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Editors: Bruce K. Holst & Susan A. Murphy
BSI Journal, c/o Marie Selby Botanical Gardens, 811 South Palm Ave., Sarasota, FL 34236-7726. Telephone: 941-365-2080, E-mail: editor@bsi.org.

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Cover photographs. Front: Pictured for the first time in the Journal, *Fernsea bocainensis* has an inflorescence with a beautiful color combination. This species is found in the wild only in the Serra da Bocaina in SE Brazil. The plant pictured is in cultivation at the Marie Selby Botanical Gardens. Photograph by Bruce Holst. Back: Epiphytes make an interesting addition to any garden, and in the case of Kerry Boothe Tate's garden, are the focus. See the article on p. 98 for some tips on growing epiphytic bromeliads.

FEATURE ARTICLES

BROMELIAD SOCIETY BUSINESS AND NEWS

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The Darien on the Sambu River

Chester Skotak

Panama has a great deal to offer besides the canal across the Isthmus. We were going to visit the Darien, the most eastern province of Panama bordering Colombia (FIGURE 1). This rich biological barrier of diverse plant and animal life separates Central and South America. We soon learned that the daily commercial flight to the town of Sambu, the Darien, was booked solid for days. We had to make a quick decision. The cost involved in chartering a flight was expensive but we were expedicionistas, eagerly awaiting the chance to explore the Serrania (mountain range) de Jungurudo.

It was March, the height of the dry season, and there was a plan: we would travel up the Sambu River, a World Heritage site since 1981, until we reached Pavarando, an Ember·/Wounaan Indian village. We would walk southeast towards the mountains. That was our plan-after that we simply had no way of knowing what to expect. This sounds easy as I put down these words on paper, but it was not! The Sambu River would be low this time of year, so at least we would not fight heavy currents and rain as we worked our way upriver towards the Colombian border to reach those mountains. We met in Panama City: Bart van Schie, anthropologist from Holland, Reginald Deroose, adventurer and avid nature lover from Belgium, Hugo Chaverria from Costa Rica and your author from whichever passport I use for the occasion. I hesitate to explain exactly what I am good at; it depends on whom you talk to.

Since the commercial flight from Panama City was full, other arrangements had to be made if we were determined to ruin our health in the unknowns of the Darien. A small landing strip and circumstances beyond our control forced us into negotiations to take a chartered plane to Sambu. Negotiations started and were finished in short order. The flight was expensive. "It is a small plane señor", the five of us were almost too much weight. I responded that we only wanted to rent his plane, not buy it. He insisted and explained the details of 'how it is'. We nodded our heads in agreement. I honestly believe we had paid him enough money that day to make a down payment on a new plane. The pilot then politely informed us that he must return to Panama City and bring our equipment. Expensive times two! I calculated those emergency chili peppers I brought along now cost $14 US a can and might have been cheaper delivering them to Sambu by Federal Express. But the Darien beckoned and we intrepid explorers were determined to explore those unknown cloud covered mountains hugging the Pacific coast in eastern Panama.

Our flight was an hour crossing the Gulf of Panama over the majestic Pearl Islands (FIGURE 1) then, reaching the coast, our destination was in sight. We circled the town of Sambu, buzzing the airstrip to get people, cattle and even rocks removed so we could make a decent landing. Almost clipping a large mangrove, we made our perfect landing and waited the rest of the

day for the return flight with our precious luggage. The town's name is Sambu. However, across a small bridge, what seemed to be the same town to us was actually called Puerto Indio. Across that bridge where one finds oneself within the borders of what is called the "Comarca Emberá No. 2", an autonomous Emberá/Wounaan Indian preserve. I am not sure why, but am willing to bet there is a tale of the two cities.

Walking the long path through the clean village of thatched houses, we found the dwelling of our soon to be life long friend, *cacique* (chief) Jose Teucama. He had agreed to go with us up the Sambu River and have the opportunity to visit his people, the Emberá/Wounaan Indians. These Indians emigrated here from the Chocó region of Colombia. Anthropologists place the Chocóes in two linguistic groups: The Emberá and Wounaan. Still, with the exception of language, the two peoples' cultural features are virtually identical. Teucama also was intrigued about the adventure of going upriver to Pavarando, a town he had never visited. His enthusiasm soon boiled into reality. He waved his hands and the town was abuzz getting us ready for a trip that some locals believed (we learned later) would surely end in tragedy. We contracted a ten-meter dugout, locally known as a *cayuco*, with a good motor. The captain, our river guide, and his helper, the *marinero*, were soon packing their bags for the trip upriver. Provisions of all types had to be purchased, including twenty gallons of extra gasoline.

Teucama is a friendly and generous man, obviously a chief of all chiefs and was much respected by all. He soon had our trip in order. We first had to make a donation to the tribe; in return we were given an official paper, permission from the Indian authorities to travel upriver in their reservation.

Figure 1. Geographical location of the Jungurudo mountain range, Darien Province, Panama.

This paper had to be presented at each stop on the river before we entered any village. The local Panamanian Sambu police (just outside the reservation) tracked us down and had us sign a form that we were aware and informed of guerrilla activity on the border. In the southern United States this word "guerrilla" is most always pronounced as a species of ape from Africa but for the record, these are paramilitary men with guns that cross into Panama from Colombia to create whatever havoc and mayhem that occurs to them at the moment. Then the Panamanian police gleefully informed us of kidnappings; it was their job to let us know of all possibilities we might face on our trip. There are parts of Darien that are quite active but many areas are quite safe. We were so informed.

Photograph by Bart van Schie

Figure 2. A view over the lush Darien from atop Garra-Garra Mountain.

Reginald and Bart had brought malaria pills, Hugo never considered the possibility, and I was prepared to shake the fever if I got it. After all, it is always the other guy that gets malaria; any intelligent *expedicionista* knows that as a fact. The responsible health department worker tracked us down in Sambu—there were reported cases upriver of malaria, and he gave, or better said, ordered us to take three dull colored pills each and watched as we eagerly swallowed them down. He advised us to drink only filtered water and pointed to a faucet with a rag over its snout. We drank with no fear; we were *expedicionistas*. I asked for an extra pill and just got a glare. He advised us about the dangers of malaria, dengue fever and Hanta virus. I had suffered the calamities of two out of three already so the only real danger for me was being eaten by a river crocodile. The Panamanian and Indian officials should be commended, not only for being efficient, but also quite friendly to tourists that show up in an area where tourists are as rare as turtle teeth. They went

out of their way to prepare us and inform us, and left me with the knowledge that they were there to help us if we should need them.

We pushed up the Sambu River the next morning. When I say pushed, we had to get out of our dugout, push it over shallow, warm water rapids, fifty, maybe sixty times; I lost count that first day. It was dark when we landed in the village of Boca Trampa, or as translated, 'mouth trap'. This is where we would sleep our first night on the river. With sore feet and a letter of introduction in hand we walked into Trampa. It was nothing like a trap, they were friendly people. We were given our room for the night. A square thatched hut. I noticed many children spying on us in the silence of darkness in our room as we ate our dinner; they studied us quietly in the dim candlelight. If any one of us had yelled "boo!" at that moment I believe those kids would have jumped right through the woven thatched walls of our over night hotel. Bart, during an anthropological study in the region, had stayed in Trampa before and was well known in this village. The Indians affectionately call him 'Barto'. His friends were many up and down this river.

That morning we were offered the excellent woven handicrafts produced in Trampa. We solemnly promised with smiles and waves that we would stop on the way down river; dejectedly they agreed. I am sure they felt that was the last they would see of us; we amateur naturalists had doom written on our faces, and everyone could read it but us. In the boat and once again, we pushed upriver. We meticulously patched a nasty hole on the side of our dugout with chewing gum to pass the long hours of river travel. Routine becomes learning as we crossed each low spot on the river. We coordinated our moves at those rapids, we knew when to jump out in unison without tipping our dugout, and then just as gracefully jump back in! It was ballet on the river and even the Rockettes of Broadway would have been envious of our uniform steps to continue pushing that floating log upriver. We made Pavarando before dark. The cloud-covered mountains of the Jungurudo mountain range in the distance were now in sight (FIGURE 2). Pavarando was apparently empty, not an adult soul to be seen, but a few children were playing in the river. As we walked right through the middle of the village, people slowly began to appear. They hadn't seen anyone like us for a few years and were surprised. Once again our room for the night was a small thatched square house on stilts. Near our patio there stood a modern blue and white telephone booth. It had windows, a new phone and even a working door. That evening the women gathered in line in front of the phone, chattering between themselves of the day's events. However, the phone had not worked in three years!

We explained to the village chief our intentions of going exploring; he agreed to go with us. He offered five porters and two Winchester rifles and would guide us in the general direction of those mountains. They were curious about those mountains and us. The morning brought chaos getting everything we would need, including tents and all things big and small one might need if he is to go off into the unknown. We marched in single file up partially forested trails; the hot tropical sun reflected its heat back on us viciously as we walked through fields, reaching cool virgin forest by midday.

Immense trees, birds of all descriptions, and plants were everywhere. Our first bromeliad encounter was a *Vriesea heliconioides*. *Guzmania lingulata, G. glomerata,* and *G. donnelsmithii* were common also as we slowly climbed higher with each new step forward. We walked about twelve kilometers that first day, up and down then up and up. We made camp at eight hundred meters, built a fire while the Indians gathered palm leaves to sleep on as a mattress. Bats passed over our heads as we sat around the fire; they were eating insects attracted to the light. Hugo passed his time in camp collecting ticks on his legs and tossing them in our campfire.

A loud noise woke us at two in the morning, at first I thought it was Reginald snoring, a great jaguar preventative. But no, it was even louder than Reginald. A massive tree picked up its feet and came crashing down very close to us. I didn't care about the old adage of "if no one was there to hear a tree falling, did it really happen," or some such nonsense. It spooked us as we gathered outside our tents in the dark and agreed it was must have weighed tons and also agreed we did indeed hear it! We packed camp early and continued our climb. At midday we reached the summit of Garra-Garra Mountain, 1100 meters. The excitement of walking several days up to a summit overlooking the Pacific Ocean and seeing bromeliads that had possibly never been seen, named or recorded was overwhelming. We expedicionistas were the first to see those plants! There were several species of Guzmania and Pitcairnia, and on the rocks grew a miniature red Philodendron. We were unfamiliar with most plants on that summit, an area no larger than half an acre. The Darien seems to have endemic plants on most of its mountains. This was just another example. We had to turn around that day as an immense rock wall convinced us not to go any further.

We were told by our polite Indian guides that the walk was to be a few kilometers that day. That casual promise turned into about fifteen kilometers to explore another mountain, Chichika (the Indian name for this mountain). We had to camp by water and those trusted Indians knew where we must go. It was just an hour away but one hour turned to ten hours before we realized that the Indians weren't sure either. We found the river in the dark, and it was as dry as the paper you are holding. No water! We made camp and two Indians went off in the dark into the forest to search for water. They returned in a few hours with two jugs of about ten gallons of high school biology class microscope study water. I was sure that water had more unique life breeding in it than a simpleton like me could see in the dark. It still tasted good as we gulped down large volumes of water. Of course we purified the water (sometimes!). I had decided to take an anti-parasite pill on my return home and hope I did not ingest some new species of resistant bug that would be named for me shortly after my own autopsy. We climbed once again that morning to the top of Chichika. Passing through bamboo forest, then palm groves, we began to see many bromeliad species, unknown aechmeas, an unknown Bromelia, perhaps *Ronnbergia explodens*, but no blooms. There were large plants that looked, in all vegetative appearances, to be a form of *Tillandsia platyrachis*. The variety of

bromeliads was infinite. An unknown *Guzmania* in one tree soon led to a new *Aechmea* in another. There was a great representation of many plant families on this mountain and at times the question came up, "What is that?" with someone in our group uttering, "I do not know."

After eleven days of traveling and camping, it was time to get out. Food was low and we were eating native palm seeds and fruits. Reginald sat on a log eating a small purple grape; although it was not a grape, but something he had pulled off a tree! After finishing a few more and remarking as to its excellent flavor, the clever Indians informed him that it was poisonous. He didn't immediately die, so those Indians marked it off their mental list of fruits too avoid. Reginald, along with the rest of us, reacted with nervous laughter. We packed our camp and headed in the general direction of the Sambu River. It was a long walk that day. Nightfall had come once again and we camped by a large pool on a stream. *Tillandsia monodelpha, Guzmania angustifolia, Werauhia kupperiana* and several unknown species of *Pitcairnia* were along this river. Of course, there were other remarkable bromeliads but I only mention what was immediately recognizable.

The pool of water was like on a post-card photo, a bath was in order for all of us but we soon discovered that here lived an unusual species of small fish that had a pecking taste for flesh. We bathed in our underwear to avoid the embarrassing question of a doctor in Panama City, "How did that happen?" That night the Indians slept on the palm leaves with rounded river rocks underneath as a mattress; although there were other areas to sleep

Photograph by Bart van Schie

Figure 3. Emberá/Wounan women body-painted with *jagua*.

that were more comfortable, they awoke in good spirits. During the night, ants had eaten all of the large plastic bags we used for storing our gear. What species; I do not know but can only assume they were very hungry ants. Everything had to be repacked. We walked many kilometers that morning, found the trail to Pavarando and arrived that afternoon.

The villagers gathered around us as we walked and staggered into town. There was jubilation in the air as the crowds circled around us. It was announced to us that we were not expected to walk out alive. They had always believed the summit of Garra-Garra Mountain was a place ruled by the devil! In their eyes, we were most certainly going to die in the forest and they were shocked and happy that it had not happened. Young girls put on many traditional dances for us that evening. They used a dark dye locally known as jagua to paint their bodies (FIGURE 3), made from the fruit of the tree *Genipa americana*, a member of the Coffee Family. The tattoos fade away in about a week. After the celebration, the dancers got dressed and went back to that phone booth to wait for a phone call that would never come. If those girls had dressed in designer jeans, makeup and high heels, it could have been any phone booth in Miami, New York or Paris.

One should enjoy the cultures of the Indians. We valiant *expedicionistas*, now recently body-painted, ordered four of the largest chickens to be found in Pavarando for dinner that night. This was to be solid food for a change! Just for the written record this must be a new sub-species of chicken, the cook served our plates with stringy bones. Exactly what a chicken looks like after it is eaten. Our portions were practically meatless, although those chickens were almost the size of small turkeys! We nourished on those large bones and nothing more was said. I supposed that the famous Darien Gap also included a gap in Pavarando chicken meat. We left on the Sambu River in the dark of the early morning, no breakfast, except more meatless chicken bones. We pushed hard that day, bought the handicrafts in Boca Trampa, and made the town of Sambu by nightfall. Tomorrow we would leave for Panama City.

Fast asleep in our quarters, it was a short night! Packing in the dark of early morning, we rushed to get ready, and we made it on time. The runway was lifeless as far as planes are concerned. It suddenly became evident that there was no plane waiting for us. It wasn't there! We waited patiently passing the time picking rocks off the runway and reflecting on the past few days. A young boy pushed his grandmother in a wheelbarrow to and fro on the runway. Entertainment was scarce. *Tillandsia flexuosa* and *Guzmania monostachia* grew on a few trees in town.

Hours past waiting and we were now on a first name basis with the people that gathered to see for themselves that we were unshaven but indeed alive. Nearby, a large rusting boat was putting on cargo at the Sambu River (much deeper here at its mouth near the ocean). The captain told us he would be leaving when he was good and ready. The ocean trip was a full twenty-four hour journey to Panama City. We discussed this alternative amongst ourselves. First the negatives (without a

doubt a mutinous crew was on board), and even if our imaginations were over-active, no chewing gum would fix that peppered hull as water poured into the boat in mid-ocean, soon forming a shallow reef, or a new home to deep-water fish! Scratch that idea. Where was that plane? We waited and listened for the engine, nothing. Eight hours later, a little before nightfall, "the plane!" The smiling, apologetic pilot told us Panama City was fogged in that day; he waited anxiously also and was worried about us. Leaving was to be no simple matter. As we began to enter the plane, a large, robust man walked briskly out from between the houses. He was not from the area. He belonged to a tribe named "The Pompous/Arroganti" that seem to be plentifully located in most large cities all over the world. Most of you readers are familiar with its members. He was furious. He told us to get off the plane! His self-importance had priority over tourists and we could wait another day. Tourists! He did not realize we were now experienced *expedicionistas* ready and willing to go up against any fire spitten' dragon. As we left Sambu, I looked out the window and saw him, his fist clenched towards us, he was not wishing us 'good journey', he was cursing me, my friends, and most of humanity, and this would include you readers also. As we lifted in elevation, I looked out towards the horizon at the mountains of the Darien; it is an enormous area, so much still unknown.

Teucama went to Panama City with us, his first trip back to the city in seven years. We gave him a nice watch as a gift of gratitude and friendship. The watch stopped cold on his return to Sambu. This I know as true; he called me recently in Costa Rica to talk about future trips to the Darien and informed me of his broken watch. I told him it would have perfect time twice a day. He laughed. Teucama is a special person that knows how to laugh at what we sometimes refer to as civilization. One day, Sambu, Puerto Indio and its people, its scenic river with so many indigenous plants and animals will become a tourist destination. The area will have to be "discovered" by those who appreciate pristine wilderness and appreciate even more some of the nicest people on this planet.

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Responsibilities of Taxonomists Part Two - Communication

Gregory K. Brown and Dorothy E. Tuthill[1]

Some years ago a paper was published in the Journal entitled *Comments on the Responsibility of Taxonomists* (Brown et al. 1993). That contribution was directed at the need for taxonomists to provide supporting data when proposing name changes for species or genera within Bromeliaceae. Taxonomists and systematists have other responsibilities too, and one of great importance is effective and clear communication of what we do, and why, to all who are interested in our work. This communication is particularly important for societies like the BSI that contain a diversity of enthusiasts ranging from the bromeliad neophyte-hobbyist, to professional horticulturalists, to the academic researcher using the newest tools and techniques to discover new biological information about bromeliads. We believe that the BSI will function best if there is good communication between the diverse members in regards to bromeliad-science. The Society has a good track record in fostering communication between the professional-science and non-science parts of the membership. This is, perhaps, most notable in the research seminar programs at recent World Conferences that have been organized by the Bromeliad Identification Center. However, a relatively small percentage of the BSI membership is able to attend these seminars.

This is the introduction to a short series of papers for the Journal designed to provide the lay-reader with clear explanations of some important philosophies, concepts, and techniques associated with modern taxonomic/systematic botany, and how these apply to bromeliads. In recent years there have been some major technique and data handling advances in plant taxonomy/systematics, and the results from these types of studies (e.g., Terry and Brown 1996) are becoming more visible to BSI members. Some of the new research is likely to produce results that will mandate name changes for well known species, genera, perhaps even subfamilies, and it is in the best interests of the readership to have some understanding of the rationale behind such changes. Basically, we hope that future scientific papers, beyond the new species descriptions that we are accustomed to seeing in the Journal, will be more comprehensible to the general readership.

Over the next few issues of the Journal, this series will address topics on taxonomic units, traditional morphological character data, molecular data, and phylogenetics. Taken together, our goal is to have the series constitute a Primer for modern Bromeliaceae taxonomic and systematic work. As the series progresses, papers will be posted on the BSI website <www.bsi.org> after they appear in the Journal, providing easy, long-term access to the Primer.

[1] Both authors: Bromeliad Research Lab, Department of Botany, University of Wyoming, Laramie, WY 82071 USA

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Errata

Thank you Helga Tarver for pointing out a mistake in Derek Butcher's article on Mark Dimmitt's hybrids, page 26 in JBS 53(1). The photo caption "'Mystic Flame Red'" should read "'Mystic Flame.'"

Figure 2 on page 52 in JBS 53(2) was mislabelled by the Editors as *Tillandsia bulbosa*. It is the flower of *Tillandsia flexuosa*. Apologies to the author.

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Growing Bromeliads Epiphytically in the Subtropical Home Garden

Kerry Booth Tate[2]

Most bromeliad growers I know, and know of, cultivate their plants in pots under shade cloth or some form of protective structure. This is necessary when climatic conditions do not replicate the bromeliads' natural habitat. However, for those lucky gardeners who live in a subtropical climate, as I do, growing bromeliads in trees of the home garden can be successful and very effective (FIGURES 4, 5, back cover).

I have many established trees in my garden, thanks to the previous owners. Moving here from a cool-temperate region, I was greatly impressed and inspired by a huge flowering clump of the common *Billbergia pyramidalis*, which was climbing the trunk of an old Silky Oak (*Grevillea robusta*). Since then, my trees have become living sculptures, embellished with their ornaments–it's like Christmas all year!

With each new bromeliad purchase, I research its origin and growth habit in the limited literature I have available, and decide where and under which conditions it might thrive. When tying a bromeliad onto the branch or trunk of a tree, I do not use sphagnum moss around the root area of the plant. Sometimes, a purchased pot-grown bromeliad already has an established root ball including pine chunks. This can be easier to secure to a branch, especially if the plant is not stoloniferous. Well-grown pups, with an obvious stolon, can be tied directly onto the upper side of a branch very easily. I cut dark-brown stretchy fabric (like "ribbing" or "lycra") into 2cm (3/4") wide strips, and wind it around the base/stolon of the plant and branch. Once the bromeliad has rooted firmly to its host, the tie can be removed. If the tie is unpleasantly obvious, Spanish moss (*Tillandsia usneoides*), draped around the base of the plant, is an attractive camouflage. Some bromeliads' roots take longer than others to establish, and strong wind might cause another trip up the ladder to retie.

A newly-purchased bromeliad has usually been pampered under shade house conditions. Therefore, when initially exposed to the natural elements, the plants will deteriorate slightly , although subsequent pups will be tougher. Their vases will also fill with leaves and other debris, and spider webs are likely decorations. These are insignificant detractions, when viewing the overall effect. However, an occasional clean-out makes a difference, including pulling or cutting off dead lower leaves and old plants which are past their use-by date. From experience, the number one natural enemy of bromeliads in the landscape is hail, (number two is a big black possum!).

Moisture and humidity requirements for epiphytic bromeliads are best met by imitating their natural habitat. In subtropical regions, natural rainfall in warmer months will usually suffice, although in unseasonably dry, hot

[2] 447 Terania Creek Road, The Channon, New South Wales, Australia

weather, supplementary watering/misting is necessary for healthy growth. Brief, gentle rain showers will be beneficial to bromeliads growing in open, less-densely foliaged trees, but any bromeliads growing under a dense canopy will miss out. I hand-water with a hose spray, about twice a week, when there is no decent rainfall in the warmer months. Early morning or late afternoon is the best time to water. Brown tips and inward-rolling of leaves are indicators of low humidity and inadequate moisture. In subtropical areas, winter is usually dry. I do not water any of my bromeliads in the coldest months, relying on the adage "better cold and dry, than cold and wet". Root growth is obvious in autumn, with the constant moisture of the wet season.

If limited space is a subtropical gardener's plight, then going up can be a happy alternative, adding a new dimension to the garden. When size and spacing are taken into account, the form of each bromeliad is enhanced and unimpeded when grown epiphytically. Contrasting forms, size, foliage colour and patterning compliment each other if they are positioned artistically. The growth habit of each species or hybrid needs to be considered, regarding its future development, although most bromeliads seem to grow slower, and are more compact, when grown this way.

There are many factors to consider when choosing the best tree for that special bromeliad, as listed:

- Multi-branched trees, especially at lower ground level, are ideal. Horizontal, or diagonally-angled branches, are more aesthetic and attachable than vertical trunks and branches (exception - the fibrous trunk of a tree fern)
- Tree forks are good, especially for vriesea sp., and are useful for securing large plants in the desired position.
- Roots fasten more easily to rough, permanent bark. Trees which shed their bark are unsuitable, as the bromeliads might also fall off (exceptions - pine species and paperbarks).
- Judicious pruning of selected branches, for as natural or creative an effect as desired, allows more choice when positioning and tying bromeliads to the trees.
- Deciduous/semi-deciduous and evergreen trees may be suitable. Deciduous trees which are bare in winter allow the weaker sun to brighten the bromeliads' foliage. However, cold conditions might damage susceptible plants, without a canopy as protection.
- Some deciduous and semi-deciduous trees, e.g., Orchid tree (*Bauhinia sp*) and Cape chestnut (*Calodendron capense*), lose most or all of their leaves late winter, and do not commence regrowth until late spring, or even summer. Care should be taken when selecting bromeliads for these conditions, as shade-loving plants will likely suffer, unless they are down low and near the center of a well-branched tree. The bromeliads in my bauhinia are stretched to the limit of their sun tolerance, until the

tree finally grows lush new foliage in mid to late summer. The bromeliads show their obvious relief by starting to change in form and leaf colour, due to the shadier conditions.

- The denseness of foliage, the size, and the shape of each tree will affect the light factor. Evergreen trees with a large, dense canopy would suit shade-loving bromeliads, both in the tree, and underneath it.
- Aspect is of great light significance. A large tree will have different light conditions within it, e.g., a specimen tree, surrounded by lawn, will have brighter light on the outer branches of the northern and eastern sides of it, compared to the inner and south-facing branches (southern hemisphere - vice versa for northern hemisphere).
- Light conditions will also differ when other trees, or buildings/structures/walls, are nearby. Every garden is unique, so its owner needs to look carefully at his/her trees, and all the variables which affect them.

Another important consideration is each potential bromeliad tree's exposure to wind. Bromeliads like plenty of ventilation, which they will receive, in most cases, by growing on any outdoor tree. However, extreme exposure to very strong wind may cause serious damage to the leaves of vulnerable bromeliads, such as soft-leaved vrieseas, guzmanias, and some aechmeas. Strong winds and dry conditions, such as we experience in northern N.S.W., Australia during early spring, necessitate extra protection for certain bromeliads - like choosing a more suitable micro-climate. The tougher-leaved aechmeas and stiff billbergias, once rooted to a branch, survive harsher conditions - in fact, many thrive on neglect.

Some trees on which to grow bromeliads

The following list is comprised of trees on which I have either grown bromeliads (most), or have seen used successfully. Many other trees are likely to be suitable, if the previously mentioned factors are considered.

Acer negundo (Box elder maple)
Banksia sp.
Bauhinia sp. (Orchid tree)
Buckinghamia celsissima (Ivory curl)
Calliandra haematocephala (Red powder-puff)
Callistemon sp. (Bottlebrush)
Calodendrum capense (Cape chestnut)
Citrus sp. (Grapefruit, Lime, Mandarin)
Cotoneaster sp.
Cyathea sp. (Tree fern)
Delonix regia (Royal Poinciana)
Ficus sp. (Fig)
Grevillea sp. (Silky oak, 'Sandra Gordon', other small tree varieties)
Jacaranda mimosifolia
Melaleuca sp. (paperbark and rough bark)
Omalanthus populifolius (Bleeding heart)
Pinus sp. (some pines and other conifers)
Plumeria sp. (Frangipani)
Prunus sp. (Peach, Plum)
Syzygium and *Acmena sp.* (Lillypilly)
Tibouchina sp. (Lasiandra)

Recommended bromeliads for epiphytic culture

Most bromeliads which grow epiphytically in their natural habitat should be suitable in the subtropical home garden, as long as habitat requirements of each species or variety are closely met. Terrestrial genera, such as *Ananas, Bromelia, Dyckia,* and *Orthophytum,* are unsuitable.

The winning genera for epiphytic culture in my garden are: *Aechmea, Billbergia, Canistropsis, Canistrum, Hohenbergia* (some), *Neoregelia* (especially the small-growing and stoloniferous types), *Nidularium* (low in tree), *Portea, Quesnelia, Tillandsia, Vriesea* and several bigeneric species.

Of the many different varieties of bromeliads grown epiphytically in my garden, I have agonized over choosing only 40 to recommend. They are all species - except ×*Neomea* Strawberry. Hybrids and cultivars, with any of the listed plants as a parent, are also recommended for epiphytic culture.

Top 40 Hit Parade

Aechmea chantinii
Aechmea fendleri
Aechmea fosteriana
Aechmea lueddemanniana
Aechmea nudicaulis (all varieties)
Aechmea orlandiana (all cultivars)
Aechmea penduliflora
Aechmea racinae
Aechmea retusa
Billbergia alfonsi-joannis
Billbergia elegans
Billbergia leptopoda
Billbergia vittata
Billbergia zebrina
Canistrum fosterianum
Canistrum seidelianum
Canistrum triangulare
Hohenbergia correia-araujoi
Hohenbergia stellata
× *Neomea* 'Strawberry'
Neoregelia compacta
Neoregelia 'Fireball'
Neoregelia olens
Neoregelia pauciflora
Neoregelia punctatissima
Nidularium procerum
Quesnelia marmorata
Quesnelia testudo
Tillandsia geminiflora
Tillandsia juncea
Tillandsia stricta
Tillandsia tricolor
Tillandsia usneiodes
Vriesea carinata
Vriesea flammea
Vriesea philippo-coburgii
Vriesea platynema (all varieties)
Vriesea racinae
Vriesea simplex
Vriesea vagans

Figures 4 & 5. Scenes of epiphytic bromeliads in cultivation in Australia. A multi-trunked callistemon and bauhinia (Figure 4, above) and a judiciously pruned tibouchina tree (Figure 5, below) are excellent hosts. See also back cover. Photographs by the author.

A New Miniature *Portea* from Brazil

Elton M.C. Leme[3] & Harry E. Luther[4]

The existence of this smallest known *Portea* was first reported by Leme (1997), when describing *Canistrum montanum*. Since then, we have had the opportunity to observe several specimens blooming in cultivation which maintained the general morphological characters which make this bromeliad very distinct from all previously classified species of *Portea*, as described below.

Portea nana Leme & H. Luther, sp. nov. **Type** Brazil, State of Bahia, Una, road São José to Una, km. 9, 7 Apr. 1995, *E. Leme, P. Nahoum, A. Amorim, L.A. Mattos & J.C. da Silva 3028*, flowered in cultivation July 2000 (Holotype: HB; Isotype: SEL, WU). FIGURES 6, 7.

A *Portea kermesina* Brongniart ex K. Koch, cui affinis, planta solum ca. 30 cm alta, laminis foliorum distincte brevioribus et angustioribus, basin versus haud angustatis, inflorescentia 6-8 cm longa, ca. 3 cm diam., bracteis primariis ramos omnino occultantibus et solum petala per anthesin exhibentes, ramis basalibus ca. bifloris, bracteis floriferis ramulorum subellipticis vel sublinearo-lanceolatis, 20-30 x 5-10 mm, floribus minoribus et sepalis brevioribus subduplo angustioribus differt.

Plant epiphytic, stoloniferous, stolons ca. 14 cm long, ca. 1 cm in diameter, flowering ca. 30 cm tall. ***Leaves*** 20 to 30 in number, suberect, densely rosulate, forming a broad subglobose water reservoir at base; ***sheaths*** broadly elliptic, 8-9 x 6-7 cm, minutely pale-lepidote, dark purple; ***blades*** linear, apex acute and slenderly apiculate, not narrowed toward the base, 10-16 x 2.7-3.3 cm, inconspicuously and sparsely lepidote on both sides, green, densely spinose, the basal spines acicular, straight to slightly retrorse, dark brown, 2-3 mm long, 2-3 mm apart, the apical spines paler, 0.5-1 mm long; ***scape*** 10-13 cm long, ca. 0.6 cm in diameter, subdensely white-lepidote, whitish; ***scape bracts*** broadly elliptic, apex acute and slenderly apiculate, ca. 4.5 x 3 cm, minutely white lepidote, erect, imbricate and wholly covering the scape, reddish-pink, the upper ones inflated, margins wine colored, the basal ones spinulose toward apex, the upper ones entire. ***Inflorescence*** corymbose, densely ellipsoid or nearly so, bipinnate at base, simple toward the apex, 6-8 cm long, ca. 3 cm in diameter, shorter to equaling the leaves; ***primary bracts*** resembling the upper scape bracts, densely imbricate and completely covering the branches (except for the exserted corolla at anthesis), erect, subinflated, reddish-pink, entire, apex acute to subrounded and minutely apiculate; ***branches*** 3 to 4 in number, ca. 5 cm long (including the petals), very shortly pedunculate, subdensely arranged, ca. 2-flowered; ***floral bracts*** those of the simple part of the inflorescence resembling the primary bract but smaller, elliptic-lanceolate,

[3] Herbarium Bradeanum, Rio de Janeiro, Brazil. e-mail: leme@tj.rj.gov.br
[4] Bromeliad Identification Center, The Marie Selby Botanical Gardens, 811 S. Palm Avenue, Sarasota, FL 34236 USA

acute and minutely apiculate, 35-40 x 15-23 mm, entire, sparsely white-lepidote, ecarinate, equaling to exceeding the sepals, erect, reddish-pink, those from the branches subelliptic to sublinear-lanceolate, acute and distinctly apiculate, apex suberect-recurved, 17-30 x 4-10 mm, equaling to

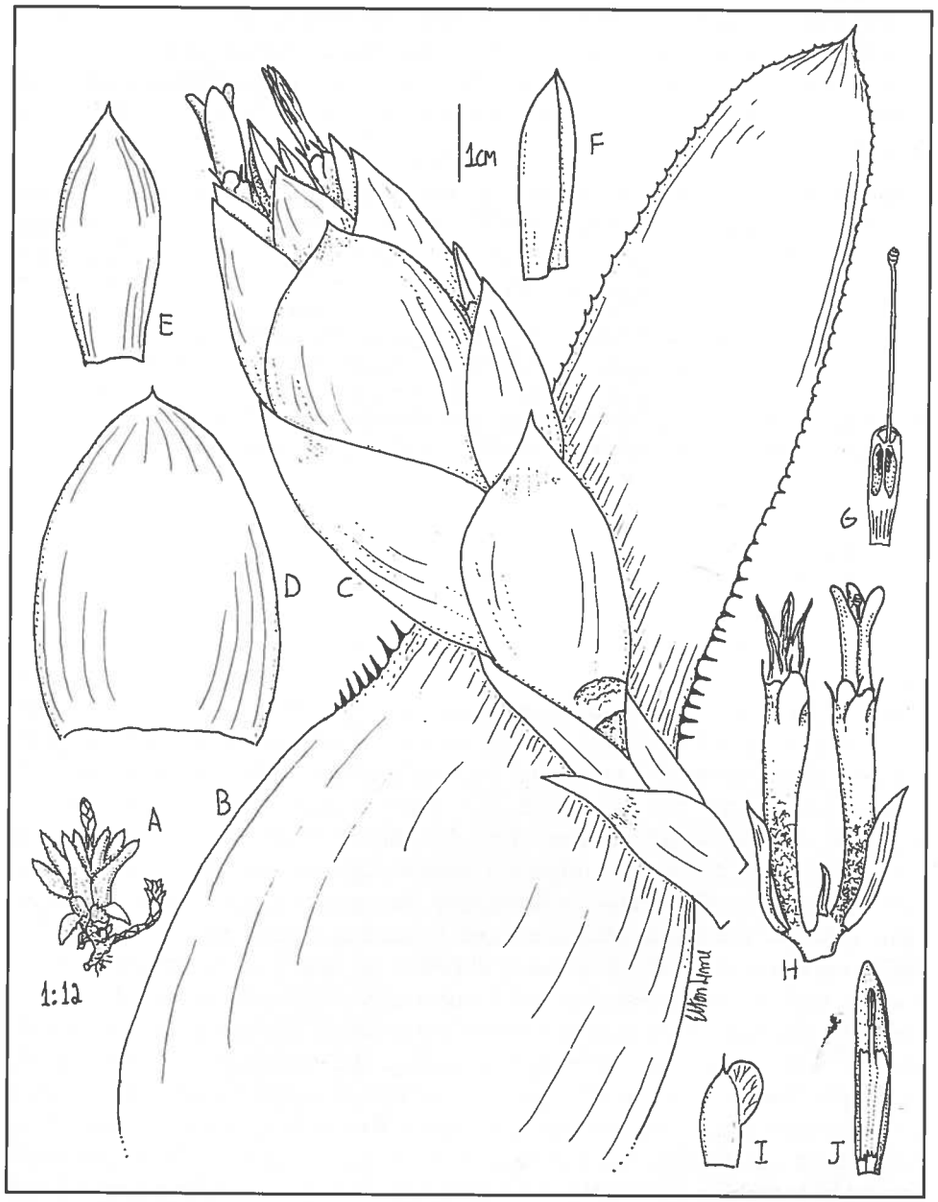


Figure 6. *Portea nana*. A. Habit. B. Leaf. C. Inflorescence. D, F. Primary bracts. F. Floral bract. G. Ovary & pistil. H. Branch of inflorescence. I. Sepal. J. Petal and epipetalous stamen.

exceeding the ovary, but usually distinctly shorter than the sepals, reddish-pink, glabrescent, obtusely carinate. ***Flowers*** 45-47 mm long, erect, densely arranged, odorless, those from the simple part of the inflorescense polystichous, those from the branches nearly distichous, pedicels stout and not notably contrasting with the ovary, 3-5 mm long, ca. 3 mm in diameter, subdensely white-lanate; ***sepals*** strongly asymmetrical with a very broad lateral, rounded, membranaceous wing, mucronate, 11-18 mm long, including the apical suberect spine 2-3 mm long, ca. 7 mm wide near the apex including the lateral wing, connate at base for 7-9 mm, pink, sparsely white-floccose near the base; ***petals*** sublinear, apex narrowly rounded, suberect at anthesis, 30-35 x 5 mm, free, lilac toward the apex, whitish near the base, bearing 2 suboblong to obovate, 2-3 mm long, apically truncate and minutely denticulate appendages at base, as well as 2 lateral callosities 18-22 mm long; ***filaments*** lilac-white, the antepetalous ones adnate to the petals for 17-22 mm, the antesepalous ones free; ***anthers*** 5-6 mm long, obtuse; ***stigma*** conduplicate-spiral, capitate-globose, lilac, margins entire or nearly so; ***ovary*** subcylindrical, ca. 10 mm long, ca. 5 mm in diameter, whitish-rose, white-lanate; epigynous tube 2-2.5 mm long; placentation apical; ovules caudate. ***Fruits*** unknown.

Paratypes: Same locality as type, 7 Apr. 1995, *E. Leme, P. Nahoum, A. Amorim, L.A. Mattos & J.C. da Silva 3044*, fl. cult. May 2001 (HB); Santa Luzia to Una, Serra da Onça, ca, 4.5 km from the road, 23 Jul. 1996, *J.G. Jardim, S.C. de Sant'Ana, H.S. Brito, J.A.L. dos Santos & S. Oliveira 843* (CEPEC, NY).

Portea nana comes from a mountainous region covered by moist Atlantic forest at an altitudinal range of 500 to 600 m. The area is subject to dense fog, which provides ideal conditions for many epiphytes. This forest is rich in bromeliads, both epiphytic and terrestrial. Bromeliad taxa not previously recorded for the state of Bahia such as *Neoregelia pauciflora*, the wine-colored *Nidularium innocentii, Vriesea flammea*, and *V. breviscapa* were seen here.

The region contains many organisms still unknown to science, perhaps because it is hard to reach, or because the efforts of scientists have been concentrated in the lowland forests-always the first to be destroyed by human activities.

Portea nana grows on the higher branches of the tallest trees of the forest, some to 30 meters. With a long stoloniferous habit and a compact leaf-rosette, *P. nana* forms dense clumps appearing very similar, from a distance, to those of some *Neoregelia* species.

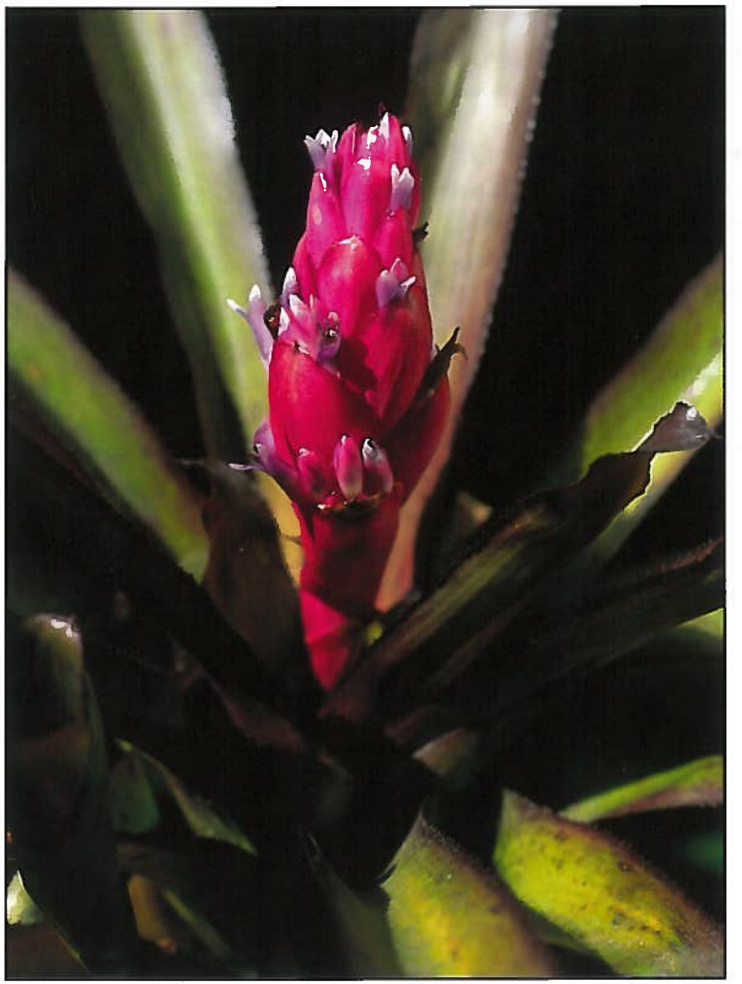
Portea nana is closely related to *P. kermesina* (FIGURES 8, 9), from which it differs in its long stoloniferous habit, the distinctly smaller size, only ca. 30 cm high, leaves shorter (20-30 cm vs. 40-80 cm), leaf blades narrower (2.7-3.3 cm vs. 4-5.5 cm) and not narrowed toward base, inflorescence smaller (6-8 x 3 cm vs. 10-20 x 5-8 cm), primary bracts completely hiding the branches, except for the exserted corollas at anthesis [not showing the

sepals as in *P. kermesina*; see pictures in Rauh (1990) and Baensch and Baensch (1994)], basal branches ca. 2-flowered (vs. 4 to 5-flowered), floral bracts of the branches subelliptic or sublinear-lanceolate, ca. 5-10 mm wide (vs. 15-20 mm wide), as well as by its shorter flowers (45-47 mm vs. 55-65 mm) and smaller sepals (11-18 x 7 mm vs. ca. 22 x 14 mm), bearing a much reduced lateral wing. In addition, the foliage rosette of *P. kermesina* tends to be more spreading with reddish tinged leaves.

The type of *Portea kermesina* was supposed to be deposited in the herbarium of the Botanischer Garten und Botanisches Museum, Berlin-Dahlem, Germany (B). However, according to the information of the Curator of that institution, Dr. Manfred Baessler (pers. comm.), the type of *P. kermesina* is no longer extant. Smith and Downs (1979) cited the existence

Photograph by Elton Leme

Figure 7. *Portea nana.*



Photograph by Elton Leme

Figure 8. *Portea kermesiana.*

of probable clonotypes deposited in the National Museum of Natural History in Paris, France (P) and in The Netherlands National Herbarium, in Leiden (L). Although the material deposited in Paris herbarium was not examined for this study, all material deposited in Leiden herbarium looks very typical and probably represents clonotypes of *P. kermesina*. Examined material of *P. kermesina* used for comparison in this study are as follows: Brazil: without locality, *Leiden Hortus 3640*, 21 Dec. 1964 (L); *Leiden Hortus 8291*, 10 Apr. 1969 (L); *Leiden Hortus 8291A*, 7 Feb. 1970 (L); *Leiden Hortus 8281*, 13 May 1976 (L); *Leiden Hortus*, leg. *B.K. Boom s.n.*, 27 Feb. 1953 (L); leg. *B.K. Boom s.n.*, 9 Aug. 1955 (L); ex hort. *R. Burle Marx s.n.*, fl. cult. *E. Leme 3296*, Aug. 2001 (HB); ex. hort *Wally Berg 94*, fl. cult. *E. Leme 4662*, Aug. 1999 (HB).

Acknowledgement

We thank the Curator of The Netherlands National Herbarium in Leiden (L), for providing the material of *Portea kermesina* used for comparison in this study.

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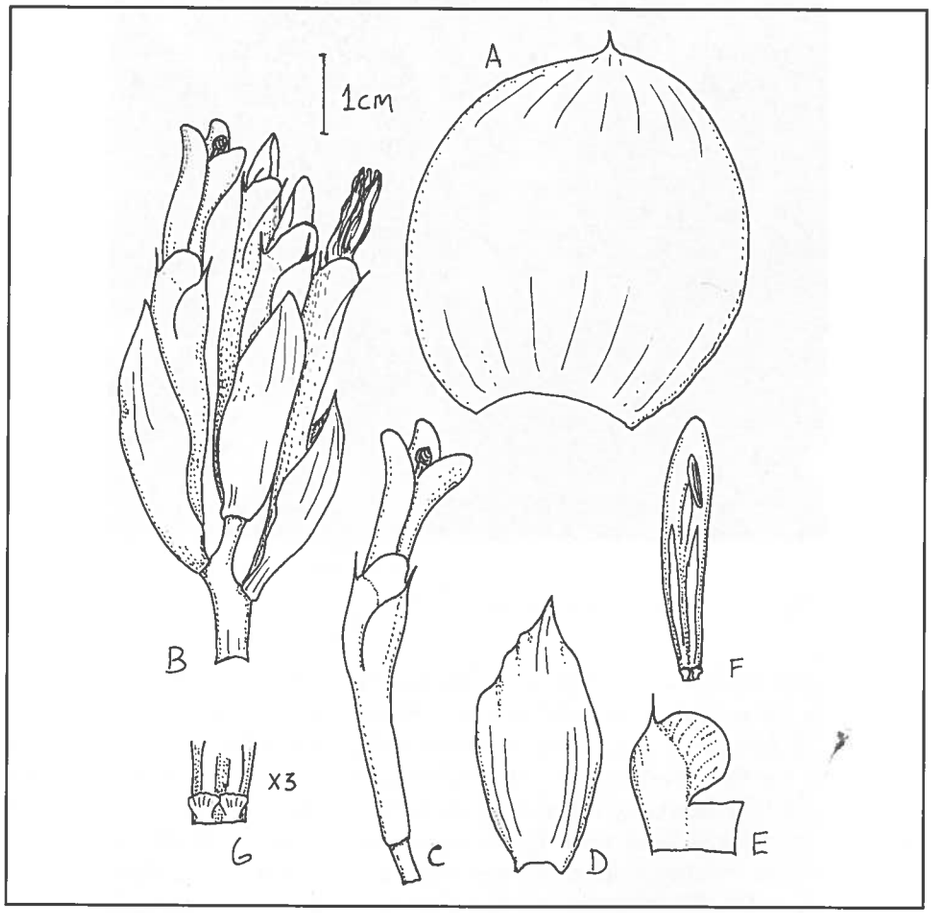

Figure 9. *Portea kermesiana*. A. Primary bract. B. Branch of inflorescence. C. Flower. D. Floral bract. E. Sepal. F. Petal and epipetalous stamen. G. Base of petal with appendages.

Sixteenth BSI World Bromeliad Conference Chicago, Illinois —July 29 - Aug. 1, 2004

WELCOME TO CHICAGO! We hope to say this many, many times in July, 2004. Things are moving right along and the BSI and BSGC are working diligently to have a great conference here in the northern United States.

Registration forms are available on the BSI web site (www.bsi.org) and in this issue of the Journal.

Questions contact: Jack Reilly, 248 Lawrence St., Illiopolis, IL 62539. Phone: 217-486-5874. E-mail: jar56@one-eleven.net

Ballot-Free Issue

Normally, a ballot is enclosed in the May-June issue for subscribers in regions in which there is an election for the office of Director. As there was only one opening (California), and it was uncontested, there is no ballot enclosed.

A New *Puya* from the Upper Cloud Forest Limit in Bolivia

Roberto Vásquez Ch.[5], Pierre L. Ibisch[6] & Stephan G. Beck[7]

Abstract: A new *Puya* species from Páramo vegetation at the Bolivian cloud forest-limit is described and illustrated. It is similar to *P. brittoniana*, but differs by a tomentose indument of the inflorescence, smaller floral bracts, and longer sepals and petals.

Resumen: Se describe e ilustra una nueva especie de *Puya* propia de la vegetación del Páramo en el límite con el bosque de neblina boliviano. Es similar a *P. brittoniana* pero difiere por el indumento tomentoso de la inflorescencia, brácteas florales más pequeñas, y sépalos y pétalos más largos.

Currently, more than 55 species of *Puya* are known from Bolivia (Krömer et al. 1999). Species of the genus occur in the majority of the Andean ecoregions, from the dry montane Chaco at less than 600 m elevation to the High Andean vegetation at more than 4500 m above sea level. Although the genus is most diverse in the inter-Andean valleys, some species are even found in wet montane rain forests. The new *Puya* described here grows in open habitats at the upper cloud forest limit of the Yungas region in the Sud Yungas Province, La Paz department, Bolivia (FIGURE 10).

Photograph by R. Vásquez.

Figure 10. *Puya pizarroana* in its natural habitat.

Puya pizarroana R. Vásquez, P.L. Ibisch & St. Beck, sp. nov. **Type:** Bolivia. La Paz: Prov. Sud Yungas, Canton Lambate, Chilkani, 16°35'S, 67°44'W, 3400 m, bosque siempreverde, transecto 14, 1 May. 1994, *Emma Luna Pizarro E. 98* (Holotype: LPB; Isotype: VASQ). FIGURES 10-12.

Similis est *Puyae brittonianae* Baker sed indumento inflorescentiae tomentoso non lanoso, bracteis floralibus minoribus et sepalis petalisque longioribus differt.

Plants aggregated, flowering to 1.50 m high. ***Leaves*** rosulate; rosette 60-80 cm in diameter. ***Blades*** attenuate, 40-50 cm long, 4-5 cm wide near the base, covered beneath with closely appressed scales, above glabrous; margins laxly serrate with antrorse, uncinate, castaneous, spines, 3-5 mm long. ***Scape*** suberect, 1.10-1.20 m long, 3-4 cm in diameter, dark maroon, covered with

Photograph by Bart van Schie

Figure 11. Inflorescence of *Puya pizarroana*, showing the dark maroon floral bracts and blue-green petals.

[5] Sociedad Boliviana de Botánica/Funación Amigos de la Naturaleza (FAN-Bolivia), Casilla 3822, Santa Cruz, Bolivia (rvasquez@cotas.com.bo).

[6] Funación Amigos de la Naturaleza (FAN-Bolivia), Casilla 2241, Santa Cruz, Bolivia, Integrated Expert CIM, Associated Researcher, Institute of Botany, University of Bonn, Germany (pibisch@fan-bo.org)

[7] Herbario Nacional de Bolivia, Correo Central, Casilla 10077. La Paz, Bolivia (becks@ceibo.entelnet.bo)

white tomentose processes. ***Scape bracts*** the upper ones oval, densely imbricate, erect to 60 mm long, 25 mm wide, serrate, dark maroon, internally white tomentose, becoming lepidote and aristate to the apex, the lower ones unknown. ***Inflorescence*** simple, densely cylindric, erect, 30 cm long, to 7 cm in diameter. ***Floral bracts*** densely imbricate, amply ovate, erect, coriaceous, closely appressed, dark maroon with bluish tinge towards the apex, 30-40 mm long, 30-35 mm wide, covered by light maroon tomentum processes, the apex acuminate. ***Flowers*** erect, longer than the floral bracts, to 60 mm long. ***Pedicels*** and ***ovary*** obconic, to 10 mm long. ***Sepals*** lance-oblong, coriaceous, to 25 mm long, 8 mm wide, dark maroon, densely white lepidote; the apex mucronate. ***Petals*** to 50 mm long, 14 mm wide, elliptic-oblong, obtuse, blue-green. ***Stamens*** 40 mm long. ***Anther*** 10 mm long, orange-yellow, equaling the petals. ***Style*** 35 mm long. ***Capsule*** subglobose, 40 mm long, lustrous; seeds irregularly triangular, 3.5-4 mm long including the pale wings.

Etymology: *Puya pizarroana* is dedicated to Emma Luna Pizarro, the collector of the type specimen who studies the Andean spectacled bear (*Tremarctos ornatus*) that frequently uses bromeliads as food resource, including *Puya* hearts and tender leaves.

Observations: *Puya pizarroana* is closely related to *P. brittoniana* Baker (see Smith & Downs 1974) sharing several characters such as the simple, densely cylindrical inflorescence and the lance-oblong, coriaceous sepals, obtuse petals, and inserted stamens. However, it differs by having wider leaves (4-5 cm wide vs. 1.5-1.8 cm), a tomentose indument of the inflorescence (vs. ferrugineous-lanose indument in *P. brittoniana*), smaller floral bracts (30-40 mm long vs. 60 mm), and longer sepals (25 mm long vs. 22 mm), and petals (50 mm long vs. 40 mm). The type specimen of *P. brittoniana* was collected some 100 km to the northwest in the Sorata valley; the geographical ranges of the species possibly are separated by the very high Cordillera of La Paz.

Habitat: This new species is found in the Yungas Páramo vegetation, a humid grassland distinguished from the Puna by its lack of seasonality and by containing several plant families and genera typical of the northern Andes Páramo (López 1998). Some authors have postulated that the habitat may be anthropogenic due to forest burning which may have lowered the limit of the treeline (e.g., Kessler 2000). Originally, there could have been a continuous forest belt from the lower mixed cloud forests to the *Polylepis* forests of the Puna region. The *Puya* in this original forest region, as many other Páramo taxa, would have grown at azonal sites like steep rocky slopes. It is rather typical that the mostly fire and grazing-resistant *Puya* species are benefited by human land use converting forests into open grass or shrub vegetation (Ibisch 1998). In the case of the new species it is assumed as well that it does not have any conservation problems.

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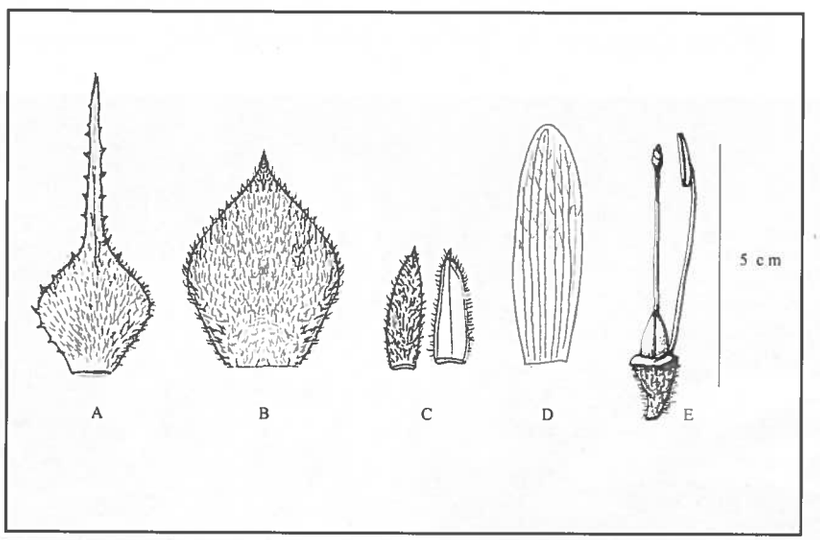

Figure 12: *Puya pizarroana*. A. Upper scape bract. B. Floral bract. C. Sepal. D. petal. E. Pistil and stamen. (drawing R. Vásquez).

Vegetative Propagation In Bromeliads

Robert W. Reilly[13]

The production of seed, known as sexual reproduction, is one of two mechanisms bromeliads use to reproduce themselves. The other mechanism is asexual reproduction, or vegetative propagation. The most common type of vegetative propagation is the formation of pups (offsets) at the base of the plant, either at the time of flowering or shortly thereafter. Typically, the plant will produce around three pups which, if they are removed when they are about one third to one half of the mother plant's size, will often be followed by another "batch" of pups. Many of the cultivated bromeliads use this reproduction strategy. The pups can usually be removed with a sharp knife about 20 cm long. A variation to this approach occurs when the pups are produced on the plant's stem. Usually only one (sometimes two) pups are produced initially. Removing it without destroying the mother plant requires a fair degree of skill and care. If the pup is removed successfully, a further batch of one or two pups may be produced. Examples of plants with this strategy are: *Guzmania sanguinea, Vriesea elata, V. splendens,* and *V. zamorensis*.

Photograph by Bruce Holst

Figure 13. An example of a pup produced along a plant's stem (*Navia arida*).

[13] 66 Agnes St., Toowong, Queensland, 4066, Australia

An interesting modification of this strategy occurs with cryptanthus plants. In their case, pups form on the upper part of the plant's stem and, if left undisturbed, may detach themselves. Usually though, they are detached by the grower when they are about one third of the parent plant's size by gently moving the pup from side-to-side, and outwards.

Pups produced at the base of, or along, a plant's stem, are usually located quite close to it (FIGURE 13). However, in some cases, pups form at the end of the stolon. While the stolon is normally relatively short, that is, less than 20 cm, in other cases it may exceed 50 cm in length. Examples of plants with stolons are: many aechmeas, some tillandsias (for example *disticha*), some vrieseas (for example *vagans*), and *Cryptanthus sinuosus* (which has a stolon exceeding 50 cm).

Photograph by Bruce Holst

Figure 14. *Tillandsia somnians*, displaying the unusual habit of reproducing vegetatively from the inflorescence.

In all cases, pups can be removed with about 2 cm of the stolon attached, and then potted. Secateurs, or pruning shears, are useful for cutting thin stolons, while small pruning saws can be used on thick (1 cm plus) ones. The remaining part of the stolon can be removed from the plant (so as to improve its appearance), as the stolon will not produce any more pups.

Some bromeliads produce one to several "adventitious" pups. These pups appear like grass seedlings usually well before the plant is mature. It is best to leave them on the plant until they are 7 to 10 cm tall. Examples of plants that produce pups this way are: many alcantareas, *Vriesea glutinosa*, and certain tillandsias such as *T. edithae, T. grandis, T. rauhii,* and *T. viridiflora*.

If you wish to vegetatively propagate a plant, which produces adventitious pups, then it is best to obtain an immature plant. Otherwise, your plant may have lost its ability to produce adventitious pups and thus reproduce itself (other than through seed).

Other bromeliads produce pups on their inflorescence. Pups may form along the inflorescence, at its end, or in both locations. Plants with this type of pupping strategy are usually described as "viviparous." Examples of such plants are: the common pineapple, *Tillandsia flexuosa, T. latifolia, T. lymanii, T. secunda*, and *T. somnians* (FIGURE 14). These pups can usually be removed with secateurs when they are about 10 cm tall or one-third the height of the parent plant; whichever is the smaller size.

Some bromeliads produce shoots arising from underground rhizomes. Many pitcairnia species use this strategy. Remove the shoots when they are one third to one half of the parent plant's size. While a shovel can be used when dividing larger plants, a knife is better for smaller growing ones. Other pitcairnias form bulbous-like offsets, which can be broken apart to provide new plants.

Some bromeliads do not produce any pups. They are known as "monocarpic". Examples are: *Tillandsia eizii*, *T. prodigiosa*, and *Puya raimondii*. Such plants rely solely on seed to reproduce themselves.

Three final points are worth making:

- Some bromeliads routinely produce pups through several of the mechanisms described above. For example, *Tillandsia somnians* produces pups at each plant's base, and along (as well as at the end of) its inflorescence.
- Some "populations" (that is, a group of plants of one species growing in one location) may have particular reproductive strategies not shared with other populations of that species. For example, some populations of *Tillandsia latifolia* are viviparous while others are not.

Importantly, from a grower's perspective, some populations of a species that is normally monocarpic may produce pups. Examples are: *Tillandsia complanata* and *T. utriculata*. If you wish to buy plants of such species, it is important to ensure you are obtaining one that can reproduce vegetatively.

- Some bromeliads will normally use only one reproductive strategy, but can vary that approach if it appears unlikely to succeed. For example, Benzing (1980) states:

  "....Resource availability plays a major role in monocarpy, as is illustrated by an occasional T. dasylirifolia specimen. In parts of its range in Mexico, this large epiphyte does produce occasional and often weakly growing offshoots, but only when fruit set is poor. .....This kind of behavior suggests that the seed crop is favored when resources are allocated during the growth process. Asexual activity is held in abeyance as a fail-safe option in case the sink (young [seed] capsules) is too small to store enough of the available nutrients...."

One implication of Benzing's comments is that the removal of young (immature) inflorescences may stimulate the production of pups, as seed production is no longer an option for the parent plant. I don't know whether this strategy has been scientifically evaluated.

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Benzing, D.H. (1980) The Biology of the Bromeliads Mad River Press, Eureka, CA. p. 138.

Book Reviews

Jason Grant[9]

Jewels of the Jungle - Bromeliaceae of Ecuador, Part I: Bromelioideae. José M. Manzanares. 2002. 30 cm, 240 pages, hard cover. ISBN: 9978-42-547-0, ISBN: 9978-42-546-2, English. Joyas en la Selva - Bromeliaceae del Ecuador, Parte I: Bromelioideae, Spanish. Imprenta Mariscal, Quito, Ecuador.

This is the first of a three-part flora to describe and illustrate the bromeliads of Ecuador. It is published simultaneously in both English and Spanish-language versions and divided into fourteen chapters: I. Introduction, Major Contributors to the Ecuadorian Bromeliads, Friends of the Ecuadorian Bromeliads, Friends of Bromeliads, II. Bromeliads in their Habitat, The Bromeliad Biodiversity of Ecuador, III. Morphology of Bromeliads, IV. Ecuadorian Collections, Preparation of Specimens, V. Taxonomic classification, Characteristics of the Subfamilies, VI. Subfamily Bromelioideae, VII. The genus *Greigia*, VIII. The genus *Ananas*, IX. The genus *Billbergia*, X. The genus *Neoregelia*, XI. The genus *Ronnbergia*, XII. The genus *Bromelia*, XIII. The genus *Chevaliera*, and XIV. The genus *Aechmea*. There are also important appendices including an illustrated glossary of terms used in the book, and maps of Ecuador.

This volume covers the bromeliad subfamily Bromelioideae with eight genera and 78 species: *Aechmea* (44 sp.), *Ananas* (5 sp.), *Billbergia* (4 sp.), *Bromelia* (3 sp.), *Chevaliera* (5 sp.), *Greigia* (5 sp.), *Neoregelia* (6 sp.), and *Ronnbergia* (6 sp.). For each genus there is a description and key to the species, and for each species, a description, list of herbarium specimens examined, and additional notes. The species are illustrated by high-quality color photos taken in the field.

In its style and format, this book follows in the footsteps of Leme's groundbreaking series on *Canistrum, Canistropsis* and *Nidularium*. Jewels of the Jungle is the first floristic treatment of the family for a single country in such a user-friendly format. It is not only colorful and pleasing to the eye artistically, but comprehensive in its informative content of Ecuadorian bromeliads at the general and specific level. It is a serious taxonomic monograph of the bromeliads of Ecuador, and an artistic piece of work that will be appreciated by horticulturists and amateurs. The level of excellence in bromeliad books has been pushed to a higher plateau. Manzanares is to be congratulated on a fantastic work that is heartily recommended.

Flora del Ecuador. Ed 2. Ediciones del Banco Central del Ecuador. Erwin Patzelt. 1996. 30 cm, 334 pages, hard cover. ISBN: 9978-72-276-9, Spanish. Order from: Koeltz.

[9] Laboratoire de Botanique Évolutive, Institut de Botanique, Faculté de Sciences, Université de Neuchatel, 11 rue Émile-Argand, Case Postale 2, CH-2007 Neuchatel, SWITZERLAND. E-mail: jason.grant@unine.ch

Rather than a traditional flora as the title may suggest, this is a difficult-to-find, hardcover, coffee-table style book with large, colorful photographs describing a selected range of Ecuadorian plants. The book is divided into different ecological zones, from which selected plants are illustrated. Each zone includes numerous photos of landscape, as well as common plants one encounters. Bromeliad-wise, there are eight pages dedicated largely to *Guzmania* and *Tillandsia* (pp. 132-139) and to illustrations of bromeliad trichomes (pp. 306-307). The book is a very general guide to the flora of Ecuador, containing little on bromeliads.

Plant Diversity of an Andean Cloud Forest: Checklist of the Vascular Flora of Maquipucuna, Ecuador. University of California Publications in botany; v. 82. 2001. 25 cm, 211 pages, soft cover. ISBN 0-520-09830-7, English. Order from University of California Press.

This is a large, important checklist of plants from the Maquipucuna Forest Reserve and adjacent areas in Pichincha province, Ecuador. For Bromeliaceae, six genera (*Catopsis, Guzmania, Mezobromelia, Pitcairnia, Racinaea*, and *Tillandsia*) comprising 35 species are listed. More important than the bromeliad list alone is the overall picture created by the checklist of an entire flora for a relatively small area in the Neotropics. Statistical comparisons of family species numbers to other regions, e.g., Monteverde (Costa Rica) are given.

Libro Rojo de las Plantas Endémicas del Ecuador 2000. Herbario QCA, Pontifica Universidad Católica del Ecuador, Quito. Valencia, R., N. Pitman, S. León-Yánez & P.M. Jørgensen (eds). 29.5 cm, 489 pages, hard cover. ISBN: 9978-77-090-9, Spanish.

This book lists and describes localities of all Ecuadorian species for which there is a conservation concern. It is most useful when used in concert with the "Catalogue of Vascular Plants of Ecuador" (Jorgensen & León-Yánez, eds, 1999). The Bromeliaceae (pp. 135-151), contributed by José Manzanares, covers 158 species in eleven genera (*Aechmea, Greigia, Guzmania, Pepinia, Pitcairnia, Puya, Racinaea, Ronnbergia, Tillandsia, Vriesea,* and *Werauhia*). Three species are listed as critically endangered and may become extinct soon because of the loss of habitat: *Guzmania lepidota, G. poortmanii,* and *G. striata*.

Flora de Nicaragua. Monographs in Systematic Botany from the Missouri Botanical Garden, Volume 85 in 3 tomes. W.D. Stevens, C. Ulloa Ulloa, A. Pool and O.M. Montiel, eds., 2001. 25 cm, 2666 pages, hard cover. ISBN 0-915279-95-9, ISSN 0161-1542, English. Order from: Department Eleven, Missouri Botanical Garden, P.O. Box 299, St. Louis, MO 63166-0299 USA; fax: (314) 577-9594; e-mail: dept11@mobot.org; web site: http://www.mobot.org.

This 3-volume set is unusual in tropical floras in that it represents an entire flora published at once. Typical floras are published in a series of volumes over a period of years, and either will take a significant time to

complete (e.g., Flora Costaricensis, Flora Mesoamericana), or are never completed (e.g. Flora of Panama). This Spanish-language flora comprises 5,796 species of gymnosperms and angiosperms. Ferns are not included.

The Bromeliaceae (pages 460-495) authored by John Utley, Kathleen Burt-Utley, and Michael J. Huft consist of 11 genera and 99 species, while an additional 8 species that may eventually be found in Nicaragua are also included. Genera included are: *Aechmea* (12 species), *Ananas* (1 species), *Androlepis* (1 species), *Billbergia* (1 species), *Bromelia* (4 species), *Catopsis* (11 species), *Guzmania* (9 species), *Hechtia* (3 species), *Pitcairnia* (4 species), *Tillandsia* (47 species), and *Vriesea* (14 species).

While the treatment is satisfactory, it was prepared some years ago and does not include recent name changes such as the recognition of *Bromelia karatas* as the correct name for *Bromelia plumieri*, or the genera *Racinaea* and *Werauhia*. There are no illustrations, nor distribution maps. For each genus and species there is a description, synonyms, bibliographic references, habitat data, and a single voucher listed.

Bromeliaceae III. Oliva-Esteva Ediciones, Caracas, Venezuela. Francisco Oliva-Esteva, 2002. 33 cm, 274 pages, hard cover. ISBN 980-07-7310-X, English.

As the title suggests, this is the third book on Venezuelan bromeliads by Francisco Oliva-Esteva, following Bromeliaceas of Venezuela (1987), and Bromelias (2000). The three books may be used together to identify bromeliads from the two major areas of diversity in the country, the Andes and the Guayana Highlands, as well as other parts of Central and South America.

The book begins with a short illustrated history of plant collecting in Venezuela. The remainder of the book is dedicated to large color photographs of bromeliads in the field or in cultivation. Most of the field photos in Venezuela are by Oliva-Esteva, but most photos of individual species are those of colleagues. Most species have a brief description adapted from the protologue or elsewhere.

A total of 30 genera with species numbers treated include: *Aechmea* (47), *Alcantarea* (3), *Billbergia* (9), *Brewcaria* (2), *Brocchinia* (1), *Canistropsis* (1), *Canistrum* (3), *Catopsis* (3), *Cryptanthus* (1), *Deuterocohnia* (2), *Dyckia* (5), *Encholirium* (1), *Fosterella* (1), *Guzmania* (44), *Hechtia* (1), *Hohenbergia* (2), *Lindmania* (1), *Mezobromelia* (2), *Navia* (5), *Neoregelia* (3), *Orthophytum* (4), *Pitcairnia* (21), *Portea* (3), *Puya* (16), *Quesnelia* (4), *Racinaea* (2), *Ronnbergia* (2), *Tillandsia* (120), *Vriesea* (24), and *Werauhia* (8).

This is an excellent book to have on one's shelf for identification of species, or for amusement. The scientific content is marginal, but the book isn't intended as such anyway. As in all of Oliva's books, the most important photos are those of landscape photos of the tepuis, and rare Guayana Highland endemic genera and species of bromeliads. This is the first place of publication of color photographs of many species, and therefore, a highly recommended book for all bromeliad enthusiasts.

Vriesea fosteriana, Revisited

Derek Butcher[10]

Chet Blackburn (1999) pointed out the problems with identification of the many forms of *Vriesea fosteriana*, but little information has filtered through to the Cultivar Registrar so that it can be captured for posterity.

In September, 2002 I received some copies of protologues from difficult-to-find sources in Brazil, from Jason Grant. Amongst these was a "Vriesia hasselbladi" named by Ruschi (1964). This species does not appear anywhere in Flora Neotropica (Smith and Downs 1977), and I sent detail to Harry Luther for comment. It seems related to what was described by Reitz (1965) as *Vriesea fosteriana* var. *seideliana*. Note that "Vriesia hasselbladi" is not in italics, because I do not know if it was validly described. Some taxonomists say "yes," and some say "no." This is now purely academic because any written material at the Biological Museum in Santa Teresa, Espirito Santo, Brazil seems to have been destroyed in the floods of 1979. It was thought that living material could still be growing in the gardens there (albeit without a label), but Elton Leme reports (April 2003) that this plant cannot be found there. *Vriesea hasselbladi* comes from the area around Santa Teresa, which is the same area from which var. *seideliana* comes, but in this case the leaves are green with brown markings. This variation in leaf colour got me wondering.

Vriesea fosteriana, if grown from self set seed, will produce seedlings with different coloured leaves. *Vriesea fosteriana* var. *seideliana* will also produce seedlings with different coloured leaves. In 1975, Alvim Seidel reported that from one seed capsule he got 60% seedlings similar to the description, but in the other 40% he could discern eight main groups that differed to some degree from the description of the variety. It had been formally described by Reitz in 1965, but this variety did not appear in Flora Neotropica Monograph (Smith and Downs 1977). Had it been investigated outside Brazil or just forgotten? It was only brought to notice in 1994 in the BSI Binomial listings (Luther and Sieff 1994), but without explanation. In DeRebus II (Luther and Sieff 1997) there was the comment, "This is the cultivar 'Red Chestnut' common in horticulture." However, the variety seideliana was originally described as only differing from the type by having leaves "flava" (pure yellow) or "albo-flavescens" (whitish yellow) with "purpureis" (dull red) transverse markings. This does not exactly equate with the "white" portions usually associated horticulturally with this variety and neither does it equate with the colours usually associated with 'Red Chestnut' (FIGURE 15). This indicates to me that leaf colouration in *Vriesea fosteriana* varies considerably in the wild.

I believe that we should treat *Vriesea fosteriana* as having variable leaf patterns, and drop the reference to any variety based purely on leaf colour.

[10] BSI Cultivar Registrar

This should be investigated in the field and decisions should be made.

Now let us look at the forms in cultivation. Luckily, the problem of variation in leaf colouration can be covered under the International Code of Nomenclature of Cultivated Plants (ICNCP) rules. Just as there are many cultivar names for *Aechmea fasciata*, so too will we have many for *Vriesea fosteriana*, and the time may be right to try to rationalise some of these names. Anybody who has grown seed from this species or its cultivar, 'Red Chestnut,' will know there is a great variation in the seedlings which brings a gleam in the eye of the nurseryman.

'Red Chestnut' has a checkered career. It was named by Eddie Waras, an expatriot Dane, in the late 1960's, when he sent a plant to Ervin Wurthmann. This collected plant (we do not know from where exactly in Brazil) was more compact than the "normal" species, and had reddish-brown markings. Harry Luther remembers this clone as being not particularly robust and not as easy to grow as the species! At the same time, a plant was sent to Hans Gulz in Germany. In the current Bromeliad Cultivar Registry (BCR) (Beadle 1998) it is said to have reddish-brown markings on a creamy pale green background, but where did this information come from? This cultivar first rated a mention in the JBS in 1973 (Wurthmann 1973), as a form of *Vriesea fosteriana*. This was 9 years after variety *seideliana* was described, but *seideliana* is not mentioned! In fact, there were quite a few mentions, but nobody described it, nor did they supply a photo of this magnificent plant to the Registrar, nor was it ever referred to as var. *seideliana*. The first we see it linked to the variety *seideliana* is in the BCR (Beadle 1998), with no reference as to where the information came from. I can only assume the description was compiled from several contemporary publications such as the 1982 BSI Handbook for Judges, and Baensches' (1994) Blooming Bromeliads, and advice from Harry Luther, because of the comments in DeRebus II (Luther and Sieff 1997).

In the late 1970's, 'Red Chestnut' was imported to Australia from Germany (possibly by Gulz). Clearly, the size of the plant meant mass production in Europe would not be warranted, and this may be why it found its way to Australia. One interesting point is that this German form seems to have a flatter, fatter leaf than the American counterpart which is more concave in shape!

From what I can gather, in the 1970's this cultivar was rare and it seems to have been propagated in Florida, USA by offset. We know that Dr. Morris Dexter got one offset! This was a slow process, BUT, it appears it was later grown from seed throughout the USA and Australia where all were called 'Red Chestnut' if they had reddish brown markings on the leaves. Anecdotal evidence suggests that even seedlings from *Vriesea fosteriana* suffered the same fate! There is, however, no suggestion that another species was involved in producing a possible hybrid.

Jeffrey Kent advises me that 'Red Chestnut' came to Kent's Bromeliad nursery as seedlings from Gulz. Seed raised plants grown in California under more controlled conditions than that in say, Brazil, showed very little variation other than in width of leaf or slight variation in lighter or darker leaves, and thousands were distributed.

So, although the name 'Red Chestnut' is not a cultivar name in the strict sense, because plants are not all true offsets from the original imported by Wurthmann or Gulz, it will remain in the Register.

Now let us look at an almost parallel situation. In 1976 Alvim Seidel's catalogue offered no 'Red Chestnut' plants (Waras and Seidel each had their own nurseries!), but did offer seed of *Vriesea fosteriana, V. fosteriana* var. *seideliana*, and *V. fosteriana* var *seideliana* 'Rubra', and this seed is still available when and if seed is set. Alvim Seidel advised me that the subvariety 'Rubra' had not been formally described but differed by having darker, reddish leaves where the transverse striations were less accentuated. We do not know what precautions are taken to ensure there is no accidental cross pollination or who has grown on this seed. We do know that a 'Rubra Broadleaf' was supplied to Kent's Bromeliad Nursery by Seidel in these early days, and it too has reproduced faithfully from seed, except again for slight variations in leaf width and light and dark forms. So 'Rubra Broadleaf' and 'Rubra' are closely linked. We do know that var. seideliana was described in Reitz (1965) and Seidel would have had the seed on the market shortly afterwards. Could all the variations currently being experienced with *Vriesea fosteriana* be traced back to the seed offered from Brazil from this period?

There was a *Vriesea fosteriana* 'French Selection' in Grande Magazine (1978) (frontispiece), and Alvim Seidel (1978) alerted bromeliad growers that this was in fact *V. fosteriana* var. 'Seideliana'. This may have been expressed correctly in the original letter but the quote marks suggest a cultivar name was intended by the Editor. In any event, the fact that there was a *V. fosteriana* var. *seideliana* did not become well known until the fourth edition of the Binomial list (Luther and Sieff 1994).

Kent's Bromeliad Nursery in California grows many *Vriesea fosteriana* from seed, and some have cultivar names. 'Vista' was selected from a batch of some 10,000 'Red Chestnut' seedlings as having more white in its narrower leaves. This trait has continued in seed reproduction. Perhaps we will see more cultivar names from this source in the future.

I have checked the Register and other sources for names of cultivars and the following is a summation of the current situation. If you are aware of any others, please let me know.

'Bianca' - Originating in the USA and in the "Trade" but I know no details other than it seems to be like 'Vista'. A photo taken in New Zealand is held and is on Register.

'Big Red' - Named in Brisbane, Australia by persons unknown but already being grown in New Zealand. It has bright red markings on the leaves. Photo held and on Register.

'Golden Legend' - Named in New Zealand for golden leaves and brown markings. Photo held and on Register.

'Memoria Howard Yamamoto' - Creamy pale green leaves with lavender-purple markings which are pink-violet when young. Photo held and on Register.

'Red Chestnut' - Creamy pale green leaves with reddish-brown markings. Photo held and on Register.

'Rubra Broadleaf' - Maroon colour leaves with reddish-brown markings (description from Tropiflora). No photo held, but on Register.

'Seidel' - White leaves with dull red transverse markings (this would be in place of var. *seideliana* if considered necessary). Photo held and on Register.

'Seidel Red Leaf' - Reddish leaves darker than 'Seidel' with less accentuated transverse markings. Photo held and on Register.

'Vista' - Nearly white foliage with fine reddish-chocolate markings (description from Tropiflora). Photo held and on Register.

Acknowledgements

I would like to thank all of those who helped me in this intriguing search including Helga Tarver, Ervin Wurthmann, Alvim Seidel, Jeffrey Kent, Oscar Ribeiro, John Catlan, Jason Grant, Elton Leme, and Harry Luther.

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Photograph by Marcel Lecoufle

Figure 15. The maroon coloration, characteristic of the leaves of *Vriesea fosteriana* 'Red Chestnut', extends into the flower bracts, sepals, and even the petals.

Events Calendar

AUSTRALIA

Sept. 11-14, 2003. *CENTRAL COAST NSW BROMELIAD SOCIETY SHOW.* Central Coast New South Wales Bromeliad Society. Australia.

UNITED STATES

July 24-27, 2003. *SUMMER BROMELIAD FIESTA.* Saddleback Valley Bromeliad Society. Orange County Fairgrounds, 88 Fair Drive, Costa Mesa, California. 10 until midnight. Admission to Fair required: Adults $7, Seniors $6. For more information, contact George Long (949-837-2111).

Aug. 2,3 2003. *2003 BROMELIAD SHOW AND PLANT SALE.* South Bay Bromeliad Associates. Rainforest Flora (new location), 19121 Hawthorne Blvd., Torrence, California. Sales: Sat. & Sun. 10-4:30. Show: Sat. 12-4:30, Sun. 10-4:30. No charge, admission and parking free. For more information, contact Bryan Chan (818-366-1858 or bcbrome@aol.com).

Sept. 5-7, 2003. *29TH ANNUAL SOUTHWEST BROMELIAD SHOW AND SALE.* Shreveport Bromeliad Society. Barnwell Garden & Art Center, 601 Clyde Fant Parkway, Shreveport, Louisiana 71101. For more information, contact Harvey Beltz (318-635-4980).

Sept. 20,21, 2003. *FALL ARBORETUM SALE.* Bromeliad Society of Houston. Houston Arboretum and Nature Center, 4501 Woodway, Houston, Texas. Sale hours: Sat. 9-5, Sun. 11-4. For more information, contact Allyn Perlman (713-772-7831 or deliboys@ev1.net).

Nov. 7-9, 2003. *CALOOSAHATCHEE BROMELIAD SOCIETY'S STANDARD BSI SHOW AND SALE*, Show and Sale. Caloosahatchee Bromeliad Society. Terry Park, 3410 Palm Beach Blvd., Ft. Myers, FL. Judging Nov. 7, open to the public Nov. 8, 9-5; Nov. 9, 10-4. For more information, contact Larry Giroux (239-997-2237) or Brian Weber (239-591-4268).

Sept. 11, 2003. *FLORIDA BSI JUDGE'S WORKSHOP.* Held in conjunction with Caloosahatchee Bromeliad Society Sale. For more information, contact Polly Pascal, 4413 SW 38th Terr., Ft. Lauderdale 33312, (954-962-0018).

July 26 to August 2, 2004. *WORLD BROMELIAD CONFERENCE.* Bromeliad Society International/Bromeliad Society of Greater Chicago. Rosemont, Illinois, USA. For more information, visit www.bsi.org.

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Kerry Booth Tate's epiphyte garden in Australia is vibrant with colors and diversity. See inside for more photographs and tips on growing epiphytes.