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Editor: Thomas U. Lineham, Jr., 1508 Lake Shore Drive, Orlando, Florida 32803-1305.

Cover photographs. Front: *Tillandsia zecheri* var. *cafayatensis.* The discussion of this new variety begins on page 107. Photo by Renate Ehlers. Back: Páramo de Tamá with espeletia. The description begins on page 99. Photo by F. Oliva-Esteve.

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Looking for Bromeliads in the State of Táchira, Venezuela

Francisco Oliva-Esteve and Bruno Manara

The state of Táchira in western Venezuela offers a peculiar flora, especially in its southwestern portion, since different Andean elements not found elsewhere in that country converge there from adjacent Colombia. If this is true for the flora in general, it is true also for bromeliads specifically.

Our research began on December 27th. Its main purpose was to visit the Páramo[1] of Tamá in the southwestern corner of the state. We left the city of San Cristóbal, the capital of Táchira, at 9 a.m. in a Trooper station wagon and headed southwest toward Rubio, a town created in the last century from a coffee plantation. In this stretch of the way, we very soon observed large quantities of *Tillandsia fendleri* in various shapes, varieties, and colors on the trees. In addition, *T. usneoides, T. juncea, T. myriantha, T. tenuispica* and others, not to mention *T. recurvata,* covered the trees and the electric wires in the villages and towns we passed through. In the town of Rubio, some showy individuals of *T. fasciculata* on trunks of royal palms *(Roystonea venezuelana)* caught our attention and we stopped to take a picture of them.

We continued our trip towards Bramón (1,400 meters above sea level), and on the banks along the road some *Pitcairnia maidifolia* and especially a great many P. *brevicalycina* became frequent. The latter was seen growing even in places reforested with pine trees under which there was no other vegetation. In that tract, we noticed also a number of beautiful specimens of *Tillandsia denudata* on the shoulders of the road and even on tree tops (figure 1), where they produced a particularly decorative effect. The first really unusual finding took place at noon: a *Guzmania* with a laterally ascending, green inflorescence, with many short spikes, in prefloral stage. The plant intrigued Francisco all during the journey.[2] *Tillandsia schultzei* and *Vriesea tequendamae* started to appear also (figure 2). Of the latter, we collected a couple of individuals in full bloom. The dark purple flowers with yellow stamens produced a remarkable color effect in contrast with the red bracts of the inflorescence.

We noticed also many a *Vriesea incurva,* either the variety with drooping inflorescence (the most common one) or some individuals of the variety with ascending spike. All of them were in fruiting stage. But of these species, the most remarkable finding was a relatively small bromeliad with grayish silvery leaves and

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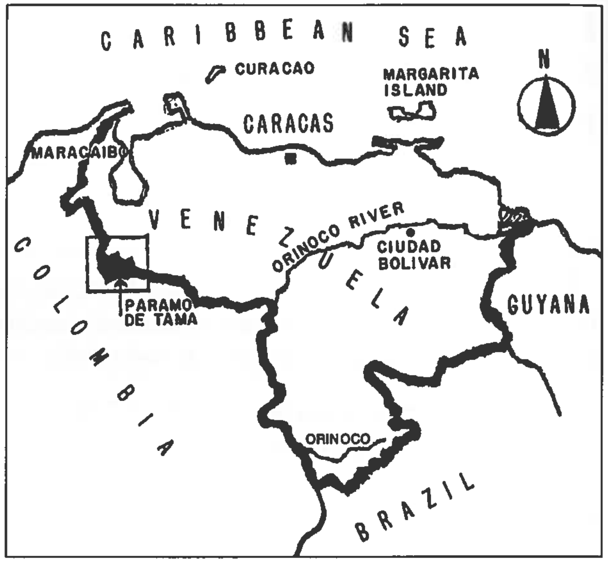
[1] A high, barren plain.

[2] Later identified by H.E. Luther as *G. mitis. See Journal 1986, page [193].*



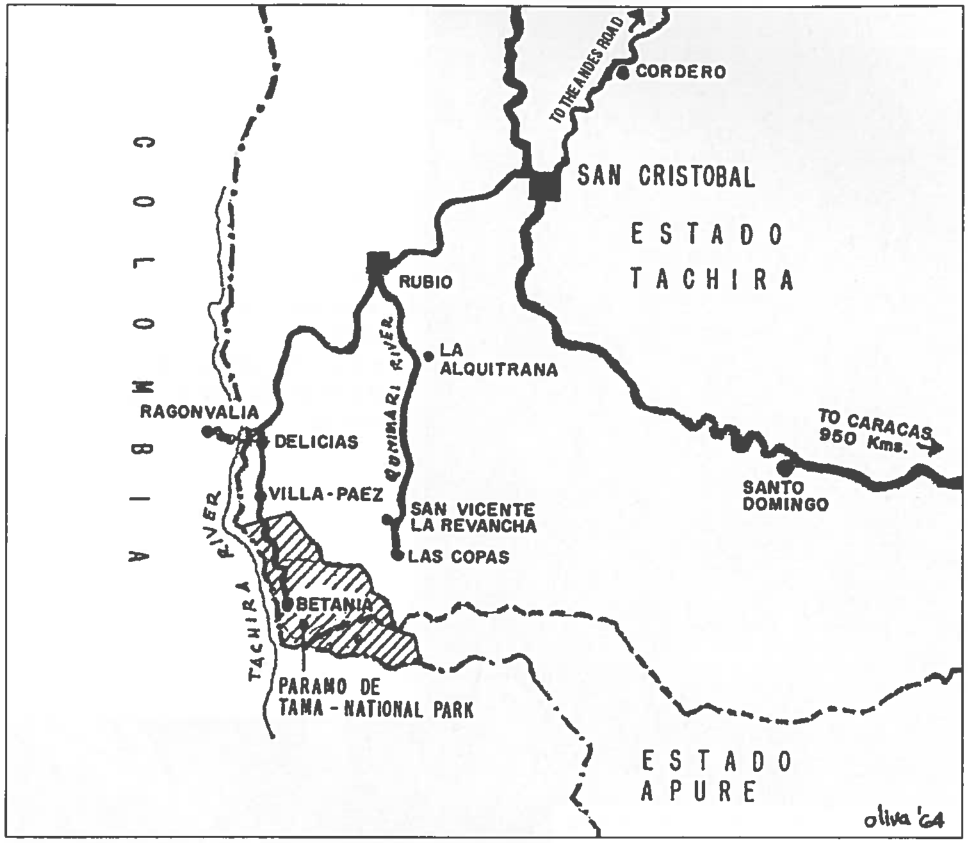
a showy inflorescence consisting of several ascending spikes with yellow bracts and an orange border complemented with white, tubular flowers. Perhaps it is a new variety of *T. turneri* intermediate between variety *orientalis* and var. *turneri,* or a dwarf form of variety *turneri.*

By that time we had already reached 2,000 meters above sea level, and the variety and quantity of bromeliads had become impressive. Now, *Tillandsia tetrantha* var. *aurantiaca,* and *T. biflora* were outstanding although *T. fendleri* surpassed them in abundance. That species was everywhere on trees, on the ground, or attached to rocky cliffs. We observed also that from 1,000 meters and up, bromeliads were the dominant epiphytic family present with lichens, some ferns *(Polypodium* spp.) and some small peperomias.

The road then began to descend towards the first station of our journey, the town of Delicias (1,500 meters). There something happened that might possibly be hard to believe. We felt the car moving downhill, as if the brakes were on. We stopped the engine, left the brakes off, but instead of moving forward downhill, it started to move slowly backward for about 20 meters and then stopped. In astonishment, we repeated the experience again and again and, finally, surrendered to the evidence of the phenomenon—known also in other parts of the world and presumably caused by a huge mass of magnetic iron underground.

We finally reached Delicias and found the town decked for the seasonal holidays. Among the decorative elements, were rosettes of *Tillandsia fendleri* (known locally as "guicho") attached to the light poles on the street corners. We saw bromeliads used in homes as substitutes for Christmas pine and also *T. tenuispica, T. fasciculata,* and *T. usneoides* serving as typical decorations of the manger in the parish church.

The following day, December 28th, was to be the most important of our journey since we had planned on that day to reach the Páramo of Tamá. All of the bromeliads collected on the day before were left in a corner of the hotel yard. We moved early in the morning towards Betania (2,100 m above sea level) about 30 km south, where the gravel road ended.



The road, in this stretch, snakes onward on the left slope of the Táchira river, which, flowing northward in its deep canyon, marks the border in that region, and we could observe the cliffs, farmed land, and also the village of Herrán in Colombia on the other side of the river. On a steep cliff a lone *Tillandsia fendleri* towered. All along the way, in addition to the already familiar *Tillandsia fendleri, T. biflora,* and *Vriesea tequendamae,* we began to see *T. complanata* and *T. tovarensis,* easy to recognize for the red wine color of its leaf rosette. The original forest vegetation all along the way had been destroyed to make way for intensive farming, but bromeliads were abundant on the few remaining original trees as well as on the edge of the road and the cliffs.

Once in Betania, we contacted the ranger, showed him our collecting permit, and with his direction parked the car at a farm. We then followed the trail through a rich rainforest almost undisturbed but for a small meadow area opened up by fire where some cattle and horses grazed. As the trail climbed on, our packs became heavier and heavier. Very soon, however, a bit at the right of the path, we had the first joyous surprise of the day: a mass of *Tillandsia turneri* var. *turneri* in full bloom. We hurried to take pictures (figure 3).

Figure 1.
Two examples of *Tillandsia denudata* mixed with *T. myriantha* on top of a tree in rainforest at 1800 m altitude.

Photos by F. Oliva-Esteve

Figure 2.
The inflorescence of a *Vriesea tequendamae* in bloom seen along the road, 1700 m.

Figure 3.
In an open area along a stream of clear water we found *Tillandsia turneri* var. *turneri.*

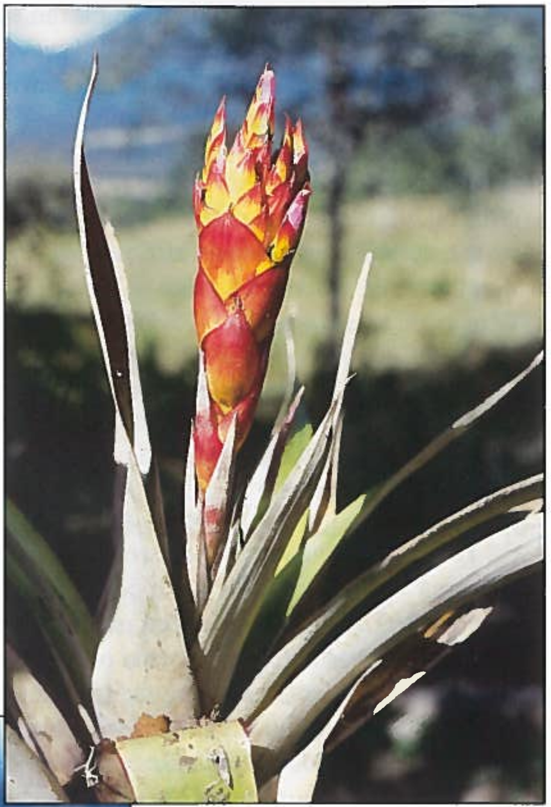


Figure 4.
On top of Páramo de Tamá we saw *Puya cardonae,* 2100 m.

When we reached 2300 meters above sea level, bromeliads were as frequent as usual, but *T. fendleri* started to fade away while the presence of *T. tovarensis* increased. A small colony of *Guzmania squarrosa* along the trail was almost unnoticed because the going was so difficult. The deep mud covering the trail was pitted with deep holes left by the hoofs of horses and mules.

At 2700 m we found a few plants of the rare, terrestrial *Greigia alborosea,* frequent, epiphytic individuals of *T. turneri* var. *patens,* and *T. biflora* with different leaf patterns.

Above 2900 m, the forest trees were shorter, but the branches were thicker. Some espeletias, peculiar to páramos began to appear mingled with the forest vegetation. A little higher, a "páramo smoke" *(Drymis granatensis)* and a line of aromatic-leafed, circular-crowned, and compact-branched *Myrica arquta* indicated the upper limit of the forest.

There, the vegetation underwent a decided change. We entered a rocky and bushy area where espeletias were dominant: the Páramo of Tamá (please see the back cover). The bromeliads seen earlier were no longer to be spotted upwards from here. Instead, very soon, two other endemic bromeliads appeared on the rocks, on cliff borders, and along the trail: the thorny *Puya cardonae* (figure 4), of which several beautiful individuals with huge grayish green flowers were in full bloom, and the milder *Guzmania confinis.*

At 3200 m we reached the uppermost point of our hike and entered a wide valley running from east to west for about 6 km. It was of obvious glacial origin and was bordered on the south by the naked Cerro El Cristo, 3530 m high. since the headwaters now flowed south, we realized that we were no longer in the state of Táchira but in Apure. Now the vegetation looked poorer than on the northern slopes. The reason was—as we learned later—that before this area was declared a national park in 1979, there had been some barns and the valley was wasted each year by fire to provide fresh grass for cattle and sheep. That fact became obvious since the dominant vegetation consisted of several kinds of grasses, sedges, and dwarf bamboos. Only in wetter or protected places, some bushes *(Espeletia brassicoidea)*, the endemic espeletia of Tamá, and a number of small trees subsisted.

Although we were exhausted by the hard climbing and rareness of oxygen, there was no shelter available except the house of the second ranger, exactly six km further. It was on the banks of the Oirá River, which is the border with Colombia in that area. We were obliged to continue painfully along La Línea, as the path there was named, noting that *Puya cardonae* was now absent but in its place *Puya killipii.* That species is smaller than *P. cardonae,* the leaves thinner, and twisted together, but none was in bloom or in the fruiting stage.

In the same place we spotted another puya occasionally. Its leaves were longer and lighter colored than the other two already mentioned. It reminded us of *Puya aristeguietae* or *P. trianae,* but since neither has been reported for the Páramo of Tamá, and no flowering or fruiting specimen was found, our doubts stand.

At dusk we reached the house of Sr. Luis Alfonso Gonzáles, the second ranger, who, with his wife María and all his children, welcomed us and offered shelter for the night. He told us that he had seen the Andean bear (*Tremarctos ornatus*) feeding on the stems of "cardos" (he called them thistles but he meant puyas) after removing their thorny leaves with his paws. Now we were at 3085 m. The night was chilly and the next morning we found the grass completely covered with frost while a small pool along the river was covered with ice.

On December 29th, we lost no time in retracing our way, picking up specimens, seeds, and small plants of the bromeliads we had found when climbing. At nightfall, we were back in our hotel at Delicias, exhausted, but satisfied with the "crop" of the journey.

On the morning of December the 30th, before leaving the little hotel, we processed our bromeliads and prepared some botanical specimens, and had the bad surprise of the trip. Some rodent had eaten almost all of the inflorescences of the small, new variety of what we considered to be *Tillandsia turneri* that we had found three days earlier between Bramón and Delicas. Luckily enough we had taken some pictures at the time and now hoped that pups would sprout from the mother plant. There was no great loss except for the botanical specimen.

We started back to Bramón. When we reached 2000 m, the highest point of the road, we stopped to check a place where a number of tall, original trees had been left. They looked densely covered with bromeliads, as usual, and there we found a tillandsia not seen before. It was in ripe fruiting stage. Its habit stood between *Tillandsia denudata* and *T. tenuispica,* perhaps closer to *T. tenuispica,* but its leaves were more erect than in either of those species and, in addition, it had red spots from the middle towards the tips.

We descended quickly to 900 m and midway between the towns of Bramón and Rubio, turned southeast to La Alquitrana (The Tar) where the first, famous burst of petroleum occurred in 1878. Now we passed through many coffee farms shaded by ingas and erythrinas and noticed that in addition to bromeliads there were many other epiphytes such as orchids *(Epidendrum* spp., *Castasetum* spp., *Jacquiniella* spp., and others), Cactaceae (*Rhypsalis* sp., *Epiphyllum* sp.), Piperaceae (*Peteromia* spp.), ferns and other botanical families. Among bromeliads, *Guzmania monostachia* and *Tillandsia juncea* were particularly frequent.

When we reached La Alquitrana, we turned southward along the Quinimarí River and at a place called Ayari spotted a dense colony of *Pitcairnia echinata* in late fruiting stage, as well as some *P. maidifolia,* on a steep cliff to the right. We continued and in another area of coffee farms, observed several beautiful individuals of *Aechmea spectabilis* in full bloom, growing either as epiphytes or on shaded rocks. We also saw a *Guzmania capituligera* in early blooming stage.

Then we hurried back to San Cristóbal and had a chance to see more bromeliads not seen so far during the journey. For instance, on the trunk of an erythrina on the edge of a coffee farm there were three examples of *Aechmea pubescens* blooming, but their young inflorescences were longer than usual. On another tree stood a robust *Tillandsia elongata* var. *subimbricata,* easy to spot by its yellowish hue and inflorescence about 1.5 m tall. On a high, horizontal branch of an inga, an *Aechmea angustifolia* in bloom was perched. Somewhat further, at the edge of the road, we saw *Puya floccosa,* the most widely spread puya in Venezuela.

Later in the day, we reached the highway, passed by San Cristóbal and Táriba, then turned toward the northeast to the trans-Andean road and drove to Párama Zumbador, about 50 km further on. At 3000 m, we saw thick colonies of *Greigia colombiana,* endemic to this páramo but found also in Costa Rica. Although all of the fertile plants were in fruiting stage, we were lucky to find one with some flowers in a leaf axil and hurried to photograph that feature. In the same páramo there were several *Puya aristeguietae,* although none in flowering or fruiting stage.

By then, since it was getting late, we started back and at about 2600 m the last surprise of the day was waiting for us: a magnificent mass of *Tillandsia compacta* var. *intermedia,* both blooming and fruiting. It was night when we reached the town of La Grita, about 40 km northeast, and there we rested.

The next morning, December 31st, the last day of our journey, we headed toward the city of Mérida, crossing through the Páramo de La Negra.

The vegetation of the valley, of glacial origin, through which we passed, looked greatly altered because it was devoted to farming and grazing. In some spots, however, there were a few trees, or even small groves of *Podocarpus respigliosii,* the last evidences of a massive podocarpus forest that carpeted the valley originally. On the branches of the trees, some bromeliads such as *Vriesea tequendamae, Tillandsia biflora,* and a number of others already recorded on previous days, were frequent.

At about 2400 m the characteristic páramo vegetation began to appear. In that region it was a dense, bush thicket with a great variety of botanical species including bromeliads. Among them, *Tillandsia tovarensis* was frequent. We saw a specimen with an inflorescence at least three meters long. Yet, we were particularly satisfied with finding a massive Tillandsia *longifolia* in ripe fruiting stage.

[continued on page 119]

The *Tillandsia zecheri* Complex and a New Infraspecific Taxa from Northwestern Argentina

Carlos A. Palací and Gregory K. Brown[1]

Illustrations by C.A. Palací

Tillandsia zecheri is an interesting, saxicolous plant originally discovered by Dr. W. Till in 1983 on the banks of the Calchaqui River in the province of Salta, Argentina.

The Calchaqui River drains an extensive, semiarid region of northwestern Argentina. This river, together with the Río de Santa Maria and the Río de las Conchas forms a series of interconnected valleys known as the "Calchaqui valleys" (figure 5). These valleys were occupied by important Indian cultures in the past (Marquez Miranda, 1983) and today represent an important resource for agriculture and tourism.

Also found in the Calchaqui valleys is *Tillandsia muhrii.* That species was described by Werner Rauh in 1986, who cited the province of Jujuy, locality uncertain, as the type locality. Our field experience indicates, however, that *T. muhrii* is unlikely to be present in Jujuy, but rather that it is restricted, and probably endemic, to the Calchaque valleys.

Tillandsia muhrii was named in honor of Dorothea Muhr, a plant collector from Buenos Aires. The name was identified recently as an illegitimate homonym because of its close resemblance with *T. muhriae* Weber (Till, 1989). As a consequence, this taxon has been left without a legitimate name.

During our field trips into Argentina in December 1989–January 1990 and July–August 1990, we collected samples of both *Tillandsia zecheri* and *T. muhrii.* We investigated freshly preserved floral material as well as herbarium specimens in order to determine the systematic position of the latter.

A careful comparison of the original descriptions indicates that the most significant difference between *Tillandsia zecheri* and *T. muhrii* is in their sepals, which were described as "posteriorly carinate" in *T. zecheri* but "posteriorly ecarinate" in *T. muhrii.* A close examination of the type specimen of *T. muhrii* (i.e. D. Muhr T8A) shows somewhat ecarinate sepals. This specimen, however, represents a very immature inflorescence with poorly developed flowers. Another specimen from the same type collection (i.e. D. Muhr T8F), with a well-developed inflorescence,

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[1] For both authors: Dept. of Botany, University of Wyoming, Laramie 82071.

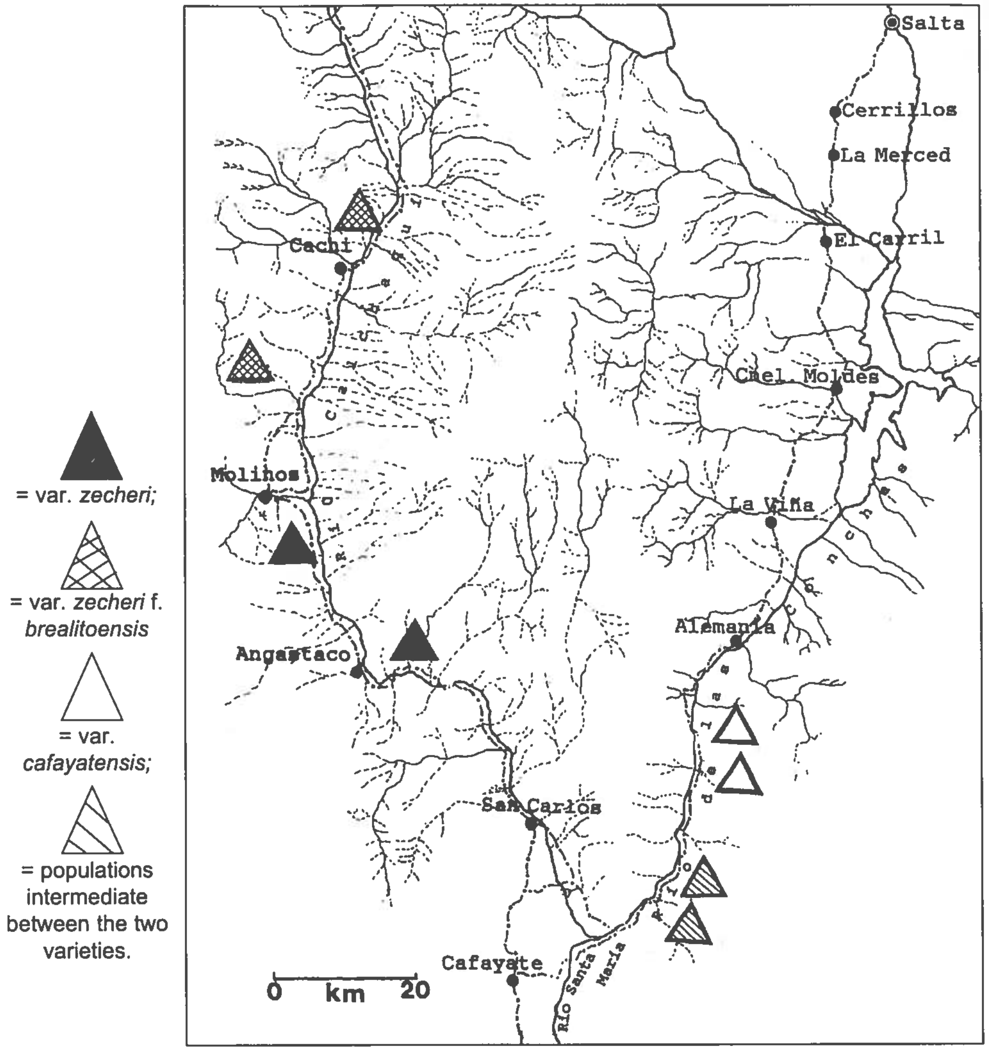

Figure 5
Distribution of *T. zecheri* complex in the Calchaqui Valleys.

exhibits posteriorly carinate sepals. All of the other specimens of *T. muhrii* that we have examined so far also have carinate sepals (figure 6).

Another difference between the two taxa is supposed to be the size of the floral bracts and petals. The floral bracts of *Tillandsia muhrii* were described as being 25 mm long, whereas those of *T. zecheri* were described as ranging from 18 to 48 mm long. Thus, the length of the floral bracts of *T. muhrii* falls within the range of variation described for *T. zecheri.* The petals of *T. zecheri* range between 37 and 40 mm in length whereas those of *T. muhrii* were described as being 33 mm long. Our samples of *T. muhrii* exhibit petals ranging between 28 and 40 mm in

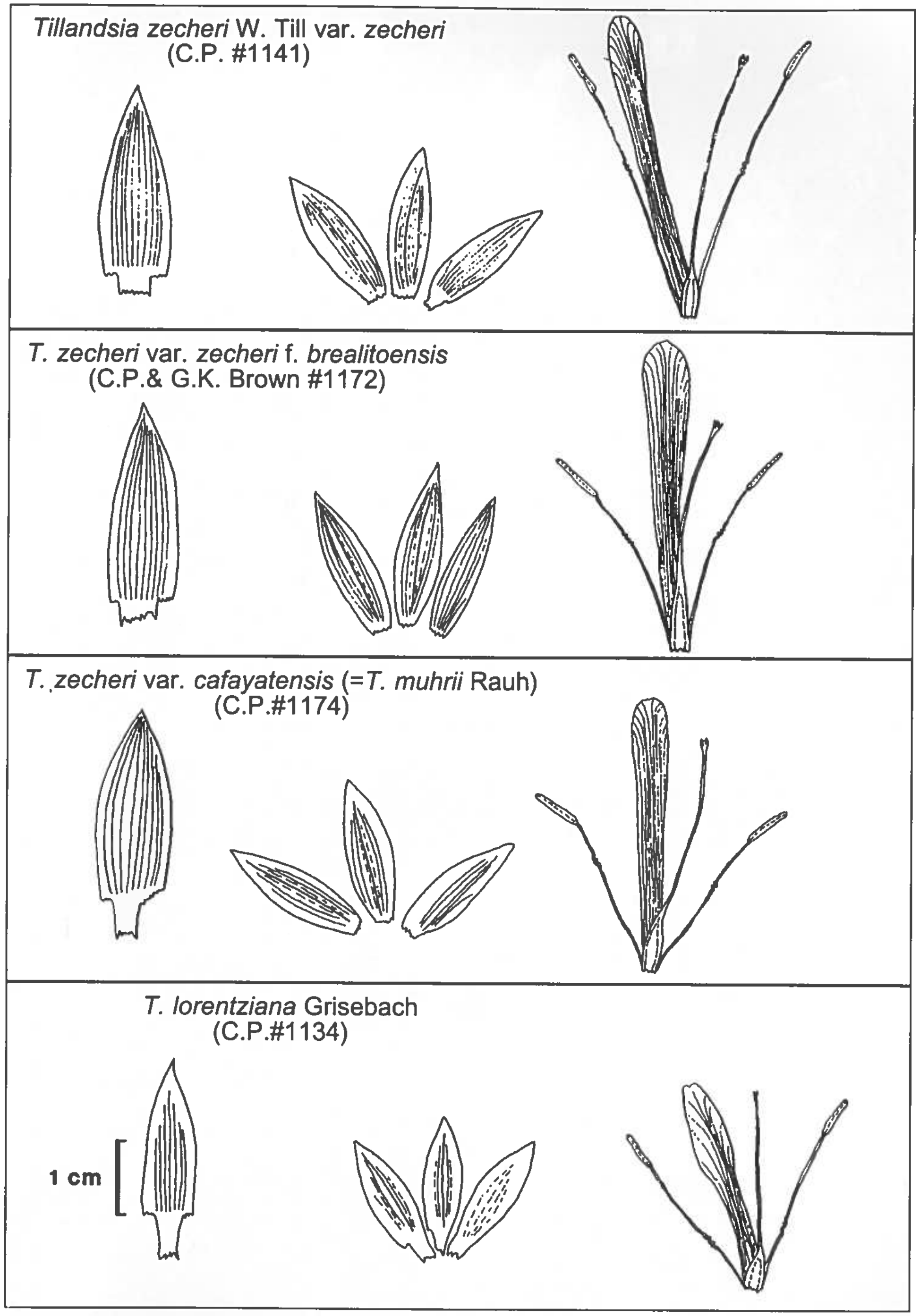

Figure 6.
Floral characteristics of *T. zecheri* complex and a putative relative: *T. lorentziana.* From left to right: floral bract, sepals, and reproductive organs. Note the posteriorly carinate sepals.

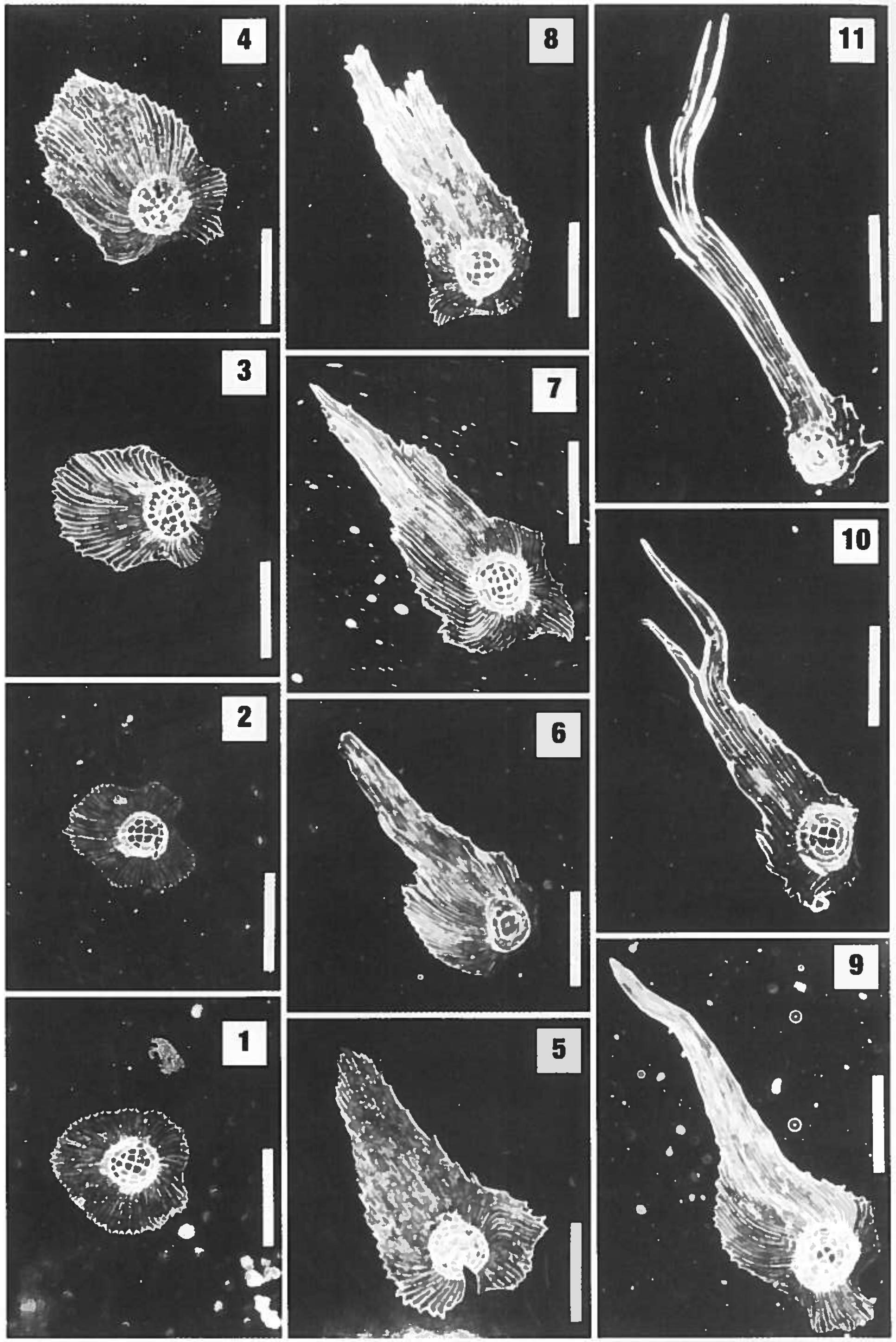

Figure 7. Representative leaf scales from the abaxial surface of the middle part of the leaf in *T. zecheri* complex.1–2: var. *cafayatensis;* 3–5: intermediate populations between the two varieties; 6–9: var. *zecheri;* 10–11: var. *zecheri* f. *brealitoensis.* Note progressive elongation of the wing cells. Bars=30µm.

length. We observed that these characters tend to vary, within certain limits, among different plants and even within different flowers of a single inflorescence. The color of the petals of both taxa ranges from purple-red to purple-blue passing through different intensities of blue and violet. The flowers of all the plants we have seen in the field are not fragrant.

According to their descriptions, *Tillandsia zecheri* and *T. muhrii* differ in their leaf shapes and indumentum. The leaves of *T. zecheri* are channeled and pruinose lepidote, whereas those of *T. muhrii* are flat with somewhat appressed scales. The pruinose appearance of *T. zecheri* is caused mainly by the largely extended wings of the scales (figure 7). However, populations with leaf indumentum and shape characteristics intermediate between *T. zecheri* and *T. muhrii* are known (figures 6 and 7). Trichome variability within tillandsioid species is well documented [e.g. *T. xiphioides* Ker-Gawler (Smith & Downs, 1977) and *T. utriculata* (Gardner, 1983, p. 64]. Thus, leaf indumentum and shape characters are not sufficient in distinguishing *T. zecheri* from *T. muhrii.*

We conclude on the bases of the similarities of the floral characters, the geographical proximity of the populations, and the plasticity of vegetative features, that there is not enough evidence to support separate species status for *T. muhrii.* Further support for this conclusion is the presence of intermediate populations that we have collected in the same region (figure 10; Ehlers pers. comm.) Since *T. muhrii* has been recognized as an illegitimate homonym of *T. muhriae* Weber, and in order to prevent further confusion with these names, we have decided to establish a new variety (i.e. var. *cafayatensis)* with a name referring to the typical locality where this taxon is distributed.

In addition, we have collected a specimen from one population in which the leaves are shorter (i.e. (4) 5 (7) cm long) and more rigid than in the typical variety, with a pungent apex and a coarser, strongly pruinose indumentum. The inflorescence is also shorter with only three to four flowers (figure 11). These plants were found close to Brealito and a similar population was detected near Cachi, both above 2500 m elevation. These populations represent, in our opinion, a dwarf form with characteristics that seem to have been fixed through time as an adaptation to extremely dry and stressful conditions at higher elevations in the Andes. The plants are distinct enough to be considered a different form from the typical variety.

Tillandsia zecheri* W. Till var. *zecheri (Die Bromelie 1–2/1983, pp. 6–7, figure 8).

Plant short caulescent; *leaves* erect, sometimes slightly secund; *leaf sheath* indistinct, nerved, lepidote; *leaf blade* narrowly triangular, 13–17 cm long, firm, slightly succulent, obtuse, with involute margins forming a channel on the adaxial surface, densely cinereous lepidote; scales with elongated wings especially at the leaf base. *Scape* short, 2–7 cm long, straight or slightly recurved, completely cov-

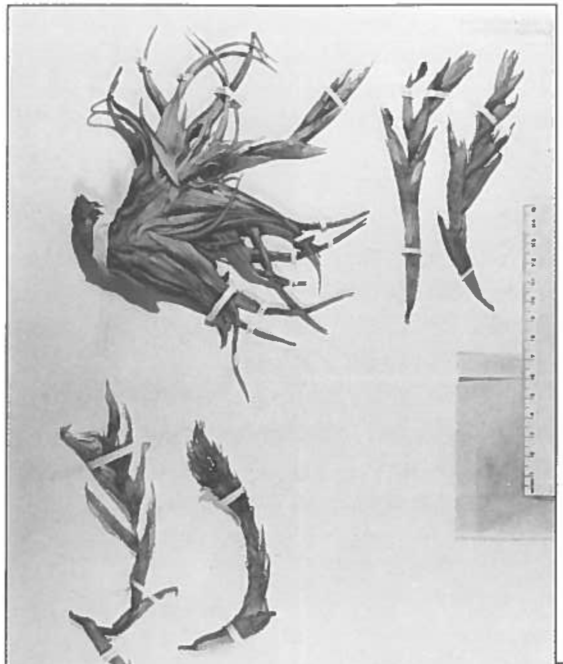

Figure 8.
Tillandsia zecheri W. Till;
H.& L. Hromadnik #7162,
holotype.

Figure 9
Tillandsia zecheri var.
cafayatensis; Palací
#534; holotype.

ered by the scape bracts; lower *scape bracts* subfoliaceous and grayish, the upper ones lanceolate acute, 30–40 mm long. *Inflorescence* simple, complanate, recurved, to 14 cm long, to 3 cm wide, with (3) 4–6 (8) flowers. *Rachis* slightly flexuous, laterally compressed, green, glabrous. *Flowers* subsessile, 2–3 mm stipitate. *Floral bracts* reddish, more or less densely imbricate but partially exposing the rachis after anthesis, glabrous, ecarinate, nerved, obtuse, (18) 30–35 (48) mm long, exceeding the sepals. *Sepals* oblong-lanceolate, acuminate, equally free, posteriorly carinate, 18–26 mm long, green. Petals obtuse, lingulate, 37–40 mm long, dark purple-violet. *Stamens* about equaling the petal claw at anthesis, *filaments* slightly plicate in the middle. *Stigma* simple, erect with three lobes (Type I). Stamen and stigma included. Flowers not fragrant. *Capsule* cylindric, 22 mm long.

Type. *H. & L. Hromadrik 7162* (WU). Salta, Valles Calchaquies, Angastaco, Piedra Pintada. 1900 m elev. August 1981.

Additional material examined.

Hromadnik 7163 (WU). Salta, Angastaco, Piedra Pintada. 1900 m elev., 1981. (Cultivated, W. Till 938).

Palací 1141 (MNCS). Salta, Angastaco, Piedra Pintada, km. 1110, on banks of the Calchaqui River. 1900 m elev., January 6, 1990.

Palací & Brown 1176 (MCNS, RM). Salta, Finca La Angostura, road from Molinos to Angastaco, km. 1150, July 1990.

Tillandsia zecheri **W. Till var.** ***cafayatensis*** **Palací & G. Brown, var. nov.** (figure 9).

Synonym: *Tillandsia muhrii* Rauh.

A varietate typica foliis tenuioribus et applanatioribus, indumento appresse lepidoto, et inflorescentia graciliore differt; sed plantis intermediis cum ea juncta est.

Leaves 10–12 cm long, less succulent than in the typical variety, flat, appressed lepidote with somewhat symmetrical scales. *Inflorescence* somewhat slender and narrower (to 2 cm wide), typically with (4) 6 (8) flowers. Flowers not fragrant, purple-violet.

Type. *Palací 534* (MCNS); isotype (RM). Argentina, Salta, Dpto. de Guachipas, Garganta del Diablo, 15 mm elev. April 4, 1986.

Additional material examined:

Cabrera & Marchioni 13080 US). Salta, Dpto. Guachipas: Quebrada de las Conchas, Santa Rosa. March 14, 1958.

D. Muhr T8A = B.G.H. 31839 (HEID), "genauer Fundort unbekkant, Prov. Jujuy." May 1973.

D. Muhr T8F = G.B.H. 31835 (US).

Figure 10. Population intermediate between var. *zecheri* and var. *cafayatensis;* Palací & Brown #1178.

Figure 11
Tillandsia zecheri var. *zecheri* f. *brealitoensis* Palací & Brown; holotype.

Hromadnik 7169 (WU). Salta, Quebrada de Cafayate, Santa Rosa, 1800 m elev., 1981.

Material intermediate between var. *zecheri* and var. *cafayatensis* (figure 10).

E. Markus s.n. "Auf erodierten Fels. Cafayate, near Alemania, km 25." (Cultivated, W. Till 951).

Helmut & Hromadnik 7167 (WU). Salta, Quebrada de Cafayate, km. 20, 1500 m, Aug. 1981.

Palací, Mármol & Nuñez 1147 (MCNS, RM) Salta, Cafayate, km 20. Jan. 1990.

Palací & Brown 1178 (MCNS, RM) Salta, Cafayate, km 31, July 1990.

***Tillandsia zecheri* W. Till var. *zecheri* f. *brealitoensis* Palací & G. Brown, forma nova** (figure 11).

A forma typica, foliis rigidioribus et brevioribus (5–7 cm), inflorescentia breviore et pauciflora differt.

Plant dwarf, smaller than the typical form, leaves short, (4) 5 (7) cm long, more rigid, sometimes with a pungent apex, channeled, coarsely pruinose lepidote. Inflorescence short, 7–9 cm long, with 3–4 flowers; corolla dark purple-blue.

Type: *Palací & Brown 1172* (RM); isotype (MCNS). Argentina, Salta, Brealito, on the way to the school. On reddish, rocky walls; 2500 m elev. July 27, 1990.

Additional material examined:

Helmut & L. Hromadnik 7154 (WU). Salta, Valles Calchaquies, Brealito, 2350 m elev. Aug. 1981.

O. Irrnstorfer s.n. (WU). Salta, Valles Calchaquies, Payogasta, Feb. 1981 (Cultivated, W. Till 714).

W. Till (1983) considered *Tillandsia zecheri* to be related to *T. lorentziana* Grisebach and to *T. cardenasii* L.B. Smith. We have observed, however, that *T. lorentziana* differs from *T. zecheri* in its usually compound inflorescence and its smaller flowers with white petals (figure 6). *T. cardenasii* has very distinct floral bracts and a completely disjunct distribution area in southern Bolivia. As judged by the floral characteristics, other putative relatives to *T. zecheri* are *T. friesii* Mez and *T. argentina* C.H. Wright. The high diversification of habitats and the geographical isolation in distant, narrow valleys may have promoted the evolution of the Andean section of subgenus *Anoplophytum* in the eastern slopes of the Andes (Palací, 1991; Till, 1983). Phylogenetic relationships, however, seem to be obscured by rapid evolution and incomplete divergence within this group.

The *Tillandsia zecheri* complex is restricted and probably endemic to the Calchaqui valleys of Salta, Argentina. Its populations are frequently small and probably fragile because of their restricted habitat on rocky outcrops, which are subjected to frequent erosion by intense rains and river flooding during the summer months. We recommend that collections of these plants be restricted to scientific research, or that careful collection of seeds from ripening fruits be considered.

ACKNOWLEDGMENTS

We thank Harry Luther and Renate Ehlers for valuable comments during the preparation of the manuscript. We acknowledge a research grant by The Bromeliad Society, Inc. and the assistance provided by the University of Salta, which helped support several field trips in northwestern Argentina. The research was also supported by National Science Foundation grants BSR-8708267 to G.K. Brown and BSR-8706788 to the late Amy Jean Gilmartin.

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THE FIFTH NATIONAL EXPOSITION OF BROMELIADS was held in Caracas, Venezuela, during the 15th and 17th of April, 1994. The exposition was sponsored by the Comite de Bromeliologia, an activity of the Sociedad Venezolana de Ciencias Naturales. We thank President Isabel de Bellard for the notice and regret that it was received too late to appear in the March–April issue of the JOURNAL.

Introducing: *Tillandsia beutelspacheri* Matuda

Harry E. Luther

Tillandsia beutelspacheri was first described in 1971 by Dr. Eizi Matuda who, unaware of a previous use of the specific epithet,[1] named it *Tillandsia insignis*. This oversight was corrected in 1974.[2]

Nothing new has been added to our knowledge of this species since Dr. Lyman Smith's treatment in the Flora Neotropica monograph 14, part 2 where it was included in *Tillandsia* subgenus *Allardtia* based on the original descriptions statement of included stamens.

Examination of living plants, brought into cultivation by Pamela Koide, has shown that several reported characteristics of this species do not exist! Most important, the stamens and style are conspicuously exserted at anthesis and the abaxial sepal is free from the pair of adaxial sepals. *Tillandsia beutelspacheri* is not at all related to the *Allardtia* tillandsias (very few of which grow as far north as Mexico) but is really very closely related to *Tillandsia fasciculata* Sw.; I'm sure a case could be made to include it as a variety although this would even further complicate the circumscription of this variable species (or complex of species). At any rate, *Tillandsia beutelspacheri* cannot be identified by the keys to *Tillandsia* in the Flora Neotropica monograph 14.

Vern Sawyer for Selby Gardens

Figure 12.
Tillandsia beutelspacheri.
Midway through its flowering develoment the plant is approximately 48 cm tall.

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[1] *Tillandsia insignis* (Mez) L.B. Smith & Pittendrigh, 1953. Based on Morren's painting of *Pepinia insignis*. The final generic placement of this very problematic taxon is far from settled.

[2] Readers interested in the literature should consult the Flora Neotropica monograph 14, part 2, page 759.

To introduce this species to hobbyists and to correct the published description, the following synopsis of *Tillandsia beutelspacheri* is given.

The plant is lithophytic and densely clustering. The leaves are stiffly spreading; the leaf blade is very narrowly triangular, 30–60 cm long, 10–25 mm wide, cinereous-lepidote (more so abaxially); the leaf apex is thick and subulate. The scape is erect. The inflorescence is digitate with three to twelve branches, at first it is erect, then arcuate and finally nutant as the flowering progresses. The floral bracts are 35–50 mm long and bright yellow with a white lepidote apex. The sepals are 30–40 mm long, rather thin, yellow-green, the adaxial pair of sepals is carinate and more than $^1/_2$ connate, the abaxial sepal is free and ecarinate. The corolla is tubular, 45–55 mm long and blue violet. The stamens and style are conspicuously exserted at anthesis.

So far as is known, *Tillandsia beutelspacheri* is restricted to the vicinity of the Sumidera Canyon in the state of Chiapas, Mexico.

Plants appear to grow equally well in pots or mounted on cork or driftwood.

M.B. Foster Bromeliad Identification Center
Marie Selby Botanical Gardens, Sarasota, Florida 34236

New Edition of An Alphabetical List of Bromeliad Binomials

Harry Luther has announced that the fourth edition of AN ALPHABETICAL LIST OF BROMELIAD BINOMIALS (Luther & Sieff) will be available at the World Bromeliad Conference in San Diego. The list will represent all changes, additions, and deletions made through 31 March 1994. Of particular interest are 1) the establishment of a new genus, *Racinaea*, which incorporates most of the *Pseudocatopsis* subgenus of *Tillandsia*; 2) the transfer of all *Streptocalyx* to *Aechmea* (two taxa with changed epithets); and 3) the relocation of three *Vriesea* species to *Mezobromelia*.

Users are counselled to check the new list against the old, and file the old in an inaccessible spot.

The new edition will be available from BSI Publication Sales, 29275 N.E. Putnam Road, Newberg, OR 97132 after 20 June 1994. The new price will be announced at the World Conference and in the next issues of the JOURNAL.

Looking for Bromeliads in the State of Táchira, Venezuela

[continued from page 106]

At last we reached the upper part of the road, at 2900 m, where there were cows grazing in grassy meadows created by fire at the expense of the original páramo vegetation. There, the road turned east and we started down toward the valley of the town of Bailadores, entirely devoted to farming, which means that the original vegetation including bromeliads had been destroyed.

By now we had reached the state of Mérida and since Francisco claimed that he knew all the bromeliads to be found in that state, we ended our exploration.

During those five days, we spotted about 50 different species of Bromeliaceae, mostly *Tillandsia.* Of them, several were photographed in bloom for the first time. Two or three may be species or varieties new to science or new records for Venezuela. We made botanical specimens of the outstanding species, collected several young, living plants or seeds of the most valuable findings to give to friends and members of the Sociedad Venezolana de Bromelias and to the Caracas Botanical Garden.

Caracas, Venezuela

NEED FOR SELECTED BACK ISSUES OF THE BULLETIN/JOURNAL

There is a continuing demand for BULLETIN/JOURNAL volumes and separate issues of 1951 through 1975. Those listed in the ad on page 92 of the last issue were sold quickly.

The editor has supplies of original copies of 1951 through 1958 but most of those volumes are now incomplete. We do not have 1959–1975 except for (oddly enough) eight copies of 1970, no. 6.

If you have any of these volumes or separates in reasonably good condition that you would consider donating to the society or to offer for sale write to or telephone: T.U. Lineham, editor, 1508 Lake Shore Drive, Orlando, Florida 32803-1305; telephone 407-896-3722.

In Vitro Culture of *Vriesea hieroglyphica*, an Endangered Bromeliad from the Brazilian Atlantic Forest

Helenice Mercier[1] and Gilberto B. Kerbauy

Photographs by the authors

Introduction

Vriesea hieroglyphica (Carrière) Morren is a Brazilian native endemic to the Atlantic coast rain forest (figure 13). Its existence is threatened by habitat destruction and collection for illegal trade.

The pre-Columbian Atlantic Forest covered more than 350,000 square kilometers (figure 14a), an area larger than Italy, Poland, or Great Britain. Today, only five percent remains, its largest remnant occurring in the Serra do Mar of the southeastern region (figure 14b). That area continues to harbor much plant diversity including many species of bromeliads and orchids.

Figure 13.
Vriesea hieroglyphica adult plant found in the Serra do Mar Atlantic Forest.

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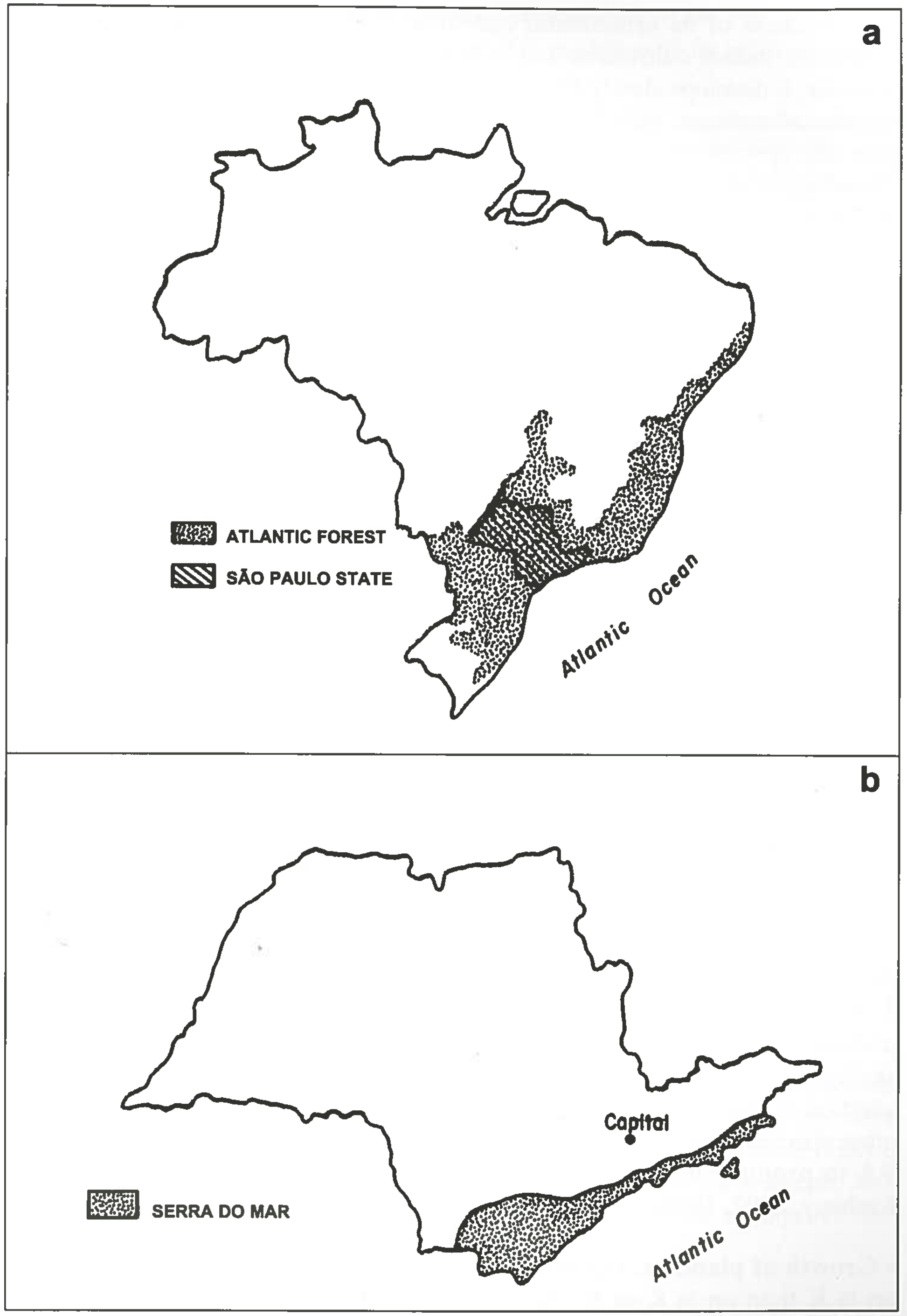
[1] Dept. of Botany, São Paulo University, C.P. 11461, CEP 05422-970, São Paulo-SP, Brazil



Drawings by Ninon Mercier

Figure 14.
The Brazilian Atlantic Forest historic extent (a) and present remaining growth in the Serra do Mar of the state of São Paulo (b) (without scale).

Because of its ornamental qualities, *Vriesea hieroglyphica* is highly valued for indoor cultivation and in landscaping. Like other *Vriesea* species, however, it develops slowly from seed and produces few offshoots. Despite the obvious advantages, little has been done to develop *in vitro* methods to propagate this species like those perfected for *Tillandsia* (Slack, 1992) and *Puya* (Varadarajan et al. 1993). Plants are simply removed from the forest and sold in florist shops. This report describes a method to conserve the genetic diversity of *Vriesea hieroglyphica* and possibly other endangered bromeliads from the Serra do Mar Atlantic Forest.

Material and Methods

Seeds of *Vriesea hieroglyphica* were harvested from plants in the Serra do Mar. They were sterilized in 70% (V/V) ethanol for 2 minutes followed by 40 minutes in 50% chlorine bleach and rinsed 5 times with sterile, distilled water. Then seeds were cultured in 125-ml Erlenmeyer flasks containing 50 ml of solid (7% agar) Knudson (1946) medium (K). The effects of different concentrations of macronutrients and sucrose with ½ K and ¼ K were also tested. The cultures were maintained for 10 months at 24 ± 2° C and 16-hour photoperiods (10 Wm^{-2}).

Plantlets were transferred to ¼ K medium supplemented with the auxins naphthalene acetic acid (NAA) and indole acetic acid (IAA) at 0.1 to 1.0 mgl^{-1}. Two cytokinins, kinetin and benzylaminopurine (BA), provided either separately or combined with auxins were also added to the ¼ K medium at 0.5 to 5.0 mgl^{-1} to induce the explants to proliferate.

Results and Discussion

• ***In vitro* germination.** Up to 90% of the seeds had germinated after 6–12 days on K medium at 50% or 25% at full strength. Each embryo gave rise to 3–7 plantlets (figure 15). Roots developed after two months. Ten months later, plantlets were separated and some were transferred successfully to soil. The ability of the Knudson basal medium to induce plantlets to form without the addition of growth regulators was not consistent with the performance of two other species. Both *Vriesea fosteriana* and *Dyckia macedoi* required NAA and BA to produce multiple, leafy shoots in previous studies (Mercier and Kerbauy, 1992, 1993).

• **Growth of plantlets.** Plants of *Vriesea hieroglyphica* grew more vigorously on ¼ K than on ½ K or K. At ¼ K shoot growth was correlated with root growth (Table 1). Mekers (1977) reported that plantlets of certain Tillandsioideae required very dilute salts for growth *in vitro* during the first two months following germination.

Table 1. Effect of the Knudson medium concentration on the growth of *Vriesea hieroglyphica* plantlets after 10 months of *in vitro* culture. Standard errors never exceeded 10%.

medium	plantlet length (cm)	number of leaves	number of roots
K	2.0	9.7	0.8
½ K	2.2	8.3	0.6
¼ K	3.4	12.1	2.1

Vriesea hieroglyphica grew fastest when the plantlets were cultivated on ¼ K medium supplemented with 0.2 or 0.4 mgl^{-1} NAA. After 6 months, the number of leaves and roots per plantlet was three-fold greater than plantlets cultivated on K medium without NAA. Only callus developed when NAA concentrations exceeded 0.4 mgl^{-1}. The indole acetic acid at 0.1 to 0.6 mgl^{-1} had no measurable effect on growth, while at 0.8 to 1.0 mgl^{-1} it induced callus formation.

• **Multiplication of plantlets.** Plantlets obtained from seed germination on basal K medium (10 months old) were used in experiments of induction of axillary bud development. We observed that adding some growth regulators to basal K medium promoted the development of axillary buds. The presence of 2.0 mgl^{-1} BA alone or BA (2.0 mgl^{-1}) added to 0.5 mgl^{-1} NAA was more effective in producing new leafy shoots. The multiplication rate was 7 shoots (mean value) per plantlet after 6 months of culture. Kinetin had no effect on proliferation. For *Tillandsia cyanea,* the best axillary branching result was obtained with 0.2 mgl^{-1} BA and 0.005 mgl^{-5} NAA added to the liquid Murashige and Skoog (1962) medium (Pierik and Sprenkels, 1991). These results demonstrate that each bromeliad species requires different levels of growth regulators to reach the maximum proliferation rate.

In order to promote root formulation, the leafy shoots were separated from the plantlets when they reached approximately 2 cm in length. They were then transferred to K medium supplied with NAA, IAA, or IBA (indole butyric acid) at various concentrations. However, in the presence of these auxins, less than 30% of them formed roots. We are continuing our work to improve this rooting rate.

Conclusion

Seeds of *Vriesea hieroglyphica* can be cultured *in vitro* on Knudson medium (K, ½ K, and ¼ K). Large numbers of plantlets can be obtained from

Figure 15.
Multiple, leafy shoots of *Vriesea hieroglyphica* originate from seed germinated *in vitro* on Knudson medium without growth regulators.

embryos that, under normal conditions, would have produced only one seedling. Plantlets generated *in vitro* provide a potentially abundant source of material and could reduce the need to further deplete wild stocks of this endangered species.

São Paulo, Brazil

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San Diego World Bromeliad Conference, 1994 – *Bromeliads In Paradise,* Update #7

Jack Percival

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Nominations for Directorships

Ballots for the election of regional directors will not be provided again this year because there are four uncontested candidates:

Terms 1995–1996	Central Region – Inez Dolatowski
	Northeast Region – Doris D. Bundy
	Southern Region – No candidate
	Western Region – No candidate
Terms 1995– 1997	Australia Region – No candidate
	Florida Region – Peggy Bailey
	Texas Region – John Anderson

The formal announcement of these election results will be made in the minutes of the 1994 meeting of the Board of Directors.

T.A. Calamari
Chairman, Nominations Committee

ANNOUNCEMENT OF FOREST CANOPY SYMPOSIUM

The Marie Selby Gardens will host an international symposium entitled, "Forest Canopies—Ecology, Biodiversity, and Conservation," in Sarasota, Florida, USA, on November 10–13, 1994. The major goal of the symposium is to bring together canopy researchers from different countries and from different forest ecosystems, both temperate and tropical, to discuss methods, results, and future directions in canopy research. The conference is open to all biologists and conservationists interested and/or working on aspects of forest canopies. Invited and contributed papers will address canopy structure, organisms, processes, and aspects of conservation of forests.

A large collection of canopy plants, both living and dried, is housed at the Selby Gardens. In addition, the gardens offers venues for workshops and discussions regarding different techniques for canopy research.

Persons interested in attending the conference should write to: Dr. Meg Lowman, Director of Research, Selby Botanical Gardens, 811 South Palm Avenue, Sarasota, FL 34236. Fax: (813) 366-9807. Further details about the program, speakers and schedule of activities will be available in July 1994.

"Feeding" Bromeliads

William Louis Stern

Popular literature overflows with pleas to "feed" one's plants. Manufacturers and distributors sell us "plant food" to restore the vigor of our botanical pets. And even some guides to plant culture written by professional horticulturists encourage gardeners to "feed" their plants for improved growth, flowering, and fruiting. Of course, we understand "feeding" of plants to mean provide them with fertilizer, mineral preparations, or organic compost. The former usually consist of inorganic salts (e.g., potassium nitrate and potassium phosphate) containing the chemical elements nitrogen (N), phosphorous (P), potassium (K), and sometimes calcium (Ca), magnesium (Mg), and sulfur (S). In addition to these major chemical elements (or macronutrients) commercially available mineral fertilizers often contain additives in minute quantities, the so-called micronutrients among which are iron, chlorine, copper, manganese, and zinc. These elements, which together constitute the mineral nutrients, also exist in organic compost or are incorporated into it by manufacturers. However, in order to become available to plants, i.e., to be absorbed by the roots or other absorbing structures, the complex organic compounds of which the compost consists must be broken down into simpler, soluble substances, some of which are the chemical salts noted above. The task of performing this breakdown is carried out naturally by microorganisms, bacteria and fungi.

It is important to understand that plants can only absorb mineral nutrients that are dissolved in water. Fertilizers consisting of mineral preparations are soluble in water and consequently are more or less immediately available to plants. On the other hand, because organic compounds must be reduced to simpler substances in order to go into solution and be absorbed by plants, time must be allowed to permit the breakdown activities of the microorganisms to take place.

The functions of the chemical elements in these mineral salts, also called inorganic nutrients, are mostly well known. For example, nitrogen is a basic component of amino acids (the "building blocks" of proteins), nucleic acids (for instance, DNA is a nucleic acid), chlorophylls, and coenzymes; potassium is central to the osmotic balance of cells and promotes certain cell functions as the closing and opening of stomata and activation of many enzymes; phosphorous is a component of the energy-storing phosphate compounds and nucleic acids (DNA/RNA); and magnesium is the central atom of the chlorophyll molecule and, like potassium, it activates certain enzymes. None of these inorganic mineral nutrients, as contained in fertilizers, is food. they do not accumulate energy that can be made available to the plant by respiration for work.

Among all the organisms that inhabit.Earth, with few exceptions, only green plants manufacture their own food. The stuff we apply to their roots in the form of macro- and micronutrients (fertilizer) and the food plants manufacture during photosynthesis, account for plant growth, i.e., the production of new plant substance, or biomass. Thus, to use the verb "to feed" green plants is basically flawed, erroneous, and misleading, and it should be purged from the popular and technical literature of both horticulture and botany when used in this context.

Green plants have the awesome ability to manufacture food through the process of photosynthesis. It cannot be reiterated too often. It is this process upon which the entire world of living creatures depends for its energy to do work, including the process of growth, either by eating plants directly or by feeding on other organisms that have fed on green plants. Green plants are the primary producers at the bottom of the food chain.

Photosynthesis, or the manufacture of food using the energy of sunlight, is often summarized by this simple chemical equation:

$$6CO_2 + 6H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 \uparrow$$

That is, green plants use carbon dioxide (CO_2) from the atmosphere, plus water (H_2O), with energy from sunlight (in nature) and help from the green pigment chlorophyll to produce glucose ($C_6H_{12}O_6$; a kind of sugar that is a basic carbohydrate food) and, as a byproduct of the reaction, give off oxygen (O_2) into the air. The equation above is deceptively simple and in a recently published textbook on introductory botany (Raven, Evert, and Eichhorn 1992), the story of photosynthesis required fully 21 pages to explain.

There are only three general classes of food: carbohydrates, lipids (fats and oils), and proteins. All of these are manufactured by green plants. Beginning with glucose, the first organic product of photosynthesis, mineral elements that have been absorbed as soluble substances through the root system of the plant are combined in different ways to produce plant substance. Thus, the critical distinction between food and mineral nutrients, both required by plants and animals, is that food provides organisms with energy (from the carbon in all food) and minerals do not.

Because bromeliads are green plants and manufacture their own food, they cannot be fed. but, like other green plants, they do require mineral nutrients for growth. The vast majority of terrestrial and epiphytic plants obtains mineral nutrients in solution primarily through their root systems. Bromeliaceae, on the other hand, obtain minerals in solution through their roots (terrestrials of Pitcairnioideae and Bromelioideae) and through foliar hairs (stalk cells of peltate scales as in all Tillandsioideae and tank Bromelioideae). Mature roots of Tillandsioideae (some, such as *Tillandsia usneoides,* are rootless as mature plants) function largely, if not completely, as holdfast organs and are not active in water and mineral absorption, this being carried out by the foliar hairs.

Atmospheric moisture, from fog, dew, and rain, contains dissolved mineral salts as does the watery run-off and fall-through from the canopies of host plants. Epiphytic tank Bromelioideae obtain mineral nutrients from those dissolved in precipitation, but perhaps more significant, considerable enrichment results from the breakdown of organic debris in run-off and fall-through (both plant and animal) impounded in the water-containing cisterns that characterize these plants. The so-called atmospheric Tillandsioideae probably satisfy most of their requirements for mineral nutrition from those in rainfall and to a lesser degree from host run-off. Terrestrial Pitcairnioideae and Bromelioideae obtain dissolved minerals in a more conventional manner, that is, from those in the soil in which they grow.

The description above of the devices by which bromeliads obtain their mineral nutrients is a much generalized and simplified treatment. For further and more explicit information interested readers should see literature listed below by David H. Benzing and his co-workers (Benzing 1970, 1973, 1980, 1990; Benzing and Burt 1970). Benzing is a member of the Editorial Advisory Board of the Journal and an acknowledged expert in the biology of epiphytes. Professor Benzing reviewed an early draft of this report, and I am grateful for his helpful and perceptive recommendations.

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Gainesville, Florida 32611-8526

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Tillandsia rhodocephala; a New Species from Oaxaca, Mexico

Renate Ehlers and Pamela Koide

Introduction

During the past two and one half years I have concentrated my exploration to two canyons near the town of Tlaxiaco in western Oaxaca. This primarily Mixtec Indian region is known for its many Spanish missions. It is also an intriguing area for tillandsias. On my first trip to the region with Alfredo Lau, we discovered several new species of Tillandsia. The description of one, *Tillandsia rhodocephala*, follows.

Tillandsia rhodocephala was the most unusual population of any *Tillandsia* species I have ever seen. The population was located on one sloping hillside and from afar the near-blooming plants appeared as a vibrant rosy glow above the brown, dry landscape. We first thought that it was a rose-colored perineal grass but close inspection showed that it was indeed a species of *Tillandsia.* The notable difference about this population was that most of the plants were the same size. There were very few plants that had previously bloomed among the more than several thousand. In the usual case, a population of *Tillandsia* will have several generations of growth as well as some seedlings, but these plants were all the same size, nearing anthesis. They were all on the ground or on boulders. It appeared as if someone had carefully placed the entire colony. I suspect that this is not the only locality for the species and recommend further investigation of the nearby region to locate another, if not the original, population.

Pamela Koide

P. Koide

Figure 16.
Tillandsia rhodocephala in habitat. From a distance the large group of plants appeared as a rosy glow above the brown, dry landscape.

P. Koide

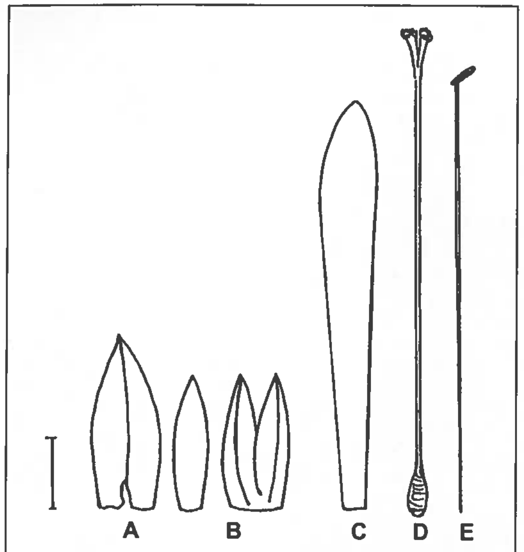
Figure 17.
Tillandsia rhodocephala (rosy-headed) inflorescence.

Tillandsia rhodocepahala R. Ehlers & P. Koide sp. nov.

A *T. capitata* Griesebach, cui affinis, foliis multo longioribus et recurvatis, scapo multo longiore cum bracteis scapi recurvatis, inflorescentia longiore crassioreque magis spicis composita, bracteis primariis multo longioribus, bracteis florigeris subglabris sepala suberanthbus, acuminatis et petalis apice albis differt.

Typus. Mexico. Estado Oaxaca, in via Yosundua ad Buenavista, 1500 m s.m., leg. *P. Koide & A. Lau 9103191* March 19, 1991 (holotype, WU).

Plant caulescent, stem to 70 cm long, to 50 cm in diameter, flowering to 90 cm high, growing in dense groups, roots lacking. *Leaves* many, to 50 cm long, densely polystichous. *Leaf sheaths* 8–13 cm long, 4–6 cm wide, ovate, convex, merging indistinguishably into the blade, adaxially light brown, densely brown



A: floral bract, B: sepals, C: petal, D: stigma, E: filament.

Drawing by R. Ehlers

Figure 18.
Tillandsia rhodocephala R. Ehlers & P. Koide sp. nov.

lepidote, abaxially green-gray lepidote, light brown at the base only. *Blades* to 40 cm long, 2–3 cm wide above the sheath, narrowly triangular, tapering into a long, linear apex, recurved, canaliculate, green or red, densely gray lepidote. *Scape* to 35 cm long, much exceeding the rosette, erect, stout, to 1.3 cm in diameter, covered by foliaceous, imbricate scape bracts, the lower ones to 30 cm long, the upper ones 20 cm long, the blades recurved, internodes 4–5 cm, the axis slightly visible. *Inflorescence* bipinnate, to 12 cm long, 10 cm in diameter, ellipsoid, capitate; composed of 10 to 20 erect, polystichously arranged spikes, internodes at the base 1 cm, towards apex very dense. *Spikes* sessile, 2.5 cm long, 1.5 cm wide, elliptic, complanate, 1–4 flowered, plus often a sterile spike at the base and a depauperate stipitate apical one; the basal spikes reduced to one flower. *Primary bracts* like the upper scape bracts, the sheaths longer than the spikes, subinflated, enfolding the flat side of the spike (spikes not visible, only the petals are visible at anthesis), the blades of the lowest many times as long as the spikes, foliaceous, recurved, the upper ones gradually reduced and only acute. *Floral bracts* 2–2.7 cm long, 8–10 (13) mm wide, ovate, acuminate to obtuse with slightly cucullate apex, green, adaxially nerved, abaxially glabrous except the slightly punctulate, lepidote apex exceeding the sepals and enfolding them. *Flowers* sessile. *Sepals* 1.8–2.4 cm long, 5–6 mm wide, narrowly elliptic, acute, membranaceous with subhyaline margins, yellow-green, the adaxial pair carinate and connate for 3 mm. *Petals* 5.5–6.3 cm long, 7 mm wide, at the base 3 mm wide, forming an erect tube, the tips slightly curled back, basal 3 cm white, then light blue-violet (#50 orchid) (Isley, 1987), tips white. *Stamens* exserted. *Filaments* 5.3–6.3 cm long, in 2 sets of unequal length, broadened near apex, concolorous with the petals; *anthers* 3 mm long, 0.8 mm wide, elliptic, subbasifixed (fixed 0.5 mm from the base) dark yellow, pollen egg yellow, lobes erect or spreading, light yellow, [Type I of Brown & Gilmore (1984)]; *style* 6–6.5 cm long, white, *stigma* 2 mm long, 2–3 mm wide; capsules cylindrical, 33 mm long. *Ovary* 5 mm long, 2.5 mm wide, conical, green.

Type. Mexico. Oaxaca, Yosundua to Buenavista, 1500 m s.m., leg. *Pamela Koide* and *Alfredo Lau 9103191,* March 19, 1991.

Distribution. Known from the type locality only. Terrestrial in big groups. In the type area, a small, yellow-bracted *Tillandsia capitata* grows lithophytically but never terrestrially. In contrast, *T. rhodocephala* never grows lithophytically although the two species grow side by side.

Comparison. *Tillandsia rhodocephala* seems to be related to *T. capitata* but it differs by the following characters: Plant caulescent, roots usually lacking, leaves less succulent, thinner, much longer, recurved; blades with long, linear apex; scape much longer with long, recurved scape bracts; inflorescence longer, composed of more spikes; primary bracts with much longer, recurved blades; flora bracts subglabrous exceeding the sepals, acuminate; petals orchid-colored with white tips.

The specific name is derived from the rose-colored, capitate inflorescence.

In cultivation the color may range from pale green to orange-red.

ACKNOWLEDGEMENT

We thank Dr. Walter Till, University of Vienna, for his cooperation in providing the Latin diagnosis and Harry Luther, director of the M.B. Foster Bromeliad Identification Center, Selby Botanical Gardens for his comments.

REFERENCES:

Brown, G.K.; Gilmartin, A.J. 1984. Stigma structure and variation in Bromeliaceae—neglected taxonomic characters. Brittonia 36(4):364–374.

Isley, Paul. 1987. TILLANDSIA. Gardena, CA: Botanical Press [color chart, page (241)].

Calendar *[continued from back cover]*

20 August	Seminole Bromeliad "Fantasy" at Earl Brown Park in Deland, FL. Saturday, 9 a.m. – 5 p.m. Pat Carey, 904-734-7436; Charles Tait, 904-789-1052.
27–28 August	Bromeliad Society of Greater Chicago 10th Annual Accredited Show and Sale. Chicago Botanic Gardens, Lake-Cook Rd. and Eden Expressway at Glenco. Len Dolatowski, 708-526-3693.

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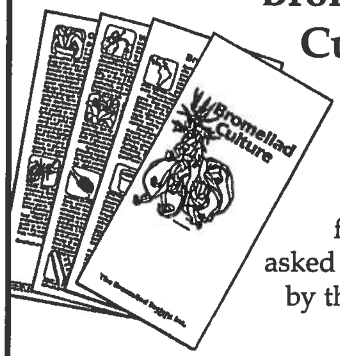

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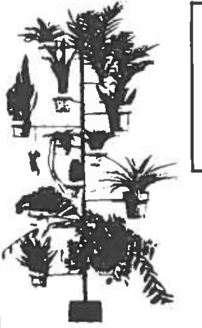

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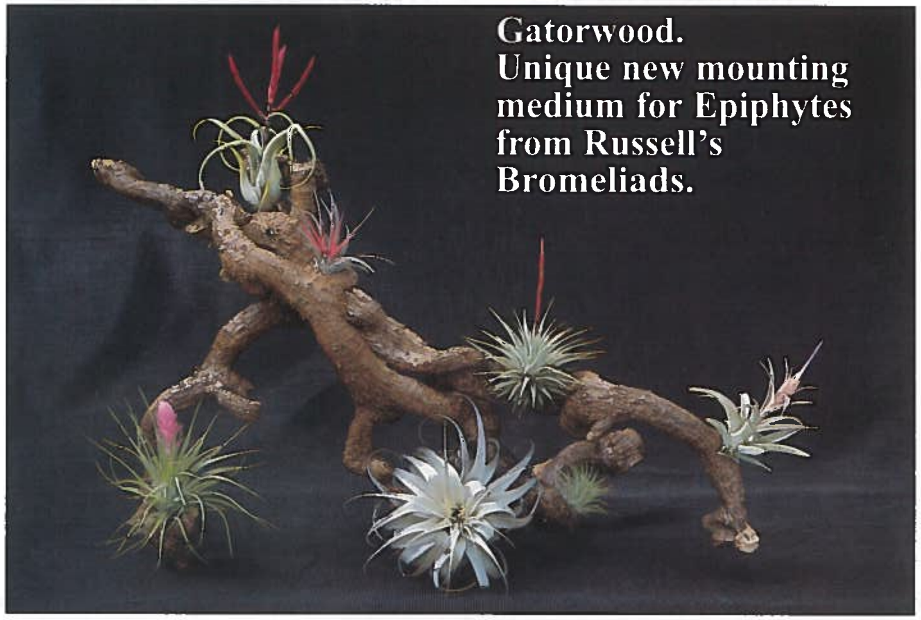

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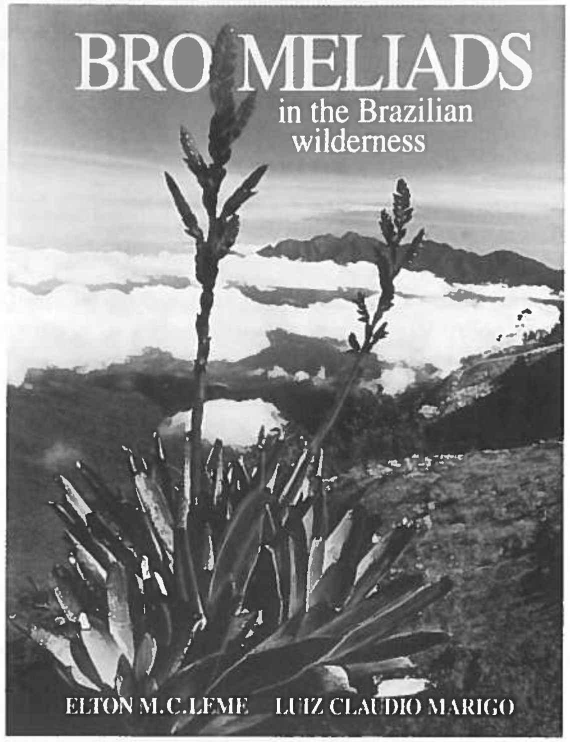

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16–17 July	Sacramento Bromeliad Society Annual Show and Sale. Shepard Garden and Arts Center, 3330 McKinley Blvd., Sacramento, CA. Both days 10 a.m. to 5 p.m. Keith Smith, 916-823-0203, 1330 Millertown Road, Auburn, CA 95603.
6–7 August	South Bay Bromeliad Associates 27th Annual Show and Sale. South Coast Botanic Garden, 26300 S. Crenshaw Blvd., Palos Verdes, CA 92074. Saturday, noon –4:30 p.m.; Sunday, 10 a.m. – 4:30 p.m. Judged show open to all amateur bromeliad growers; demonstrations; member and commercial sales. Admission $5.00, $3.00 for students and senior citizens over 61, children $1.00. Philip A. Fetchko, 3918 W. 148th St., Hawthorne, CA 90250, 310-644-6164.

[continued on page 134]