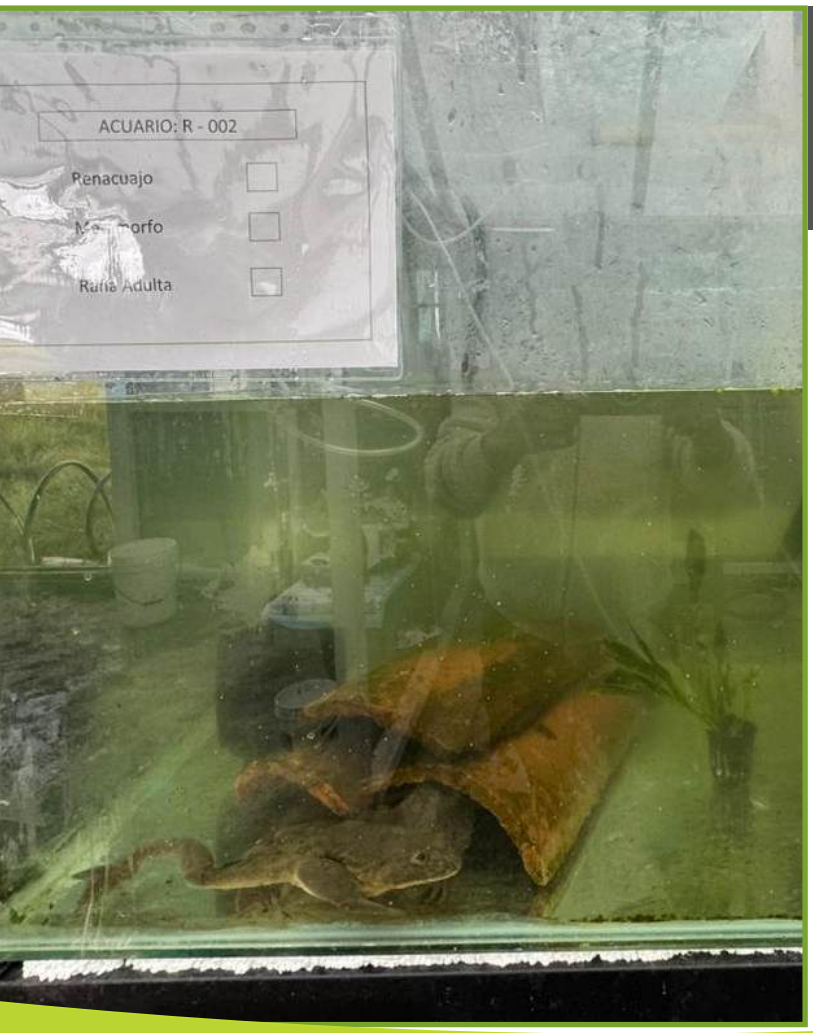
Frog Guardians from the Oxapampa Village and environmental advisor from the Denver Zoo Conservation Alliance participating in the monitoring of *T. macrostomus* aquariums in Pasco, Peru. Photo: GRUPO RANA

The tadpoles were fed mainly natural periphyton until November, when *Trachurus murphyi*, the Peruvian jack mackerel, was introduced to their diet. We then tried to feed them *Sarda chiliensis chiliensis*, the bonito fish, which was better accepted. This variation in diet resulted in a notable increase in weight in tadpole 2 and 3, but tadpole 1 decreased in weight and length probably because it was passing through the metamorphosis stage. The addition of jack mackerel to their diet proved to be effective for the development of the tadpoles, however an increase in organic matter and changes in ammonium levels were noted. Currently, the use of earthworms has been incorporated into the diet of the tadpoles.

Finally, thanks to a report from civil society in March 2024, the national police, SERFOR (National Forest and Wildlife Service), the Denver Zoo Foundation, and GRUPO RANA intervened in a case of illegal frog trafficking. The two confiscated frogs were brought into custody at the breeding center for rehabilitation. Currently, one of the confiscated frogs remains at the breeding center.

In 2024, three new aquariums were donated by the company Electroperú. In 2025, we hope to start a head-starting project. This center will not only serve as a place for environmental education, but also a tourist destination that complies with biosecurity and active participation standards.

We emphasize that the achievements and lessons learned are the result of the joint effort of the institutions and people involved. We especially appreciate the field work of Henry Tinoco, Katherin Taramona and Delcy Uscuchaguaa, whose commitment has been fundamental to the project.



Aquarium at the *Ex situ* Breeding and Conservation Center for the Giant Frog of Lake Chinchaycocha. This individual was rescued from an illegal trafficking attempt and brought to the center for rehabilitation. Photo: Henry Tinoco

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Opportunities with the Conservation Planning Specialist Group (CPSG)

Christina Dembiec | Training Program Officer, IUCN SCC CPSG

Amphibian Ark partners closely with the IUCN Species Survival Commission (SSC) Conservation Planning Specialist Group (CPSG), whose mission is to save threatened species by increasing the effectiveness of conservation efforts worldwide. For 40 years, CPSG has accomplished this by using scientifically sound, collaborative processes that bring together people with diverse perspectives and knowledge to catalyze positive conservation change. They provide species conservation planning expertise to governments, Specialist Groups, zoos and aquariums, and other wildlife organizations.

Check out the following opportunities through CPSG below:

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Check out the online training opportunities organized by CPSG to gain new tools for effectively developing and implementing species conservation plans. Courses include: Facilitating Species Conservation Planning Workshops, Wildlife Disease Risk Analysis, and *Ex Situ* Conservation Assessment. For more information and registration: www.cpsg.org/our-approach/training

Scholarship opportunity for Facilitating Species Conservation Planning Workshops (FSCPW) online course
Thanks to a generous IMLS grant, CPSG, in partnership with the Association of Zoos and Aquariums (AZA), have a limited number of full scholarships available for the FSCPW course. To qualify, learners must work for, or in partnership with, an AZA-accredited organization, or an AZA-affiliated conservation project or program, including conservation partners working in the field. For more information on the scholarship, or to see if you qualify, please contact christina@cpsg.org.

It's VIETNAMAZING: First successes in the EAZA conservation campaign for Vietnamese mossy frog species

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Thomas Ziegler | Cologne Zoo, Germany

The VIETNAMAZING conservation campaign 2024-2025 of the European Association of Zoos and Aquaria (EAZA) and its amphibian focus was already presented in detail in AArk Newsletter No. 64. Here we report on what has been achieved so far for mossy frogs (genus *Theloderma*), VIETNAMAZING's amphibian flagship species, along with the crocodile newts (genus *Tylototriton*).

Mossy frogs are one of the most diverse treefrog groups, with 30 recognized species. They are known for their cryptic diversity; many species were described only recently (Ninh et al. 2024). The name "mossy frog" comes from the fact that some species imitate plant material (moss or bark) or even bird droppings. They are found from northeastern India and southern China through Southeast Asia to the Greater Sunda Islands, with the greatest species richness found in the Indochinese region. With 17 species, Vietnam has more mossy frogs than any other country.

Ryabov's bug-eyed frog (*Theloderma ryabovi*), an Endangered mossy frog found in the Central Highlands of Vietnam. Photo: T.T. Nguyen

Mossy frogs currently face significant threats. According to the IUCN Red List, 24 *Theloderma* species have a declining population status, with five of them - all found in Vietnam – officially listed as threatened: three as Endangered (*T. nebulosum*, *T. palliatum* and *T. ryabovi*), and two as Vulnerable (*T. auratum*, *T. petilum*). Further research on actual distribution, population size, and threats to primarily micro-endemic species needs to be undertaken in the field, and with this knowledge, next steps and further conservation measures can then be planned. Conservation efforts can include official protection statutes, expansion or establishment of protected areas, and, if necessary, parallel *ex situ* conservation by local initiatives. Integrative taxonomic research should also be prioritized to determine the true extent of species richness.

In the study by Krzikowski et al. (2022), which focused on the gaps in amphibian species conservation in Vietnam, the Central Highlands of Vietnam was clearly shown as a center of amphibian endemism with 26 amphibian species endemic to this region. The Endangered Ryabov's bug-eyed frog (*Theloderma ryabovi*), stands out as needing research, since no assessment of its conservation status and ecology has been conducted since its discovery 18 years ago (Orlov et al. 2006).

Thus, on behalf of VIETNAMAZING and Stiftung Artenschutz, the team led by Prof. Dr. Tao T. Nguyen and Dr. Hoa T. Ninh from the Institute of Genome Research in Hanoi set off for Kon Plong District in Kon Tum Province, the region from which the species was originally described, to find out more about it for improved species conservation. Interviews were conducted with local people and, of course, field research was carried out. Although they did not locate the frog on their first expedition in April 2024, the second trip in July 2024 was successful. The first individuals were found and preliminary data on ecology, population and threats were collected.

It appears that Ryabov's bug-eyed frog is not particularly common. Threats include deforestation and habitat fragmentation, agricultural development, road construction, and overcollection for food, medicine, and the illegal pet trade.

The recently discovered Wolter's mossy frog (*Theloderma woltersi*) highlights the need for amphibian conservation in Vietnam.
Photo: T.T. Nguyen

In order to establish an *ex situ* insurance population, a few individuals were transferred to the Me Linh Station for Biodiversity. The Vietnamese mossy frog (*T. corticale*) has been successfully kept and bred there for years and we hope to achieve similar success with *T. ryabovi* soon to establish a conservation breeding program, with the intention of eventually returning them to the wild.

Another aim of the Vitenamazing campaign was to better understand mossy frog diversity in the country, because you can only protect what you know. And indeed, the integrative taxonomic research in the working group of Prof. Dr. Tao T. Nguyen, again together with Dr. Hoa Thi Ninh and other international co-authors, has led to the discovery of a new *Theloderma* species, *T. woltersi*, which brings the total number of amphibians known from Vietnam to 287 (Frost, 2024). The new species was named after the late Jürgen Wolters, founding member of Stiftung Artenschutz, which has been supporting amphibian research through its specialised amphibian program for over 15 years.

Knowledge of species boundaries is important, as is the description of previously unrecorded species, because if species believed to be widespread turn out to be a complex of species, this also has an impact on species conservation. Instead of one widespread species, two or more species with a smaller distribution must inevitably have a smaller occurrence and population size, which also makes them more susceptible to disturbance and, in the worst case, extinction. This knowledge is not only important for effective *in situ* species protection, but also for proper conservation breeding.

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Amphibian Ark Donors, January-August 31 2024

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

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Luca Cassetta
Richard Cissel, in memory of Katie's mom
Diana Hassel, in memory of Julie Gionfriddo
Heiko Janssen
Christopher Laker
Ruby Mitchell
Taj Mumma
Marjan Navidpour
Taylor Nixon
Isabella Padron
Amanda Restell Mand
James Rook
John Szymendera
Mike Tong
Paul White

Up to $10

Alexa Bangert
Alexis Campisi
Eithan Dudnik
Kane Hutchinson
Jennifer Irish
Laura Jaenicke
Aiden Nixon
Ezra Nutt
Michal Zakrzewski