

Plant News

Celebrating an “Extinct in the Wild” Waterlily Rescue in Rwanda

By Michael B. Thomas, Pascal Sibomana, and Bonny Dumbo

In the heart of Africa lies a landscape so enchanting, it seems painted by the hand of a master artist. Rwanda, a land of contrasts and captivating biodiversity, unfolds like a breathtaking tapestry of tropical landscape draped in forest green. Verdant tropical forests teem with an abundance of wildlife including the mountain gorilla and chimpanzees. Their ancient canopies whispering tales of resilience and harmony.

Rivers cascade down rocky slopes, their waterfalls creating melodious songs echoing through the fertile valleys. Towering dormant volcanoes of the Virunga range punctuate the horizon, their rugged silhouettes standing as silent sentinels over the land. Other landscapes host unique ecosystems such as hot springs, known as mashyuza in Kinyarwanda—the national language. It is places like this where biological worlds collide to create extremophiles, organisms that are able to live in extreme environments with conditions approaching or expanding the limits of what known life can adapt to, such as extreme temperature.

Amidst this picturesque biodiversity and tranquility lies a new story of profound resilience and rebirth. For it was in a remote wetland adjacent to a geothermal ecosystem that in the summer of 2023, our small international species recovery team, celebrated the rescue of a wild population of the extinct miniature waterlily—*Nymphaea thermarum*. Working alongside local villagers, we spent two days exploring to relocate a population thriving within the outflow of the geothermal spring. Often, individual plants were not fully immersed in water. Through informal discussions with local farmers, they provided several local names for *N. thermarum* including amarebe, imposha, and gutwikumwe. We also recorded its use medicinally and as an edible plant sometimes also incidentally collected to feed livestock.

Documented to be “Extinct in the Wild” since about 2008, it was believed to only survive in cultivation outside of Rwanda. In the past, it has been popularized as the world’s smallest waterlily flower with leaves as small as 1 cm in size, with tiny 1 cm white flowers and as many as 16 bright yellow stamens. Fruit are up to 1–1.5 cm in diameter and contains as many as 200 seeds. This wetland species was known previously from only a single site in the Western Province. Following the watershed rediscovery, we have



Figure 1. *Nymphaea thermarum*. Photo: Michael B. Thomas.

since learned that at least since 2015, there have been indistinct observations and photographs made through botanical survey work in the area by several Rwanda biologists (REMA, 2015). These occurrences were not widely proclaimed due in part to concerns over the past history of parachute science and the lack of inclusivity without appropriately acknowledging the importance of the local research infrastructure and expertise.

Additionally, there were concerns of potential exploitation through unofficial research by foreign scientists, illegal collecting, as well as the strong desire to conserve the tiny population and prohibit potential disturbance.

Our rediscovery was officially recognized by the Rwanda Environment Management Authority (REMA), and a formal press release was published on August 25, 2023 alongside the launch of an online fundraising campaign (CoEB, 2023).

Threatened Habitat

The hot springs of Rwanda are well-known for healing effects since ancient times. As a consequence the water is often collected to be used for improving health. Today, the hot spring serves as a gathering place for personal healing and improving one’s healthcare. Local residents believe that the healing waters from thermal springs cures illnesses like skin rashes, cuts, wounds, joint pains, and headaches. Even today, the story of the tradition of its magical healing waters persists with the new generation. Today, the hot spring ecosystem remains utilized by local villagers for recreation, tourism, and healing practices. As a result, we are currently working to engage these stakeholders as con-

servation stewards. In this way, they may assist in promoting site protection measures and restoration efforts of *N. thermarum* and its unique habitat.

Unfortunately, the waterlily's wetland environment is presently undergoing rapid transformation by conversion to swidden agriculture by farmers who are farming the land cultivating numerous cash crops including tomato, cassava, beet root, amaranth, pineapple, colocasia, and several tree crops such as mango, avocado, papaya, macadamia, and oil palm. Farmers informed us that agricultural activity including fish pond construction has steadily increased over the last decade. More recently, some landowners are planning to possibly benefit from selling their land to the neighboring Cimerwa Cement factory, which is reported to be interested in expanding its local limestone quarry operation. Although, this extractive industry is aiding Rwandans with much-needed job creation and the locally produced cement is reducing the reliance on imports and expanding the market in the neighboring countries, it probably poses the greatest immediate threat to *N. thermarum*.

Historic Species Discovery

The waterlily's original story actually begins some 35 years ago, when in 1987 during plant research on the vegetation of the Albertine Rift in Rwanda, a foreign scientist incidentally came across the small waterlily growing in a hot spring. Following close examination, it became quickly apparent that a new species of *Nymphaea* had been identified, one of about 11 species distributed in Africa, which was subsequently described in a publication (Fischer, 1988). This particular species was unique as it was found in very close proximity to hot water flowing out of the hot spring. However, today, following its most recent distribution in its native habitat, the specific epithet, *thermarum*, could be construed as somewhat misleading as the current population thrives quite a distance in cooler less than 75°F/24°C waters in contrast to the source of the hot spring's 95°F/35°C water.

After the discovery, several of the hot springs in the Albertine Rift from Lake Albert (D.R. Congo/Uganda) to Lake Edward (D.R. Congo/Uganda), Lake Kivu (D.R. Congo/Rwanda) and Lake Tanganyika (D.R. Congo/Burundi/Tanzania) were visited between 1988 and 2005 to search for *Nymphaea thermarum* (Fischer and Magdalena-Rodriguez, 2011). However, no other population was ever discovered and the species was assessed to be endemic to Rwanda. By 2000, it was believed that the original population might have been destroyed due to a canalization of the wetland. In 2009, the course of a major stream was altered, increasingly affecting the landscape. Thus, foreign scientists came to be-



Figure 2. Left, Bonny Dumbo pressing a *N. thermarum* specimen Right, *N. thermarum* specimen. Photos by Michael B. Thomas.

lieve that the original habitat of *Nymphaea thermarum* had dried out resulting in the extinction event of the species. By 2010, the IUCN listed it as extinct in the wild (Fischer et al., 2019).

However, in speaking with local villagers last summer, their narrative was a stark contrast to the biological extinction assessment, where they informed us—"the plant has always been present in the area—since time immemorial." The truth probably lies somewhere in between these differing points of view. Whereas, it is likely some individuals may have disappeared from the landscape during periods of intensified agriculture while some persisted along the streams and in ponds. In some instances, we witnessed individual plants appearing to benefit from the swidden agriculture through the creation of favorable micro-habitats.

In the years that followed its original species description, the species became formally accessioned and conserved in numerous ex situ botanical garden collections outside of Rwanda. Wild harvested seed was first introduced to Germany, then both seed and plant material were exchanged throughout Europe including the Royal Botanic Gardens, Kew in England and some of the leading botanical institutions in the United States including Harvard University's Arnold Arboretum, the New York Botanical Garden, and the Missouri Botanical Garden. These exchanges were often through planned material transfers within the International Plant Exchange Network. However, sometimes undocumented collegial gift transfers have also occurred as the species has proven to be challenging to cultivate and flower as a self-pollinating species.

Regrettably, after nearly 40 years of ex situ conservation, all 23 institutions we contacted neglected to repatriate either seed or live plants back to Rwanda. The gardens were more often focused on highlighting the *N. thermarum*



Figure 2. *Nymphaea thermarum* observed in the wetland area.
Photos by Michael B. Thomas.

as an extinction crisis case study and focused on public educational horticultural displays or botanical research. Fortunately, there is now a renewed interest in restoring Rwanda's unique waterlily (Kuteesa, 2023).

Successful Ex Situ Conservation in Rwanda

Following the relocation of a wild population in the summer of 2023, we collected seeds and initiated a propagation and cultivation program. The propagated *Nymphaea thermarum* seeds successfully germinated and we currently have cultivated hundreds of ex situ seedlings since September 2023 (Sibomana and Thomas, 2023). The successful cultivation in Rwanda of *N. thermarum* demonstrates for the first time the potential for ex situ plant species conservation within Rwanda. This success provides a practical foundation for establishing a cultivation center for future reintroductions of the species. We are now moving forward with a Master's thesis research at the University of Rwanda and collaboration with the Royal Rotterdam Zoological and

Botanical Gardens along with collaboration with a student intern from Erasmus University Rotterdam. This collaboration will include conducting a comprehensive studies of its reproductive biology, physiological ecology, medicinal uses, and ecology.

Species Recovery Plan and Future Conservation Efforts

Currently, we are developing a model species recovery plan. Lessons learned from collaborators at Harvard University's Arnold Arboretum are guiding the techniques for large-scale propagation. Although *N. thermarum* remains categorized as Extinct in the Wild on the IUCN Red List, a reassessment will shortly update this listing conservatively to a Critically Endangered (CE) status. Recent surveys have established a much wider distribution than previously documented.

Critical Infrastructure Needs

The development of a modern plant propagation and conservation facility dedicated for endangered species conservation is lacking in Rwanda. We are in need of additional support through increased funding to continue to develop infrastructure and research capacity. *N. thermarum* is just one of more than 50 endangered or threatened plant species we plan to target in the future. If you are interested in support our initiative, please visit our GoFundMe campaign—Save the Rwandan Waterlily from Extinction (<https://www.gofundme.com/f/sav-rwanda-water-lily-from-extinction>).

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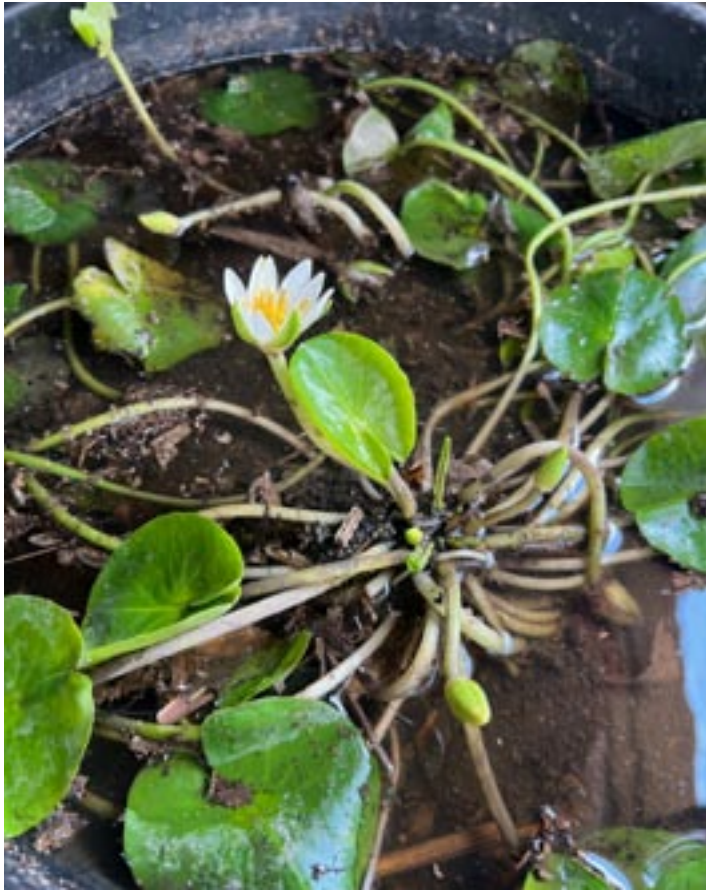


Figure 3. Live specimen of *N. thermarum* for ex situ conservation and seed source. Photo by Michael B. Thomas.

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About the Authors

Bonny Dumbo Bosilana is a Congolese botanist who holds a degree in Biology. He began his career more than 25 years ago at Centre de Recherche en Science Naturelles (CRSN, Lwiro, D.R. Congo) and has served as a consultant for numerous botanical projects throughout Central and East Africa.

Pascal Sibomana is a graduate student in the Biodiversity Conservation and Natural Resource Management program, University of Rwanda at Huye. He works at the National Herbarium of Rwanda as an Associate Herbarium Collections Manager. He completed a BSc. degree in Conservation Biology in 2019 from the University of Rwanda. He has been documenting plant diversity in the past few years within Nyungwe National Park and other protected areas.

Dr. Michael Thomas is a botanist with over 25 years of professional museum curatorial and conservation experience on the assessment, preservation, redevelopment, and digitization of natural history specimens, primarily herbaria. He currently serves as Curator of the National Herbarium of Rwanda at the University of Rwanda. As a professional curator with a background in botany, Michael has focused on curating botanical and biocultural specimens. He has become a well-regarded regional and international expert on the diverse issues pertaining to herbaria and museum specimen management. He has worked and traveled in Africa working with development projects in Egypt, Ghana, Malawi, Namibia, and South Africa.

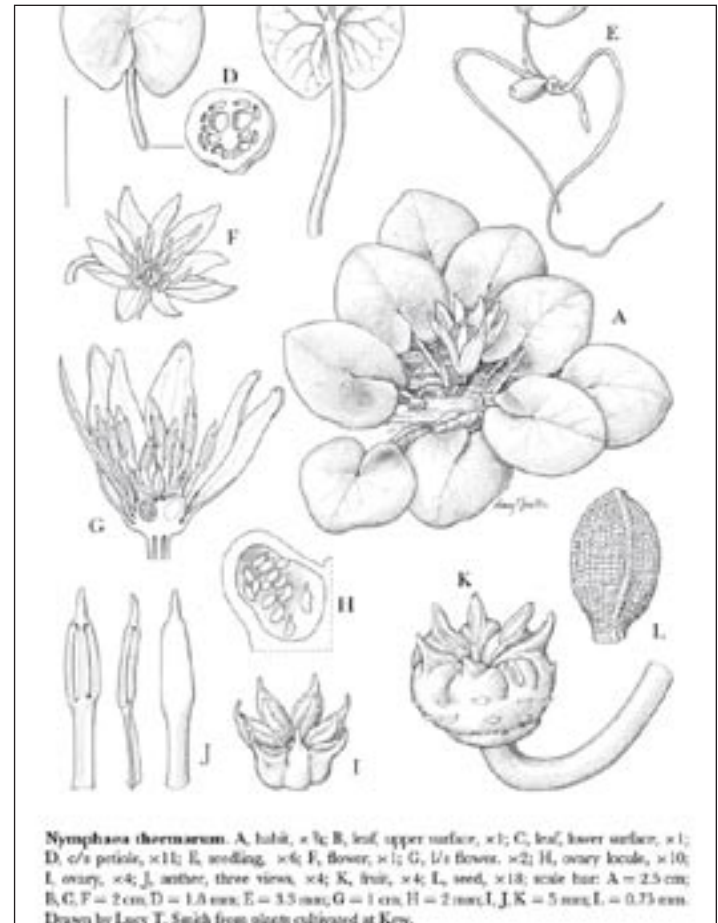


Figure 4. Illustration by Lucy T. Smith (Fischer and Magdalena-Rodriguez, 2010).