

Journal of The Bromeliad Society



VOLUME 52 •

May-June 2002 •

NUMBER 3

Journal of the Bromeliad Society

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Vol. 52, No. 3

May-June, 2002

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Cover photographs. Front: Common in both collections and in the wild, *Tillandsia ionantha* has long been a favorite of bromeliad enthusiasts. This pretty little plant ranges from Mexico to Nicaragua. Photograph by Marcel Lecoufle. **Back:** BSI Honorary Trustee Marcel Lecoufle, who took the photograph on the front cover.

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The Journal, ISSN 0090-8738, is published bimonthly at Orlando, Florida by the Bromeliad Society International. Articles and photographs are earnestly solicited. Closing date is 60 days before month of issue. Advertising rates are listed in the advertising section. Permission is granted to reprint articles in the Journal, in whole or in part, when credit is given to the author and to the Bromeliad Society International. **Please address all correspondence about articles and advertising to the editor.**

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Printed by Fidelity Press, Orlando, Florida.

Tillandsia Lucida: Its Use as a Ritual Offering Virginia Guess and Robert Guess

Chiapas is home to one of the largest indigenous populations in Mexico, mostly rural dwellers who frequently incorporate bromeliads into their daily lives. They not only sell them in outdoor markets during holiday seasons, but also gather them throughout the year for their traditional rites. Acutely tuned to their environment, they seek out those epiphytes, especially *Tillandsias*, whose flowering cycles coincide with significant days on their religious calendar.

We have described on several occasions how the Maya harvest hundreds of *Tillandsia guatemalensis* L. B. Smith and *Tillandsia eizii* L. B. Smith for "ritual adornment." This refers to ceremonial use where many plants of the same species are collected for decorating shrines and altars (Guess and Guess 1996, 1998). We also have observed other situations where individuals select a single bromeliad of a specific species as a personal offering to the object of their veneration, such as *Tillandsia ponderosa* L.B. Smith by the Tzeltal-speaking Maya of Tenejapa, and *Tillandsia lucida* E. Morren ex Baker by the Tojolabal-speaking Maya of Las Margaritas. We define this more private expression of devotion as "ritual offering" in contrast to "ritual adornment."

During major festivals in Tenejapa, for example, religious officials carry an olla containing a flowering inflorescence of *T. ponderosa* in solemn procession (Morris and Foxx 1987). To honor their patron saint whose day they celebrate in July, the Tojolabales select *T. lucida* as their offering. In both cases where *Tillandsias* are used for this purpose, the devotees need far fewer plants than in those ceremonies where large numbers are required for adornment. Yet they still must adjust to the increasing habitat loss which affects the availability of their favored epiphyte. Such adaptation becomes evident when one observes celebrations over a number of years as the use of *T. lucida* by the Tojolabales illustrates.

Tillandsia lucida grows from southern Mexico to Honduras at elevations ranging from 900 to 1700 meters. In Chiapas, this large epiphyte with a tall, erect inflorescence often attains a meter in height. Here, the species still survives in a few small pockets of oak-pine forests scattered throughout the Central and Northern Highlands. Rarely does it occur in great abundance.

When encountered in full flower, the vivid-pink inflorescence of *T. lucida* overshadows other Bromeliaceae growing in the same area. The species is readily identified by this stately inflorescence, the branches of which open outward in a candelabra-like fashion as the flowers develop. Its rosette of soft green, mottled leaves, deep purple to dark brown on the underside and lighter green on the upper surface, serves as another distinguishing characteristic. Local people refer to the plant as "una de gallo" (claw or talon of the chicken) possibly due to the shape and prominence of the floral bracts. Although one of the lesser known *Tillandsias*

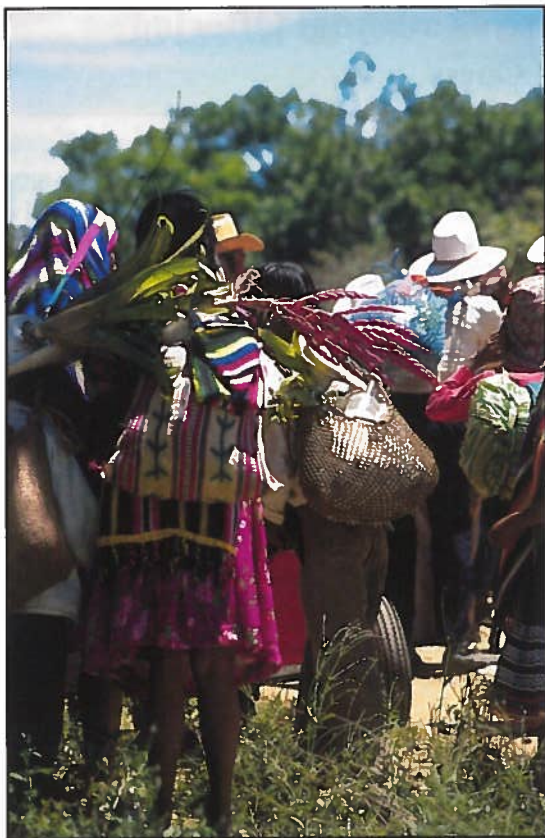


Figure 1. Tojolabales transport individual inflorescences of *Tillandsia lucida* in the procession that begins the celebration for Santa Margarita.

Robert Guess



Robert Guess

Figure 2. An offering of *Tillandsia lucida* stowed in a net bag is destined for the church in Las Margaritas.



Robert Guess

Figure 3. The branches of the inflorescence of *Tillandsia lucida* start to open outward following the emergence of the first flowers.

Figure 4. Delicate, tubular flowers of *Tillandsia lucida*.



Robert Guess

in Chiapas, *T. lucida* assumes a prominent place in festivities held each year in Las Margaritas, located some twenty kilometers northeast of Comitán.

In July, the Tojolabales of this region collect the inflorescences to honor their patron saint, Santa Margarita. Several factors favor their selection of *T. lucida*: (1) it flowers from April to early July, reaching its peak near the time of their festival; (2) the delicate color of the floral bracts accented by pale blue flowers makes it an appropriate offering to their female saint; (3) due to the ongoing deforestation, they have difficulty in locating the plants, thus making the quest more of a hardship and increasing the "value" of their offering.

The festivities follow a nine-day cycle of preparation, and culminate on the actual day set aside to honor the saint. Activities begin on 11 July with a *romería*, a procession of devotees led by drummers and flautists (Adams 1988). The pilgrims, many carrying a single inflorescence of *T. lucida* or an entire plant stowed in a net bag, assemble on the outskirts of town to escort a statue of the saint to the church, a distance of several kilometers. At the central plaza, officials receive the plants, and then hang them with the inflorescences pointing downward from the rafters of a temporary arbor installed at the entrance to the church. The offerings remain there until 20 July.

On that day, the fiesta reaches its climax. The devotees, satisfied they have fulfilled their obligation to the saint, return to their outlying communities leaving the once vibrant inflorescences at the church to shrivel and die. Similar to other *Tillandsias* found in Chiapas that reproduce primarily through seeds, such as *Tillandsia dasylyriifolia* Baker and *T. eizii*, the abundance of *T. lucida* decreases as forests - are cleared to free land for pastures and agricultural plots.



Robert Guess

Figure 5. *Tillandsia lucida* left as offerings hang from an arbor in front of the church in Las Margaritas.

A portent for the demise of *T. lucida* may have appeared recently in Las Margaritas. Whereas in previous years, we have observed the arbor in front of the church draped only with offerings of this preferred bromeliad, in July 2001, additional species were interspersed among them. Although specimens of *T. lucida* still far outnumbered other offerings that year, plants and inflorescences of *T. guatemalensis*, *T. eizii*, *T. lampropoda* L.B. Smith, *T. multicaulis* Steudel, and *Catopsis subulata* L. B. Smith were also included. Not only is this substitution of plants just one more omen for the future of the more uncommon epiphytic bromeliads in Chiapas, it also confirms how humankind adjusts to habitat changes in order to preserve their customs.

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Santa Barbara, California

Chicago, My Kind of Town

The sixteenth World Bromeliad Conference will be hosted by the Bromeliad Society International and the Greater Chicago Bromeliad Society from July 26 through August 2, 2004. The locale will be the Westin O'Hare Hotel in Rosemont (Chicago), Illinois. Mark your calendar...you won't want to miss it!



Figure 6. The inflorescence of *Tillandsia ponderosa*, carried in a clay pot, becomes a ritual offering in Tenejapa.

Robert Guess



Figure 7. The vivid-pink inflorescence of *Tillandsia lucida* is an uncommon sight in Highland Chiapas.

Robert Guess

An Addition to the Genus *Canistrum*: a new Combination for an old Species from Pernambuco and a new Species from Alagoas, Brazil

J. A. Siqueira Filho¹ & Elton M. C. Leme²

Canistrum is a genus of the subfamily Bromelioideae, typical of the Brazilian Atlantic Forest. It is distinguished by flashy and ornamental capitate and involucrel inflorescences, with upper scape bracts and primary bracts disposed in a cup-shaped format. Its flowers are bird-pollinated and it has distinctly asymmetrical mucronate to spinescent sepals, (Leme, 1997; Siqueira, 1998). There are currently ten species grouped in two subgenera, *Canistrum* and *Cucullatanthus* (Leme, 2000; Luther, 2001). The overwhelming majority of species occur in the northeastern sector of the country, throughout the States of Pernambuco, Alagoas and Bahia, with just one species found in Espírito Santo in the Southeast (Leme, 1997; 2000).

In 1996, during the beginnings of the survey of Bromeliaceae in Pernambuco conducted by the first author in Brazilian herbaria (Siqueira, 2001), a specimen from the Empresa Pernambucana de Pesquisa Agropecuária herbarium (IPA) soon attracted attention. It was the holotype of *Portea pickelii*, presenting a compact inflorescence and an unusual bract disposition that distinguished it considerably from all the species of *Portea* known at the time. Through comparison, it was possible to perceive the structural resemblance of its inflorescence to *Canistrum aurantiacum*, a typical species of Pernambuco.

Portea pickelii was described in 1970 by the late botanists D-rdano de Andrade Lima and Lyman B. Smith, on the basis on a specimen collected in 1963 by the former, in the Mata do Camocim, in Pernambuco (Smith, 1970). In the protologue, the authors characterized the species as a plant that lived in the shaded areas of low open woods, differing from *P. kermesina* – that was according to them, the species with most morphological similarities – by smaller leaf spines and short connate sepals with short mucronate apex.

After the conclusion of the revision of *Canistrum* (Leme, 1997), it became even more evident that *P. pickelii* was uncomfortably positioned in *Portea*. Curiously, the label of the holotype and also of the isotype (unclear on the latter), contains an identification by Andrade Lima himself that indicated the taxon as a new species of the genus *Wittrockia*. However, this initial conception by Andrade Lima, certainly intuitive and more natural from a phylogenetic point of view, was unrelated to the concepts of this genus that prevailed at the time.

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In order to respond to the numerous questions regarding the taxonomical positioning of *P. pickelii*, field investigations aimed at finding its remaining populations were intensified. The search was initiated at the type locality, known as Mata do Camocim, belonging to the Ecological Station of Tapacurá, in the municipality of São Lourenço da Mata, that shelters stretches of seasonal semi-deciduous forest (*sensu* Vasconcelos Sobrinho, 1970). However, after several expeditions, no populations of *P. pickelii* were found. These probably became locally extinct due to the flooding caused by the Tapacurá dam. Finally, in January 1997, dense rupicolous and epiphytic populations of *P. pickelii* were found in Pernambuco in the forests of the Frei Caneca sugar-mill, in the municipality of Jaqueira, whose morphological traits were revealed to be perfectly adequate to the protologue of the species.

The study of these new populations has allowed deeper understanding of the taxonomical traits of the species, specially the floral morphology, but also of the phenological and floral biology. Also, the resumption of its studies and an expansion in field investigation, covering the neighboring state of Alagoas, gave rise to the recognition of another taxon, very similar to *P. pickelii*, but still unknown to science. So, taking the morphological, palynological, phenological and ecological information into account, it became clear that both should be placed within the genus *Canistrum*.

Materials and Methods

Besides several field expeditions between 1996 and 2001, the herbaria of the Empresa Pernambucana de Pesquisa Agropecuária, Professor Dárdano de Andrade Lima (IPA), Universidade Federal Rural de Pernambuco, Professor Vasconcelos Sobrinho (PEUFR) and Professor Sérgio Tavares (HST), Universidade Federal de Pernambuco, Professor Geraldo Mariz (UFP), all in Pernambuco, Universidade Federal da Paraíba, Areia (EAN) in Paraíba, Instituto do Meio-ambiente de Alagoas (MAC) and Universidade Federal de Alagoas (MUFAL) in Alagoas, Herbarium Alexandre Leal Costa (EAL) in Bahia, and the National Herbarium of the Botanical Department of the Smithsonian Institution in Washington, D.C. (US), were visited. (Three of the herbaria mentioned above (HST, MUFAL, and EAL) are not presently listed in the Index Herbariorum or on the electronic version available at <http://www.nybg.org/bsci/ih/>.)

For scanning electron microscope studies, plant material was dried using the critical point method. The material was coated with gold and observed in a SEM.

Herbarium material of the studied species collected by the authors were deposited in Herbarium Professor Geraldo Mariz (UFP) and Herbarium Bradeanum (HB), and living specimens were maintained in the author's collection in Recife and Rio de Janeiro.

Taxonomical treatment

Canistrum pickelii (A. Lima & L. B. Sm.) Leme & J. A. Siqueira, comb. nov. (Figures 8-15)

Basionym: *Portea pickelii* A. Lima & L. B. Sm., *Phytologia* 20 (3): 180, pl. 2, figs. 4-6. 1970.

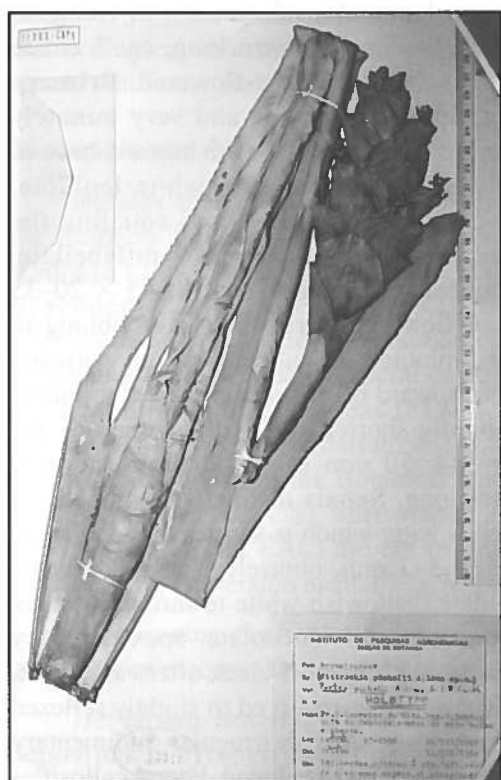
Plant rupicolous or epiphytic, propagating by short basal shoots. **Leaves** 18-24, suberect, rosulate, coriaceous, forming a funnellform rosette at base. **Sheaths** elliptic, 13-19 × 9-11 cm, densely brown-lepidote, dark purple toward apex; **Blades** linear, not narrowed at base, 15-56 × 3-5.5 cm, densely white-lepidote mainly abaxially, green to purplish-red toward apex, apex broadly acute and apiculate, apiculum ca. 2 mm long, margins densely spinose, spines triangular-uncinate, nearly black, 2-4 mm long. **Scape** ca. 47-74 cm long, 0.6-1 cm in diameter, erect to suberect, rigid, sparsely and inconspicuously white-lanate. **Scape bracts** ovate to sublinear, apex rounded and minutely apiculate, densely imbricate, the upper ones exceeding the internodes, yellowish-green toward base and purplish-red near the apex, subdensely and minutely lepidote, chartaceous, entire. **Inflorescence** clavate, bipinnate, subcylindrical, elongate, not flat at apex, surpassing than the leaf-blades, 7-13 cm long, ca. 5 cm in diameter at middle (including the primary bracts), many-flowered. **Primary bracts** nearly orbicular, holding water, apex subrounded and very minutely apiculate, yellow to orange-yellow toward apex and greenish toward base at anthesis, subcoriaceous, subdensely and inconspicuously white-lepidote, suberect-spreading toward apex, 45-60 × 40-60 mm, about equaling the fascicles (excluding the petals), entire. **Fascicles** 10 to 17, subflabellate, complanate to subpulvinate, shortly pedunculate, the outer ones 40-45 × 20-35 mm (excluding the petals), with 4 to 10 flowers. **Floral bracts** suboblong to ovate-triangular, apex acute to obtuse and minutely apiculate, distinctly carinate, entire, greenish-yellow toward apex, green toward base, subdensely and minutely white-lepidote, 30-45 × 15-25 mm, slightly shorter to slightly surpassing the sepals. **Anthesis** nocturnal. **Flowers** 44-50 mm long, odorless, shortly pedicellate, pedicel indistinct, ca. 2 mm long. **Sepals** distinctly asymmetrical with a semicircular lateral, membranaceous wing which is shorter than the apex, ca. 20 × 8-11 mm, connate at base for 1.5-3 mm, obtusely if at all carinate, sparsely and inconspicuously white-lepidote, yellowish-white toward apex, apex acute and mucronulate. **Petals** narrowly sublinear-lanceolate, apex narrowly obtuse, 27-35 × 3-5 mm, white at anthesis and brownish-black afterwards, free, erect and forming a tubular corolla at base, suberect-recurved to slightly reflexed near the apex at anthesis, without any appendage or with irregular, rudimentary appendages ca. 2 mm above the base, bearing 2 well developed, lateral callosities extending for 18-22 mm above the base; **STAMENS** included. **Filaments** dilated toward apex and complanate, the antepetalous ones adnate to the petals for 15-20 mm, the antesepalous ones free. **Anthers** sublinear, ca. 5 mm long, base and apex obtuse, dorsifixed at the middle. **Pollen** polyporate, ca. 35 µm long

in diameter, spherical, exine reticulate with regular and rounded lumina, ca. 18 per μm^2 , muri plain, aperture thickened. **Stigma** conduplicate-spiral, subglobose, white, margins inconspicuously crenulate. **Ovary** narrowly clavate, trigonous, ca. 15 mm long, ca. 5 mm in diameter, whitish, glabrous; epigynous tube ca. 2 mm long; placentation apical; ovules caudate. **Fruits** dark wine-red.

TYPE: Brazil. PERNAMBUCO, São Lourenço da Mata, Engenho São Bento, Forest of Camocim, 8°04' S, 35°14', in shade of low open woods, 26 Dec. 1963, A. Lima 63-4198. (Holotype: IPA, Isotype US).

Etymology

This species is named in honor of the Benedictine Monk Bento José Pickel the pioneer in botanical systematics in Pernambuco state, who acted as a botany teacher at the Escola de Agricultura de Tapera, (Agricultural school) Pernambuco, from 1914 to 1936. Later, without abandoning his teaching profession, he entered the Serviço Florestal do Estado de São Paulo, (Forestry Service of the State of São Paulo) where he retired in 1960 (Hilbers, 1994).



J.A. Siqueira

Figure 8. Holotype of *Canistrum pickelii* deposited in IPA

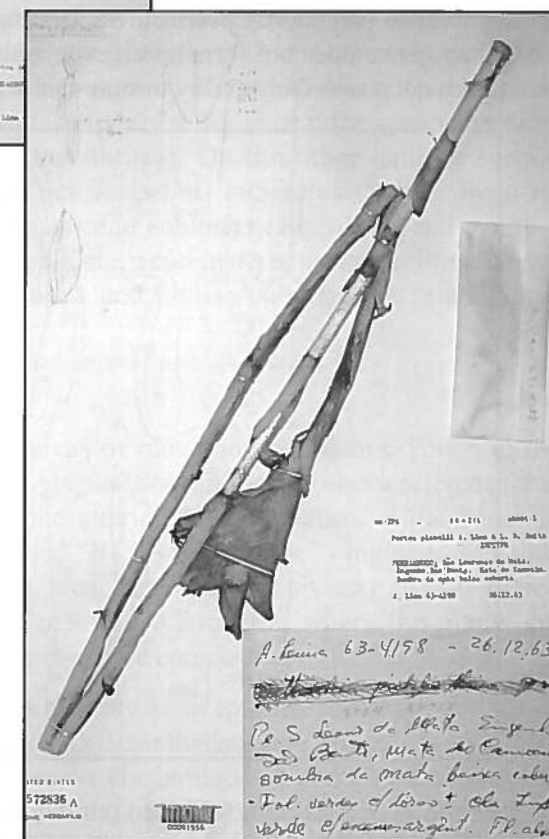
Additional specimens examined

Alagoas: Ibateguara, Serra do Sacramento, 17 May 1984, M. N. R. Staviski & A. I. L. Pinheiro 749 (MAC); Murici, 23 Mar. 1996, E. M. Gonçalves s. n. (MUFAL). **Pernambuco:** Cortês, 6 Oct. 1972, A. Lima 72-7031 (IPA); Gravatá, Fazenda Harmonia, 10 Oct. 1970, A. Lima s. n. (IPA); Entre Maraial e Lagoa dos Gatos, Serra do Uruba á 10km da Usina Frei Caneca, 13 Jan. 1997, J. A. Siqueira-Filho 475, cult. BBIO 49 (UFP, WU); Jaqueira, Usina Colônia, Açude do Amarelo, 28 Jun. 1999, J. A. Siqueira-Filho 959 & J. A. Vicente (UFP, WU); Serra do Urubu, Pedra do Cruzeiro, 17 Nov. 2000, E. Leme 5027, J. A. Siqueira & G. K. Brown (HB); Serra do Quengo, 17 Nov. 2000, E. Leme 5045, J. A. Siqueira & G. K. Brown (HB); São Lourenço da Mata, Estação Ecológica do Tapacurá, Dec. 1927, B. Pickel 266 (IPA).



E. Leme

Figures 9. First sheet of the isotype of *Canistrum pickelii* (two leaves) deposited in US.



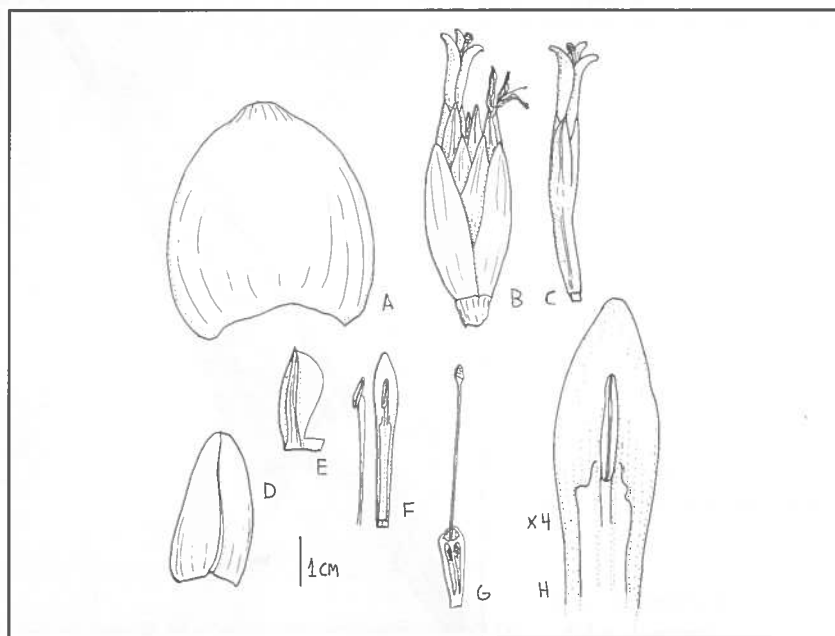
E. Leme

Figures 10. Second sheet of the isotype of *Canistrum pickelii* (one inflorescence) deposited in US.

Discussion

In historical terms, *Canistrum pickelii* was initially identified in October 1928 as *Quesnelia* aff. *arvensis* by Harms. Later, Andrade Lima identified the species as a member of *Wittrockia*, as mentioned before. Finally in 1970, Andrade Lima and Lyman B. Smith published the taxon as *Portea pickelii*. However, the original inclusion of this species in the genus *Portea* was probably because of the obscurely pedicellate flowers. Flowers with pedicels were excessively valued at the time, as having absolute diagnostic importance, which distanced the taxon from the other phylogenetically related taxa, especially the syntopic *Canistrum aurantiacum*.

In the context of an interpretational analysis of the whole morphological traits of this species, facing a multiple correlation of its characteristics, as proposed by Leme (1997) to group the species of the nidularioid complex in a more natural manner, the taxon in question fits the genus *Canistrum*. This is because it possesses corymbose, involuclral and multiutriculate inflorescences, with large brightly colored rosulate and imbricate primary bracts, which impound some amounts of water for several days. In fact, the reasonable ability of the inflorescence of this species to store water is greater than in all the other species of *Canistrum*. Furthermore, its floral fascicles are densely subflabellate, complanate to subplicate and shortly pedunculate, bearing carinate floral bracts. In *Portea*, the inflorescence does not form a cup even when it is dense (e. g., *P. kermesina*) and it does not possess any ability to store rain water or even moisture.



E. Leme

Figure 11. *Canistrum pickelii*: a) primary bract; b) fascicle; c) flower; d) floral bract; e) sepal; f) petal and stamens; g) ovary cross-section, style and stigma; h) petal apex.

The sepals of *Portea* are ecarinate and usually connate at base for about half of their length, while in *Canistrum* the sepals are shorter connate and the posterior ones are almost always carinate, with the keels decurrent on the ovary, which is therefore trigonous. In contrast, the ovary in *Portea* is terete. Also, the sepals of *C. pickelii*, despite being distinctly asymmetrical, have a lateral wing shorter than their apex (defined by the mucronulate termination of the midrib). This characteristic draws *C. pickelii* to *C. aurantiacum*, and distances it from *Portea*, whose sepals, in the typical species, present a lateral wing that will be at least equal in length to the apex and usually much longer than it.

Although *C. pickelii* has pedicellate flowers, these pedicels are inconspicuous and not long, slender and conspicuous like those of *Portea*. The ovules, although caudate, do not contrast significantly with the ovules reported for *Canistrum* that can be obtuse to distinctly apiculate, as in *C. aurantiacum*.

Preliminary results of recent cladistic studies of the nidularioid complex, based on Brown & Leme (2000) and using revised or new morphological figures, have positioned *C. pickelii* and the species described below in the *Canistrum* clade. These two species presented an intermediate position on the cladogram between the basal group formed by *C. aurantiacum* and *C. camacaense* (typical subgenus) and the group with more terminal topology, composed by species of the subgenus *Cucullatanthus* (Brown & Leme, *in prep.*). Despite its intermediate positioning, the general traits of *C. pickelii* permit its inclusion in the typical subgenus, which is: funnellform leaf rosette (not ellipsoid or tubular), petals suberect-recurved to slightly reflexed near the apex at anthesis (not erect), and caudate ovules (not obtuse). On the other hand, a certain proximity of *C. pickelii* to the *Cucullatanthus* subgenus derives from its bipinnate inflorescence (not tripinnate) and sublinear-lanceolate petals, with a narrowly obtuse apex (neither lanceolate, acuminate or acute as in subgenus *Canistrum*, nor sublinear or spatulate and obtuse-cucullate as in subgenus *Cucullatanthus*).

Distribution and Habitat

Canistrum pickelii occurs in areas of mountainous Atlantic Forest in the South of Pernambuco and North of Alagoas States. There is also a reference that indicates its presence further into the interior of Pernambuco, at the Serra do Orurubá, in Pesqueira, in the so called "Brejos de Altitude" - highland wetlands (*sensu* Vasconcelos Sobrinho, 1970). It can also be found in rocky areas bordered by forests, like at the Pedra do Cruzeiro, in Jaqueira, where the plants are exposed to the full sun and are generally more compact.

In forests, the species occurs preferably as an epiphyte in the upper parts of trees such as *Eriotheca crenulaticalyx* (Bombacaceae), *Sloanea obtusifolia* (Elaeocarpaceae), *Pterocarpus violaceus* (Leguminosae) and *Ficus* cf. *maxima* (Moraceae). It can occur together with *C. aurantiacum*, that is pollinated by hummingbirds. In contrast, *C. pickelii* depends on another group of pollinators,

since it flowers at night, probably sphingids. Nocturnal anthesis is in fact one of the most remarkable characteristics of *C. pickelii*, being an uncommon phenomenon in Bromelioideae, only reported for *Aechmea kleinii* (Reitz 1983), which curiously presents a bright yellow, tubular corolla, like some of the other species of the same subgenus *Ortgiesia*.

Canistrum pickelii flowers between November and January, during the dry season, and its fruits are dispersed by passeriform birds.

***Canistrum alagoanum* Leme & J. A. Siqueira, sp. nov.** (figures 16-20)

A *C. pickelii* (A. Lima & L. B. Sm.) Leme & J. A. Siqueira, cui affinis, sed bracteis primariis aurantiaco-rubellis, integris vel apicem versus sparse et inconspicue spinulosis, floribus diurnis pedicellis duplo longioribus, petalis per anthesim suberectis (haud suberecto-recurvatis vel reflexis), flavidis et appendicis petalorum conspicuis, obovatis, circiter 5 mm longis differt.

Plant terrestrial or epiphytic, propagating by short basal shoots. **Leaves** ca. 15, suberect, rosulate, thinly coriaceous, forming a funnelform rosette at base. **Sheaths** broadly elliptic, 14-20 × 8.5-10 cm, densely brown-lepidote, dark purplish-brown toward apex. **Blades** linear, not narrowed at base, 30-60 × 3.5-4.5 cm, densely white-lepidote mainly abaxially, green to dark purple toward apex, apex rounded and apiculate, apiculous 2-3 mm long, margins densely to subdensely spinose, spines narrowly triangular-uncinate, antrorse, nearly black, 2-4 mm long. **Scape** ca. 40 cm long, ca. 0.8 cm in diameter, erect to suberect, rigid, reddish, sparsely pale-lanate to glabrescent. **Scape bracts** sublinear, apex broadly acute and apiculate, densely imbricate, exposing to completely covering the scape, reddish, densely white-lepidote, coriaceous, entire or nearly so, the upper ones involucre and resembling the primary bracts. **Inflorescence** clavate, bipinnate, subcylindrical to cylindrical, elongate, not flat at apex, shorter to longer than the leaf-blades, 10-24 cm long, 6-8 cm in diameter at the middle (including the primary bracts), many-flowered. **Primary bracts** nearly orbicular, holding water, apex obtuse and very inconspicuously apiculate, without sheath-blade distinction, orange-red, subcoriaceous to coriaceous, subdensely and minutely white-lepidote, suberect at base and spreading toward apex, 45-70 × 42-60 mm, slightly to distinctly exceeding the fascicles, entire to sparsely and inconspicuously spinulose toward apex; **Fascicles** 11-25, subflabellate, complanate to subpulvinate, shortly pedunculate, 40-45 × 20-25 mm (excluding the petals), with 5 to 10 flowers. **Floral bracts** suboblong, apex broadly acute to obtuse and minutely apiculate, distinctly carinate, entire, greenish toward base, reddish toward apex, subdensely and minutely white-lepidote, 27-30 × 13-14 mm, slightly shorter than the sepals. **Anthesis** diurnal. **Flowers** 40-45 mm long, anthesis diurnal, odorless, shortly pedicellate, pedicel somewhat distinct, ca. 4 mm long. **Sepals** distinctly asymmetrical with a semicircular lateral, membranaceous wing which is shorter than the apex, ca. 24 × 9 mm, connate at base for ca. 3 mm, obtusely if at all carinate, glabrous, centrally orange-red toward apex and greenish at base, the lateral wing pale yellow, apex acute and

mucronulate. **Petals** narrowly lanceolate, apex narrowly obtuse, 26-28 × 5 mm, suberect toward apex at anthesis, light yellow at anthesis and brownish-black afterward, free, bearing 2 obovate, obtuse, slightly crenulate to entire, 5 × 1.5-2 mm appendages at the base, as well as 2 well developed, lateral callosities extending for ca. 10 mm above the appendages. **Stamens** included. **Filaments** dilated toward apex and complanate, yellow, the antipetalous ones adnate to the petals for ca. 15 mm, the antisepalous ones free. **Anthers** sublinear, ca. 5 mm long, base and apex obtuse, dorsifixed at the middle. **Pollen** polyporate, ca. 35 µm long in diameter, spherical, exine reticulate with irregular, polygonal lumina, ca. 23 per µm², muri protruded, aperture without any thickening. **Stigma** conduplicate-spiral, subglobose, yellow, margins minutely crenulate. **Ovary** narrowly clavate, trigonous, ca. 14 mm long, ca. 5 mm in diameter, whitish, glabrous; epigynous tube 2-2.5 mm long; placentation from median to apical; ovules caudate. **Fruits** unknown.

TYPE: Brazil:ALAGOAS Maceió, Riacho Doce, leg. Artur Frassy s. n., fl. cult. Dec. 2000, R. Menescal s. n. (cult. E. Leme 4985). **Holotype:** HB. **Paratypes:** Maceió, Riacho Doce, 4 Jan. 2001, J. A. Siqueira-Filho 1145 & A. Frassy, cult. BBio 350 and E. Leme 5159 (UFP); Porto Calvo, Faz. Porto Seguro, 14 Dec. 2001, A. Lamas s. n., cult. E. Leme 5396 (HB).

Etymology

Based on the addition of the suffix “-anum” (= belonging to a certain place), the name of *C. alagoanum* means “from the State of Alagoas”.

Additional specimens examined

Alagoas: Quebrângulo, Parque Estadual de Pedra Talhada, Sítio Gabiru, 8 Apr. 1987, M. N. R. Staviski et al. 1093 (MAC); Maceió, Engenho França, 4 Jan. 2001, J. A. Siqueira & A. Frassy s. n., cult. BBIO 350 (UFP); Paripueira, Sítio Laranjeiras, J. A. Siqueira & A. Frassy s. n. (UFP); Porto Calvo, Faz. Porto Seguro, 14 Dec. 2001, A. Lamas s. n., cult. E. Leme 5399 (HB).

Discussion

In morphological terms, *Canistrum alagoanum* is very closely related to *C. pickelii*. Its recognition as a new species was only possible with the study of living specimens, since the samples available from herbaria did not provide all the information necessary to establish the differences between the two species. Thereby, the new species differs from *C. pickelii*, mainly in its prevailing orange-red primary bracts, sparsely and inconspicuously spinulose toward the apex, as well in its flowers with diurnal anthesis. Despite the slightly shorter size of the flowers, its pedicels are twice as long (ca. 4 mm vs. 2 mm) and the sepals are longer too (ca. 24 mm vs. ca. 20 mm). In addition, the proportionally shorter petals of *C. alagoanum* (26-28 mm vs. 27-35 mm) are shorter to about equaling the primary bracts and remain suberect at anthesis, while in *C. pickelii* the petals



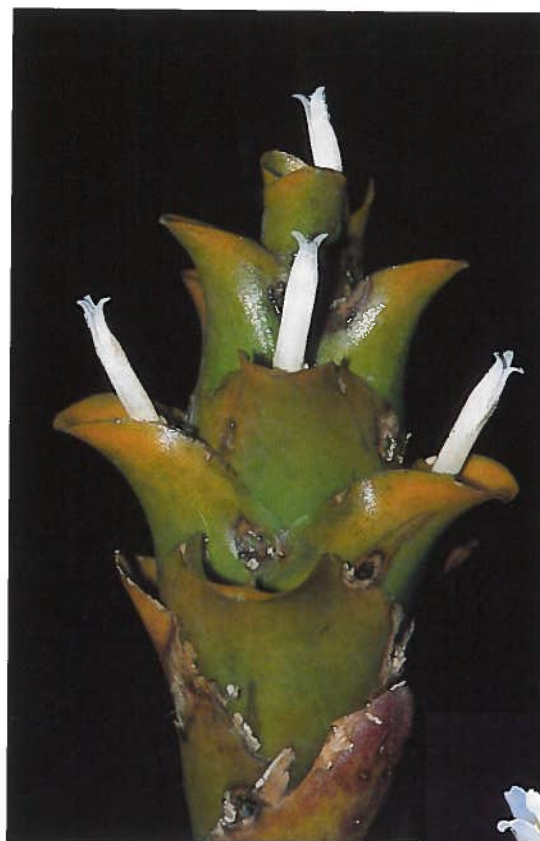
J. A. Siqueira

Figure 12. Population of *Canistrum pickelii* in Usina Colônia, Açude do Amarelo, Pernambuco.



E. Leme

Figure 13. Population of *Canistrum pickelii* in Pedra do Cruzeiro, Jaqueira, Pernambuco, where the plants are exposed to the full sun and are generally more compact.



J. A. Siqueira

Figure 14. The nocturnal flowers of *Canistrum pickelii* have well protruded corollas which are distinctly longer than the primary bracts at anthesis.



E. Leme

Figure 15. The inflorescence of *Canistrum pickelii* has an unusual capacity to hold rainwater for several days, which is comparable to *Nidularium* species only.

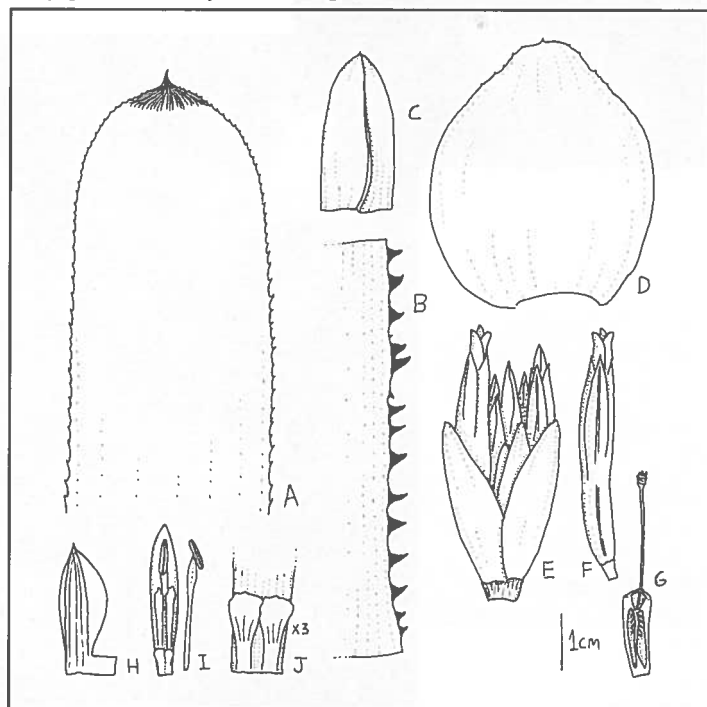
are well protruded and distinctly surpass the primary bracts, becoming apically suberect-recurved to reflexed at anthesis. Another outstanding difference of the new species is the light yellow color of the petals and their well-developed basal appendages. In the night-blooming *C. pickelii* the petals are white and naked or bearing rudimentary appendages only.

Concerning pollen features, the new species differs from *C. pickelii* by its exine lumina which are irregular (vs. regular), polygonal (vs. rounded), larger, about 23 per μm^2 (vs. ca. 18 per μm^2) and by the wider aperture.

Distribution & Habitat

Canistrum alagoanum occurs as an epiphyte in the coastal Atlantic Forest in the Maceió region and neighboring areas, such as Paripueira. The fragmentation of the remaining forests which it inhabits are a serious threat and little different from the situation observed in Pernambuco for *C. pickelii*. Besides sugar cane, there is coconut production and urban expansion that is gradually eliminating the remaining forest fragments.

The species flowers between December and January, during the dry season and is probably pollinated by hummingbirds.



E. Leme

Figure 16. *Canistrum alagoanum*: a) leaf apex; b) basal leaf margin; c) floral bract; d) primary bract; e) fascicle; f) flower; g) ovary cross section, style and stigma; h) sepal; i) petal and stamens; j) petal appendages.

Conclusion

The rediscovery of *C. pickelii* in nature after 25 years and the discovery of *C. alagoanum* reveals four basic aspects of the situation in which the Atlantic Forest of the Northeast, North of the São Francisco River, finds itself, and of the level of taxonomical knowledge of Bromeliaceae: 1) It has been verified that an accelerated process of destruction of the few fragments of the Atlantic Forest biome that have survived in the Northeastern sector, North of the São Francisco River, is still underway despite the fact that only 2% of the original forest still exists (Teixeira, 1986). 2) It can be verified that very little is yet known about the floristic composition and biology of the species of these fragments. In fact, these fragments of Atlantic Forest, that form one of the five most threatened hotspots of the planet (Mittermeier *et al.*, 2000) and now give us a vague picture of the original vegetation of yesteryear, still hold a great variety of organisms that are little known or completely unknown to science. A good example is the discovery of five new species (*Aechmea frassyi* Leme & J. A. Siqueira, *A. gustavoi* J. A. Siqueira & Leme, *A. marginalis* Leme & J. A. Siqueira, *Cryptanthus alagoanus* Leme & J. A. Siqueira and *Neoregelia pernambucana* Leme & J. A. Siqueira) during the taxonomical research already reported (Siqueira & Leme, 2000; Leme & Siqueira, 2001). 3) It has also been verified that the perfection of taxonomical knowledge and the reconstruction of the phylogeny of Bromeliaceae are closely related to the increase of information provided especially in the field or with the maintenance in cultivation of live specimens. Research based only on herbaria samples is insufficient to fulfill the purpose of taxonomical and phylogenetic improvement of the Bromeliaceae, as exemplified by the recognition *C. alagoanum*. 4) Finally, it can be concluded that an intensified and immediate effort to research and preserve the fragments of Atlantic Forest of Northeastern Brazil should be carried out, emphasizing groups of organisms such as Bromeliaceae that are known to be bio-indicators of biodiversity.

ACKNOWLEDGEMENTS

We thank the Pro-rectors of the Campi Avançados of the Universidade Federal Rural de Pernambuco (UFRPE), Gustavo J. P. S. Barros and Gustavo D. P. S. Barros (Colônia Agroindustrial Ltda) for logistical support; R. J. R. Padilha (LIKA/UFPE) for his careful help in SEM; M. P. C. A. Coelho (UFPE) for valuable discussions about pollen of these species; R. C. A. Pereira (Curator of IPA) for courtesies extended while studying collections; CAPES for financial support, and Artur Frassy and Alonso Lamas, for providing living material and logistical support during field activities in Alagoas.

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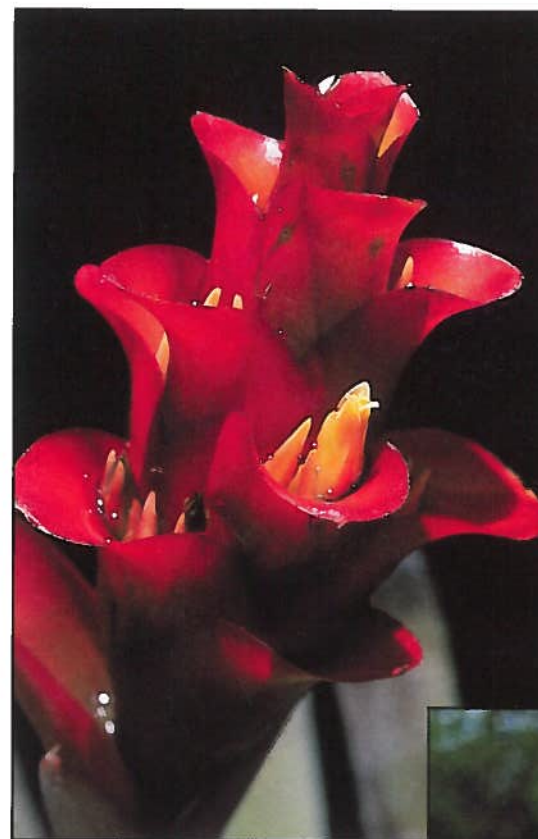
Figure 17. Population of the paratype of *Canistrum alagoanum* in Riacho Doce, Maceió, Alagoas.

J. A. Siqueira



Figure 18. Holotype of *Canistrum alagoanum* which flowered in cultivation

E. Leme



E. Leme

Figure 19. Close up of the colorful orange-red inflorescence of the holotype of *Canistrum alagoanum*.



Figure 20. The longer, cylindrical inflorescence of the paratype of *Canistrum alagoanum* from Porto Calvo, Alagoas.

E. Leme

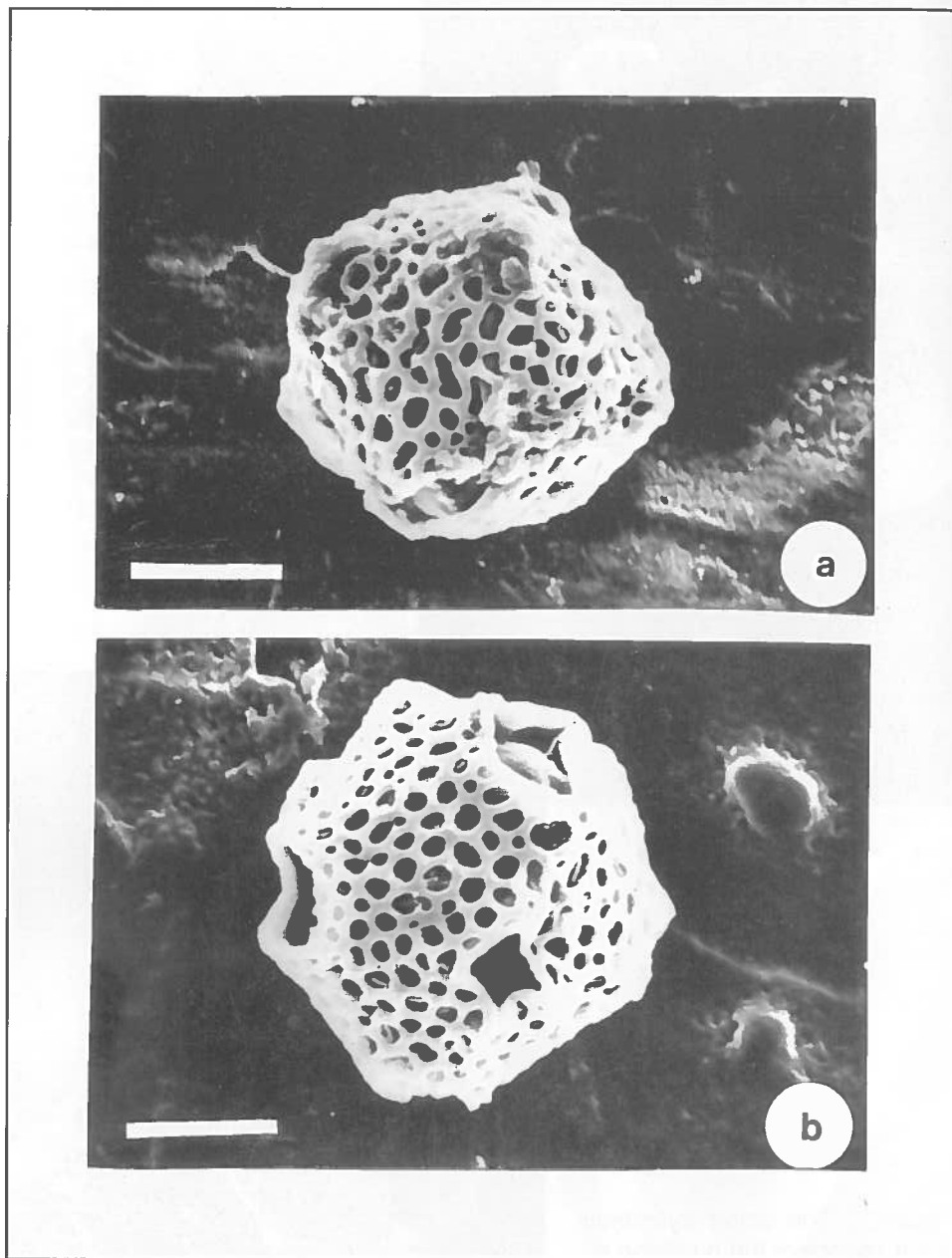


Figure 21. SEM photo of the Pollen: a) *Canistrum alagoanum*;
b) *Canistrum pickellii* (Bar = 10 μ m).

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Notes on the Association of *Pachistopelma rufonigrum* Pocock 1901 (Theraphosidae) with Phytotelm Bromeliads in Eastern Rio Grande do Norte State, NE-Brazil.

Roberto Lima Santos¹, Maria das Grayas Almeida¹
& Jose Valmar Nunes¹.

Three major vegetation types can be observed on the eastern coast of Rio Grande do Norte State (northeastern Brazil): the Brazilian Atlantic Coastal Rainforest (Mata Atlantica), the savanna-like coastal tableland (Tabuleiro Litoraneo), and the semi-arid *restinga*. Surveys of the macrofauna found in phytotelm bromeliads in these ecosystems recorded the presence of the tarantula-like spider *Pachistopelma rufonigrum* Pocock, 1901 (Theraphosidae) (Platnick, 2002).

In the Mata Atlantica patches of the Natal Dune State Park and in the coastal tablelands, near the Pitimbu River (both in the municipality of Natal) *P. rufonigrum* was found in *Aechmea lingulata* (Linnaeus) Baker and *Hohenbergia ramageana* Mez. In the *restinga*, near Pitangui (in the Ceara Mirim municipality), *P. rufonigrum* was found in tubular specimens of *Aechmea aquilega* (Salisbury) Grisebach growing in full exposure to sunshine and the dominant trade winds, and also in *H. ramageana* growing in the shade under bushy vegetation (Almeida, 1997; Varela-Freire 1997; Rochaneto, 2001).

Pachistopelma rufonigrum has been also reported from *A. aquilega* in the dry *caatinga* of Sergipe State, northeastern Brazil (Bispo *et al.*, 1998).

In Rio Grande do Norte; field observations showed that both small and large host bromeliads were inhabited by *P. rufonigrum* and usually only one adult individual was observed in each ramet. Immature *P. rufonigrum* was recorded either alone or with adult specimens. Male specimens were seldom observed, and may be rare in the overall population. Females tending oothecae were also recorded, which indicates that this spider breeds in association with bromeliads.

In the host bromeliad, the spider spins a tent -like cover across a single leaf blade and remains behind it facing outwards. When disturbed, they turn around and quickly seek refuge deep within the bromeliad cup. In different instances, both adult and immature individuals were observed completely submerged in the phytotelm water.

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Figure 22. Adult female *Pachistopelma rufonigrum* in host *Aechmea aquilega* from Pitangui *restinga* (Rio Grande do Norte state, Brazil).

So far, in Rio Grande do Norte, *P. rufonigrum* has been reported only from ground dwelling phytotelm bromeliads, and Varela-Freire (1997) suggests that this spider is a bromeliad mutualist.

The field observations made by the authors show that this spider uses the bromeliad as shelter against predation and as a nursery area. Moreover, the predatory activities of *P. rufonigrum* probably help import nutrients into the host bromeliad through buildup of prey leftovers and fecal matter. This represents a benefit for the host phytotelm bromeliad, especially for those specimens growing on exposed sites, such as in the local *restinga* areas, where organic matter buildup within the phytotelm through leaf litter downfall is not possible (Benzing, 2000).

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A New Natural Hybrid from Mérida, Venezuela Eric Gouda¹

Introduction

This natural hybrid has been found in only one location, growing together with *Tillandsia flexuosa* Swartz and *T. funckiana* Baker, two species with slightly zygomorphic red flowers. *T. × wilinskii* has to be considered a natural hybrid of these two species and shows many intermediate characteristics between the two. This new natural hybrid is named in honor to Albert Wilinski Jeanmonod (Ingeniero Agrónomo), who discovered this plant at the type location.

Tillandsia × wilinskii E.J. Gouda hybr. nov. (Figures 23-25)

Planta breviter caulescens foliis numerosis, inflorescentia breviter exserta. Folia 15-16 cm longa vaginis non inflatis intus indumento pallide brunneo praeditis, laminis c. 14 cm longis et 1-1.4 cm latis. Inflorescentia (cum pedunculo) 7.5-20 cm longa. Pedunculus brevis bracteis folisque fere omnino obtectus. Bractee florigerae ovatae. Flores breviter pedicellati, sepalis oblongis, petalis 4.3-5 cm longis, antheris 5.5 mm longis.

Typus: Fué localizada a orillas de la carretera El Vigía - Mérida aproximadamente a 10.5 kms. antes de llegar a la población Los Estanques, recolectada directamente del suelo, Leg. A. Wilinski Jeanmonod s.n. 1997?; La vegetación y clima predominante en el lugar corresponden al tipo bosque seco pre-montano (holotipus, U; isotipus VEN).

Plant short caulescent, 20–25 cm tall, flowering slightly taller, dense, with very many leaves, cinereous-green. **Stem** much shorter than the leaves, ca. 5 cm long, ca. 1 cm in diameter, for about the half covered by leaves. **Leaves** coriaceous, ca. 16 cm long, much shorter than the inflorescence. **Sheaths** ample, adaxially contrasting with the blade only in color, ovate, not inflated, 1.7–2.5 cm long, 1.6–1.8(–20) cm wide (the very base widened), with membranaceous margins, very densely lepidote, on both sides, with spreading, brown and dark centered scales (adaxially), pale brown. **Blades** first erect and then arching or recurving, channeled, very narrowly triangular, ca. 14 cm long, ca. 1 cm wide at the very base, attenuate, sub-pungent, very densely lepidote, on both sides, with spreading, whitish scales. **Inflorescence** simple (but sometimes with one branch at base), 10–18 cm long. **Peduncle** wholly covered by bracts or partly exposed above, erect, 6–10 cm long, 2.5 mm in diameter, sparsely lepidote. **Scape-bracts** erect, imbricate, rigid-chartaceous, the lower ones long caudate and the upper acuminate or acute, exceeding the internodes, densely lepidote. **Racemes** sub-erect, laxly and distichously 3–5 flowered, elongate, 6–9 cm long, (with a very small undeveloped flower at apex). **Rachis** wholly exposed, slender, strongly flexuous or geniculate, concave and acute angled, sparsely lepidote, green. **Floral-bracts** divergent with the flowers (caused by geniculate rachis),



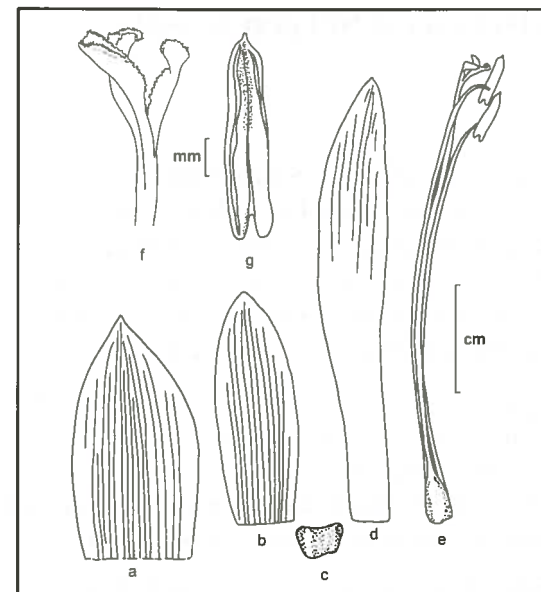
Eric Gouda

Figure 23. *Tillandsia* × *wilinskii*



Eric Gouda

Figure 24. *Tillandsia* × *wilinskii*
inflorescence



Eric Gouda

Figure 25. *Tillandsia* × *wilinskii*: a. floral-bract; b. sepal; c. pedicel; d. petal; e. pistil and stamens; f. stigmas; g. anther

remote, thin coriaceous, even and prominently nerved when dry, ecarinate or slightly carinate toward the apex, ovate, sub-acute, nearly straight, 1.3-2.4 cm long, 0.9-1.3 cm wide, slightly exceeding the internodes, much shorter than the sepals (especially in upper flowers), with thin margins, outside subdensely lepidote to sparsely lepidote, greenish. **Flowers** divergent, short pedicellate (if at all). Pedicel 2—3 mm long. **Sepals** subcoriaceous, even or distinctly nerved when dry, oblong, obtuse, nearly straight or incurved at the extreme apex, 1.8—2.3 cm long, 0.8 cm wide, with hyaline margins, posterior and anterior ones all alike and ecarinate, ecarinate (but thickened in center at base), free, glabrous, only outside, green tinged with pinkish-red. **Petals** thin, with the blade spreading to recurving at the apex only (coiled), linear-lanceolate, with ovate-lanceolate blade, acute, 4.3 cm long, 0.7 cm wide, pinkish-red. **Stamens** exerted. **Filaments** stout and (sub-)terete for most of their length, unequal (three longer) in length, 4.2—4.6 cm long, upper part red. **Anthers** dorsifixed at 2/5, linear-sagittate, 5.5 mm long. **Pollen** yellow. **Pistil** about equaling (in between shorter and longer 3) the stamens. **Ovary** ovoid, 5 mm long, tapering into the style. **Style** elongate, many times as long as the ovary. **Stigmas** linear, spreading and coiled, red with hyaline papillae.

ACKNOWLEDGEMENTS

I am grateful to Alexis Pardo for providing the herbarium material, photo and collecting information needed for this manuscript and Drs. L.Y. Th Westra for preparing the Latin diagnose.

Utrecht, the Netherlands

Using Tillandsias as a Screen

Bob Reilly

In southern coastal Queensland, Spanish moss and *Tillandsia mallemontii* can be used to form screens in the garden. In both cases, select locations, which, at least, receive shade in the afternoon. This is especially important in summer. Good air movement, such as that occurring in "breezeways" or locations with a northeasterly aspect, is also important. This is especially true for *T. mallemontii*. However, avoid locations, which are exposed to cold, dry winds.

Build a framework for the screen out of wood or galvanized pipes. A wide variety of material can be used to form the lattice from which the *Tillandsias* are hung. Examples include: timber lattice panels (but not those which have been treated with a timber preservative), plastic garden mesh, weld mesh fencing panels, and galvanized wire netting (but avoid rusty wire).

For Spanish moss, hang strands along the mesh. Use strands, which are two or three plants "thick", and hang down the full length of the framework. Leave a gap of two to five centimeters between each strand.

Tie two to five plants of *T. mallemontii* to the lattice. Use plastic covered wire or strips of nylon pantyhose to do this job. Each cluster of plants should be separated at intervals of about five centimeters horizontally, and seven to ten centimeters vertically. (This job can be quite time consuming. However, you can do it when you are watching television similar activities. In this regard, it is a bit like knitting).

Water the *Tillandsia* "walls" once a week in winter and twice weekly in summer. Use liquid fertilizer every fortnight.

The *Tillandsias* will form an effective screen within one year. They need "renovation" every three years, as they "thicken up" over that period. In turn, this results in plants in the center of the clumps, not receiving sufficient light, air movement, water or nutrients.

Brisbane, Queensland, Australia

Would You Like Flies With That?

Chet Blackburn

At first glance it would seem that bromeliads and carnivorous plants have little in common. They not only do not look much alike, but most bromeliads grow in trees while the majority of carnivorous plants are denizens of swamps, bogs, fens, and other wet sites. However, both types of habitat present plants growing in them with exactly the same problem...a lack of nutrients available to the plant's roots. Both bromeliads and carnivorous plants have responded by adapting their foliage into their main nutrient gathering structures instead of their roots. It's just that one group became carnivorous in the process whereas the other became largely vegetarian.

To be regarded as carnivorous, a plant must be able to accomplish 3 things: attract prey, capture prey, and be able to absorb the resulting nutrients. Some would add a fourth requirement, that of actually producing digestive enzymes (proteases). However that requirement would eliminate some obviously carnivorous species that instead depend upon bacterial and fungal action to break the prey down to substances they can absorb instead of producing their own proteases.

Therefore, there is not universal agreement as to what constitutes a carnivorous plant, but carnivory has been attributed to more than 550 species of plants in 9 families and 17 genera (Cheers 1992). The methods of attraction, capture and nutrient absorption differ widely. The foliage of some, such as the genera *Utricularia*, *Aldrovandra* and the famous *Dionaea*, or Venus flytrap, have evolved into active trapping mechanisms, while others such as *Cephalotus*, *Heliamphora*, *Sarracenia* and *Nepenthes*, have developed water-holding structures from their leaves that are passive in nature but are equally effective at trapping prey. Insects are lured downward to their fate by strategically placed nectar glands. Once inside the pitchers, escape is prevented by a combination of downward facing hairs that allow movement in one direction only, waxy slippery sides inside the pitchers that do not allow a foothold for the prey to climb out, or translucent "false exits" that the prey continually crash into while trying to fly out.

Whatever the method or combination of methods the plant uses to prevent escape, the result is the same. The prey eventually tumbles into the liquid below and drowns. The body is then broken down into a digestible state either by the action of enzymes produced by the plant itself or enzyme action by bacteria and fungi growing within the liquid. The liquid becomes a nutritious soup that is then absorbed by specialized cells within the pitcher.

Tank-type bromeliads operate in pretty much the same manner, except that the resulting "soup" is mostly vegetable instead of bug broth. The wide-spreading rosettes of tank-type bromeliads are marvelously efficient mechanisms

for gathering both water and falling debris, mostly of a vegetative nature. If one looks down on a bromeliad rosette, it is obvious that everything falling within the circumference of the circle formed by the rosette of leaves is collected and carried down to the base of the leaves.

Actually, bromeliads could be said to be omnivores, instead of vegetarians. While the cups are usually filled with decaying vegetation, the water is also home to a wide variety of aquatic life that pay rent to their host plant in the form of their waste products. That, along with bird droppings and of course an occasional accidental drowning of an insect that had blundered into the water all become ingredients for the soup.

Bromeliads then, have at least eight things in common with carnivorous plants:

- Both are evolutionary products of nutrient poor environments
- In both groups, the foliage has been specifically adapted for gathering nutrients and is equipped with specialized cells to absorb them.
- Both contain phytotelmata plants. Phytotelmata plants are those that hold water. They are an important aquatic eco-system for a variety of life. There are species of mosquitoes, for example, that breed in the cups of bromeliads and other species that breed in the pitcher of such carnivorous plants as *Nepenthes* and *Sarracenia*.
- Both attract small creatures to supplement their nutritional requirements, bromeliads in a benign way, and carnivorous plants in a more sinister way.
- A variety of small animals - everything from protozoa to crabs and frogs - depend upon the reservoirs of both types of plants for at least a portion of their life cycle. Some species of frogs are known to breed only in bromeliads. It is not surprising that in providing aquatic habitats high in the canopy, the bromeliad biota is extensive. More surprising is the existence of a number of creatures able to withstand the highly acidic content of the pitchers of some of the carnivorous plants. For example, at least 150 creatures are known to depend upon *Nepenthes* for a part of their life cycle (D'Amato 1998).
- Some species of both groups bring a mini-aquatic environment up into trees. Many bromeliads do this, but so do members of the carnivorous genus *Nepenthes*.
- At least one carnivorous species, *Utricularia nelumbifolia*, has so far been found only in bromeliads.
- Three bromeliad species are regarded by many as carnivorous plants. They are *Catopsis berteroniana*, *Brocchinia reducta*, and *B. hechtoides*

In 1976, a researcher examining materials found in various south Florida bromeliad tanks noticed that *Catopsis berteroniana* always seemed to have an unusual number of non-aquatic insect corpses in its leaf bases. Subsequent experiments proved that *C. berteroniana* consistently contained many times more non-aquatic insect victims than other bromeliads of comparable size. The areas above the water-filled leaf bases are heavily coated with a powdery substance that would hinder the insect from escaping once they've fallen into the tank, and it is theorized but not yet proven, that the foliage reflects UV light in such a manner as to confuse insects and cause them to fly into them and tumble into the tank.

In 1984, a second bromeliad, *Brocchinia reducta* from Venezuela and Guiana also came under suspicion of being carnivorous. It is surprising to me that this plant wasn't regarded as a potential carnivore before then. With its tall tubular structure and tank of highly acidic water, It LOOKS like a carnivorous plant and grows among plants from the carnivorous genus *Heliamphora* in wet, nutrient poor soils on the tepuis of Venezuela. They grow in open, exposed areas where access to vegetative debris is minimal. The primary food of *Brocchinia reducta* and its close relative, *B. hechtoides* appears to be ants.

Catopsis and *Brocchinia* do not produce digestive enzymes themselves but instead rely on their bacterial and fungal symbionts to reduce their prey to substances that can be absorbed by the plant's trichomes. It can be argued that as long as this process works so well for the plant, there is no need to expend energy in developing digestive enzymes, but the lack of enzyme production is the point of contention as to whether the plants should be regarded as carnivorous or not.

At the 2002 World Bromeliad Conference in St. Petersburg, Florida, there was an enormous *Brocchinia macrantha* on display in the hotel lobby. We should all thank providence that this large species of *Brocchinia* is not one of the carnivorous members of the genus. The BSI can ill afford to lose any of its conference registrants.

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Auburn, California

Utricularia nelumbifolia Gardn. At Last!

Fernando Rivadavia¹

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. All are 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 the carnivorous genus *Heliamphora*.

Although widespread in the highlands of eastern Brazil (Taylor, 1989), *U. nelumbifolia* is elusive and it took many years of intense searching before I finally found it in early 1996. For a while I even doubted that 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 3400 km around southeastern Brazil, during a ten-day carnivorous plant marathon with two friends: Fabio Pinheiro from Sao Paulo, Brazil, and Joe Mullins, visiting from Ireland. While exploring highlands in eastern Minas Gerais state, we were lucky to meet Lucio Leoni, who maintains a 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.

Lucio 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 mountaintop 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!

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On our way back to Cararangola, Lucio 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 *Alcantarea extensa* (L.B.Smith) J.R.Grant, and that these were in turn packed tight with *U. nelumbifolia*. Of Course we immediately decided to go there on the following day!

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 Fabio 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, eventually becoming a vertical cliff. My lungs were burning, but 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 a 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 Fabio soon caught up with me and joined my frenzy. And still we could find no *U. nelumbifolia*! Starting to feel a terrible emptiness in the pit of my stomach, I continued moving slowly uphill, zig-zagging from one bromeliad to another, my eyes like 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 and knelt down on the rock next to it as if in prayer. Was that truly a *U. nelumbifolia* leaf, or a heat-induced hallucination? My hand unexpectedly acted on its own, zapping out and



Fernando Rivadavia

Figure 26. The carnivorous plant *Utricularia nelumbifolia* inhabiting *Vriesea extensa* at Serra da Araponga.



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Figure 27. The outer leaves of *Vriesea extensa* removed to reveal *Utricularia nelumbifolia*.

plucking the suspicious-looking leaf. A fraction of a second was enough to confirm that it was not imagination but truly a round peltate *Utricularia* leaf. (Figures 26 and 27). I immediately shouted out to Joe and Fabio, “NE-LUM-BI-FO-LIAAAAAA!!” They quickly clambered up the steep mountainside towards me as whoops of joy escaped my throat and I jumped up and down, commemorating the moment. I could not believe that I had finally found *U. nelumbifolia* in nature after so many years!

As soon as the initial exhilaration 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 figure 28). 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; 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 V-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. 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:

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 treeless terrain had been a bi 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 younger leaves closer to the center of the bromeliad rosettes.
3. The watertight 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 farther 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?



Fernando Rivadavia

Figure 28. Fruit and flowers of *Utricularia nelumbifolia* at Serra dos Orgãos.

Anyway, back to the Serra da Araponga, where after a few hours of studying, photographing, botanizing, 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 *Vriesea extensa* that 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 altitude in the Serra dos Orgaos 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! (Figure 28).

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. My friend Marcelo Fontana is even successfully cultivating it outside bromeliads, in live Sphagnum moss. 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*. On contact with water, each seed sheath breaks open and releases the three-dimensional snowflake-shaped plantlets. 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 *Alcantarea imperialis* 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 realized 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.

ACKNOWLEDGMENTS

I would like to thank Joe Mullins and Fábio Pinheiro for their company on that memorable trip and congratulate Fábio, Marcelo Fontana, and Maurício Piliackas for keeping *U. nelumbifolia* alive in cultivation here in São Paulo. I especially want to thank Lúcio Leoni for pointing out the exact place where we finally found *U. nelumbifolia*.

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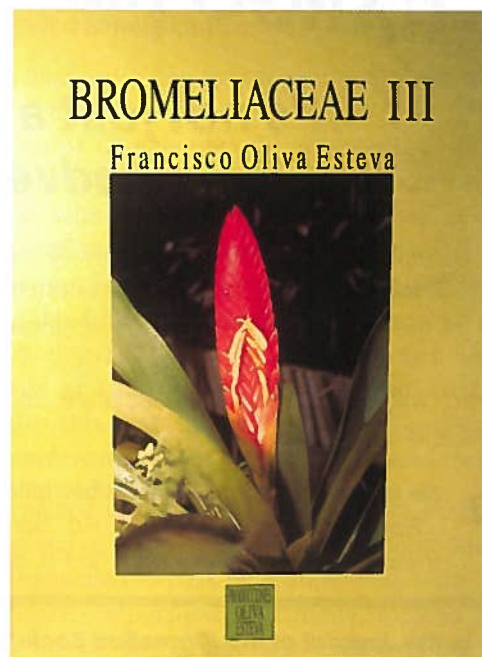
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Photograph by Marcel Lecoufle

The name Marcel Lecoufle is well known to plant lovers the world over, especially those specializing in orchids, bromeliads, and carnivorous plants. A talented photographer, author, and renowned nurseryman, he is also an Honorary Trustee of the BSI. He has contributed many of his slides to the BSI over the years and they have graced front and back covers of a number of issues of the Journal, including this one. The photograph above was taken at Mr. Lecoufle's nursery in 1990.

Calendar

- 3-4 Aug The South Bay Bromeliad Associates show and sale will be held at Rainforest Flora Nursery, 19121 Hawthorne Blvd., Torrance, CA. Show hours are noon to 4:30 p.m. on Saturday and 10 to 4:30 on Sunday. Plant sale hours on both days are 10 to 4:30. Contact: Bryan Chan, 818-366-1858 or by e-mail at bcbrome@aol.com.

- 6-7 Sep The Florida Council of Bromeliad Societies Extravaganza will be held at the Daytona Beach Resort, 2700 N. Atlantic Ave., Daytona, FL.

- 21-22 Sep The San Diego Bromeliad Society Show and Sale will be held in Balboa Park at the Casa del Prado, room 101. Show hours are 1 to 4 on Saturday and 10 to 4 on Sunday. Plant sale hours are 10 to 4 on both days. Contact Joyce Brehm at joycesjoy@aol.com.

- 21-22 Sep The Houston Bromeliad Society Show and Sale will be held at the Houston Arboretum and Nature Center, 4501 Woodbury, in Houston, TX. Hours are 8 to 5 on Saturday and 8 to 4 on Sunday. Contact: L.D. Stewart. 713-649-8464