Utricularia nelumbifolia Gardn. At Last!

Fernando Rivadavia • Rua Inacio Pedroso 230 • Sao Paulo, S.P. 05612-050 • Brazil • fe_riva@uol.com.br

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Utricularia nelumbifolia Gardn. is one of the largest species in the genus. It is closely related to the other large species *U. reniformis* St.Hil. and *U. humboldtii* Schomb.—they are all from section *Iperua* P. Taylor. These three species are the only ones known to grow inside the water-filled leaf axils of bromeliads. While *U. nelumbifolia* thrives exclusively inside bromeliads, *U. reniformis* is mostly a terrestrial and is only very rarely found growing among the dead leaves at the base of bromeliads. *U. humboldtii* is most often found in bromeliads, but can also be observed in boggy soils surrounding the host bromeliads, and occasionally even inside pitchers of *Heliamphora*.

Although widespread on highlands of eastern Brazil (Taylor, 1989), *U. nelumbifolia* is elusive and it took me many years of intense searching before I finally found it in early 1996. For a while I even doubted it existed at all, thinking it was an artifact, the result of a few mutant leaves of *U. reniformis* growing in an exceptional habitat inside bromeliads. Ironically, I saw my first live *U. nelumbifolia* in December 1995, growing inside bromeliads cultivated at the Rio de Janeiro Botanic Garden. Although overwhelmingly happy to finally see *U. nelumbifolia* alive, I was nonetheless frustrated that they were in cultivation and in such poor health, barely alive in the hot coastal plains after having accidentally hitchhiked from their highland habitats along with their host bromeliads when these were collected.

In February/March 1996 I drove approximately 3400km all around southeastern Brazil, during a ten-day carnivorous plant marathon with two friends: Fábio Pinheiro from São Paulo, Brazil, and Joe Mullins, visiting from Ireland. While exploring highlands in eastern Minas Gerais state, we were lucky to meet Lúcio Leoni, who maintains an herbarium in the town of Carangola and knew much of the region's native flora. To our surprise, he knew a few carnivorous plant locations in the area, including a *U. nelumbifolia* population.

Lúcio took us to a beautiful mountaintop on the Serra da Araponga where we saw *Drosera villosa* St.Hil., *Genlisea lobata* Fromm-Trinta, and *U. longifolia* Gardn. This was a new recording for *G. lobata*, which until then was only known from the type location, the Serra do Caparaó, approximately 80 km to the northeast. Yet *U. longifolia* stole our attention from *G. lobata*. Not only was the whole grassy mountain top covered with millions of *U. longifolia* leaves, but there were also countless flower scapes. Each of these scapes was highly branched, with more flowers than I had ever seen on any other specimens of this species. But even more exciting was the fact that about half the *U. longifolia* lacked purple pigment and had white flowers! What a magnificent place that turned out to be!

On our way back to Carangola, Lúcio pointed to a group of mountains next to the terribly bumpy dirt road we were driving along. He claimed that the granite cliffs were absolutely covered with the bromeliad *Vriesia extensa* (L.B.Smith) J.R.Grant, and that these were in turn packed tight with *U. nelumbifolia*. We immediately decided to go there on the following day, of course!

We woke up early the next day to a beautiful cloudless morning, gobbled down

breakfast, and jumped into the car with all our gear. We could not wait to see *U. nelumbifolia*! After driving for about an hour (partly along a horrible dirt road full of holes and rocks which left numerous scrapes underneath my car), I parked at the entrance of a small ranch. We hiked up an increasingly steep hillside, passing through cow pastures, under barbed-wire fences, and over streams. At one point, stopping for a short rest, huffing and puffing with exhaustion, wiping the streams of sweat pouring down my forehead, I glanced upwards towards our destination. Squinting in the brightness of the daylight, I could see that the smooth rock face above us was polka-dotted with bromeliads by the thousands—no, millions! Would this be it? Would I finally see *U. nelumbifolia* in the wild?

That February 18 will forever remain deeply engraved in my mind as one of the most memorable days of my carnivorous plant travels, and I believe Fábio and Joe feel the same way. At about 1200m altitude, there was a brief transition between the short trees growing in brick-red lateritic soil and the bare rock surface covered with large bromeliads. The mountainside had an inclination of about 45 degrees at this point, but higher above the smooth rock curved upwards increasingly, becoming a vertical cliff. My lungs were burning, and I was getting more and more excited with each step. By the time I reached the transition zone, I felt like my heart was beating in my throat with the anticipation!

I stopped at the first bromeliad I came upon and began lifting up and looking under each of its long dark-green leaves in quick succession, like a monkey looking for ticks on its companion. Nothing. I went to the next bromeliad and proceeded to browse through it as well. Once again: nothing! I began to frantically walk from one bromeliad to another, sticking my face into each like a dog sniffing out other dogs. Joe and Fábio soon caught up with me and joined my frenzy. And still we could find no *U. nelumbifolia*! Starting to feel a terrible emptiness at the pit of my stomach, I continued moving slowly uphill, zigzagging from one bromeliad to another, my eyes radar dishes wandering from side to side.

Suddenly I spotted something and froze in mid-step. Was it wishful thinking or was that a circular leaf on a long petiole sticking out of a bromeliad? In silence, afraid to utter what I was already screaming in my mind, I cautiously approached the bromeliad in a few quick nervous jerks, kneeled down on the rock next to it as if in prayer. Was that truly a *U. nelumbifolia* leaf, or maybe a heat-induced hallucination? My hand unexpectedly acted on its own, zapping out and plucking the suspicious-looking leaf. A fraction of a second was enough to confirm that it was not a product of my imagination but truly a round peltate *Utricularia* leaf (see Figures 1, 2). I immediately shouted out to Joe and Fábio, "NE-LUM-BI-FO-LIAAAAA!!" They quickly clambered up the steep mountainside towards me as whoops of joy escaped my throat and I jumped up and down, commemorating. I could not believe that I had finally found *U. nelumbifolia* in nature after so many years!

As soon as the initial explosion of joy abated slightly, we continued exploring further uphill and kept on finding more and more *U. nelumbifolia*—there were tons of it! Some bromeliads were absolutely infested with this *Utricularia*, all the way from the outermost dead and deteriorated leaf axils right up to the central water tank. We were even fortunate enough to find a few open *U. nelumbifolia* flowers. The inflorescences were similar to those of *U. reniformis* in shape and size, reaching between 50 and 80cm in length (see Back Cover). The flowers were around 3-4 cm long and wide, colored in a beautiful bright pink-lilac with two vertical yellow stripes on an inflated bulge at the base of the lower lip, surrounded by a dark pink-purple patch. Strangely, none of the inflorescences showed any signs of ovaries swollen with seeds, nor of old spent seed capsules.

According to Taylor (1989), the traps of *U. nelumbifolia* are 1.5-2.5 mm long;

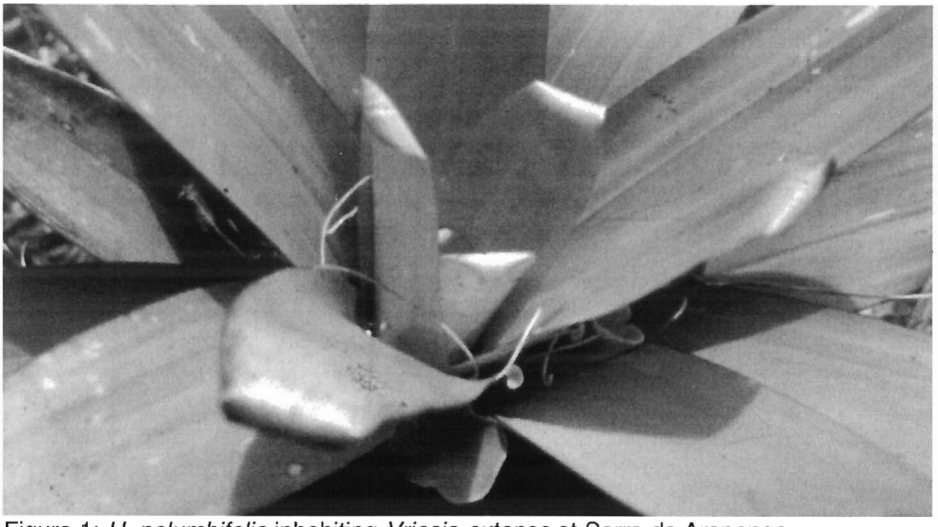


Figure 1: *U. nelumbifolia* inhabiting *Vriesia extensa* at Serra da Araponga.

larger than those of *U. reniformis* (0.7-1.5 mm), but tiny in comparison to those of *U. humboldtii* (5-12 mm). The leaf petioles of *U. nelumbifolia* may reach 45 cm in length and the peltate circular lamina may be up to 10 cm in diameter (Taylor, 1989). Most of the *U. nelumbifolia* leaves arise from stolons tightly packed within the bromeliad leaf axils, but we found occasional small (often reniform) leaves with short petioles on the so-called "aerial" stolons.

Aerial stolons are probably the most amazing feature of *U. nelumbifolia*. These organs are also present in *U. humboldtii* and are a fantastic adaptation to life in bromeliads. I had the chance to study *U. humboldtii* in the wild between December 1998 and January 1999 while botanizing Mt. Neblina, on the Brazil-Venezuela border and made some interesting comparisons with *U. nelumbifolia*.

Typical mature stolons of *U. nelumbifolia* and *U. humboldtii* are thick and white in color, although occasionally slightly greenish—possibly because some sunlight may get past the younger, translucent bromeliad leaves. Aerial stolons are atypical in that they are very thin and dark-green and most importantly because they initially grow vertically like a flower scape before suddenly curving back downwards into an inverted U-shape. If it encounters a bromeliad leaf axil on its descending route, the tip of the aerial stolon "germinates," branching numerous times just below the surface of the water.

In *U. nelumbifolia* these aerial stolons reach deep into the axils of the tightly-layered bromeliad leaves, like a grasping claw, acquiring thus a strong foothold (see Figure 2). At the Serra da Araponga we quickly discovered how well ensconced *U. nelumbifolia* was, as our initial attempts to obtain stolons from within the bromeliad leaf axils by pulling on the long petioles and aerial stolons of this *Utricularia* resulted only in broken bits and pieces of plant parts. Yet at Mt. Neblina it was quite the opposite—I had to be careful not to pull whole plants out of the bromeliads by yanking on a single leaf! I think this difference was mostly due to the different anatomy of the host *Brocchinia* species at Mt. Neblina which had more loose and open leaf rosettes.

As for the function of these aerial stolons, Taylor (1989) claims that they are a means of spreading from one bromeliad into another. But after studying both *U. nelumbifolia* and *U. humboldtii* in the wild and in cultivation, I have a different hypothesis based on the following four observations.



Figure 2: The outer leaves of *V. extensa* removed to reveal *U. nelumbifolia*.

1)Although aerial stolons may reach more than a meter in length (Taylor, 1989), I noticed that each one usually lands only 5-20cm away from where it originally emerged. Furthermore, I observed that the host bromeliads were usually located too far apart from each other to be within the reach of *U. nelumbifolia* aerial stolons arising from neighboring plants. Therefore the aerial stolons almost always grew out of and back into the same bromeliad.

2)Because the younger leaves of bromeliads stick out more horizontally than the older leaves (which are packed tightly around the base of the bromeliad), the aerial stolons of *U. nelumbifolia* and *U. humboldtii* mostly descend into the axils of younger leaves closer to the center of the bromeliad rosettes.

3)The water-tight seals between the leaves of each concentric ring in bromeliad rosettes are very smoothly-fit, possibly too perfect to allow the passage of the *Utricularia* stolons. If this is true, then the continuous growth of a host bromeliad would slowly but continuously push *U. nelumbifolia* or *U. humboldtii* outwards from the center, eventually leading it to certain death among the old bromeliad leaves as these dried and decomposed.

4)The aerial stolons of *U. nelumbifolia* and *U. humboldtii* appear to emerge most frequently from outermost leaf axils in a bromeliad rosette, where the water pools have already dried up or been squeezed out as the leaves become more tightly-packed.

Based on these observations, I believe that it is likely that the main function of the aerial stolons of *U. nelumbifolia* and *U. humboldtii* is not to colonize new bromeliads—which are usually too far away to be reached by the stolons—but rather is to continuously recolonize the central parts of the same host bromeliad. If the function of the aerial stolons was to colonize bromeliads other than the host, they would have to be able to reach father than they actually do. Based on my fourth observation above, I wonder if the production of aerial stolons is triggered by a lack-of-water-related stress?



Figure 3: Fruit and flowers of *U. nelumbifolia* at Serra dos Órgãos.

Anyway, back to the Serra da Araponga, where after a few hours of studying, photographing, herborizing, collecting, and simply drooling over *U. nelumbifolia*, we finally agreed to trudge back downhill towards the car. Our feet ached tremendously from the strain of attempting to keep our balance for so long on that steep diagonal incline where the bromeliads grew. The heat and intense sunlight on that treeless terrain had been a bit of a problem too, but I am sure it would have been much worse if it had rained. I would not like to find out how slippery that smooth bromeliad-covered rock surface becomes when wet!

We collected *U. nelumbifolia* stolons for cultivation, but we did not know if they would survive inside the species of bromeliads we had back home, and certainly did not know if they would accept a home of sphagnum moss. Therefore, we also lugged down the mountain two or three small—but heavy and cumbersome—specimens of the bromeliad *Vriesia extensa* which contained *U. nelumbifolia*. It was difficult to pry these bromeliads off the rock, they are more tightly rooted than may seem possible!

Surprisingly, *U. nelumbifolia* survived very well the following week or so, bouncing around in the hot and stuffy trunk of my car before we arrived back to São Paulo. We even found more *U. nelumbifolia* towards the end of that trip in a similar habitat at approximately 1100m of altitude the Serra dos Órgãos highlands in Rio de Janeiro state, where they grew in two different (but unidentified) species of bromeliads. I revisited this site in October 1999 and found several flowering specimens, including one which had six open flowers on a single scape! (See Figure 3)

I am now very happy to say that *U. nelumbifolia* is still thriving in cultivation, growing much better for us here in Brazil than *U. humboldtii* ever did. It is even being successfully cultivated outside bromeliads, in live *Sphagnum* moss, by my friend Marcelo Fontana. In fact Joe has helped us introduce *U. nelumbifolia* to cultivation in Europe and hopefully this wonderful species will soon be commonly traded among carnivorous plant growers.

Although *U. nelumbifolia* has flowered in cultivation several times here in São Paulo and produced plenty of seeds, these are unfortunately short-lived and very fragile. The seeds of *U. nelumbifolia* are small seedlings surrounded by a thin papery sheath, and are viable only while green, much like the seeds of *U. humboldtii* (see Front Cover). On contact with water, each seed sheath breaks open and releases the three-dimensional snowflake-shaped plantlet. Those of *U. nelumbifolia* appear to have an indefinite number of leaf segments, each with a widely-spreading forked tip. The seeds should be treated like the gemmae of pygmy sundews, and must not be allowed to dry out. It should be possible to transport *U. nelumbifolia* by keeping the seeds or seedlings wrapped in moist tissue paper or live *Sphagnum*. Hopefully this way this magnificent species will soon be more widely cultivated in carnivorous plant collections around the world.

I was most surprised one day in early 2000 to discover *U. nelumbifolia* growing in my hometown of São Paulo! Walking around one of the busiest street corners in the city, I happened to pass by a huge bank with a beautiful bromeliad garden full of *Vriesia imperialis* Carrière specimens. I could not help stopping to admire it from across the tall fence, and nearly fell over backwards as I suddenly noticed that several of the plants were packed with U. nelumbifolia leaves! Although momentarily happy with this surprise, I nonetheless immediately felt a hard kick to my stomach as I realised what the presence of U. nelumbifolia in those bromeliads actually meant: that they were illegally wild-collected, and that some beautiful cliffside had been stripped clean of those huge bromeliads, which must take decades to reach their full size. And the worse part is that bromeliads have become increasingly popular in landscaping around the city...

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Reference:
Taylor, P. 1989, The Genus *Utricularia*—a taxonomic monograph, Kew Bull. Additional Series XIV, HMSO, London.

Looking Back: CPN 25 years ago

Susan Verhoek-Williams wrote a bizarre article about ancient and modern medical beliefs and uses of carnivorous plants: "In France, sorcerers...used *Drosera* in their potions....one who searched for a sundew and rubbed its leaves over his skin on St. John's Eve would become indefatigable. *Searching* was necessary; a person who simply blundered upon the plants would be confounded and never find the spot again.

"It was easy to tell if *Drosera* were nearby, at least so it was believed in the Bourbon region of France. There, it was said, the plants glowed at night and by day green woodpeckers marked the spot; they could be seen flying strangely as they maneuvered to pluck the sundews, which were used to harden their beaks.

"Sorcerers and laymen alike collected the plant on St. John's Eve (midsummer eve), midnight being considered the time to gather the most effective plants. The gathering was perilous; the collector had to do his collecting walking backwards to avoid being followed by the devil. Devil or no, walking backwards in a bog at midnight would give a collector an uneasy feeling."



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Front Cover: *U. humboldtii* seeds, photograph by Thomas Carow.

Back Cover: Flowers of *U. nelumbifolia*. Photograph by Fernando Rivadavia.

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ICPS, Inc.
PMB 330
3310 East Yorba Linda Blvd.
Fullerton, CA 92831-1709, USA
icps@carnivorousplants.org

President	David Gray, email: david@carnivorousplants.org
Vice President	Carl Mazur, email: carl@carnivorousplants.org
Secrertary	Cindy Slezak, email: cindy@carnivorousplants.org
Board Member	Jay Lechtman, email: jay@carnivorousplants.org
Seed Bank	John Brittnacher, email: john@carnivorousplants.org, seedbank listed in this issue.

Editors:
Barry Meyers-Rice, P.O. Box 72741, Davis, CA 95617, USA, email: barry@carnivorousplants.org
Jan Schlauer, Zwischenstr. 11, D-60594 Frankfurt, Germany, email: jan@carnivorousplants.org
Page Layout: Steve Baker, email: steve@carnivorousplants.org

Business Manager: Leo C. Song, Jr., (714)278-2766, email: leo@carnivorousplants.org

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