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Cover photographs. Front: A large clump of *Tillandsia tenuifolia* var. *tenuifolia* bearing more than 100 open flowers. Jaline Nahoum, wife of Brazilian botanist Pedro Nahoum, is modeling the clump as a headpiece. Photograph by Wally Berg. **Back:** *Tillandsia lautneri* Ehlers. Photograph by Herb Plever

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Some New Species of the 1996 Expedition in Brazil

Elton M. C. Leme[1] & Harry E. Luther[2]

Photographs by Elton M. C. Leme

In early December 1996, we (Leme and Luther) together with David Benzing and Pedro Nahoum, set off on an expedition to study and sample Brazilian bromeliads and to photograph their habitats. High priority for Luther and Benzing was visiting caatinga (deciduous thorn scrub) and Bahia Atlantic (rain) forest habitats.

We left the city of Rio de Janeiro early on the morning of December 2 traveling north toward Itaobim and the Jequitinhonha River valley in Minas Gerais State. This is a region of Campos Rupestres (grasslands on rocky soil). Only a few collections were made this first day but one was of a new shiny-leaf *Orthophytum* species to be described elsewhere. We reached the city of Almenara that night after an 1100-km drive.

The next morning (December 3), we found the strange new *Orthophytum benzingii* (figure 1) before setting off toward Vitória da Conquista in Bahia State where we planned to spend our second night. Along the way, near Pedra Azul, we found *Orthophytum leprosum, Aechmea bromeliifolia, Tillandsia kurt-horstii, T. tenuifolia* and a large *Encholirium* species among others.

Leaving Vitória da Conquista on the morning of December 4, we explored dry caatinga on the way to Jequié where we found plants of the enormous *Aechmea perforata* and clusters of *Tillandsia juncea.* The latter species had not, to the best of our knowledge, been found previously in Brazil. Heading toward Chapada da Diamantina, we entered campos rupestres vegetation in the region of Contendas do Sincora. Here we found bottle-shaped plants of *Aechmea bromeliifolia, Hohenbergia utriculosa* (figure 4) and the new *H. undulatifolia* (figures 2-3). After a short exploration of some of the rocky hills we arrived, after dark, in Barra da Estiva.

The next morning (December 5) we visited some sites in the vicinity of Barra da Estiva and were happy to find plants of *Cottendorfia florida,* one of the prime taxa of Luther's interest, before turning back toward the coast and reentering caatinga vegetation. We passed through Maracas and Planaltina, making only a few collections, mostly tillandsias and *Hohenbergia catingae* before reaching Milagres where we spent the night.

Early on Dec. 6 we drove through Amargosa and Elisio Medrado where we

[1] Herbarium Bradeanum, Rio de Janeiro, Brazil
[2] Marie Selby Botanical Gardens, Sarasota, Florida, USA

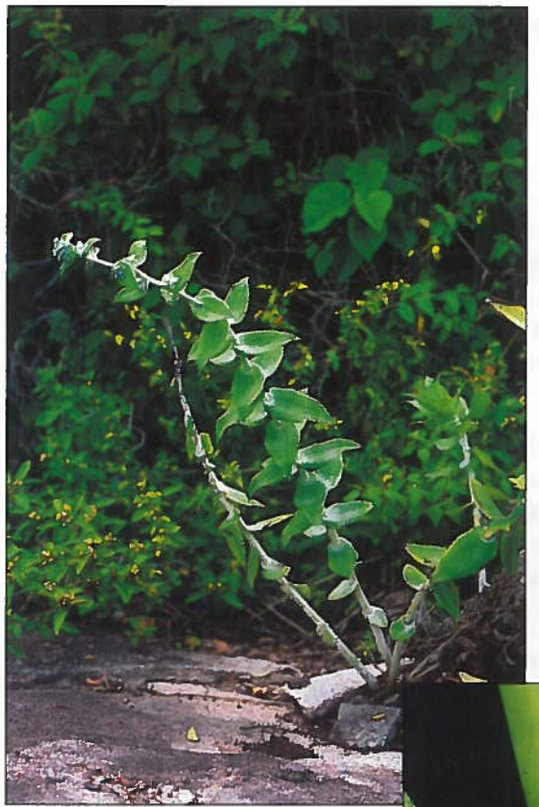


Figure 1.
Orthophytum benzingii in habitat, Jequitinhonha Valley, Minas Gerais State.

Figure 2.
Details of the leaf undulation of *Hohenbergia undulatifolia.*

Figure 3.
Close-up of the inflorescence of *Hohenbergia undulatifolia.*

Figure 4.
Hohenbergia utriculosa in habitat at Barra da Estiva, Bahia, Chapada Diamantina region, close to the type locality.

found colonies of a *Cryptanthus* and several *Aechmea* and *Hohenbergia* species in moist Atlantic forest before reaching the resort town of Guaibim on the ocean. In the vicinity of Guaibim, in restinga vegetation (coastal forest), we found another species of *Cryptanthus, Hohenbergia castellanosii, Aechmea blanchetiana* and *Vriesea procera.* We next turned southward, passing through Camamú before stopping for the evening in Ilhéus.

On December 7 we explored restinga and Atlantic forest habitats at Olivença, Una, and Santa Luzia (areas of cacao cultivation), arriving at Itamarajù late in the afternoon. The find for this day was a spectacular flowering specimen of *Neoregelia longisepala* in a flooded restinga forest.

On December 8 we drove straight to Roberto Kautsky's home in Domingos Martins in Espirito Santo State. After an all-too-short visit to Kautsky's wonderful collection and private conservation preserve, we left for Rio de Janeiro on the morning of December 9 arriving that evening

In all, we traveled over 5000 km on a zigzag course and sampled a variety of bromeliad habitats from sea level to 1000 m elevation.

After a few days of R & R in Rio de Janeiro, allowing enough time for Luther to visit the Botanical Gardens and some private collections, we started out on the last portion of our expedition. Luther, Leme, and Benzing were joined by Luiz Felipe Nevares de Carvalho, president of the Brazilian Bromeliad Society, and guided by Luiz Knud Correia de Araujo. We traveled to the southern part of Rio de Janeiro state, to the vicinity of Mangaratiba where we explored a rare, nearly pristine example of wet, lowland (near sea level to ca. 200 m elevation) Atlantic forest. This area was extremely rich in bromeliad species including *Aechmea pectinata, A. fasciata* var. *purpurea, Nidularium meeanum, Edmundoa lindenii, Billbergia amoena,* several *Vriesea* species, and the new and remarkable *Neoregelia nevaresii* (figure 7).

***Orthophytum benzingii* Leme & H.Luther, sp. nov.** (Figures 1, 5)

A *0. leprosum* (Mez) Mez, cui affinis, foliis et bracteis scapalibus ovatis, brevioribus latioribusque, subtus praecipue apicem versus albo-floccosis, sepalis asymmetricis, petalis apice rotundatis differt.

Type: Brazil. Minas Gerais: Almenara on the way to the tower of Telemig, near the city; 450 m elev., 3 Dec. 1996, *E. Leme 3661, H. Luther, D. Benzing & P. Nahoum.* (holotype: HB. isotype: SEL).

Plant saxicolous, clustering, very long caulescent, 60–100 cm high, stem without distinction from the scape, greenish, densely white-lanate, 0.7–1.2 cm in diameter. Leaves 22 to 28 in number but indistinguishable from the scape bracts, spreading, recurved near the apex, sheaths not distinguishable, blades ovate, acute to acuminate, 7–10 × 45 cm, thin-subcoriaceous, somewhat succulent, green, abaxially densely and minutely white-floccose mainly toward the apex, densely nerved; adaxially densely and coarsely white-floccose mainly toward base,

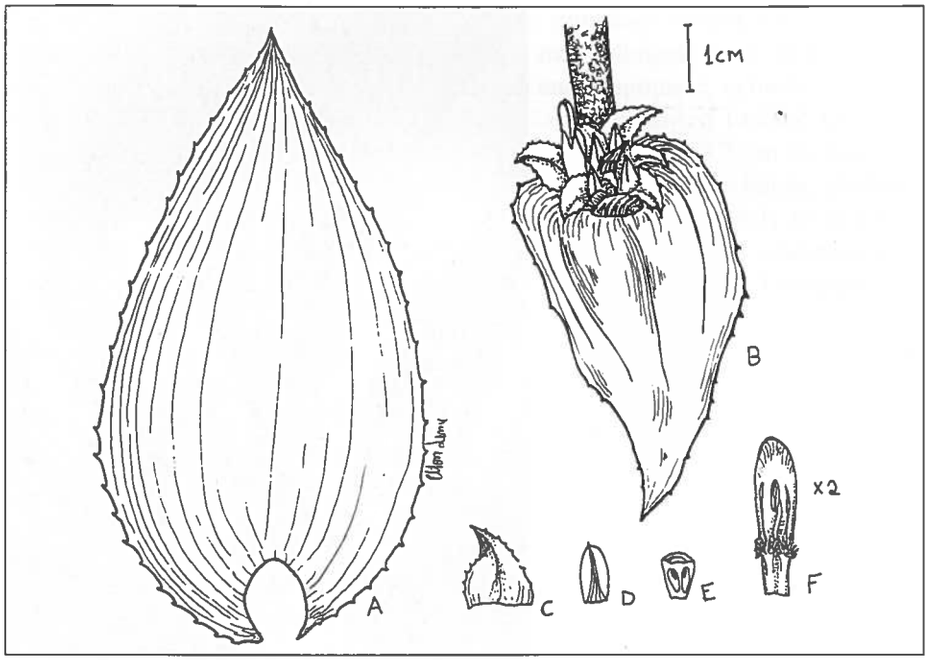


Figure 5.
Orthophytum benzingii: A, leaf; B, basal fascicle and primary bract; C, floral bract; D, sepal; E, longitudinal section of the ovary; F, petal.

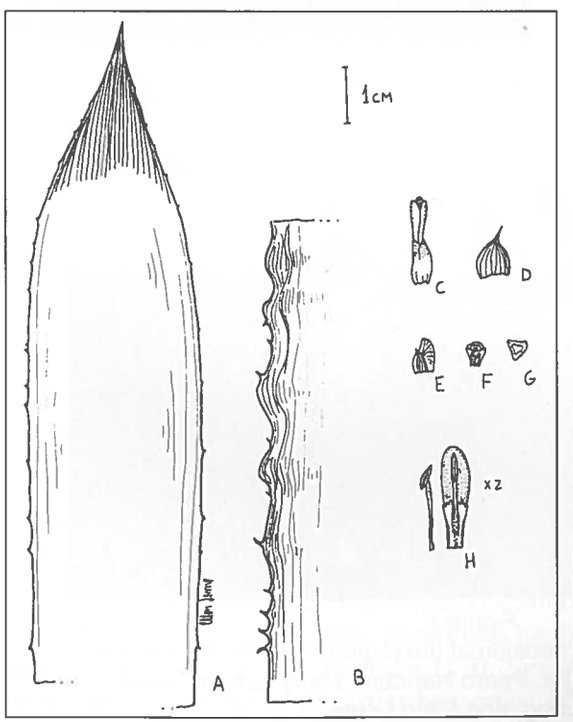


Figure 6.
Hohenbergia undulatifolia:
A, leaf-apex; B, basal leaf margin; C, flower; D, floral bract; E, sepal; F, longitudinal section of the ovary; G, cross-section of the ovary; H, petals and antesepalous filament and anther.

Figure 7.
Neoregelia nevaresii which flowered in cultivation in Brazil.

Figure 8.
Members of the 1996 expedition at the region of Serra do Sincorá, Bahia. From Left to right, Pedro Nahoum, Harry Luther, David Benzing, and Elton Leme.

glabrescent toward apex, margins subdensely spinulose, spines antrorse, 0.5–1 mm long. **Scape** not distinguishable from the main elongate stem. **Scape bracts** not distinguishable from the leaves. **Inflorescence** bipinnate, cylindrical, 17–22 cm long, ca. 3 cm in diameter, fascicles laxly arranged toward base and subdensely to densely arranged near the apex, rachis 0.5–0.7 cm in diameter, greenish, densely white-lepidote. **Primary bracts** like the scape bracts, gradually reduced in size toward apex, 2.5–5 × 1.8–3 cm, reflexed, slightly to distinctly exceeding the fascicles, minutely white-floccose toward base, glabrescent to glabrous toward apex, densely spinulose, spines ca. 0.5 mm long. **Fascicles** 10 to 20 in number, polystichously flowered, sessile, slightly flat at the apex, ca. 1.5 cm long, 2–3 cm in diameter, with 5 to 10 flowers. **Floral bracts** ovate-triangular, acute and apiculate, densely spinulose toward the apex, spines 0.5 mm long, carinate, strongly recurved toward apex, green, densely white-lanate mainly abaxially, 12 × 9 mm. **Flowers** 15–16 mm long (including the petals), densely arranged. **Sepals** slightly asymmetrical, ovate-lanceolate, acute and apiculate, 7–8 × 3 mm, free, entire, green, densely white-lanate toward apex, the posterior ones carinate. **Petals** sublinear, apex rounded, very minutely if at all apiculate, 12 × 3 mm, free, suberect at anthesis, greenish-white toward base, the apical 1/3 white, bearing 2 densely fimbriate appendages ca. 4 mm above the base, as well as 2 conspicuous longitudinal callosities which equals the filaments. **Filaments** the epipetalous ones adnate to the petals for ca. 4 mm, the antesepalous free. **Anthers** oblong, ca. 2 mm long, base and apex obtuse, fixed near the middle. **Ovary** ca. 4 mm long, trigonous. **Stigma** simple-erect, blades ca. 1 mm long, slightly recurved toward apex, white, margins lacerate. **Epigynous tube** inconspicuous. **Placentation** apical. **Ovules** obtuse, numerous. **Fruits** slightly enlarged from the ovary, lacking mucilagenous material, whitish. **Seeds** subconical-obtuse, ca. 1.2 mm long, finely sulcate.

Orthophytum benzingii is a very unusual species; it superficially resembles members of the family Commelinaceae. It is from a rocky habitat in somewhat humid sites along a border of shrubby vegetation and is named after one member of the expedition, the worldwide epiphyte expert David Benzing. Never forming any kind of rosette, it is difficult to differentiate the caudex of the plant and its floral scape. This new species has some relationship with *O. leprosum,* but can be clearly distinguished by the ovate, shorter and broader leaves and scape bracts, which are white-floccose abaxially mainly toward the apex, asymmetrical sepals, and by the apically rounded petals. Apparently, *0. benzingii* does not proliferate by any vegetative buds on the inflorescence, but by short basal shoots only.

***Hohenbergia undulatifolia* Leme & H.Luther, sp. nov.** (Figures 2-3, 6).

A *H. pennae* E. Pereira, cui affinis, limbis foliorum subtus glabris, fasciculis subglobosis, glabrescentibus et distincte minoribus, bracteis floriferis longioribus acuminato-caudatis, petalis basi ligulis denticulatis, ovulis obtusis vel leviter apiculatis; a *H. edmundoi* L. B. Sm. & Read, cui proxima, laminis foliorum longioribus et angustioribus, apice acuminate, margine basin versus

spinis tenue acicularibus et apicem versus laxe perminuteque spinulosa, fasciculis glabrescentibus, bracteis floriferis acuminato-caudatis differt.

Type: Brazil. Bahia: road Contendas do Sincorá to Barra da Estiva (via Casa de Pedra), rupiculous or epiphytic on *Vellozia* sp., amidst *Syagrus harleyi,* ca. 900 m elev., 4 Dec. 1996, *E. Leme 3685, H. Luther, D. Benzing & P. Nahoum.* (holotype: HB. isotype: SEL).

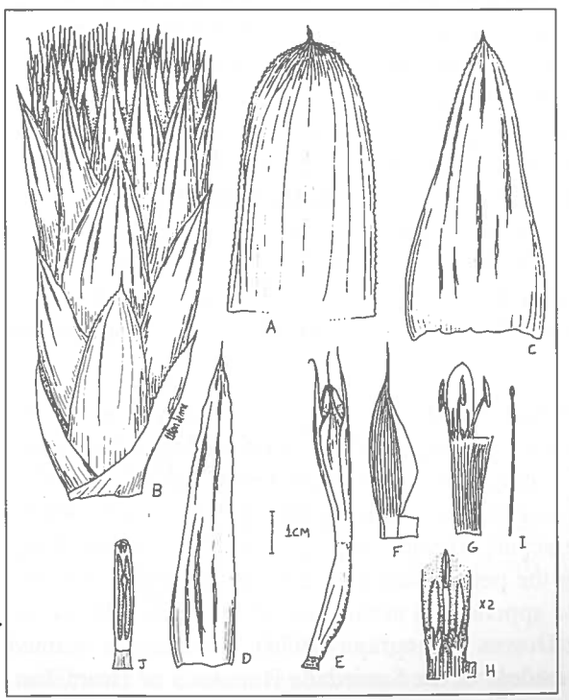
Plant flowering ca. 90–110 cm tall. **Leaves** ca. 12 in number, forming a narrowly subtubular to ellipsoid rosette, bottle-shaped at the base. **Sheaths** elliptic, 28 × 11 cm, chartaceous, nerved, subdensely pale-lepidote on both sides, dark brown toward the base, purplish-green and canaliculate toward the apex. **Blades** linear, nearly erect at anthesis, apex acuminate, slightly dilated near the apex, margins strongly undulate toward the base, 27–35 × 3–3.5 cm, subdensely and inconspicuously white-lepidote adaxially, glabrous and finely nerved abaxially, coriaceous, green with the exception of the blackish-purple apex, laxly spinose with brown, straight, tenuously acicular, 2–3 mm long spines near the base and 0.5 mm long spines toward the apex. **Scape** erect, ca. 85 cm long, 0.5–0.6 cm in diameter, reddish, white-lanate but soon glabrous. **Scape bracts** narrowly lanceolate, acuminate, entire, erect, distinctly shorter than the internodes, stramineous, papyraceous, nerved, white-lanate but soon glabrous, 5–7 × 1.5 cm. **Inflorescence** shortly and subdensely paniculate, narrowly conical, tripinnate at base, erect, 18–25 cm long, 5–6 cm in diameter at base, glabrous at anthesis. **Primary bracts** resembling the upper scape bracts but smaller, 2–4.5 × 0.4–0.8 cm, spreading, stramineous, papyraceous, slightly shorter to slightly exceeding the branches. **Branches** the lower ones 2.5–5 cm long, suberect-spreading, shortly pedunculate, peduncle 0.5–1 × 0.4 cm, subcomplanate, with three sessile secondary branches (including the apical one) subdensely arranged near the apex, the upper ones 1.5–1.8 cm long, sessile, spreading, densely arranged on the main axe. **Secondary bracts** narrowly triangular, acuminate-caudate, densely nerved, about equaling the branchlets. **Secondary branches** subglobose, ca. 1.4 cm long, with three to six flowers. **Floral bracts** broadly ovate, acuminate-caudate, 8–9 × 6–7 mm, margins inconspicuously crenulate, glabrescent, green, nerved, ecarinate, about equaling the sepals, apex suberect. **Flowers** ca. 15 mm long (including the petals), sessile, densely and polystichously arranged. **Sepals** strongly asymmetrical with the lateral membranaceous wing distinctly surpassing the midnerve, ca 6 × 4.5 mm, minutely mucronulate at apex but soon muticous, free, green toward base and lilac toward apex, bearing long-fimbriate scales on the apex, ecarinate. **Petals** narrowly obovate, apex rounded to slightly emarginate, 9–11 × 3 mm, free, lilac toward apex and whitish toward base, suberect at anthesis, bearing two sublinear, 3.5–5 × 1.5 mm, irregularly denticulate basal appendages. **Filaments** complanate, the epipetalous ones adnate to the petals for ca. 1 mm, the antesepalous free. **Anthers** ca. 2.5 mm long, base obtuse, apex apiculate, fixed at 1/2 of its length above the base. **Ovary** ca. 3mm long, ca. 3.5 mm in diameter,

subtrigonous, green, glabrous. **Placentation** apical. **Ovules** few, obtuse to slightly apiculate. **Epigynous tube** inconspicuous. Stigma subglobose, conduplicate-spiral, white, blades conspicuously lacerate.

This new species, like most of the species of *Hohenbergia* with a bottle-shaped leaf-rosette, is difficult to recognize when not in flower due to the phenomenon of the convergent shapes that make those bromeliads from the Bahian grasslands on rocky soils very similar to each other. Despite not being observed growing side by side, *H. undulatifolia* is quite sympatric with *H. utriculosa* Ule, which was seen only a few kilometers away, sometimes forming large populations. *Hohenbergia undulatifolia* - the name is a reference to the strongly undulate leaf-margins - is related to *H. pennae,* but differs from it by the abaxially glabrous leaf-blades, the subglobose, glabrescent, and distinctly smaller fascicles of flowers, the longer, acuminate-caudate floral bracts, the petals bearing denticulate basal appendages, as well as by the obtuse to slightly apiculate ovules. On the other hand, this new species also resembles *H. edmundoi,* differing by the longer and narrower leaf blades with acuminate apex, leaf margins bearing acicular spines toward base and laxly spinulose toward apex with very small spines, flower fascicles glabrescent, and by the acuminate-caudate floral bracts.

***Neoregelia nevaresii* Leme & Luther, sp. nov.** (Figures 7, 9).

A *N. macwilliamsii* L. B. Sm., affinis, laminis foliorum dense spinulosis, sepalis longioribus, apice longe caudatis, petalis albis, apice late acutis, quam sepala distincte brevioribus, 20-24 mm supra basin ligulis binis laminis duplicatis, integris ornatis differt.



Type: Brazil. Rio de Janeiro: Mangaratiba, Fat. Trés Orelhas, 13 Dec. 1996, *E. Leme 3776, H. Luther, D. Benzing, L. K. C. de Araujo & L. F. N. de Carvalho,* fl. cult. Jan. 1997. (holotype: HB. isotype: SEL).

Figure 9.
Neoregelia nevaresii: A, leaf-apex; B, inflorescence; C, involucral bract; D, floral bract; E, flower; F, sepal; G, petals; H, details of the petals' appendages; I, style; J, longitudinal section of the ovary.

Plant stoloniferous, stolons ca. 10 cm long, ca. 2 cm in diameter, very rigid. **Leaves** ca. 18 in number, spreading-arcuate at anthesis, forming a laxly crateriform rosette. **Sheaths** elliptic, 12–14 × 7–8 cm, densely pale-lepidote on both sides, greenish. **Blades** linear, 40–70 × 4–4.5 cm, very inconspicuous narrowed toward the base, margins densely spinulose, spines ca. 0.5 mm long, glabrescent, lustrous, green with irregular dark green spots as well as dark green cross-lines visible by transmitted light, the inner ones abruptly pink toward the base, the apex rounded and tenuously apiculate, the apiculous ca. 4 mm long. **Scape** ca. 3 cm long, ca. 2 cm in diameter, glabrous. **Scape bracts** triangulate-ovate, acute and apiculate, erect, 4–5 × 2.5 cm, minutely spinulose toward the apex, green, glabrescent, membranaceous, the upper ones involucrate, 7 × 3 cm, erect, about equaling the midpoint or the sepals, green, distinctly sulcate, sparsely pale–lepidote near the apex, densely and minutely serrulate toward the apex, spines irregularly curved. **Inflorescence** subcylindric-capitate, simple, umbellate, sunk in the center of the rosette, ca. 7.5 cm long, 4–5 cm in diameter, ca. 50-flowered. **Floral bracts** narrowly lanceolate, acuminate-caudate, 8 × 1.5 cm, margins minutely and irregularly undulate and very tenuously and minutely spinulose, obtusely if at all carinate toward the base, pale brown-lanate toward the apex, green, membranaceous, distinctly sulcate, about equaling the sepals. **Flowers** 7.5–8 cm long, odorless; pedicels 4–8 mm long, brown-floccose, the outer ones complanate and dilated toward the base. **Sepals** asymmetrical, subelliptic, 47–48 × 11–12 mm, apex tenuously long-caudate the apiculous ca. 12 mm long, connate for ca. 5 mm, ecarinate, green, inconspicuously lepidote, membranaceous. **Petals** sublinear, broadly acute, 35–40 × 6 mm, connate for ca. 20–24 mm, white with a lilac-rose spot at the center of the blade, erect at anthesis, the tube becoming strongly plicate and the blades remaining erect after anthesis, bearing two ca. 2.5 mm long laminate appendages, each one almost completely bisected at the middle and appearing as four appendages in total, also bearing two longitudinal callosities equaling the filaments. **Filaments** equally adnate to the corolla tube and free above it, terete. **Anthers** sublinear, ca. 7 mm long, dorsifixed at the middle, base obtuse, apex apiculate. Stigma subcylindrical, ca. 3 mm long, conduplicate-spiral, blades strongly contorted, white, margins minutely and densely lacerate. **Ovary** cylindrical, 25–27 mm long, ca. 4 mm in diameter, white, glabrous. **Placentation** subcentral. **Ovules** obtuse. **Epigynous tube** ca. 2 mm long.

This very unusual species was found growing on the shady floor of the lowland Atlantic Forest. It does not present a clear relationship with known species due to a combination of features including stoloniferous habit; leaf-blades densely spinulose, central leaves abruptly turning pink; inflorescence simple; floral bracts about equaling the sepals; flowers shortly pedicellate; sepals long-caudate and distinctly exceeding the petals; petals broadly acute, highly connate, and bearing two large bilaminate appendages at the base of the blades. However, according to the key in Smith & Downs Monograph (1979), *N. nevaresii* - named after one of its collectors and president of the Sociedade Brasileira de Bromélias,

Luiz Felipe Nevares de Carvalho comes close to *N. macwilliamsii,* differing by the densely spinulose leaf-blades, longer and long-caudate sepals, and by the white petals with broadly acute apex, bearing the amazing large bilaminate appendages well above the base.

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Copper in any Form is Still Copper...and Deadly!

Marie Bessellieu

Sometime in late November or early December 1997, I noticed some of my neoregelias were looking bad...as if they had cold damage. The temperature had gotten down to 37° one morning a week or so earlier, so I thought I was observing a few overly-sensitive-to-cold effects. But in thinking back to last year, it got colder than that with no damage to any of them. As days went by, more and more damage appeared on more and more plants. First the neoregelias, then aechmeas, tillandsias, vrieseas, guzmanias, and a few from various other genera. I began to panic. The shade house looked like it had been sprayed with Round-up™. Perhaps there was some kind of fungus running rampant through the collection. I could think of nothing else that could be causing the devastation that was increasing daily. I hadn't sprayed, dipped, fertilized or anything, so I called my sister to get the name of the agricultural plant inspector, but he wouldn't return my call when I left a message at his office. In the meantime, I called my brother, who is a nurseryman, and who had been refurbishing his boat in an open shed about 40 feet from my shade house. "Next time you come out to work on the boat", I said, "take a look in my shade house and see if you can figure out what is going on. It looks like the place has been sprayed with gasoline!"

The next day I called my sister, Betty Prevatt, to see if she would call the plant inspector for me, thinking he might respond to her request, since she is also in the nursery business with our parents and brother. She said, "Have you talked to our brother today?" "No....why?" I asked. "Well," she said, "he called this morning and wanted to know if copper in any form other than in treated lumber would kill bromeliads...."

What had happened was that one very windy Sunday (while my husband and I were at church) my brother had decided to grind the paint off the bottom of

the boat....paint that was loaded with copper. The wind was blowing toward the shade house and evidently most of the plants got a generous dusting. At that time, El Niño was providing us with daily downpours, washing the copper dust deep into the leaf axils of the plants before I even knew what had happened.

I had no idea that the blue paint on the bottom of the boat was loaded with copper, although had I been there to see what was happening, I may have expressed displeasure at my plants being covered with blue dust. As it was, the daily rains washed it in and I never saw it.

Once the mystery was solved, I began the long slow process of individually blasting each plant with the hose to wash out as much of the copper as possible. Then we trimmed damaged leaves and removed as many of the dead ones as possible. There were probably close to 1000 plants. Some of the vrieseas and guzmanias were much slower to show damage, and billbergias, orthophytums, and cryptanthus showed almost no damage, probably due to their growth habits. They either didn't hold as much copper, or the continual rains washed the copper out more easily. Or perhaps due to their location in the shade house they were more protected, or further away from the dust.

It is amazing how strong their will is to survive. Since I couldn't bear to throw any plant out unless I was positive it was dead and had no chance of pupping, I had a large number of pots with a chopped-off plant stub and a nametag. Many rotted off completely and I threw them out, but some are putting out vigorous pups. It remains to be seen what the final outcome will be, whether the pups will eventually show signs of copper poisoning or not.

I have fertilized the entire collection with liquid fertilizer and Super Thrive and am also gradually repotting everything to get rid of any copper remaining in the potting mix. Most of the plants have responded to the fertilizer and are putting out new leaves, but the extreme heat that we have been having is severely stressing the most heavily damaged plants.

Hopefully, this story will have a happy ending, and most of the collection will recover or produce healthy pups. But the main purpose of writing this is to let readers know that copper is deadly, and it may lurk in products you would never suspect, such as paint. I think we all know that treated lumber contains copper, and some fungicides contain copper, and I don't know what else. So read ingredients of any product you intend to use on or near your bromeliads, and if anyone is doing any work near your plants, ask questions...what products/chemicals will they be using, what type of work or material will they be working on, and WHICH WAY IS THE WIND BLOWING!!

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Alva, Florida

Dyckias

Carol Johnson

It seems that whenever dyckias are discussed, they are lumped with the rest of the subfamily Pitcairnioideae and given little attention. They are, however, very much different and deserve special attention. Terrestrial plants with wicked spines and tremendous root systems, they really should be grown in the ground where possible and not in pots, as their conformation suffers when potted. All (at least 90% of them anyway) are indigenous to Brazil, and 100% are from South America. While the bloom spikes may be susceptible to frost, the plants are extremely hardy and seem to thrive during the Florida cold season.

Blooming normally occurs in Florida between February and May. I am probably wrong, but I swear many of my dyckias seem to bloom more than once from the same plant. Blooms range from yellow through orange, inflorescences stand well above the foliage, and they are susceptible to chewing insects while in bloom.

Of the more than 100 *Dyckia* species named in the Luther binomial list, it is doubtful that more than 10 or 12 are found in Florida collections, and these species are (to me) of doubtful authenticity if grown from seed, as the plants enthusiastically cross pollinate and produce some strange progeny.

CULTURE: To repeat, dyckias do best in the ground. In Brazil, they grow in arid regions and on rocky outcroppings, but over the years I have found that if you are going to grow the plants in pots, overpot to accommodate the root system, keep well watered and fed, and furnish small amounts of lime as a top dressing twice a year. Soft and orchid scale seem to be fond of dyckias, and the best treatment for this is a 50/50 spray solution of alcohol and water.

GROWING FROM SEED: *Dyckia* seed are the only bromeliad seeds that I make a habit of covering at planting time. Cover them lightly, or perhaps just push the seed into the soil with a toothpick Collecting *Dyckia* seed is quite an experience. The seed is produced at the top of a tall bloom spike, where the three part capsule turns dark brown and eventually splits open. Stacked in the pods like pennies in a coin wrapper, seeds must be taken just when the pod splits. Delay even one day and the seeds are gone with the wind. Take seed when the pod is not completely ripe and germination will be poor or non-existent. The plants do cross-pollinate, so if you want to keep pure species, stick with offsets.

BIGENERICS: While dyckias cross pollinate freely, it is beyond my understanding how it is possible to manage a bigeneric cross with any other Pitcairnioideae considering the physical makeup of the various seed. Hazel Quilhot swore she had what she called "Dyckipoo" (*Dyckia* × *Puya*) but I always maintained that any resulting seed must be a selfing of one side or the other, and

I have yet to see a bloom on any so-called bigeneric.

There is one hybrid resulting from *D. encholirioides* × *D. brevifolia* which has no spines on the leaves at all. It is called D. 'Naked Lady'. It is apparently sterile, as I have never known one to bloom.

Many dyckias are not suitable for a collection where space is limited. Recommended species are: *D. brevifolia* (and 'Orange glow'), *dawsonii* (which does not readily self-seed), *fosteriana, choristaminea, remotiflora, platyphylla,* and *marnier- lapostollei* (a little difficult in Florida). I have yet to authenticate any of my supposed hybrids. I inherited a very nice, red plant from George Anderson which I named *D.* 'Nola Red'. Also, I am growing seedlings from Mr. Foster's *D.* 'Lad Cutak', which should be quite an adventure.

HINT: When you boil eggs, save the water, and (when cool) pour it on the soil in the dyckia pots to provide needed Calcium.

Dyckias are attractive, different, and belong in every collection. Just remember that in Florida don't try to grow them as you would in Brazil.

NOTE: I have a *Hechtia marnier-lapostollei* that is setting copious quantities of seed which look viable. It will be interesting to see what results, or did it just cross-pollinate with the dyckias that were in bloom at the time?

Longwood, Florida

Reprinted from the Florida Council of Bromeliads Societies, Inc. newsletter, Vol XVIII – Issue II (May 1998).

Letter to the Editor

Dear Sir:

Is there any reason, scientific or otherwise, why we must keep referring to grey leafed tillandsias as "Air plants"?

I find it increasingly depressing going around garden centers seeing dead and dying plants stuck to shells, dishes, and any other object that can be used to adhere tacky toys to. Above the display there is a "regulation" notice enticing people to the belief that "These plants grow on air – misting occasionally may be advised".

Are I and Mr. Hiroyuki Takizawa of Japan lone voices crying in the wilderness? I propose that we be bold and call for a worldwide ban on the name "Air plant". What do other members and growers think?

G. H. Mottershaw,
Leicester

Tillandsia capitata

Herb Plever **Photographs by the author**

Tillandsia capitata Grisebach gets its name from the shape of its inflorescence which is capitate - - its flowers aggregate into a very dense cluster, forming a head. It is found growing epiphytically or on rocks at altitudes between 2,500 –3,500 feet in Mexico, the Dominican Republic, Cuba, Guatemala and Honduras. Being widely distributed *T. capitata* might be expected to exhibit considerable variation, and so it does. The many, gray-green, narrow leaves of the type specimen arch over and form an attractive rosette 10 to 14 inches in diameter. The scape is erect or suberect with long, foliaceous bracts whose sheaths may be tinged with red and/or with the inflorescence turning red.

But such is its variability that it can be found with diameters ranging from four inches to fifteen inches (sometimes even larger). The leaves may be bright red or mauve-purple or orange even before flowering time; or they may stay green as a modest backdrop for a colorful inflorescence. The short inflorescence (1/2 to 6 inches) sports either red, peach or yellow bracts depending on the particular form. These primary bracts provide the color of the inflorescence. They may be all red, purple or yellow, or the lower half may be of one color and the upper half may be another color. The spikes are 1 to 5 flowered and the tall, tubular petals are an attractive blue-purple.

This plant is often grown by tillandsia people, because it is easy to grow and exhibits such beautifully diverse coloration. Despite this, *Tillandsia capitata* seems to have gotten little coverage in bromeliad literature. The major opus on the genus, "Tillandsias" by Paul Isley[1] has not a single reference to the plant. Rauh[2] has one black and white photo of the plant, but not in bloom. Over the years, The Journal of the Bromeliad Society and its predecessor, the Bromeliad Bulletin, have displayed only 2 or 3 non-blooming shots. Only Victoria Padilla's "The Colorful Bromeliads"[3] has a color photo of the 'Rubra' form in bloom, but does not show the flowers. This article is an attempt to fill that void and give growers a visual look in color of the different forms of *T. capitata.*

T. capitata readily adapts to most conditions and can be grown mounted on bark or wood or in a well-drained potting medium. I find that with my bi-weekly, one hour fertilized soakings, it grows and flowers rapidly. If you grow tillandsias, you certainly should grow at least one of the beautiful forms available.

T. capitata 'Rubra' (figure 10) is the most commonly grown form. Its leaves remain bright red even before flowering. The leaves of my personal favorite *T. capitata* 'Peach' (figure 11) acquire a mauve-purple color, but upon flowering the

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[1] Isley, P.T. 1987. Tillandsia, Botanical Press, Gardena, CA
[2] Rauh, Werner. 1970. Bromeliads for Home and Garden. Blandford Press.
[3] Padilla, Victoria. 1981. The Colorful Bromeliads, Their Infinite Variety. BSI

Figure 10.
Tillandsia capitata 'Rubra'

Figure 11.
Tillandsia capitata 'Peach'

Figure 12.
Tillandsia capitata 'Yellow Form'

Figure 13.
Tillandsia capitata "Marron(e)" also known as "Old Gold"

inner parts of the upper leaves take on the bright peach of the inflorescence. The 'Yellow' form of *T. capitata* (figure 12) shown has green leaves, but the inflorescence is much taller than other forms. The primary bracts are very long with purple blades and yellow sheaths, and the rest of the inflorescence is bright yellow.

There seem to be many forms with red to maroon leaves and yellow inflorescences called Marron(e)' or'Old Gold'. The plant shown in figure 13 bloom similar to the "Yellow' form but have shorter scapes, their leaves are bright red to maroon and the primary bracts are red and yellow. Another form also called 'Marron(e)' has yellow leaves with orange-red margins, but the primary bracts are green. None of these descriptive name designations have any taxonomic standing, so there is no taxonomically correct name. In any event, these pictures do show how very variable *T. capitata* can be.

Dr. Lyman Smith's 1976 Monograph of the Bromeliaceae listed a variety of *T capitata* var. *guzmanioides*. However, the latest list of bromeliad binomials by Harry Luther and Edna Sief places this variety in synonymy with *Tillandsia lautneri* (back cover), recently described by Renate Ehlers. I have grown and flowered this plant but find that it is quite finicky, perhaps requiring more humidity than it gets in my apartment.

New York, New York

Reprinted from Bromeliana, the newsletter of the New York Bromeliad Society (34:4). April 1997

Time to Clean out and Update your Library

Updated versions of three important BSI publications were released at the World Bromeliad Conference in Houston. All are available from BSI Publications, 29275 N.E. Putnam Rd., Newberg, OR 97132.

An *Alphabetical List of Bromeliad Bromeliad Binomials* by Harry Luther and Edna Sieff has been revised to include all known species of bromeliads as of July, 1998, with the correct spelling of the names for each species. The cost is $10. Please note...previous versions of this list are obsolete and should be discarded. Continued use of them would, in some instances, result in applying incorrect names.

The *Bromeliad Cultivar Registry* compiled by Don Beadle is the culmination of years of compiling the names and origins of known cultivars. The cost is $40 dollars.

Another important publication, the popular *A Bromeliad Glossary* has been updated by Pamela Koide. It is available from BSI publications for $10

All three of these should be part of every serious grower's library and should be referred to frequently not only by hybridizers, but also by everyone who grows bromeliads. Applying accurate names to the plants we grow is one of the most important objectives of the BSI and should always be given high priority by growers everywhere.

Bromeliads in Honduras

Ronald D. Cave[1] **Photographs by the Author**

Honduras is a country of diverse topography and ecological zones. For this reason, and its tropical locality, the country's bromeliad diversity is substantial. This diversity was initially documented and described by Gilmartin (1965), with photographs and keys to genera and species. Molina (1975), who listed 101 species in 11 genera later enumerated the species recorded from the country. However, synonymizations, more precise identifications and new findings adjust these figures to as many as 106 species in 12 genera.

In some areas of Honduras, bromeliads are a highly visible component of the local flora. Along the northern Caribbean coast there are remnants of formerly extensive lowland rainforests, cut down to plant crops such as pineapple, *Ananas comosus* (L.) Merrill. In the mountainous interior of the country, pine forests dominate at mid-elevations (500 to 1400 meters). In large areas north of Lake Yojoa extensive undergrowth within these forests have been cleared in order to cultivate pineapple. Beginning at about 1000 meters, pines become substrates for many species of *Catopsis* and *Tillandsia* (figure 14). Williams (1954) reported that *Tillandsia punctulata* S. & C., *Tillandsia lampropoda* L.B. Smith and *Tillandsia standleyi* L.B. Smith are almost exclusively confined to pines as hosts. In the pine-oak forests north of Tegucigalpa are the densest populations of Spanish moss, *Tillandsia usneoides* L., that I have seen in Honduras.

Beginning at about 1400 meters the pines gradually surrender their dominance to deciduous trees, such as oaks and laurels, in the montane cloud forests. There are 34 cloud forests in Honduras. Although some of these forests may have been connected some hundreds of years ago, most have been isolated for very long periods of time, so that unique flora and fauna have evolved within them. In these cloud forests, bromeliads are a dominant component of the epiphytic biomass. Large forest trees may harbor hundreds or thousands of individuals, which give the trees a "fuzzy" appearance (figure 15).

Because of the unique conditions (abundant moisture, high humidity, cool temperatures) in cloud forests, some bromeliad species are restricted to this habitat, *Catopsis hahnii* Baker, *Catopsis morreniana* Mez, *Tillandsia cryptopoda* L.B. Smith, *Tillandsia guatemalensis* L.B. Smith, and the very large *Tillandsia ponderosa* L.B. Smith and *Tillandsia yunckeri* L.B. Smith are some of the more common species restricted to cloud forests.

Only four bromeliad species are known to be endemic to Honduras: *Hechtia malvernii* Gilmartin, *Tillandsia glossophylla* L.B. Smith, *Tillandsia hondurensis*

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[1] Plant Protection Department, Escuela Agricola Panamericana, Zamorano, Honduras

Figure 14.
Pines covered with *Tillandsia* and *Catopsis*, Cerro Uyuca, Honduras

Figure 15 .
Cloud-shrouded oak tree covered with bromeliads, Cerro Apalagua, Honduras

Rauh and *Tillandsia steiropoda* L.B. Smith. However, these same species are known only from the type specimens, which were collected in cloud forests. All other bromeliad species have ranges, which extend into at least Guatemala or Nicaragua, and usually into southern Mexico and Costa Rica (Davidse et al. 1994).

The high visibility, ease of recognition and utility of bromeliads has allowed them to be colorfully named by locals. The names "gallinazo" and "gallito" are applied to *C. hahnii, Catopsis nitida* Griseb., *Pitcairnia imbricata* (Brongn.) Regel, *Tillandsia anceps* Lodd., *Tillandsia balbisiana* Schult., *Tillandsia fasciculata* Sm., *Tillandsia guatemalensis, Tillandsia lampropoda* L.B. Smith, *Tillandsia multicaulis* Steud., *Tillandsia polystachia* L, *Tillandsia punctulata, Tillandsia tricolor* S. & C., *Tillandsia schiedeana* Steud. and *Tillandsia recurvata* L. Both names refer to the inflorescences of the plants appearing like rooster tails. "Cresta de gallo, or rooster's crest, is used for *Tillandsia dasylirifolia* Baker. Spanish moss and *Tillandsia recurvata* commonly go by the names of "barba de viejo", meaning old man's beard, and "paste de cerro", or mountain scrubcloth. *Hechtia dichroantha* D. Smith is called "motate" and *Hechtia guatemalensis* Mez is "motatillo" and "motate cimarrbn"; these are indigenous names and infrequently used. Many species of *Pitcairnia* and *Bromelia* are called "pinuela", which refers to the plant (not the fruit) being similar to that of pineapple. Miscellaneous species are called "mión" because as one walks under the plant he or she is sprinkled with water leaking from the plant.

The fruits of some wild bromeliad species are edible and occasionally used by rural folk as a food source. Four species specifically sought for this purpose are *Aechmea bracteata* (Sw.) Griseb., *Aechmea mariae-reginae* Wendl., *Bromelia karates* L. and *Bromelia wercklei* Mez. A soft beverage is also made from the fruits of *B. karates;* in addition, young sprouts are consumed.

In the weeks leading to Christmas many bromeliads are in flower and thus make attractive ornamentals for the holiday. Particularly showy are many species of *Tillandsia.* Williams (1954) recorded that the most common species seen in markets is *T. fasciculata.* Its popularity is enhanced by it attractiveness and extreme abundance in some mountain areas. Other species that Williams (1954) observed in the markets of Tegucigalpa and Comayagua were *Tillandsia punctulata, Tillandsia rotundata* L.B. Smith, *Tillandsia lanpropoda, Tillandsia standleyi, Tillandsia ponderosa* and *Tillandsia orogenes* Standley & L. Williams.

The bromeliads of Honduras house a wide variety of invertebrate species, particularly arthropods. However, one particular insect may be of help to bromeliad enthusiasts in Florida, where the weevil *Metamasius callizona* (Chevrolat) recently colonized and is causing economic and ecological damage. The closely related *Metamasius quadrilineatus* Champion is a frequent inhabitant of many bromeliad species in Honduras. Like *M. callizona,* its larvae burrow in the meristem of plants. *Metamasius quadrilineatus* may be the host for a natural enemy, which could potentially control *M. callizona* in Florida. Current research

in Honduras is examining this possibility.

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Contributions to the Society

Listed below are individuals and organizations who have made recent contributions to the BSI. Some contributed to the color fund, some have contributed memberships, others to the Mulford B. Foster Bromeliad Identification Center, and still others have donated to the BSI to use at it sees fit. Our thanks go out to all of them.

John Anderson
Ulrich Baensch
Don Beadle
Bromeliad Society of Austin
Bromeliad Society of Broward County
Bromeliad Society of Central Florida
Bromeliad Society of New South Wales
Caloosalhatchee Bromeliad Society
Clinton Carson
Nancy Dinwiddie
Edward Doherty
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Joe Sandel
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Irma Sriyanti
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Tropiflora Nursery
Neal White
Chokei Yoshida

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Vriesea tillii, a New Species from Ecuador

José M. Manzanares[1] **Photography by the Author**

In July 1994, I traveled to Lago Agrio to study the Bromeliaceae in the National Park of Yasuni and the Huaorani Etnica Reserve. On the way to Lago Agrio from Quito I particularly concentrated my collecting in areas where primary forest still exists. I found this beautiful new Vriesea close to Gonzalo Pizarro in the province of Sucumbios at ca. 1800 m elevation

***Vriesea tillii* Manzanares sp.. nov.** (Figure 16)

Type. Ecuador. Prov. de Sucumbios: Gonzalo Pizarro, road between El Chaco-Gonzalo Pizarro, 00°12'S, 77°42'W, ca. 1800 m elevation, July 1994. *José M. Manzanares* 5205 (holotype, QCNE)

A *Vriesea heterandra* (André) L.B. Smith habitu majore, rosula subbulbosa, inflorescentia subdigitata, spicis longe stipitatis, bracteis florigeris subcarinatis peradpresse lepidotis, sepalis longioribus coriaceis et petalis minoribus differt.

Plant epiphytic, stemless, flowering up to 40 cm. **Leaves** spreading, forming a large pseudobulb, rosette 40 cm high and 30 cm in diameter. **Leaf sheaths** conspicuous, elliptic, 13 cm long, 7.5 cm wide, dark castaneous lepidote on both sides. **Leaf blades** narrowly triangular, long attenuate, recurved, 41 cm long, 2 cm wide, densely appressed lepidote on both sides. **Scape** curved, shorter than the leaves, 7 cm long, 4 mm in diameter. **Scape bracts** the lower ones foliaceous, densely imbricate, 17–20 cm long, 9 mm wide, the upper pink with a big ovate sheath and attenuate blade. **Inflorescence** bipinnate, curved, subdigitate, 20 cm long, 13 cm wide, densely appressed lepidote, 8–10 spikes a one distance of 8 mm, pink. **Primary,** the lower ones like the scape-bracts, the upper ones with an ovate sheath and apiculate, 2 cm long, 1.8 cm wide, shorter than the sterile bases, erect, pink, densely appressed lepidote, ecarinate, nerved. Spike with a long sterile bracteate base of 7.5 cm, linear, acute, slightly complanate, curved, 14 cm long, 7 mm wide, densely 20–30 flowered. **Flowers** subsessile. **Floral bracts** ovate, acute, 2 cm long, 8 mm wide, carinate, imbricate, base and tip densely lepidote, coriaceous, pink. **Sepals** free, lanceolate, acute, carinate, glabrous, 1.2 cm long, 3.5 mm wide, covered by the floral bracts. **Petals** linear, 2 cm long, with two adnate ligules at the base of 9 mm long, crenulate, dark pink with white apex. **Stamens** and **pistil** inserted. **Ovary** cylindric, 3 mm long.

Vriesea tillii appears to be related to *Vriesea heterandra* (André) L.B. Smith (figure 17) and Vriesea appenii Rauh (figure 18.)

The plant differs from *Vriesea heterandra* (André) L.B. Smith by: being a larger plant, subbulbose, inflorescence subdigitate, longer spikes, sepals larger

[1] Curator of the National Herbarium of Ecuador (QCA), Casilla Postal 17.07.9584, Quito, Eucador.

Figure 16.
Vriesea tillii in habitat at Gonzalo Pizarro

Figure 17
Vriesea heterandra near Lumbagni, Prov. Sucumbios

Figure 18
Vriesea appenii at Pasaje, Prov. El Oro

and lanceolate, and petals being smaller.

It differs from *Vriesea appenii* Rauh by: being a smaller plant with shorter leaves, possessing a curved scape, a subdigitate inflorescence, the base and tip of the floral bract densely lepidote, and by having glabrous sepals.

Vriesea tillii grows only in dense humid subtropical forest at elevations of 1800 m. In the same areas at 900 m is found *V. heterandra* (Mez) L.B. Smith, which can be found in all the Amazonian provinces of Ecuador. *Vriesea appenii* Rauh has been found only in the coastal province of El Oro in Ecuador at 400-550 m, near the city of Pasaje.

The name *Vriesea tillii* honors Dr. Walter Till, an authority on Ecuadorean bromeliads from the University of Vienna.

ACKNOWLEDGEMENT

My thanks to Dr. Walter Till, University of Vienna, for his cooperation and for the Latin diagnosis.

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Ethnobotanical Use of Bromeliaceae Revisited

Derek Butcher

In the March/April 1998 issue of the JOURNAL OF THE BROMELIAD SOCIETY we read about the link between indigenous cultures and bromeliads. Regrettably, there were at least two references omitted.

First we read about *Tillandsia xiphioides* which is used in Bolivia and neighboring areas to alleviate pains in the chest. Nothing was mentioned of the Butolgan tribe of the Adelaide Plains, which has a fetish with *Tillandsia xiphioides* var. *tafiensis*. So much so, that other Australian tribes consider it to be a pain in the bum.

Then there is *Aechmea coelestis,* which is used by the Morikeletan tribe from the hills just north of Melbourne. This tribe is unique in that the females of the tribe have a different name and are called *Ananas,* and who do the cooking. Taking psilium grains (silent 'p' as in swimming), these are pounded between a rock and a hard place and mixed with Yarra water to produce a soggy cup. This is filled with the blue berries of *Aechmea coelestis* and cooked in a bed of Eucalyptus leaves. The resultant pie is fed to the Morikeletans who call them pina-pina-qa-qa (translated as "lovely rock buns").

Fulham, South Australia

Reprinted from the BROMELIAD GAZETTE, 21(4):7, the newsletter of the Bromeliad Society of South Australia, July/Aug, 1998, though I'm at a loss to explain why.

A Puzzling Bolivian Bromeliad: *Tillandsia boliviensis* Baker

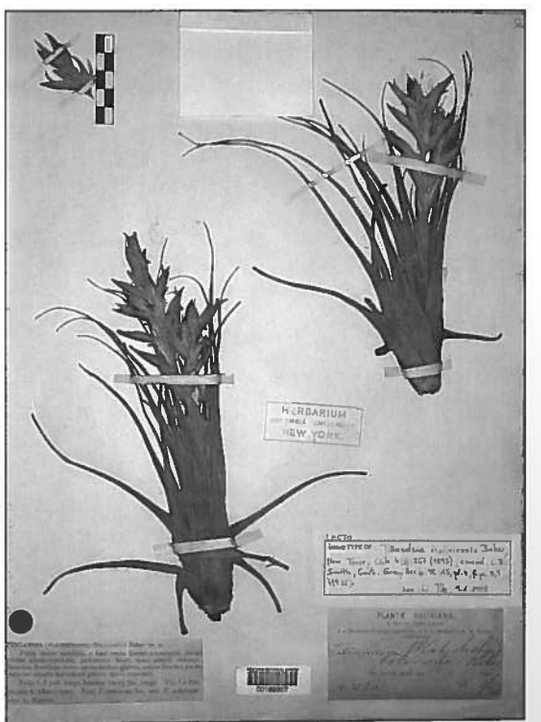
Walter Till[1] **Photographs by the Author**

Tillandsia boliviensis had been described by John Gilbert Baker, then the keeper of the Herbarium of the Royal Botanic Gardens in Kew, England, in 1895 after material collected by Miguel Bang, a Danish botanical collector active in Bolivia. However, the herbarium specimens bearing *Bangs #159a* belong to two different species that today are assigned to two different subgenera. *T. boliviensis* (subgenus *Allardtia*) and *T. paraensis* Mez (subgenus *Tillandsia*). The description seems to be a mixture of both elements (*#159a* in herbarium NY and *#159a* in herbarium K) albeit the Kew specimen is not annotated in Baker's typical handwriting and only "Bolivia" is given for the location on the label. The New York type sheet bears the label information as it is cited in the protologue

and is noted as *"Tillandsia (Platystachys) boliviensis Baker n. sp."* Hence it is clear that this latter sheet was seen by Baker while the Kew specimen obviously had not been available at the time of the preparation of the description. This difference is important when recognizing the incongruencies of Baker's description with the known material of *Bang 159a.*

Baker (1889) had characterized his subgenus *Platystachys* with "leaves… coriaceous…more or less densely lepidote" and "style and stamens often longer than the petals". In contrast, his subgenus *Anoplophytum* is mainly separated by leaf characters: "…broader and thinner, subglabrous". No petal characters are mentioned in his description and we can assume he concluded from the leaves alone when he assigned *T. boliviensis* to *Platystachys.* The Kew specimen of *Bang 159a* has quite well preserved petals and the exserted stamens are clearly visible. Baker would have mentioned these characters if he had had *Bang 159a* from K for his descriptions.

Smith (1932), who knew both the NY and the K specimens, therefore logically selected the New York material (figure 19) as to the type of *T. boliviensis* and amended its description. However, two peculiarities should be mentioned: the floral bracts are partly carinate in the type specimens and the sepals are distinctly carinate but not alate. These features doubtlessly originate from strong desiccation of the fruiting specimens. Smith's (1932) illustration was drawn from the plant at right top corner of the type sheet and was reprinted in Smith and Downs (1977). Remarkably, both plants on that sheet have a clearly visible compounded inflorescence while Baker writes, "Spica simplici oblonga". It is likely that Baker saw a duplicate of the New York specimen with a simple inflorescence as this character couldn't have been taken from the Kew material. However, no further duplicates of *Bang 159a* are known, and therefore currently there is no reason not to follow Smith's (1932) typification.



Photograph W. Till

Figure 19
Lectotype of *Tillandsia boliviensis* (herbarium NY)

[1] Curator of the Herbarium WU, Institute of Botany, University of Vienna

Figure 20 Photograph H. Till

Tillandsia boliviensis, Irrnstorfer #7, flowered 7 Sept. 1979.

Figure 21 Photograph Renate Ehlers

Tillandsia boliviensis, imported by K. Knize under the name of "T. refiflora".

Four additional specimens of *T. boliviensis* are cited in the Flora Neotropica monograph (Smith & Downs, 1977) but the petal characters are still not mentioned. Therefore Lieselotte Hromadnik, when describing her *T. recurvispica* (Hromadnik & Schneider, 1987), intended to provide the lacking floral details from material collected at the assumed type locality near La Paz (*Hromadnik 3005,* WU). However, she confused the characters of the floral bracts with those of the sepals and omitted the petal color. This has already been recognized by Derek Butcher, Fulham, Australia, and by Renate Ehlers, Stuttgart, Germany, and has been published by the former in Bromeletter. A comparison of the type of *T. boliviensis* with the Hromadnik collection provided full congruence as well as with another specimen kept in the herbarium of the University of Vienna, Austria (*O. Irrnstorfer #7,* WU) from the same locality as in *Hromadnik 3005:* the "Moon Valley" near La Paz. *Irrnstorfer #7* has flowered in cultivation in September 1979 and is illustrated in figure 20..

In his article in Bromeletter, Derek Butcher has also clarified the identity of plants which are traded by Karel Knize, Lima, Peru, under the name of *"T. refiflora"* (figure 21). They are identical with *T. boliviensis,* only the floral bracts are less densely lepidote, the naming is illegitimate and superfluous.

T. boliviensis is probably related to *T. cochabambae* Gross & Rauh. The statement of "petals blue, lilac, violet" in Butcher (1992), which is essentially a translation of and is based on Lehmann (1986), obviously represents a confusion with *T. cochabambae.* It also resembles *T. bermejoensis* Hromadnik which differs in larger corollas and glabrous floral bracts, and which is growing at much lower elevations in the Departmento Cochabamba.

ACKNOWLEDGEMENTS

My cordial thanks go to Dr. Patricia K. Holmgren, the Director of the New York Botanical Garden Herbarium, to make the type of T. boliviensis available for this study, and to Mrs. Renate Ehlers, Stuttgart, Germany, for providing the slide of "T. refiflora".

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Institute of Botany, University of Vienna, Rennweg 14, A-1030 Wien, Austria.

Welcome New Members

We are very pleased to welcome the following people who have joined the BSI from February 1998 through June 1998.

Howard Allen III
Phillip Allen
Deborah Andre
William Archip
William Armitage
Carol Barrus
Larry Beadling
Dick Bishop
Donald Blake
Janet Brown
John Bustamante
Macgregor Capes
Tammy Capo
Rovil Cayabyab
Sathitrong Chayangsu
William Claypool
Lucille Cook
Bill Corbin
Darren Crayn
Burnell Curtis
Vickie Denton
Cynthia Dickenson
Norene Dietrich
Chris Durham
Alfred Dyott
Nealy Emmerting
Juan Espinosa-Almodovar
Wild Bill Fickeisen
Joe Flaherty
Peter Frank
Charlotte Futerfas
Mark Garrison
Alfred Green
Jeremy Green
Katherine Griffith
Howard Grothe Jr.
Brian Hames
Kerry Hammer
Mary Hancock
Donald Haradon
Gladys Harrison
Fred Havilla
G. Hernandez
Brian Holst
Robin Huck
Dale Jenkins
James Johnson
James Kane
Michael Karr
Warren Katsos
Michael Katz
Shuko Kawamura
Roy Kay
Leopold Keller
B. Keith
Dennis Kellogg
Dan Kitt
George Klosterman
Louise Kohls
John Krause
Murphy Kuhn
Don Laird
Anita Langhorne
Al Lenk
Rita Levin
John Lewis
Scott Macdonald
Jun Matsuzono
Larry Mayse
David McGee
Sid McLarin
Kathi Meeker
James Miley
Tom Mirenda
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Rosemary Mowday
Wes Muilenburg
David Neethling
Gyula Nemeth
Doris Nicholas
Cecilia Olfato
Hiroko Omori
Donna Pearce
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Jean Ponton
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Ed Scharstein
Jack Schendowich
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Doris Shepard
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William Snedon
Carol Snyder
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Viola Spencer
Sharon Stoops
Sue Suehs
Christopher Tarpley
Catherine Touchton
Ken Uy
Ken Villwock
Linda Vinney
Amanda Wallace
Kelly Watson
Connie Waymer
Marc Weiss
Nancy Wellford
Phyllis Wells
Roxanne Werowinski
Dennis Westler
Charles Wilder II
Lan Willaims
Donna Worwetz
Herbert Yamanaka
James Young
Joyce Young
Miriam Ximenes
Carolyn Zambraski
Dr. George Zizka

How Quickly do Bromeliads Decay?

Edward Burgess[1], James Burgess[1], and Margaret Lowman[2]

ABSTRACT

Leaf decay and toughness of two Florida bromeliads were compared with other common vegetation found growing in close proximity. Species included: live oak *(Quercus virginiana),* passionflower vine *(Passiflora incarnata),* citrus *(Citrus sinensis),* ball moss *(Tillandsia recurvata),* Spanish moss *(Tillandsia usneoides),* and butterfly orchid *(Encyclia tampensis).* The bromeliad foliage was moderately tough, with leaves ranked (in order of decreasing toughness): orchid, live oak, ball moss, citrus, Spanish moss, and passionflower. The softest leaves (passion vine) decayed most quickly, while the toughest leaves were the slowest to decay. The epiphytes experienced a short growth burst during their duration on the forest floor, so their pattern of decay was not a linear decline as were the vines and trees.

INTRODUCTION

Decay is an important process in ecosystems, because it facilitates nutrient cycling and serves as an important regulator of the maintenance of species (reviewed in Coleman and Crossley 1996). In Florida and elsewhere, epiphytes compose a relatively large portion of the aboveground vegetation in many regions, especially forest hammocks (Lowman and Nadkarni 1995). As a result, epiphyte decay is important to the nutrient cycling of Florida hammock ecosystems. Their rates of foliage decay and associated foliage toughness, have never been measured or compared to other plants that grow in the same habitat

Benzing (1990) suggested that bromeliads suffer negligible herbivory, so we might assume that their foliage is extremely tough or toxic. Studies in tropical rain forests have shown that some bromeliads, despite high levels of leaf toughness, do suffer moderate levels of insect damage (Lowman *et al* 1996), but this is the only study to date that has measured herbivory in bromeliads of forest canopies with quantitative techniques.

In this study, we measured the toughness and decay of two common Florida bromeliads, and compared them to four other plant species that grow in association: two phorophytes, one vine and one epiphytic orchid. Our hypotheses were; 1. that bromeliad foliage would be tougher than other species, thereby rendering them relatively resistant to insect attack and also to decay; 2. and that plants with softer leaves would decay more quickly than those with tougher leaves.

[1] Research Volunteer, The Marie Selby Botanical Gardens, Sarasota FL 34236
[2] Director of Research and Conservation, The Marie Selby Botanical Gardens, Sarasota FL 34236

METHODS

Two common Florida bromeliads were selected for study: Spanish moss *(Tillandsia usneoides)* and ball moss *(T. recurvata),* both of which inhabit tree canopies in both natural hammocks and urban trees. Four plants were selected for comparisons that grow in association with these bromeliads: two phorophytes (Orange trees, *Citrus sinensis;* and live oak, *Quercus virginiana),* one vine (passionflower vine, *Passiflora incarnata)* and one epiphytic orchid *(Encyclia tampensis).*

For the leaf decay measurements, nineteen mesh fruit bags were obtained from Albritton Fruit Company. The bags measured 29 cm x 14.5 cm with a mesh of 6 mm x 4 mm. Three leaf samples, each composed of 20 gm fresh weight foliage, were obtained for all six species, and placed in a separate mesh bag. The bags were labeled and placed on the ground under a live oak canopy (see Figure 22). Bags were laid flat and staked to the ground so that wind and animals could not dislodge them. The bags were weighed every two weeks for six months, and then monthly for 8 months, until the majority of the leaves had disappeared after approximately one year. A control bag was also placed on the forest floor and weighed, to insure that the bag weights were not affecting the results. These methods had proven successful in previous field studies (Lowman 1988).

Leaf toughness was measured with a penetrometer, made from Plexiglass sleeves and a metal rod that penetrated the leaf surface with a known volume of water (Lowman and Box 1983) (see Figure 23). Three measurements on each of three fresh leaves of the six species were measured for toughness values. Toughness was expressed in g (water weight required to puncture).

RESULTS AND DISCUSSION

The penetrometer readings showed that the orchid was the toughest leaf, with almost 8000 g water weight required to puncture the foliage. In contrast, passion vine was extremely soft with only 528 g water weight required to puncture the leaf. From softest to toughest, the rankings were: passion vine, Spanish moss, citrus, ball moss, live oak, and orchid (Table 1). Statistical analyses showed that ball moss and citrus had similar toughness values, but that all other species were significantly different (t-test: $F = 324.67$, $p > 0.0001$; SNK grouping: orchid > live oak > ball moss and citrus > Spanish moss > passion vine).

The decay rates reflected the toughness values, with the passion vine leaves disappearing in two months. In contrast, the Spanish moss, ball moss, orchid and live oak foliage exhibited less than 50% decay after four months, and had approximately 25% remaining after one year (Figure 24). Both bromeliads experienced anomalies in their decay after several months. Instead of a smooth declining curve like the other four species, they actually underwent an apparent increase in foliage weight! This aberration is probably a consequence of their

Figure 22.
Mesh bags containing known weights of foliage were laid on the forest floor to monitor decay rates.

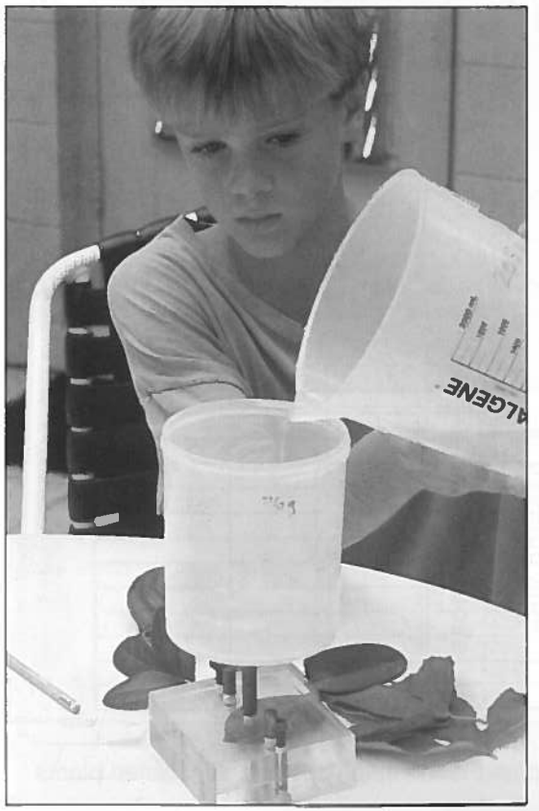

Figure 23.
A penetrometer was used to estimate leaf toughness.

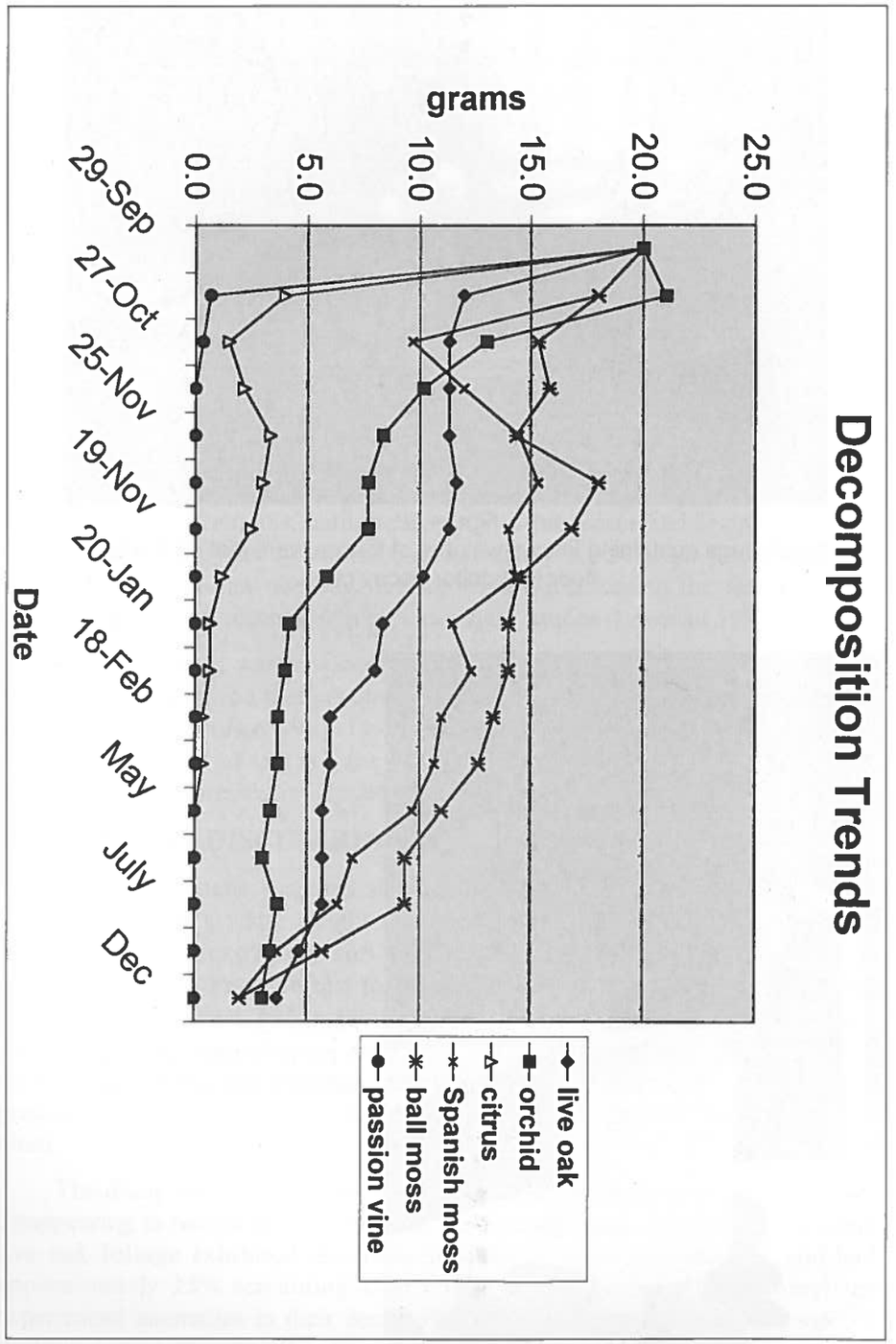

Figure 24
The decomposition trends for some Florida epiphytes and associated plants

Penetrometer Data					
species	leaf#	hole#	reading (g)	species average (g)	leaf average (g)
passion flower	1	1	465	528	510
		2	539		
		3	527		
	2	1	533		534
		2	517		
		3	551		
	3	1	569		541
		2	531		
		3	523		
citrus	1	1	1849	1952	2045
		2	1716		
		3	2569		
	2	1	1957		1897
		2	1862		
		3	1872		
	3	1	1987		1916
		2	1798		
		3	1962		
live oak	1	1	5851	5210	5711
		2	5439		
		3	5844		
	2	1	5186		4772
		2	4445		
		3	4684		
	3	1	5960		5147
		2	4669		
		3	4811		
orchid	1	1	7847	7881	8431
		2	9000		
		3	8445		
	2	1	7445		8182
		2	8655		
		3	8445		
	3	1	7445		7031
		2	7509		
		3	6138		
ball moss	1	1	2320	2288	2443
		2	2390		
		3	2620		
	2	1	2220		1992
		2	1985		
		3	1770		
	3	1	2997		2430
		2	2220		
		3	2073		
Spanish moss	1	1	1295	1365	1331
		2	1300		
		3	1399		
	2	1	1356		1383
		2	1358		
		3	1435		
	3	1	1395		1381
		2	1385		
		3	1362		

Table 1
Leaf toughness for some Florida epiphytes and associated plants.

epiphytic behavior, whereby these plants actually grew slightly when placed upon the ground instead of desiccating and undergoing immediate decay as with the leaves of trees and vines. Or perhaps bromeliads, by virtue of their tank structure, retain water for many months after falling from a host tree and survive on the forest floor without immediate death and decay.

The relatively slow decay of bromeliads has important consequences for the ecosystem. Rather than re-cycling nutrients back into the soil immediately upon displacement from the tree, Florida bromeliads appear to remain structurally intact for several months. This means that they do not contribute rapid mobilization of nutrients back into the ecosystem, but a slow trickle of nutrient material. In contrast, the citrus and passion vine foliage contribute their entire biomass with stored nutrients back into the soil within several months after senescence. Both slow and rapid nutrient re-cycling may be beneficial to the overall nutrient balance of a forest ecosystem, because together they may insure the long-term homogeneity of nutrient influx into the system.

Although none of the bromeliads ultimately survived on the forest floor, their relatively tough leaves and unique epiphytic habit facilitated slow decay. Further studies of decay rates of bromeliads in tropical systems would expand our understanding of the role that these epiphytes play in forest nutrient cycling. We speculate that epiphytes are not only important to catching nutrient pools in their tanks and enhancing biodiversity in the canopy, but they also regulate the cycling of nutrients back to the forest floor and in this fashion contribute to the biodiversity of soil organisms.

ACKNOWLEDGMENTS

We are grateful to Albritton Fruit for donation of the mesh bags, and to Mr. Steve Dacey and Mr. Yatsudo of the science faculty at Pine View School in Sarasota, Florida for advice on this project. Saul Lowitt assisted with the statistics. Several people kindly assisted with the weighing and measurements: Muriel Brathwaite, Eric Hamm, Michael Brown, and Phil Wittman.

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Affiliates in Action

Gene Schmidt

February's tornado damage to the Kissimmee/Sanford/Orlando area wiped out Bud Martin's Blossom World Bromeliads. We all hope that he and his associate will be able to rebuild and continue to grow the rare and beautiful bromeliads for which he is famous. Bud was Chairperson of the 12th World Conference held in 1996 in Orlando and did much to promote its success. Good luck and a fast rebirth! *(From the March '98 Commentary, Bromeliad Society of Broward County)*

We are going through one of the hottest periods for a long time due to the El Niño weather pattern, however we are not nearly as bad off as some parts of the country. Also spare a thought for other parts of the world like some areas of Australia and also parts of North America. *(From the February '98 Bromeliad Society of New Zealand, Inc. Bulletin)*

At press time, February has had about twelve inches of rain. I don't know about any one else, but I sure haven't been spending much time outside checking my plants. A few have been showing signs of saturation, and a few more have bloomed without me even seeing the flowers. Let's hope that this month brings a few more warm sunny days that we can spend in the garden! *(From the March '98 Pup Talk, Saddleback Valley Bromeliad Society)*

Dr. David Benzing's classic study, The Biology of The Bromeliads, has been out of print for some time. The work has now been republished by the Bromeliad Society of Victoria (Australia). The contents are the same as the original publication, but the format has changed to A4 with the spine made of plastic binding combs. Cost is $A 74, please contact: Mr. Bruce Lewis, 75 Elgin Street, Hawthorn, VIC, Australia 3122. *(From the March '98 Bulletin of the Bromeliad Society of New Zealand, Inc.)*

We thank Bill and Carol Judge for the nice display they put up on the board at the Botanic Garden about bromeliads. We now have a website thanks to Tennis Maynard. The address is www.geocities.com/rainforest/vines/4639/first.html. We now have 34 members. *(From the March '98 BSGC News, Bromeliad Society of Greater Chicago)*

Bill Paylen, at the February meeting, was made a lifetime honorary member of the South Bay Bromeliad Associates for his knowledge and contributions to the club and the bromeliad world as a whole. A discussion was held on trying to encourage greater cooperation and communication between clubs in the local area. One of the benefits would be to better attract out of state speakers, as many speakers tend to decline going out of their way for one day speaking engagement. If the clubs in a given area were able to coordinate the schedule of a speaker the costs could possible be shared and everyone would benefit. (From the March & April '98 South Bay Bromeliad Associates Newsletter)

Concerning *Vriesea* x mariae

P. Duchartre; translation by T. U. Lineham

The charming bromeliad illustrated in this issue of the JOURNAL is the product of a crossing made by M. Albert Truffaut, the skillful horticulturist of Versailles. The color plate was reproduced from a beautiful watercolor by Mlle. Jeanne Koch. The parents of this hybrid are *Vriesea brachystachys* and *V. barilletii.* M. Edouard André named this plant in honor of the memory of the late Mme. Truffaut.

M. Truffaut has informed us that when he presented this plant in its flowering to the Society on the 8th of November 1888, it was *Vriesea brachystachys* or more precisely, *Vriesea psittacina Lind.* Var. *brachystachys* Regel, that was the seed parent while the species named *V. barilletii* provided the pollen. These parents were chosen through the desire to unite in one elegant model the inflorescence of the mother, which unfortunately has dull leaves, and the rapidity of development, which is the chief merit of the father. That wish has been fully satisfied: *Vriesea* x mariae had its first blooming only two years after the seeds were sowed, and all the plants obtained later have shown the same rapidity of development. In addition, it has preserved, even notably improving the brilliant inflorescence of V. brachystachys. In short, it is a decided improvement over the parent plants.

[Translator's note: *This brief introduction provides background information and serves to present the unusually fine chromolithographic reproduction of the original watercolor. I omitted both the detailed botanical description of the plant thinking it of little interest to the general reader, and a lengthy discussion of the taxonomic groupings of Tillandsia vs. Vriesea, a subject that taxonomists are still discussing. I omitted also the author's complaint that Lindley was mistaken when he first named the genus Vriesia instead of Vriesea. Duchartre defends his choice of the generic name Vriesea calling on the authority of Edouard Morren, the eminent Belgian botanist.* –TUL]

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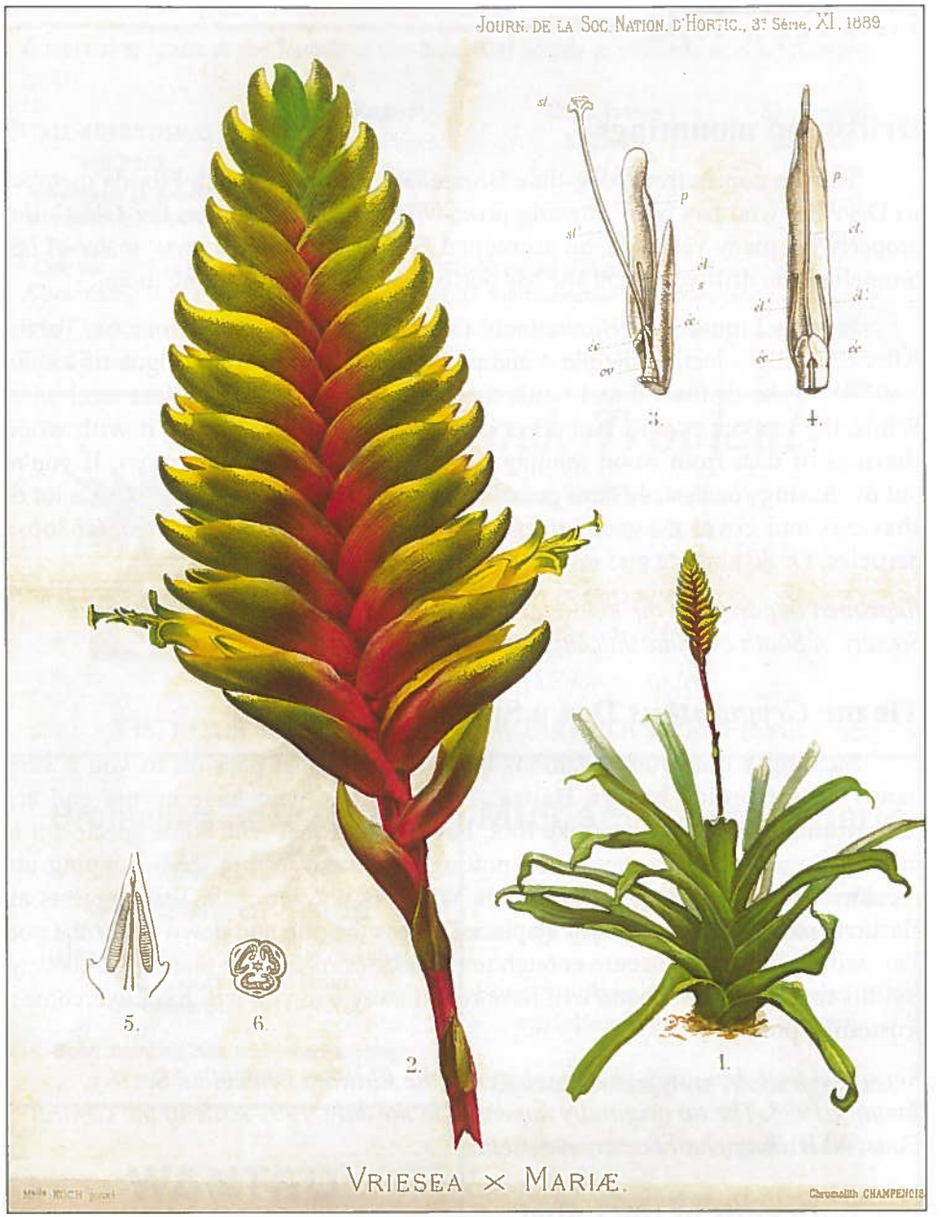
If you have an e-mail address which you would like to have included in the next BSI directory, please forward it to Membership Secretary Carolyn Schoenau at BSI@nervm.nerdc.ulf.edu.

Authors submitting articles to the JOURNAL for publication are also encouraged to send their e-mail address along with the articles. They will not be published with the articles (unless the author requests it), but may be used for communicating with the author to clear up any questions, make comments, etc. The e-mail address of the editor is blackburn@neworld.net



Legend:

1. Flowering specimen of *Vriesea* x mariae André
2. Entire inflorescence, full size (24 cm as originally reproduced).
3. Detail of flowering showing: a sepal, *s;* a petal, *p,* interior view with two scales, *éc, éc;* the stamens, *ét;* the pistil comprising the ovary, *ov,* the style, *st',* the stigma, *st.*
4. A petal with stamen, *ét,* two scales, *éc, éc.*
5. Longitudinal section of the ovary enlarged about three times.
6. Transverse section of the ovary, the same enlargement.

Grower's Tips

Driftwood mountings

This tip comes from long-time Bromeliad Society of South Florida member Jo Derville, who has been growing prize-winning bromeliads on her Old Cutler property for many years. Jo, an accredited BSI Judge, likes to grow many of her bromeliads on driftwood, and she has perfected the art of mounting them.

Jo uses Liquid Nail™, available from hardware stores in four oz. Tubes. After carefully selecting the plant and placement, she puts a small gob of Liquid Nail"™ on the driftwood and holds the plant in place with stainless steel wire. While the cement is still wet (this is the neat part) she covers it with wood shavings or dust from wood sanding. You can also use dry peat moss. If you're out of shavings or dust, Jo says pencil sharpener shavings work fine. Use a lot of shavings and cover the cement entirely, and after a few days dust off loose particles. Or do nothing and rain and watering will remove the excess.

Reprinted in part from the BROMELIADVISORY, the newsletter of the Bromeliad Society of South Florida, Jul/Aug 1998.

Tie me *Cryptanthus* Down Sport!

Stealing a line from a famous entertainer, I must pass on to you a very handy hint supplied by Ern Bailey. Those of you who have crypts and are endeavoring to get offsets to take root, have noticed that with some species, it is difficult to get them to stay in the potting mix because they keep popping up. Presuming you are using a 3 inch pot, which is not very tall, Ern suggests an elastic band of sufficient length be placed across the pup and down under the pot. This will hold the pup secure enough until roots from and the plant is on its way. By this time the rubber band will have rotted away and you will have overcome a frustrating problem.

Reprinted from Newslink, the newsletter of the Illawara Bromeliad Society, January 1998. The tip originally appeared in the July, 1997 issue of the Central Coast NSW Bromeliad Society newsletter.

Use both ends of the Label

If you use an identifying and/or inventory number along with a name when you write your plant label, write the number at both the top and the bottom of the label. The markings from even the best of the "permanent" markers fade when exposed to the elements for any length of time, but when the number is duplicated on the bottom of the label resting snuggly in the potting mix, it is readable for much longer periods of time. [Ed].

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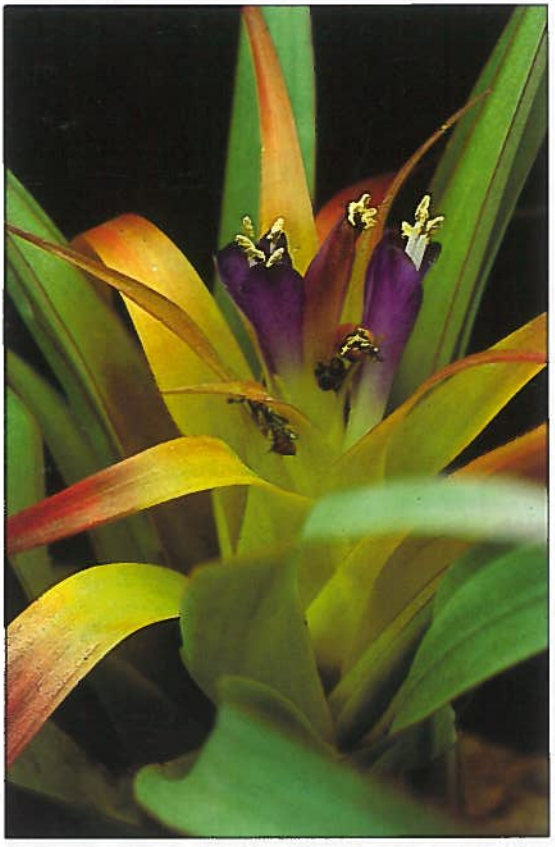

Tillandsia lautneri Ehlers was formerly known as *Tillandsia capitata* var. *guzmanioides.* Text on some of the *Tillandsia capitata* forms in cultivation begins on page 161.

Photograph by Herb Plever.

Calendar

18 Jul	The Saddleback Valley Bromeliad Society will hold its annual show and sale "Bromeliad Fiesta '98'" at the University of California, Irvine Arboretum (at the center of Jamboree and Culver Blvds.). The sale takes place from 9 a.m. to 4 p.m., and the show will be open from 11 a.m. to 4 p.m. The show is free but parking costs $1.00. Contact: George Long (714) 837-2111
1-2 Aug	The South Bay Bromeliad Associates 1998 show and sale will be held at the South Coast Botanical Garden, 26300 South Crenshaw Blvd., Palos Verde Peninsula. Show hours are from noon to 4:30 on Saturday, and 10 a.m. to 4:30 p.m. on Sunday. Plant sale hours are from 10 a.m. to 4:30 p.m. on both days. There is an admission charge to the Botanical Gardens. Contact Bryan Chan, 8110 Murietta Ave., Panorama City, CA 91402. Or phone 818-787-4265. E-mail BCBROME@aol.com.
19-20 Sep	River Ridge Bromeliad Society' annual show and sale at the City Park Botanical Gardens, 1 Palm Drive, New Orleans, LA. Show hours from 1 to 5 p.m. on Saturday and 10 to 5 p.m. on Sunday. Plant sale hours 10 to 5 on both days. There is a $3 admission charge to enter the City Park Botanical Gardens. Contact: Shirley Alcock, 601-799-4813