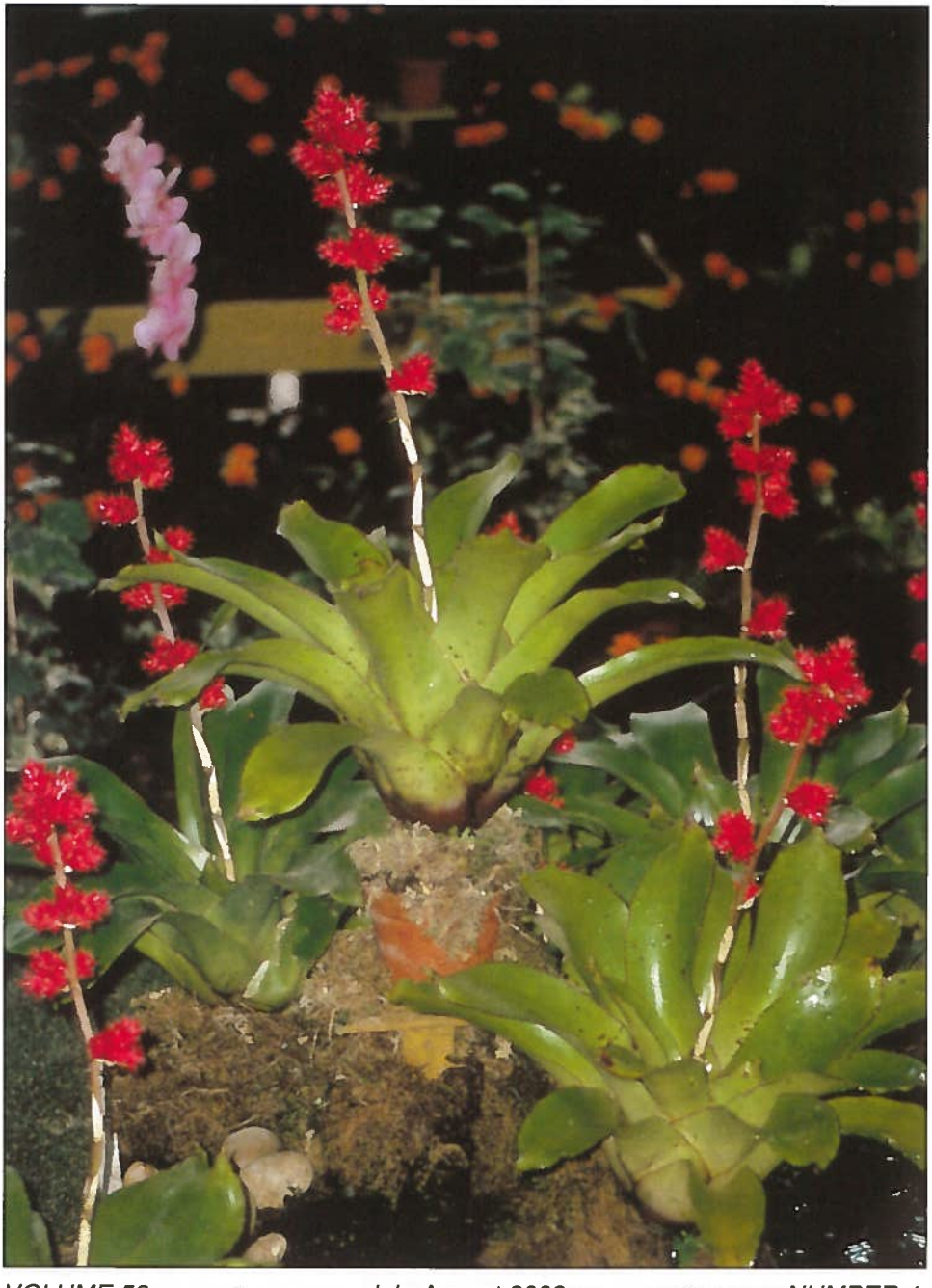
# Journal of The Bromeliad Society



VOLUME 52 • July-August 2002 • NUMBER 4

# Journal of the Bromeliad Society




Vol. 52, No. 4 July-August, 2002

**Editor:** Chet Blackburn, 720 Millertown Road, Auburn, California 95603.
Telephone and Fax: 530-885-0201, E-mail: editor@bsi.org

**Editorial Advisory Board:** David H. Benzing, Gregory K. Brown, Jason Grant, Pamela Koide, Thomas U. Lineham, Jr., Harry E. Luther, Robert W. Read, Walter Till.

**Cover photographs. Front:** The three-foot, spine-tipped leaves of *Hohenbergia stellata* can form a rosette occupying up five feet in circumference of precious greenhouse bench space, but few growers would begrudge that room once the brilliant, long-lasting inflorescence emerges. Photograph by Marcel Lecoufle. **Back:** UPPER PHOTO *Billbergia* 'Foster's Striate, a cultivar of *Billbergia pyramidalis*. Derek Butcher discusses this species in text beginning on page 172. Photograph by M. McMahon. LOWER PHOTO: *Billbergia pyramidalis* 'Kyoto'. Photograph by Marcel Lecoufle.

CONTENTS



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

Subscription price (in U.S. $) is included in the 12-month membership dues: single–$30.00, dual (two members at one address receiving one Journal)–$35.00, fellowship–$45.00, life-$800.00 in U.S., $1056 outside of U.S. For first class mail add $10.00.

**Please address all membership and subscription correspondence to Membership** Secretary Carolyn Schoenau, P.O. Box 12981, Gainesville, FL 32604. Telephone 352-372-6589. E-mail:BSI@nersp.nerdc.ufl.edu

**Back Issues:** All single copies $4.50 1st class postpaid to ZIP addresses, other countries $5.50 airmail postpaid; per volume $20.00 to ZIP addresses, $25.00 to other addresses, 3rd class or surface postpaid. Order back issues from BSI Publications, 2265 W 239th St. Torrance, CA, 90501, USA. E-mail: Publications@BSI.ORG. Make checks drawn on U S. banks, bank drafts, or money orders payable to B.S.I. Prices are subject to change.

Printed by Fidelity Press, Orlando, Florida.



# *Tillandsia parryi* and *Tillandsia sueae*, Sister Species of Central Mexico.

**Sue (Gardner) Sill**[1]

*Tillandsia sueae* Ehlers occurs as an epiphyte of cloud forests at various locations along ridges of the Sierra Madre Oriental that run parallel to the gulf coast in Mexico (Fig. 1). Its foliage is moderately thin, with a fine covering of adpressed trichomes that gives it a slight luminescence. The tall, salmon-pink candelabra-like inflorescence bears lavender flowers that open in the morning. These plants were treated as *T. parryi* J.G.Baker until Gardner (1982, 1986) discovered that living plants collected from locations of specimens assigned by Smith and Downs (1977) to *T. parryi* had two distinct flower colors, and the different colored flowers opened at different times of the day. Even more interestingly, the flower colors seemed to correlate to the substrates on which the plants grew. Renate Ehlers (1991) introduced it as a new species and compared it to *T. parryi*.

While lavender flowered *T. sueae* grows on trees, the chartreuse flowered plants believed to be the true *T. parryi* grow on rocks and their flowers open at dusk. The pale color would make the flowers visible in dim light, a distinct advantage to night-flying pollinators. The saxicoles are probably pollinated by large moths. Epiphytic, day-flowering *T. sueae* are likely pollinated by hummingbirds. The more intense pigmentation of its floral bracts supports this notion.

Both plants reach up to a meter in height. Epiphytic *T. sueae* has a broadly spreading rosette, while that of *T. parryi* tends to be slightly more narrow and upright. A tendency for strict rosettes is common among species adapted to arid conditions, and to rock dwelling species. The inflorescence spikes are also more spreading in *T. sueae*.

Reports are solicited from others who have collected these species. Of particular interest is the consistency of the connection between flower color and substrate. If you have collected either species, please contact the author and let her know if your plants were epiphytes or saxicoles, and what color flower they had. Photos would also be appreciated.

[1] Georgia Southern Botanical Garden, P.O. Box 8039, Statesboro, GA 30458. sue_sill@gasou.edu

Figure 1. *Tillandsia sueae* in its cloud forest habitat in the state of Nuevo Leon, Mexico

Sue Sill

Figure 2. *Tillandsia sueae*

Sue Sill



Figure 3. *Tillandsia sueae* flower.

Sue Sill

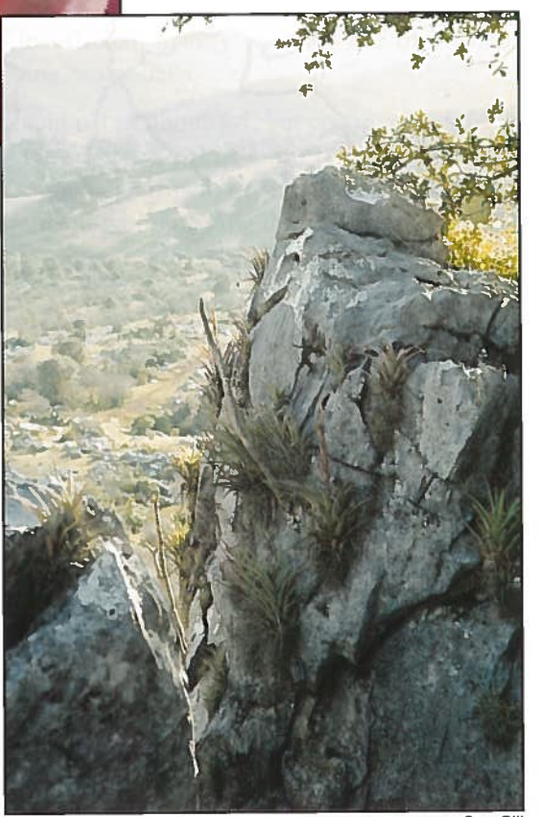


Figure 4. *Tillandsia parryi* on rocks cliff east of the city of San Luis Potosi, Mexico.

Sue Sill

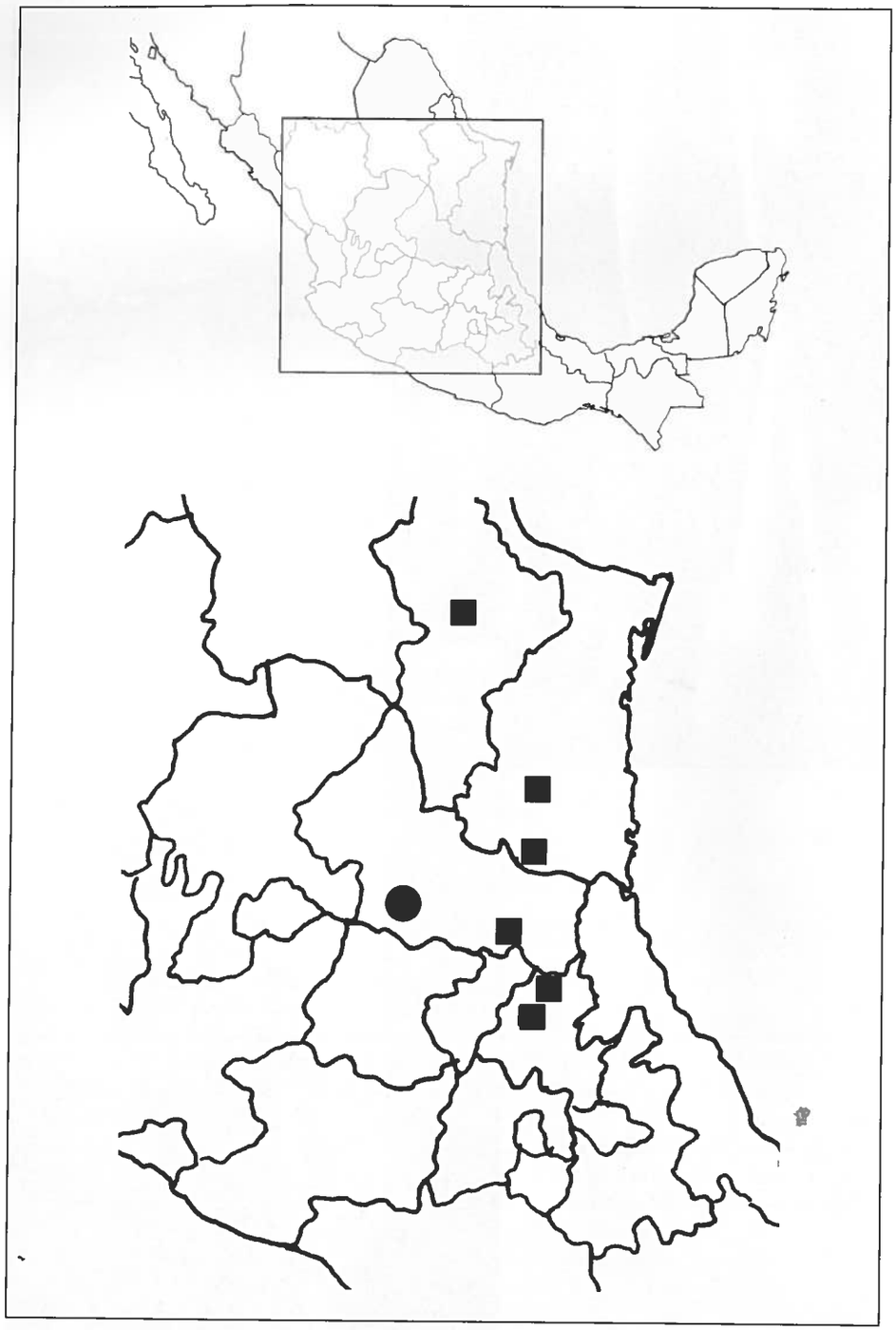



Figure 5. Known Distribution of *Tillandsia parryi* (circle) and *Tillandsia sueae* (squares) in Mexico.



ACKNOWLEDGMENTS:

The author would like to acknowledge two intrepid bromeliad explorers, Mrs. Rosa Meilleur of Corpus Christi, Texas who first brought plants of *T. sueae* to my attention, and to Renate Ehlers of Stuttgart Germany, who described it as a new species.

LITERATURE CITED

Ehlers, R. 1991. A new *Tillandsia* species: *Tillandsia sueae*. J. Brom. Soc. 41:208-213.

Gardner, C.S. 1982. A systematic study of *Tillandsia* subgenus *Tillandsia*. PhD Dissertation. College Station, Texas, Texas A&M University.

_____. 1986. Inferences about pollination in Tillandsia (Bromeliaceae). Selbyana 9:76-87.

Smith, L.B. and R.J.Downs. 1977. Tillandsioideae. Fl. Neo. Trop. Mnogr. 14:663-1494. Hafner Press. New York.

# Redwood Chips

## Herb Plever

There is potential problem of insufficient acidity with the use of coconut husk fiber as a sole medium for growing bromeliads

Bromeliads generally prefer an acid pH of about 5.5, but coconut husk fiber has a pH of 6.47 and our New York City water a pH of 6.57. This may not be a major problem but since we strive for the best growing conditions, especially in indoor setups, it may be wise to experiment with lowering the pH.

One way to acidify your mix is to add a proportion of redwood shavings, which I have found by testing to be in a range between pH 5 and 5.5. Moreover, it is quite water retentive. My usual bromeliad mix has always contained about 20% redwood shavings (fine chips) along with over 30% coarse peat moss and giant perlite and cork bark bits aaaadded for friability.

Redwood chips come in medium and fine. The fine chips are shavings resulting in small pieces and fibers. A combination of medium and fine chips would be both friable and water retentive and properly acidic.

*New York, New York*

*Reprinted in part from Bromeliana, the newsletter of the New York Bromeliad Society 39(4):4. April, 2002*

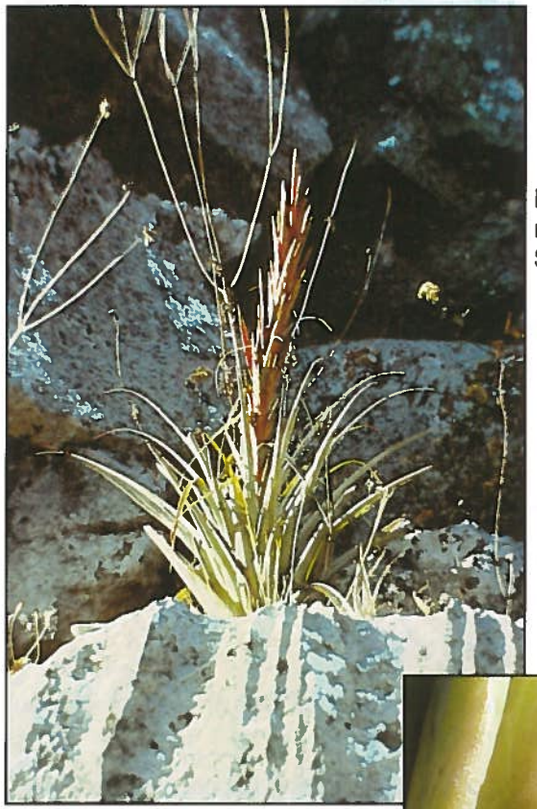


Figure 6. *Tillandsia parryi* on rocks cliff east of the city of San Luis Potosi, Mexico.

Sue Sill

Figure 7. *T. parryi* Flower.

Sue Sill



# Board of Director Candidates for 2003-2005

Members of the California and Florida regions will find ballots enclosed in this issue of the Journal. One director from California is to be elected from two nominees, and three directors from among five Florida candidates are to be elected. See the enclosed ballots for instructions for voting.

The candidates for California Director are:

**Jack Percival** is a Charter Member of the North County Bromeliad Society, a member of San Diego Bromeliad Society and the Bromeliad Society International since 1975. He has served as president of the San Diego Bromeliad Society and the North County Bromeliad Society. He has also contributed articles for the *Journal of The Bromeliad Society*.

**Robert (Bob) Griffith** first noticed Bromeliads when he saw a strange plant he later learned was a *Neoregelia* on a fellow workers desk. That led to his first purchase, in 1976; of an *Aechmea fasciata*. Over the years, his collection has grown to many hundreds of bromeliads. In 1978, he joined the South Bay Bromeliad Associates, attended the WBC in Galveston in 1982, and many others since. He has served as the Registrar at the SBBA annual Bromeliad show for the past ten years. He collects all varieties of Bromeliads but has a slight bias in favor of the Tillandsioideae subfamily and is especially interested in species with interesting leaf patterns.

The nominees for three Florida Directors are:

**Michael Andreas** has been growing bromeliads from all genera for more than fifteen years, but is especially interested in tillandsias. He is a member of the BSI and the Cryptanthus Society, a long time active member of the Bromeliad Society of Central Florida (BSCF) and a member of an informal bromeliad study group, the Space Coast Bromaniacs. Michael built one of the first bromeliad related websites on the Internet in 1996 when he designed the site for the BSI World Bromeliad Conference, Orlandiana It has since evolved into the excellent FCBS website, currently the number one bromeliad website in the world in terms of quality and activity. The website has over 8,000 images of bromeliads and bromeliad events. He also works closely with the BSI webmaster and the BSI Cultivar Registrar. He is turning his property into a botanical garden featuring bromeliads. Several times a year he co-hosts bromeliad workshops at a local nursery. Michael works for the United Space Alliance at the Kennedy Space Center where he maintains the computer network for the Center at night.

**Theresa (Terri) Bert** has been a member of the Sarasota Bromeliad Society since 1988 and of the Caloosahatchee Bromeliad Society since 1997. In the SBS, she has served as president, membership chair, and workshop chair, and has served on the by-laws revision committee twice; for SBS annual shows, she has served as entries chair and judge's chair. Her bromeliad collection consists of approximately 1,500 different types (species, hybrids, etc.) in 12 different

genera. She's won a number of show awards at local clubs and BSI world conferences. She's served on the Florida Council of Bromeliad Societies (FCBS) since 1996 and currently serves as president. She also served on the FCBS By-laws Revision Committee. She served on the BSI Board of Directors during 1999-2000, and chaired the BSI Ad Hoc Committee to Develop Criteria for the Wally Berg Award. She is a BSI-accredited judge and has judged and served as judges' clerk at local bromeliad club shows and BSI world conferences. She has given presentations on bromeliad biology and ecology at meetings of local bromeliad clubs and other organizations and is a personal donor to the Selby Gardens Bromeliad Identification Center.

**Vicky Chirnside** is a long-time dedicated Bromeliad Society member. She has served as president of both the Sarasota and Caloosahatchee Bromeliad Societies. She was one of the first Accredited Bromeliad Judges in Florida, having gone through the very first judging school in 1979. She has served as the Florida Council representative for both Caloosahatchee and Sarasota. She is a dedicated Bromeliad lover and maintains an outstanding bromeliad collection.

**Larry Giroux** is a 25 year resident of Florida and has been raising bromeliads for most of that time. His involvement became more focused when he joined the Caloosahatchee Society in 1992. Since then he has assumed the co-editorship of the *Meristem*, the newsletter of the CBS as well as serving as President, Secretary and Vice-President. He has held numerous committee positions, including Chairman of the Caloosahatchee Bromeliad Society Show and Sale. As the CBS representative to the Florida Council of Bromeliad Societies, he was appointed Chairman for 1997. Larry has served on World Bromeliad Conference committees over the years and as a BSI accredited judge he has judged 3 World Bromeliad Conferences as well as many other societies' bromeliad shows. Although he raises many of the genera of bromeliads, his primary interest has been *Cryptanthus*. In 1998 he became the Editor of the Cryptanthus Society Journal. Larry continues to enjoy his passion for bromeliads by growing, collecting, hybridizing, photographing and writing about these plants.

**Karl Green** is retired Chief of Orthopedic Surgery at Miami's Deering Hospital. Since receiving his Medical degree in 1966, he has practiced surgery at Long Island Jewish Medical Center in New York, the St. Joseph Hospital in New Jersey, the United States Air Force, and Deering Hospital in Miami. He is a Diplomate of the American Board of Orthopedic Surgery, and a Diplomate of the National Board of Medical Examiners. He first became interested in bromeliads in 1995 and joined both the Bromeliad Society of South Florida and the BSI. He and his wife Kris have been generous contributors to the world conference rare plant auctions, the Bromeliad Identification Center, the "Evil Weevil" fund, and both the BSSF and the BSI. He sponsored Elton Leme's book *Bromeliads of the Atlantic Forest - Nidularium*. He is a BSSF representative to the Florida Council of Bromeliad Societies, and has served as Show Chairman and Vice President of the BSSF. His collection contains more than 1,000 bromeliad species and he has introduced many new species into cultivation in the U.S.A.



# *Vriesea minarum* L.B. Sm., the correct name for *Tillandsia citrina* Baker

**Jason R. Grant[1], Elton M.C. Leme[2], & Albert Roguenant[3]**

Leme (1999) updated our knowledge of the *Vriesea atropurpurea* complex by recognizing two species, *Vriesea atropurpurea* and *V. citrina*. However, here we correct the nomenclature to acknowledge that *Vriesea minarum* is the proper name for *Vriesea citrina* (Baker) L.B. Sm. (based on *Tillandsia citrina* Baker (1889), not *T. citrina* Burchell ex Baker (1879).

The name *Tillandsia citrina* Burchell ex Baker (1879: 235) was recognized in synonymy under *Canistropsis billbergioides* by Smith (1955: 166) and Leme (1998: 45). Yet, there is later homonym based on a different type, *Tillandsia citrina* Baker (1889: 224); *Vriesea citrina* (Baker) L.B. Sm. (1971). So, since the name *Tillandsia citrina* Burchell ex Baker (1879) already exists, *Tillandsia citrina* Baker (1889) is a homonym, and therefore illegitimate (Greuter et al., 2000: Art. 53.1, ex 3).

Smith (1943) described *V. minarum*, yet later placed it in synonymy under *V. citrina* (Smith 1971). Smith then (1977: 1232) changed his mind, and placed both *V. minarum* and *V. citrina* under synonymy of *V. atropurpurea*. While Smith recognized *Vriesea atropurpurea*, *V. citrina*, *V. minarum* as conspecific, Leme (1999) clearly distinguished *Vriesea citrina* (= *V. minarum*) from *V. atropurpurea* taxonomically, yet did not deal with the nomenclatural issues. So here, *Vriesea minarum* is recognized as the next validly published name for *T. citrina* Baker 1889 (not *T. citrina* Burchell ex Baker 1879) as follow:

*Vriesea minarum* L.B. Sm., Arq. Bot. Estado S„o Paulo 1: 118. 1943. = *Tillandsia citrina* Baker, Handb. Bromel. 224. 1889, *Vriesea citrina* (Baker) L.B. Sm. Phytologia 21. 93. 1971, not *Tillandsia citrina* Burchell ex Baker, J. Bot. 17: 235. 1879 [= *Canistropsis billbergioides*].

LITERATURE CITED

Baker, J.G. 1879. A synopsis of the genus *Aechmea*, R. & P. J. Bot. London 17: 129-135, 161-168, 226-236.

_____ 1889. Handbook of the Bromeliaceae. London: George Bell & Sons.

[1] Laboratoire de Botanique Évolutive, Institut de Botanique, Faculté des Sciences, Université de Neuchâtel, rue Émile-Argand 11, Case Postale 2, 2007 Neuchâtel, Switzerland; jason.grant@unine.ch

[2] Herbário Bradeanum, Universidade do Estado do Rio de Janeiro, Caixa Postal 15005, Rua São Francisco Xavier 524, 20031-970 Rio de Janeiro, RJ, Brazil; leme@tj.rj.gov.br

[3] 212 Route de Charly, 69230 Saint-Genis-Laval, France; Albert.Roguenant@wanadoo.fr

Greuter, W. et al. 2000. International code of botanical nomenclature (Saint Louis Code). Regnum Veg. 138: 1-474.

Leme, E.M.C. 1998. Canistropsis: Bromélias da Mata Atlântica. GMT Editores Ltda.

_____ 1999. Revision of the lithophytic Vriesea species from Minas Gerais State, Brazil - part III. J. Bromeliad Soc. 49:3-11.

Smith, L.B. 1943. Bromeli·ceas novas ou interessantes do Brasil., II. Arq. Bot. Estado São Paulo 1: 101-122. 1943

_____ 1955. The Bromeliaceae of Brazil. Smithsonian Misc. Coll. 126(1): 1-290.

_____ 1971. Notes on Bromeliaceae XXXII. Phytologia 21(2): 73-96.

_____ & Downs, R.J. 1977. Tillandsioideae (Bromeliaceae). Flora Neotropica. Monograph no. 14, pt. 2. New York: Hafner Press.

# Encounters with Bromeliads

## Donald J. Green

One of my favorite authors, the zoologist Gerald Durrell, titled one of his books about collecting animals in the wild "Encounters with Animals". While I haven't yet had the pleasure of collecting bromeliads in the wild, I have long been intrigued by the variety of ways in which bromeliads collect people.

I grew up on a farm in Oklahoma, and although I don't think I'd ever want to return to the farm I have always enjoyed growing plants of many kinds. Like most people I had probably seen *Aechmea fasciata* in supermarket floral departments or garden centers. I first became aware of bromeliads as a diverse and fascinating family of plants during a trip to the San Diego Zoo in 1983. There were lots of epiphytic bromeliads in the trees at the zoo, particularly in the bird habitats. There was also an extensive collection of tillandsias with descriptive material.

Although I found the plants fascinating I was not prompted to go right out and start buying bromeliads. I was aware that people growing up in Southern California were somewhat different than people growing up in the Southwest, as evidenced by my former "Okie" cousins who were transplanted to California. I reasoned that plants might be just as variable.

I did start paying more attention to bromeliads when I encountered them. Bromeliads were not then ubiquitous shopping center interiorscapes! I was still reluctant to try growing bromeliads, as I knew nothing about them except that they were very beautiful and unlike any other plants. My sister Dorothy bought me my first bromeliad, a *Tillandsia cyanea* at a supermarket while she was



visiting in Houston. She probably did it to try to shut me up after listening to me go on about how wonderful these plants were. I still have descendants of that plant and *T. cyanea* remains my all-around favorite bromeliad. My second bromeliad was a small but spectacular *Vriesea* that a friend bought me during a trip to Oklahoma. I had no more luck with that plant than I do with others of that genus today, but by this time I was convinced I COULD grow bromeliads. Maybe not all of them, but I was ready to try!

I bought a few more bromeliads at garden centers and had some successes and quite a few failures as I experimented with these plants. Even moderate success with bromeliads was enough to convince me that these plants really were special.

Today the first pages I read in Saturday's newspaper are the gardening articles. In 1990 I rarely read that section of the paper, but one day (by chance?) I noted the garden calendar listed the World Bromeliad Conference currently taking place at the Warwick Greenspoint Hotel in Houston. I dropped everything else I planned to do that afternoon and rushed over to see the bromeliad show. It was probably 3:00 p.m. and very quiet when I arrived. There were only a few other people in the show room. I had followed the signs directly to the show room and in my rush to see the plants I don't remember passing an information table or seeing anyone who could have told me about the Houston Bromeliad Society. But after an hour or so of drooling over the plants in the show I was more convinced than ever that I wanted to grow bromeliads. I had earlier been fascinated by the few "garden variety" bromeliads I had seen. Now I had a hint of the immense variety available in the world of bromeliads and was encouraged by the fact that most of the plants had indeed been grown in Houston. So it could be done!

I didn't track down and join the local Society until 1993, but by then I had a little more experience with bromeliads. I have never stopped being amazed by my encounters with bromeliads. I hope your encounters are also still as amazing as when you first encountered these plants.

*Houston, Texas*

*Reprinted from the Houston Bromeliad Society bulletin (34):8, September, 2001.*

# Clarifying the taxonomic identity of *Puya humilis*, *Puya tunarensis* and *Puya butcheriana* (BROMELIACEAE), from Cochabamba, Bolivia

**Roberto Vásquez Ch[1]. & P.L. Ibisch[2]**

**Abstract:** The confusion that existed with regard to the correct identity of *Puya humilis* Mez and *P. tunarensis* Mez is clarified. A region near the Cotacajes river, in the Department of Cochabamba, Bolivia, between 1,300 and 1,400 m, is identified as the type locality of *P. tunarensis* (and as well of *P. kuntzeana*). Ecology and geographical records of both species are presented. The relevant characters are explained supporting that both taxa really are distinct species. A distribution map, ecogram and photographs of both species are provided. *P. butcheriana* H. Luther is proposed as a new synonym of *P. humilis* Mez.

**Resumen:** Se aclara la confusión que ha existido en la correcta identidad de *Puya humilis* Mez y *P. tunarensis* Mez. Se reconoce a la región cercana al río Cotacajes, en el departamento de Cochabamba, Bolivia, entre los 1.300 a 1.400 m de altitud, como la localidad del tipo de *P. tunarensis* (y también de *P. kuntzeana*). Se dan a conocer la ecología y los registros de colectas de *P. humilis* y *P. tunarensis* en Bolivia. Se presentan una tabla con los caracteres diagnósticos de *P. humilis* y *P. tunarensis*, mapa de distribución, ecograma y fotografías de ambas especies. Se propone a *P. butcheriana* H. Luther como sinónimo nuevo de *P. humilis* Mez.

## Introduction

Since the discovery of *Puya tunarensis* and *P. humilis* by Otto Kuntze, in 1892, confusion has existed with regard to the correct identity of both species. One has been called the other and vice versa. This confusion involved many botanists and collectors who tried to promote the knowledge on Bolivian bromeliads: e.g., Smith & Downs (1974), Luther (1995), Krömer et al. (1999) and Ibisch & Vásquez (2000).

In their key, Smith & Downs (1974) clearly separated both species as being distinctive with regard to the floral bract that is erect in *P. humilis* and recurved in *P. tunarensis*. However, this character is not consistent in *P. humilis* which may show recurved scape bracts and basal floral bracts like *P. tunarensis*. Thus, Smith and Downs (1974) determined the specimens *Cárdenas 2372, 3580, Cárdenas et al. 7639* and *Foster 2555* as *P. tunarensis* - although they belonged to *P. humilis*.

[1] Sociedad Boliviana de Botánica, Casilla 3822, Santa Cruz, Bolivia (rvasquez@cotas.com.bo);
[2] Fundación 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



On the one hand, among others, they did not take into account habitat characteristics like the altitude of the localities of the types of both species, and of course they were not familiar with the geography of the Cochabamba region. On the other hand, the original description of the type locality of *P. tunarensis* is confusing - leading to a somewhat misleading epithet.

Both holoypes are deposited at the New York Botanical Garden and were revised by the first author in November of 2001. The herbarium label of the holotype of *P. humilis* says: "Bolivia 3,000 m plain near Sacaba, 13-21 April 1892." This site can be identified easily. Sacaba, some 12 km to the east of the city of Cochabamba, is surrounded by mountains that are higher than 3,000 m. There the species is found with abundant populations (Figures 9-11). In the case of *P. tunarensis* the voucher label indicates as locality: "Bolivia Tunari mountains 1,300 m May 92 (1892)." It is this locality that created confusion because the city of Cochabamba is located at an altitude of about 2,500 m, and the Tunari Mountains, northwest to northeast of the city, reach an altitude of more than 5,000 m (Tunari summit). Thus, the question was: Where in the Tunari Mountains could a site exist of about 1,300 m as indicated by Kuntze? Or was he just wrong about the altitude?

The answer was found during a trip of the first author, in June 2001, participating in a botanical expedition to the Cotacajes valley that is the border between the Departments of Cochabamba and La Paz. The Cotacajes valley is one of the rather isolated dry inter-Andean valleys that are inserted in the humid forests of the Yungas ecoregion. Recently, an endemic bromeliad was discovered in this valley: *Fosterella cotacajensis* Kessler, Ibisch & Gross (Kessler et al. 1999).

Going from Cochabamba, this valley is reached crossing the Tunari Mountains northwestwards. And there, in the vicinity of the village of Cotacajes, on steep rocky escarpments, we found two species of *Puya*: the first rather large, to 1.5-2 m high, with large green leaves and reddish tips, erect scape, covered by large bracts, and a compact and multiflowered inflorescence. This species turned out to be *P. kuntzeana*, also named by Mez in honor of its first collector Otto Kuntze! Obviously, Kuntze had traveled to the Cotacajes valley. The second species was smaller and presented clear green leaves, cylindrical inflorescences with recurved apices of the floral bracts (Figures 12-14). These characters fit well to *P. tunarensis*. The fact that these two species occurred together - at an altitude of more or less 1,300 m (!) - confirmed to us that we had arrived at the type locality of both *P. tunarensis* and *P. kuntzeana*, not in the Tunari Mountains as vaguely indicated by Kuntze, but on their other side, northwestwards of the Tunari summit. This interpretation is confirmed by the label of the *P. kuntzeana* type: "Bolivien 1300 m, Tunari 4/5/1892". The three species *P. kuntzeana, P. tunarensis* and *P. humilis* were discovered by Otto Kuntze in 1892. Mez identified them as new species in 1894 and described them in 1896.

## Distribution of *Puya humilis* and *Puya tunarensis*

*Puya humilis* is endemic to Bolivia but has a rather large range, in altitudes between 2,500 and 3,900 m, more or less associated with the upper headwaters of the Río Grande river system (departments of Cochabamba, Chuquisaca and Potosí). *P. tunarensis* is restricted to the isolated and narrow Cotacajes valley, between the Cochabamba and La Paz departments, at an altitude of 1,200 to 1,400 m (Figures 8, 15). The species are separated by the at least 4,500 m high Cochabamba/Tunari Mountain chain.

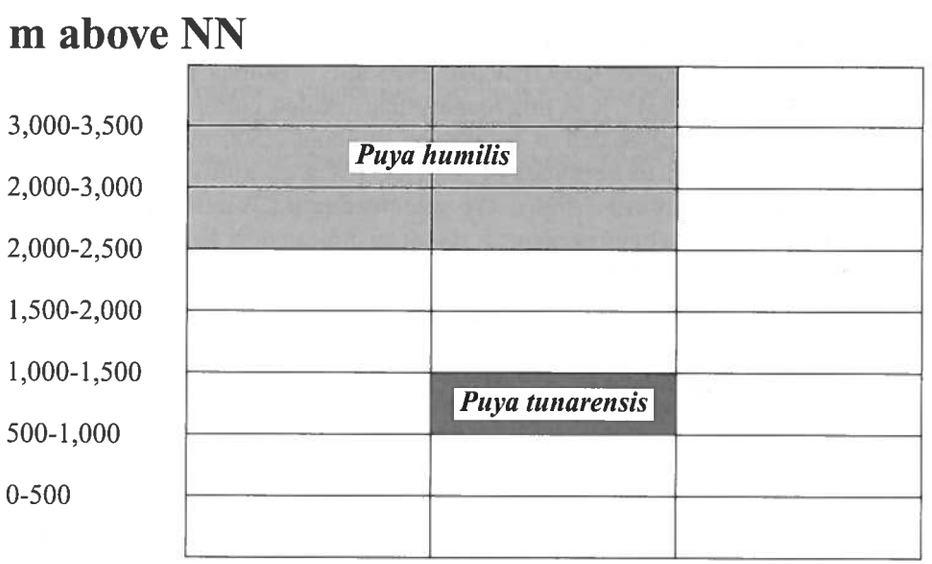



Figure 8. Ecogram of *Puya humilis* and *P. tunarensis* (number of arid months estimated considering available climate diagrams of the region and an interpolated aridity map).

## Recorded specimens

**Puya humilis** Mez, DC. Monogr. Phan. 9: 498. 1896. (Figures 9-11)

*Puya werdermannii* Harms. Notizbl. Bot. Gart. Berlin 10: 793. 1929. Tipo: Bolivia: NE sierra de Cochabamba, Incachaca, Chuquechampi to Cuchicancha, Jul. 1926, *Werdermann 2006* (B fotog. 11423, F).

*Puya butcheriana* H. Luther, Selbyana 16(2): 235-238. 1985. **Syn. nov.** Type: unknown origin, possibly Bolivia or Perú, 24 January 1992, *D. Butcher s.n.* (Holotype: SEL).

**Type:** BOLIVIA: 3,000 m (plain near) Sacaba, 13-21 Abr. 1892, *Kuntze s.n.* (Holotype: NY!).



## Other records from Bolivia:

COCHABAMBA: Prov. Arani: Toralapa, January 1946, Cárdenas 3580 (US); ibid.: between Vacas and Rodeo, approximately 17°42'S, 65°45'W, 3,400 m, on rocky crevices of dry, alpine scrub vegetation, 20 April 1987, *G.S. & U. Varadarajan & J. Brandbyge 1451* (LPB); ibid.: 1.5 km, road from Alalay to Mizque, 17°43'S, 65°39'W, 3,750 m, 23 July 1998, *P. & C. Ibisch 98.0103* (LPB); ibid.: 1.5 km, road from Arani to Mizque, 15 km after turn-off to Vacas, 17°42'S, 65°39'W, 3,900 m, 7 August 1993, *P. & C. Ibisch 93.0563* (LPB); ibid.: Chulku Mayu community, 3,700 m, *Polylepis* forest, montane forest, 2 March 1991, *I. Hensen 1223* (LPB); ibid.: Koari, km 90 old road between Cochabamba and Santa Cruz, 3,400 m, 28 December 1999, *R. Vásquez 3500* (VASQ); Prov. Carrasco: Quirusillani to Totora, April 1943, *Cárdenas 2372* (GH); ibid.: Siberia, between Comarapa and Pojo, 11 January 1965, *Vogel 468* (US), ibid.: nearby Montepuncu, on the road to Sehuencas, 17°33'S, 65°17'W, 2,800 m, 27 June 1993 (flowers in cultivation, 1 October 1993), *P. & C. Ibisch 93.0486* (LPB). Prov. Chapare: 3,500 m, 17°24'S 65°52'W, 23 Oct. 1985, *J.C. Solomon 14509* (MO); ibid.: between Melga and Waganki 3,240 m, terrestrial on rocky slopes, 5 February 1999, *R. Vásquez 3160* (VASQ). Prov. Esteban Arce: from Anzaldo to Tarata, 9 January 1943, *Cárdenas, Cutler & Gandarillas 7639* (US). Prov. Mizque: Cocha (Cocha-Cocha) to Vila Vila, 15 November 1948, *Foster 2555* (US). CHUQUISACA: Prov. Oropeza: Guerraloma, Sucre, February 1949, *Cárdenas 4128* (US); north of Presto, 3070 m, *"ckayara-kayanta"*, 29 August 1980, *G. Mühlbauer s.n.* (LPB); ibid.: track from La Recoleta to the "Cristo", *Eucalyptus* plantation, approximately 2,900 m, 25 July 1991, *P. & C. Ibisch 25072* (LPB). POTOSI: Tagua Comuño, 15 km southwards from Potosí, 25 March 1936, *West 6370* (UC); ibid.: Prov. Charcas: Toro Toro, El Vergel canyon, 18°08'S, 65°45'W, 2,500 m, 22 July 1998, *P. & C. Ibisch 98.0076* (LPB).

**Puya tunarensis** Mez, DC. Monogr. Phan 9: 498. 1896. (Figures 12-14)

**Type:** BOLIVIA: COCHABAMBA: Monte Tunari, 1,400 m, 4 May 1892, *Kuntze sn.* (Holotype: NY).

## Other records from Bolivia:

COCHABAMBA: Prov. Ayopaya: between Pujiuni and Cotacajes, 1,370 m, terrestrial on rocky slopes, 20 June 2001, *R. Vásquez, G. Navarro, M. Fernández F. Miranda & H. Rocha 4125* (VASQ, LPB).

Morphological comparisons

The relevant characters of *Puya humilis* show clear morphological differences when compared to *P. tunarensis*, strongly supporting that they are different species (see Table 1).

R. Vasquez

Fig. 9. *Puya humilis* in its habitat

P. Ibisch

Fig. 10. Habit of *Puya humilis*



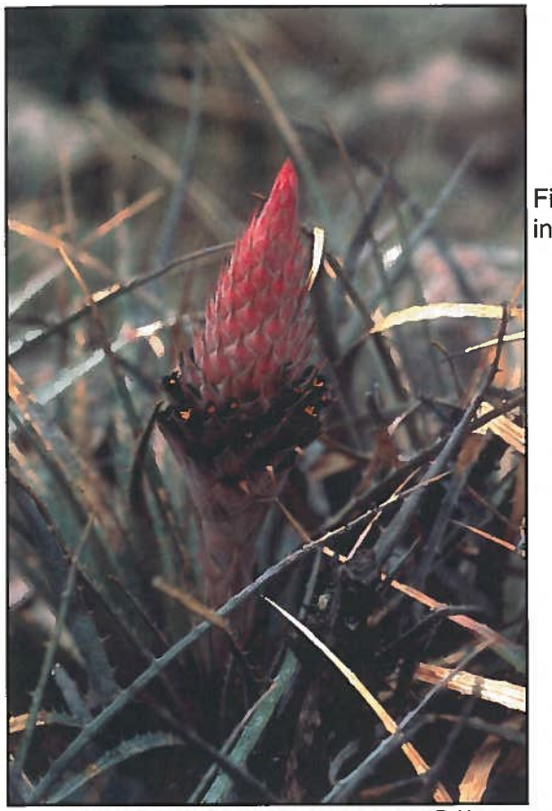


Fig. 11. Detail of the inflorescence of *Puya humilis*

R. Vasquez

R. Vasquez

Fig. 12. *Puya tunarensis* in its habitat

**Table 1. Comparison of relevant characters of *Puya humilis* and *P. tunarensis*** (based on the revision of living and herbarium material).

| Characters | *P. humilis* Mez | *P. tunarensis* Mez |
|---|---|---|
| Height | Flowering to 60 cm. | Flowering to 1.50 cm. |
| Leaves | Gray, narrowly triangular, 20-25 cm long × 10-15 mm wide, densely cinerously lepidote, in longitudinal stripes abaxially, cinerously lepidote adaxially, laxly serrate, with yellowish, 3 mm long spines. | Clear green, triangular, to 60 cm long × 4-5 mm wide, scarcely cinerously lepidote abaxially, glabrous adaxially, serrate with clear or dark brownish, to 5 mm long spines. |
| Sheaths | Ovate, 1.5 cm long. | Suborbiculate, 3 cm long. |
| Scape | 6-8 cm long, 10 mm in diameter, white tomentellous. | 6-12 cm long, 12-15 mm in diameter, slightly cinerously lepidote. |
| Scape bracts | Imbricate, lanceolate, attenuate, erect or recurved. | Imbricate, broadly ovate, attenuate, recurved. |
| Inflorescence | Simple, strobilate, fusiform or cylindric, 20-25 cm long, 2-3 cm in diameter, axis densely white-tomentellous. | Simple, cylindric, 20-40 cm long, about 3 cm in diameter, axis lepidote. |
| Floral bracts | Erect, the basal ones not recurved or slightly recurved after anthesis, imbricate but not strongly adpressed, elliptically lanceolate, 20-28 long × 10-12 mm wide, longer than the petals, adpressed, rose, nerved, acuminate apex, pungent, white tomentellous, margin microscopically serrate or entire. | Erect, recurved even before anthesis, imbricate, strongly adpressed before anthesis, less strongly after anthesis, elliptic to elliptically ovate, apiculate apex, 20-25 mm long × 12-15 mm wide, powdered-lepidote, rose violet, dry after anthesis, margin entire. |
| Pedicel | 2-3 mm long. | 2-3 mm long. |
| Sepals | Subtriangular, acute, 12-13 mm long × 3-5 mm wide, carinate, slightly lepidote, glabrous towards the apex. | Obovate-acuminate, 13-14 mm long × 4-5 mm wide, coriaceous, slightly pubescent. |
| Petals | 15-20 mm long × 10-12 mm wide, dark violet (to almost black) with a white base, apex mucronate. | 18-20 mm long × 10-12 mm wide, dark violet with a greenish base, apex acute. |
| Stamens | Not exerted. | Not exerted. |



## A new synonym

In 1995, Harry Luther published the description of *Puya butcheriana*, based on plants cultivated by Derek Butcher in Australia. Butcher had bought seeds from Karel Knize collected in Bolivia or Peru (Luther 1995). Knize had been an active trader of cacti and bromeliads and made several trips to Bolivia. It is probable that the seeds sold to Butcher indeed came from Bolivia.

Luther differentiated *P. butcheriana* from *P. humilis* for being taller, a narrower inflorescence and for a diminutely serrate margin of the floral bracts - characters, however, that can be observed as well in *P. humilis*. Using the key from Smith & Down (1974), for the recurved scape bracts the plant seemed to be close to *P. tunarensis*. However, as shown above, this is not a trustworthy character. Revising the description of Luther (1995) and the photographs of D. Butcher and L. Colgan published in the web (www: bsi.org/brom/info gallery/puya) we see that *P. butcheriana* clearly looks like *P. humilis* as we know it from Bolivia, and thus, we suggest that it should be regarded as a synonym of *P. humilis*. In the past, it had been supposed by others that *P. butcheriana* might be *P. humilis*; (e.g. see Len Colgan on Charlie's Web: "*Puya butcheriana* is named after Derek Butcher but some wonder if it is a form of *Puya humilis*") (http://www.charlies-web.com/bromeliads-alphalist/tex562.html, consulted in July 2002).

ACKNOWLEDMENTS

We thank Michael Nee and Stella Sylvia (NY) for the collaboration provided to R.V. during his visit to New York and for facilitating the access to the specimens cited. P.L.I., Associated Researcher of the Botanical Institute of the University of Bonn, is with *Fundación Amigos de la Naturaleza Noel Kempff* as an Integrated Expert of the CIM-program of the German government. We acknowledge the support of the FAN staff, especially Saúl Cúellar, for preparing the map. The study was conducted under the botanical research program of the Science Department of FAN - Bolivia, in the framework of the FAN-project *"Floristic Diversity of Bolivia-From Collection to Cognition and Conservation"*, forming part of the IBOY satellite projects (DIVERSITAS initiative 'International Biodiversity Observation Year' 2001-2002). The collection of *Puya tunarensis* was possible thanks to a botanical exploration in the framework of a specific project carried out by FAN with funding of WWF-Bolivia.

REFERENCES

Ibisch, P.L. & R. Vásquez 2000. Illustrated biodiversity of Bolivia I. Illustrated catalogue of the Bromeliaceae of Bolivia. CD-ROM. Editorial FAN. Santa Cruz.

Kessler, M., P.L. Ibisch & E. Gross 1999. *Fosterella cotacajensis*, una nueva especie de Bromeliaceae de los valles secos andinos de Bolivia. Revista de la Sociedad Boliviana de Botánica 2 (2): 111-116.

Krömer, T., M. Kessler, B.K. Holst, H.E. Luther, E.J. Gouda, P.L. Ibisch, W. Till & R. Vásquez 1999. Checklist of Bolivian Bromeliaceae with notes on species distribution and levels of endemism. Selbyana 20(2): 201-223.

Luther, H.E. 1995. Miscellaneous new taxa of Bromeliaceae 10. Selbyana 16(2): 235-238.

Smith, L.B. & R.J. Downs 1974. Pitcairnioideae (Bromeliaceae). Fl. Neotrop. Monogr. 14(1): 1-660, Hafner Press, New York, NY.

*Santa Cruz, Bolivia*

R. Vasquez

Fig. 13.
Habit of *Puya tunarensis*

R. Vasquez

Fig. 14. Detail of the inflorescence of *Puya tunarensis*.



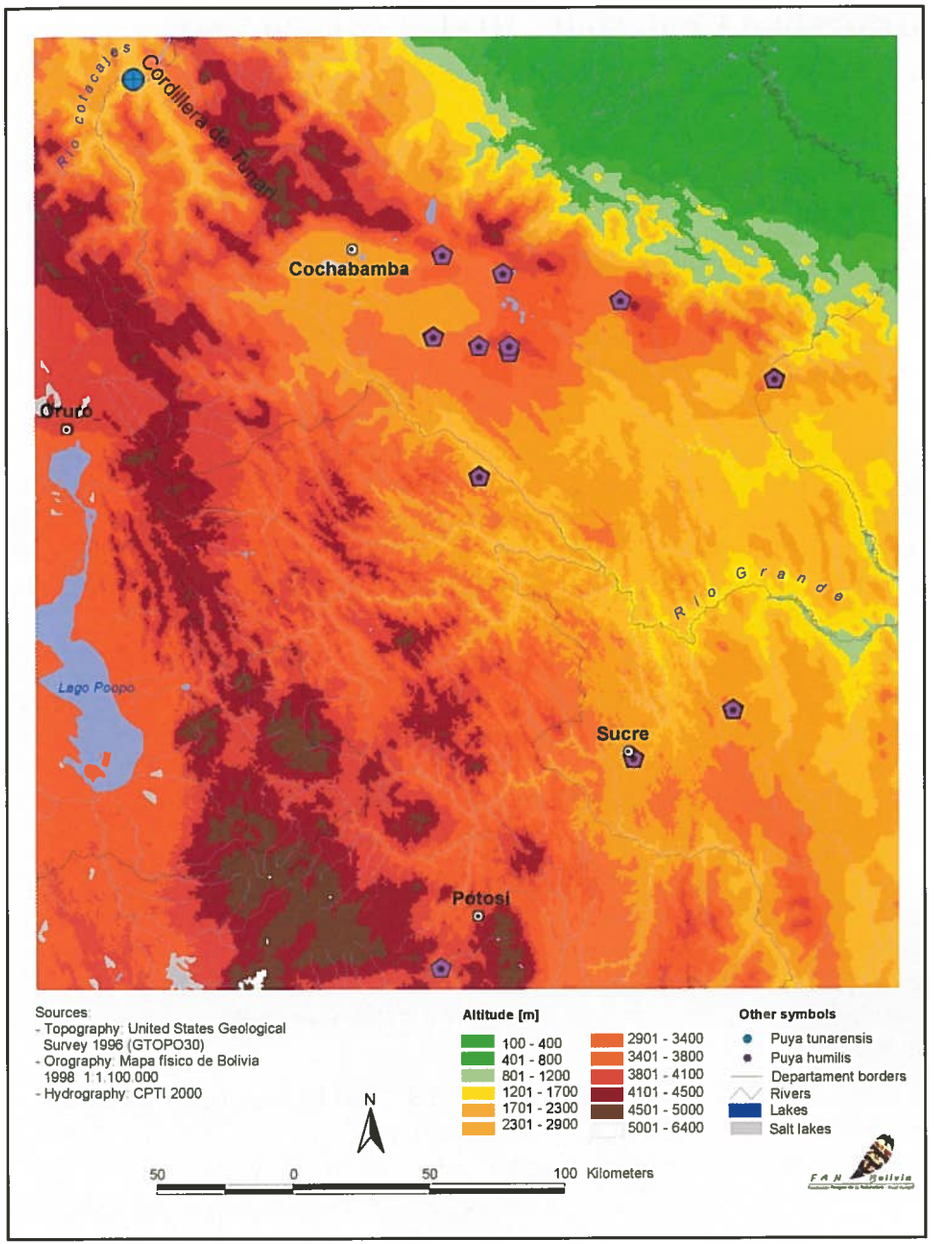



Fig. 15. Distribution map of *Puya humilis* and *P. tunarensis*.

# Bromeliad Centerfold: Dyckia 'Naked Lady'

**Chet Blackburn**

The genus *Dyckia* is composed of approximately 120 species of tough, sun-loving terrestrials found growing in exposed rocky places in Brazil, Uruguay, Paraguay, and northern Argentina. Most have succulent green leaves, often with a waxy appearance. The leaf margins are heavily armed with treacherous but frequently decorative spines. A tall inflorescence bearing yellow to orange flowers arises laterally from the foliage but ascends into a more or less erect stalk towering well above the plant's rosette.

Their succulent appearance, decorative spines, relatively small size, dependable flowering, and ease of cultivation make them eagerly sought after by both cactus and succulent growers and bromeliad collectors. Most Dyckias are clump forming, but unlike many clump-forming bromeliads, growers tend to leave them that way, primarily because taking on the task of dividing them usually involves a little pain and bloodletting. It is a project that is likely to be put off as long as possible.

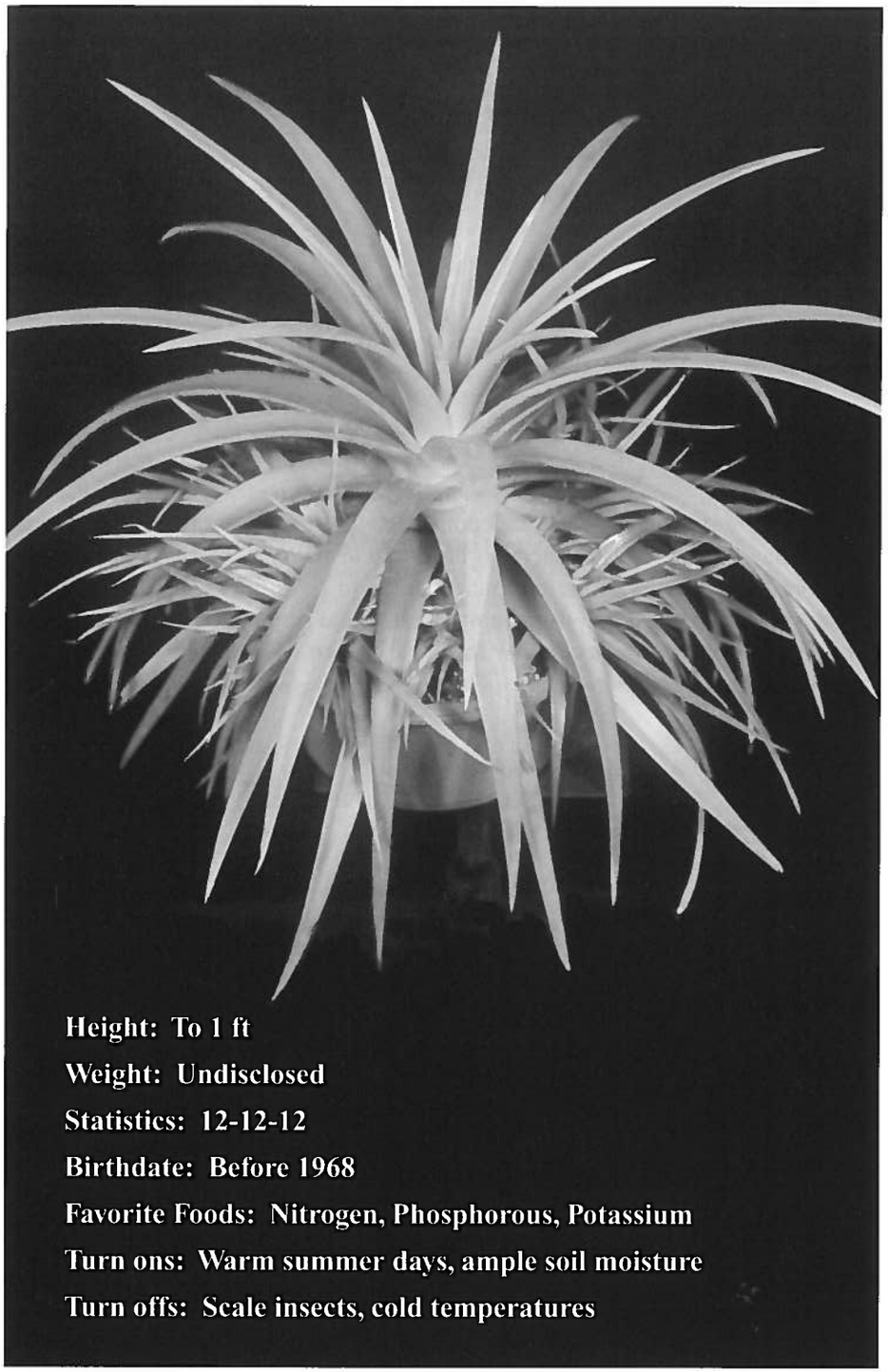
*Dyckia* 'Naked Lady', however, is a spineless cultivar that has been around for at least 35 years. According to the Bromeliad Cultivar Registry, it is a cultivar selected from the crossing of *D. encholirioides* and *D brevifolia*. The hybridizer is unrecorded, but it appeared in Bill Seaborn's retail catalogue as early as 1968. There it was listed as *Dyckia* 'Nude Lady'. In fact, it is at least as widely known by that name today as it is by the 'Naked Lady' designation.

The channeled fleshy leaves are yellowish-green. The plant reaches 7 to 12 inches in height and forms clumps up to 24 inches wide. It remains much smaller in containers than in the ground. It will withstand a light frost and is easy to grow, but, in common with many centerfolds, it tends to be a bit slow. It is a shy bloomer as well. Many people have grown it for years without having seen it flower.

It is an interesting novelty that you won't find in your local nursery, but is available through a few well-stocked mail-order nurseries. Perhaps they will mail it to you in a plain brown wrapper.

*Auburn, California*






Dennis Cathcart

Figure 16. Dyckia 'Naked Lady'

# Aechmea research in Costa Rica

**Chester Skotak**[1]

*Aechmea* has always been my favorite bromeliad genus. The genus name, derived from the Greek word aechme, means "spear point" or "lance head". Although aechmeas and their hybrids represent an unlimited number of colors and forms, there are relatively few in commercial production today. A problem with the majority of *Aechmea* species is that their leaves are like double-edged saws that can cut the unwary without warning, a characteristic that has restricted the use of this large and colorful genus.

Spineless forms of *Aechmea fasciata* have begun to appear on the market from various sources over the past few years. My favorite, *Aechmea fasciata* 'Primera', is from the firm of Corn Bak in Holland. Crossing *Aechmea tessmannii* or *A. chantinii* with any of the spineless *A. fasciata* types, produces spineless hybrids. Although we had done several hundred hybrids in this group we had never found any of them to have viable pollen. They were all sterile; therefore continuing with the program seemed to be fruitless. That all changed several years ago when one of my employees found a spineless hybrid, *Aechmea tessmannii* × *Aechmea fasciata* with viable pollen. We immediately began to pollinate all plants in the subgenus Platyaechmea (*A. Chantinii* and its relatives), a group that were blooming at that time. We were successful with ten different hybrids, and all produce pollen. The photo (Figure 17) of (*Aechmea tessmannii* × *A. fasciata*) × *A. tessmannii* without spines is a prototype that will be used to eliminate spines in new hybrids within the Platyaechmea group. In the near future there will be spineless *A chantinii* hybrids as well as a host of other Aechmea hybrids, all spineless.

Several years ago, Belgian scientist Dr. Maurice De Proft, Reginald De Roose and I, discussed a project to find a way to eliminate the spines of aechmeas *in vitro*. I sent them many spineless *Aechmea* hybrids to aid in their search for viable pollen. Maurice De Proft has since had similar success working with this *Aechmea* group in his laboratory in Belgium. The future is exciting as hybridizers continue to push bromeliads to their limits, producing plants that even ten years ago were not considered possible. Now spineless aechmeas are a reality, and the grower, interiorscaper and hobbyist will be able to handle these spectacular plants without getting cut or scratched.

*Palmares ,Costa Rica*

[1] Proprietor of Duraflor Nursery, Alajuela, Costa Rica and widely known grower and hybridizer



C. Skotak

Figure 17. An attractive new spineless hybrid, (*Aechmea tessmannii* × *A. fasciata*) × *A. tessmanii*

C. Skotak

Figure 18. An attractive hybrid between *Aechmea tessmannii* 'alba' and *A. chantinii* 'yellow'. This one was also developed at Duraflor Nursery but has typical spines.

# *Billbergia pyramidalis:*
# Search for the Totally Red Petal Form

**Derek Butcher**

It must have been in the mid 1980's that I acquired Smith and Downs Monograph (1979) on Bromelioideae and as is usual when I get a book of this nature, I read it from cover to cover. One thing that did intrigue me was *Billbergia pyramidalis*. I had two forms. One was dark-green and narrow leafed and the other pale-green and wide leafed. I was assured by those more learned than I that the wide-leafed form was called *var. concolor*, which I assumed had something to do with the leaves. However, pages 2007 to 2010 in the Monograph told me something different. I should be looking for totally red petals. When my narrow-leafed *Billbergia pyramidalis* (figure19) flowered there were clearly violetish tips on the inside of the petals. When my wide-leafed plants flowered I thought they had totally red petals. But, when the petals opened there was this telltale violetish tipping, albeit paler. I continued my search for a *Billbergia pyramidalis* with totally red petals (figure 20) grumbling to myself all the while because I could never find one.

About 1990 I started to correspond with Don Beadle, "Mr. Billbergia", and he said he had never found *Billbergia pyramidalis* with totally red petals either! My estimation of Don went up and up with this comment! Clearly, here was another observant fellow! But we got no further.

In March 1999 I received a request on the Internet from a chap who wanted to use copies of a photo we had on http://fcbs.org for his Web site. He wanted to call it 'Summer Torch'! I gave him permission but suggested that he use the correct botanical name of *Billbergia pyramidalis var. concolor*. My use of the word "correct" kept bugging me so now you know why I am writing this!

Lyman Smith (1954) decided to name a variety of *Billbergia pyramidalis* as 'concolor', basing his decision on a plant whose heritage could be traced back 100 years and was then owned by David Barry Jr. This is now a herbarium specimen so we will not be able to check the petal color! Forever the Doubting Thomas I wonder if the petals were totally red. In fact there has been no sightings of this rare totally-red-petaled *Billbergia* from California. In the 1960's, plants arrived in Australia from David Barry, but not this one. David Barry's nursery was eventually acquired by Shelldance Nursery and the Shelldance collection in turn was acquired by the Singapore Botanic Gardens in 1994. When I paid an official visit to the Singapore Botanic Gardens in June 2001 I could find no trace of the plant there. In *Bromelia* (The Brazilian Journal) June 1995, p24, Elton Leme stated "The blue color of the petal tip is very faint and often difficult to discern...nothing is known of the geographic origins of var. concolor, but the type variety grows on the ground of the Atlantic Forest, on mountain slopes, especially in Rio de Janeiro."



It all started in 1815 when Sims named a *Bromelia pyramidalis*. This is so long ago that some 's's were printed as 'f's but I won't reproduce them that way here!

His description of ***"BROMELIA" pyramidalis*** follows:

"In our specimen, the scape did not rise so as to elevate the flowers above the bracts, perhaps from a deficiency of heat: in which it flowered earlier, the spike was more lax, and the flowers, after deflorescence, became patent; the calyx, corolla, and stamens, persistent. This plant, like some others, both in this genus and in *Tillandsia*, holds a quantity of water in the bottom of the leaves; which, it has been asserted, they are never found without, even in the hottest weather, in a tropical country. Communicated by the lady of the Right Hon. George Rose, from Cuffnells, where it flowered in two successive years, in February and March. The mother plant was received from Rio de Janeiro some years ago, and threw off several offsets before it flowered, which have been treated the same as the pineapple, till of a good size for flowering, when the pot was taken out of the bark and placed upon the shelf in the stove."

The botanical drawing that accompanied the description, while not a good one, clearly equates with the description.

In 1830 Martius named a *Billbergia thyrsoidea* and I quote his comments on its difference from *Billbergia pyramidalis*.

"Differs from *B. pyramidalis* to which it has a good affinity, chiefly in: Leaves large erect, much wider, shorter, obtuse with a tip, equally concave, Spines strong, Spike larger, Scape bracts light red short acuminate, less nerved, smaller stature, Collected by Martius near Rio Janeiro on rocks."

John Lindley (1852/3) described *Billbergia thyrsoidea* without specific reference to petal color but was used by Lyman Smith for his var. concolor. I quote:

"Such are the characteristic marks of this very beautiful stove plant, originally found by Martius on rocks near Rio Janeiro, and imported by M. de Jonge of Brussels. For the opportunity of figuring it we are indebted to Mr. Henderson, of the Wellington Nursery, St John's Wood. It requires to be managed in the same way as a Pine Apple. It is most nearly allied to the Pyramidal Billbergia figured in the Botanical Magazine, t. 1732, and in the Botanical Register, t. 203 and 1181; but that plant has glaucous taper-pointed leaves, and very large spreading flowers, conspicuous for the white mealiness of the calyx."

In 1853 in Curtis Magazine plate 4756 shows Billbergia thyrsoidea with totally red petals. A photograph of this plate is in JBS 1991 Vol 41 (3):104 but this should have been referenced as *Billbergia pyramidalis* (Sims) Lindl. var. *concolor* L B Smith not *Billbergia pyramidalis* (Sims) Lindley.

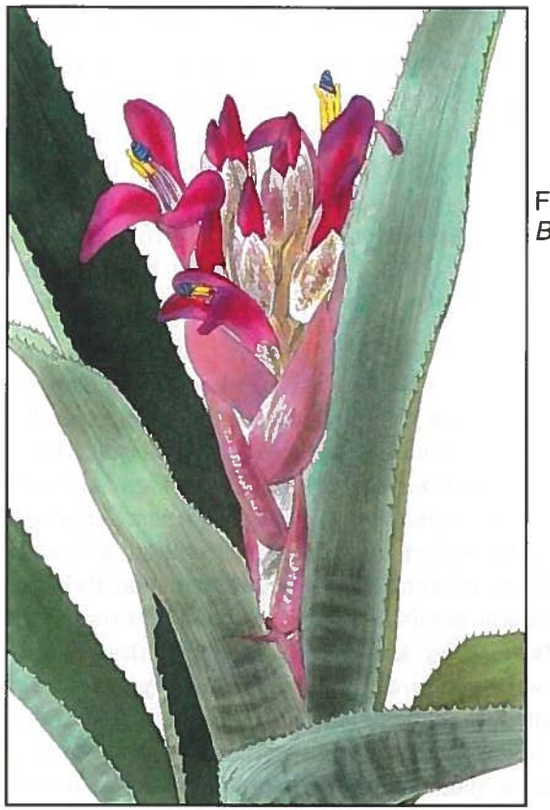
John Catlan

Figure 19. The old variety *concolor*.

Derek Butcher

Figure 20. The old variety *pyramidalis*.





Courtesy Marie Selby Botanical Gardens

Figure 21.
*B. pyramidalis* var. *bicolor* 1832.

Rob Smythe

Figure 22. *B.* 'Kyoto' with varying shapes of offsets.

***Billbergia thyrsoidea*** in Curtis Bot. Mag Plate 4756 1853

"A richly colored and very handsome Bromeliaceous plant, native of Brazil, presented to our garden by Messrs. Henderson, of the nursery, St John's Wood, under the name here retained, and which accords with the species so called by Martius, which he found growing in rocky places about Rio Janeiro. It is quite different from *Billbergia pyramidalis*, and every other with which we are acquainted. Our readers will observe, that, though the leaves grow erect, or nearly so, on the living plant, our figure of the leaf represents it bent back, to enable us to bring an entire one into the plate. It requires the heat of the stove, and flowered with us in November of the present year, 1853."

Clearly the articles in 1852/3 and in 1853 were talking about the same plant because of the reference to a Mr. Henderson and the latter article is more specific as to the red petals as well as the colored plate but was not the article referred to by Lyman Smith! Both articles pointed out that *Billbergia pyramidalis* and *Billbergia thyrsoidea* were different. What is very revealing is the last paragraph of the Paxton Garden article where the differences were noted without reference to petal color! This is in line with my interpretation of these two taxa. Baker in 1889 describes *Billbergia thyrsoidea* as petals bright red with a violet-purple tip and it was not until Mez 1935 that we see the reference to petals totally red! Clearly, botanists in the 1800's were aware of, and could identify, this taxon without stressing the violet-blue shading to the petals. Lyman Smith decided that Mez's comment that petals are totally red was incorrect because he placed *Billbergia thyrsoidea* Martius as a synonym of *Billbergia pyramidalis* var. *pyramidalis*. However, he then used Lindley 1852/3 plate 74 as his variety concolor relying purely on the artist's interpretation and not what was written. He also used Barry's plant for the type as being a PROBABLE clone of de Jonge. I maintain that 'concolor' based purely on petal color is a misnomer and I consider that a totally red-petaled *Billbergia pyramidalis* has never been in existence.

In my investigation of this species I did consider taking the splitter approach by resurrecting *Billbergia thyrsoidea* Martius and *Billbergia pyramidalis* var. *bicolor* Lindley (figure 21) but decided that this species is better treated as a single entity. Lyman Smith was clearly prepared to ignore the variation in leaf width and leaf tipping and this can be borne out in my experience by giving the plant different cultural conditions as well as sometimes having two different leaf shapes on the same plant. Various leaf shapes can also be obtained from offsets from the popular *Billbergia* 'Kyoto' (figure 22). The difference in the density of trichome covering can also vary greatly. A prime example of this is in *Aechmea fasciata*.

We are then left with petal coloring where there are contrasts if we do not use Smith's vague terminology of "towards the apex". There are two botanical terms used to describe a petal, the blade, which we can all easily see, and the claw, which is mostly hidden by the sepals. It has been my experience that the blade color can vary from red with pale violet tipping, to totally violet to totally



dark violet. The claw can vary from white to cream to yellow to pinkish but I have been unable to link these colors with a particular blade color. This variation suggests that there is no need for variety *lutea* Leme and Weber (1984) which I have also noticed varies in color in cultivation, under ICBN rules because all can be accommodated by varying the description of *Billbergia pyramidalis* to read.

***Billbergia pyramidalis*** (Sims) Lindley, Bot. Reg. 13: sub pl. 1068. 1827.Emend L.B.Smith Flora Neotropica, Bromelioideae p2008 1979. Emend D.Butcher

**Leaves** few to 13 in a tubular rosette, 4-10 dm long, often broadly white-banded beneath. **Sheaths** large, subelliptic, entire, more or less purple-tinged, covered with a membrane of fused scales. **Blades** ligulate, broadly acute or subrounded, apiculate, 4-6 cm wide, laxly and usually minutely serrulate. **Scape** erect, usually stout, densely white-farinose at first. **Scape-bracts** erect or suberect, imbricate with the highest massed beneath the inflorescence, lance-elliptic, acute, rose. **Inflorescence** erect or suberect, simple, 10-40 flowers, densely pyramidal or corymbose or short-cylindric, rarely over 15 cm long and usually much shorter, densely white-farinose. **Floral bracts** minute, ovate, acute; **Flowers** short-pedicellate. **Sepals** short-connate, slightly asymmetric, oblong, obtuse or apiculate, 13-18 mm long, pale red. **Petal** claw from white to cream to yellow to pinkish, blade from red with violetish tinge to tips to totally violet to dark violet, contorted after anthesis, ligulate, obtuse, to 52 mm long, bearing 2 fimbriate scales at base, slightly exceeding the stamens. **Ovary** subterete, 11-15 mm long, epigynous tube short, placentae extending nearly the whole length of the cell.

**Type** *Sims Hortus sn.* Description and plate

M. B. Foster (1960) described a *Billbergia pyramidalis* var. *striata* from a variegated seedling obtained from a batch of what he termed a winter flowering form of *B. pyramidalis*. At that time *B. pyramidalis* was considered to have red petals with bluish tips but not only did Foster's plant flower at a different time but it had a total petal blade of a violet hue and a claw whitish. In fact it was closer to *Billbergia pyramidalis* var. *bicolor* Lindley than to *B. pyramidalis* (Sims) Lindley. The naming of *B. pyramidalis* var. *striata* was ignored by Smith & Downs in 1979 in their monograph and was only reintroduced in DeRebus I in 1994 without any comment. Foster's *B. pyramidalis* var. *striata* will be covered under the ICNCP rules by renaming it *Billbergia* 'Foster's Striate'.(back cover)

In more recent times we have seen one taxon named *var. vernicosa* by Pereira in 1979 which was relegated to *var. pyramidalis*. This was because "In the original description *B. pyramidalis* var. *vernicosa* is described as having "brilliant leaves and flowers" but this appearance is produced by a chemical substance on the voucher specimen to avoid insect predation."

Cultivars to date as variations of *Billbergia pyramidalis* are.

'Foster's Striate'
'Gloria'
'Julian Nally'
'Kyoto'
'Pale Face'

For information see the Bromeliad Cultivar Registry.

ACKNOWLEDGMENT

I would like to thank Harry Luther and Jason Grant for their advice in this work and the numerous correspondents who have helped me in this elusive search.

REFERENCES

Baker 1889 *Billbergia pyramidalis & B. thyrsoidea*. Bromeliaceae p 71

Beadle. 1991. What you should know about Billbergias. J Brom. Soc. Vol 41:104.

Curtis Botanical Mag. 1853. *Billbergia thyrsoidea*. Plate 4756

Foster, M. 1960.A new variety of *Billbergia - B. pyramidalis* v. *striata* Bromel. Soc. Bull. Vol 10:58

Leme. 1995. *Billbergia pyramidalis* Bromelia 2(2):24.

- - - - - - & Weber. 1984. *Billbergia pyramidalis* v. *lutea*. J. Brom. Soc. Vol 34:79.

Lindley. 1828. *Billbergia pyramidalis* v. *bicolor* Botanical Register p14:plate 1181.

- - - - - - . 1852-3. *Billbergia thyrsoidea* Paxton's Flower Garden p3: pl. 74

- - - - - - & Paxton. 1884. Paxton's Flower Garden Vol III:51-3, plate 84 (Note this is a reprint of the description in the publication in 1852-3!)

Loddiges. 1832 *Billbergia bicolor* Botanical Cab. p19: plate 1819

Luther & Sieff. 1994. *De Rebus I*, Selbyana, Vol 15:76.

Martius ex Schultes fil. 1830 *Billbergia thyrsoidea*. Systema Vegetabilium Vol 7 part2 p1260

Mez 1935. *Billbergia pyramidalis & B. thyrsoidea* Bromeliaceae.

Pereira. 1979. *Billbergia pyramidalis* v. *vernicosa* Bradea 2 (47):308

Sims. 1815. *Bromelia pyramidalis* Botanical Mag. 42: 42, plate 1732.

Smith, L.B..1954. *Billbergia pyramidalis* v. *concolor* Bromel. Soc. Bull. Vol. 4 p. 6 and b/w ill.

Smith & Downs. 1979 *Billbergia pyramidalis* Flora Neotropica, Monograph No. 14, Part 3 p. 2007-10

*Fulham, South Australia*



# Affiliates in Action

## Gene Schmidt

The San Diego Bromeliad Society (CA) celebrated their 37th anniversary at the May meeting. The speaker for the evening was BSI Director Keith Golinski, who had traveled from Australia for the World Conference in Florida. He educated the group on Australia in general, its climate, and on growing bromeliads in that climate. His talk was accompanied by slides of his gardens and plants. Congratulations to the SDBS on their longevity and success. (*The Bromeliad Blade, Newsletter of the San Diego Society, Vol. 29, Issue 6, June 2002*)

The Bromeliad Society of Central Florida celebrates its 30th anniversary this year. At the May meeting, to help recall the past, Eloise Beach, Vice-president of the BSCF, presented a film of Mulford and Racine Foster's trips to South America in the 1940's. Eloise writes that years ago the Florida Council of Bromeliad Societies sold copies of this videotape so others could share in the experiences of the Fosters. The film is accompanied by a classical music track without narration, so one can only guess what was going on, but the images they recorded are captivating and worth seeing. Racine Foster did present this program about twenty years ago and these are some of her notes. "We are indebted to several people for this program. Perhaps a year ago, in a chance remark to Eloise Beach, I mentioned that I had just unearthed our (Mulford and Racine's) films on Colombia, taken in 1946 and (other film footage taken in) in 1948. Having given them perfect neglect, I concluded that after 33 years in only a paper sack in a damp packing room, they couldn't be much good. Fortunately, the mold had not done any damage. First you will see two reels (footage) on Colombia. We took a cargo plane from Palm Beach to Barranquilla. We collected palms, ferns, orchids, as well as bromeliads. We collected 8,000 seeds of palms for Fairchild Gardens (Miami). At the time, 372 bromeliads were known native to Colombia. We collected 278 of them. Fifty-seven of them were new species, and twenty-one of them were new Pitcairnias." We wish the BSCF another thirty years of growth! (*Orlandiana, Newsletter of the Bromeliad Society of Central Florida, Vol. 28, No. 5, May 2002*)

The Bromeliad Society of Queensland Inc. (AUS) announced at its Annual Meeting that Life Membership was awarded to Patricia O'Dea and Michael O'Dea. Over the last thirty years they both have served in many capacities, from President to various committee members. In all these activities, Patricia has been motivated by her love of bromeliads and the society, and continues to serve as one of the society's most enthusiastic promoters. Michael has always been a willing and active worker at the monthly meetings. Several key administrative initiatives that are still in use by the society were framed and implemented with his skillful and dedicated input. Congratulations to the O'Dea's. (*Bromeliaceae, published by The Bromeliad Society of Queensland Inc., Vol. 35, No. 1, March/April 2002*)

The Bromeliad Society of South Florida announced its new Life Members at the March meeting. Bob and Elaine Mills were named Life Members for active membership for over twenty years; they have served on the board as directors, secretary, and treasurer. Both have been important to the success of the annual show, Bob in staging and Elaine as artistic chairman. Our compliments to the Mills for their years of efforts! (*The Bromeliadvisory, published by the Bromeliad Society of South Florida, Vol. 45, No. 4, April 2002*)

The Bromeliad Society of New Zealand Inc. released its first bulletin in April for the 2003 Bromeliad Conference. Dates for the conference are March 7-10, 2003, and the venue is the Waipuna Hotel and Conference Centre, Auckland, New Zealand. International speakers for the conference are to be Elton Leme of Brazil and Dennis Cathcart of the United States of America. The BSNZ has been experiencing strong growth the last few years, with total membership now over 500 and average monthly attendance is at 100. (*The Journal, Bromeliad Society of New Zealand Inc., Vol.42, No. 4, April 2002*)

The organizers of last year's Australian Conference "Brom-A-Warra", the Illawarra Bromeliad Society Inc. also celebrated its tenth anniversary at its March meeting. Members since the first meeting in March 1992, include: Margaret and Jeff Bartley, Ann Boon, Bridgit Christoffel, Beth Churton, Glad Colquhoun, Dulcie Doonan, Bob Gray, June Henderson, Hans Kutzner, Nina and Jarka Rehak, Marj Rickard, and Phillip Robinson. Thanks to all of these members for their continuing support. (*Newslink, published by the Illawarra Bromeliad Society Inc., April 2002*)

A bromeliad society that formed twenty years ago had their anniversary in February. The Central Coast NSW Bromeliad Society Inc. (AUS) had fifty-four members and sixteen guests at the occasion, where Ruby Ryde, Patron of the Central Coast Society, described the society's formation, and paid tribute to those dedicated enthusiasts who conceived and supported the introduction of a formal organization to promote bromeliad culture on the Central Coast. (*Bromelia Post, published by the Central Coast NSW Bromeliad Society, March 2002*)

The Bromeliad Society of Greater Chicago lists their new web site as http://www.chicago-bromeliad.org/ . Their webmaster is Stan Wen.

*Duluth, Minnesota*



## Our Thanks to the following Contributors to the BSI, the Color Fund, and the Bromeliad Identification Center

Robert Adams
Alamo Bromeliad Society
Oscar Allen
Monica A. Aquino
Hannique & Karl Backus
Hayward Bacon
Carol Barrus
Virginia Barthelemy
Elaine Bassett
Robert Batts
Rita Beeler
Dorothy Berg
Marie Bessellieu
John Boardman
Carol Breen
Cristy Brenner
Brom. Soc. of Broward Co.
Brom. Soc. of C. Florida
Brom. Soc. of Houston
Brom. Soc. of Japan
Brom. Soc. of S. Florida
Caloosahatchee Brom.Soc.
Carl Bronston
Joseph and Marie Bruno
Doris Bundy
James Bush
Ramon Cantero
Dina & Uee Chuensanguansat
Trixie Clarke
Anne Collings
Robert Collis
Anita Cooper
Kay & Peter De Mello
Mark Dimmitt
Edward Doherty II
Robert Elkins
Grace G. Ferren
Roberta Fine
Melvin First
Jean and William Fishbuene
Phyllis Flechsig
John Florance
Florida W. Coast Brom. Soc.
Gainesville-Jacksonville B.S
Robert Germer
Larry Giroux
Tony Godfrey
Edward Grabert
Allen F. Graves
Robert Griffith
Thomas Grimston
Ilien Grossman
Tibor Halmagyi
Roberta Hannay
R. Haresh
Willard Hartman
Masaru Hayakawa
Evelyn Hayes
Hawaii Bromeliad Society
Lucinda Herrett
Judith Hicks
Jacqui Hodes
Alexander Holmes Jr
Leonard Howard
Robert Ing
James Irvin
Zlatko Janeba
Beverly Johnsen
Dale Kammerlohr
May Kaneshiro
Roberto Kautsky
S. Keat
B. Keith
Kents Bromeliad Nursery
Barbara Lagow
Thomas & Pat Lakers
James & Pamela Leaver
Barbara Leitner
Donald Leonard
George & Marilyn Long
Manual Lorenzo
Verdia Lowe
Thomas Lucero
Antonin Lukscheiter
Margaret Macphee
Hatsumi Maertz
Nancy Mangieri
John Mareing
Marilynn's Gardens Nursery
Jun Matsuzono
Kerry McCarthy
Bruce McCoy
Laura Mesko
James Millar
Hugh Mozingo
Michael Newell
Pat & Vern Niemeyer
Joseph Ondrejko
Thelma and Tim O'Reilly
Rodrieo Ospina
Sylvia Palmieri
Polly Pascal
Elizabeth Patterson
Bird & Charlie Peddicord
Januario Pehnk
Jack Percival Jr
Simon Pierce
Rand Plewak
Dan Joseph Porsi
Betty Prevatt
Gerald Raack
Mathew Ramras
Stephen Randorf
Evon Ray
River Bend Brom. Soc.
Betty Rogers
Jurg Rutschmann
Frances Sanjurjo
Sarasota Bromeliad Soc
Harry Sauers III
Donald Saunders
Ron & Carolyn Schoenau
Mary Schwartz
S.E. Michigan Brom. Soc
Atsushi Shirai
Ellen Sloss
Louis Spielman
Charlyne J. Stewart
Alexander Stoddart
Herbert Stone
Tim Stolten
Robert Streul
Charlotte Tanner
Andy & Melinda Trevino
Tropiflora Nursery
W. Van Den Berg
Wayne Van Horne
Robert Vandergrift
Dezi Vanderpool
Dennis Westler
Charles & Mrs.. Williams
Paul Wingert
Tom Wolfe
Robert Wright
Hideki Yamaguchi
Cary Yamauchi
Casimir Zawadecki

# Distribution of *Tillandsia recurvata* (Bromeliaceae) on *Cercidium praecox* in a Semiarid Mexican Scrub

**Numa P. Pavón**[1]

## Abstract

In an intertropical semi desert area of central Mexico, the distribution and abundance of *Tillandsia recurvata* L. (Bromeliaceae) growing on *Cercidium praecox* (Ruiz and Pavón) Harms (Leguminosae) were analyzed in order to determine the relationships between height and cover's tree and epiphyte abundance in three sites with different slopes orientation. The spatial distribution of *C. praecox* in the three areas is random but its density on the south slope was much lower. Significant differences for the number of *T. recurvata* tussocks per *C. praecox* individual between sites were registered. In contrast, distribution of tussocks was not uniform: on the north slope, 68% of the tussocks found at a height of 1-2 m and 74.5% on the hilltop in the same height. The correlation between *C. praecox* cover and the number of tussocks was significant only for the north slope (r=0.62, P=0.01), although a similar association was observed for the hilltop (r=0.59, P=0.07). This result supports the idea that in the semiarid areas like in Zapotitlán Valley, Puebla, México the orographic conditions results a heterogeneous mosaic of micro environmental conditions that affect the abundance and distribution of *T. recurvata*.

## Introduction

In limited water ecosystems, environmental elements such as climate, soil characteristics, and slope orientation have marked effects on the growth and development of plants. Due to incident radiation, slope orientation influences the level of potential atmospheric demand along gradients of increased radiation at the southern orientation to lower radiation at the northern orientation (Oke, 1987). Furthermore, changes in incident solar radiation between slope cause variations in temperature and air humidity, conditions that influence the stomatic conductivity of plants (Dubayah, 1994). This presupposes that the prevailing conditions on south-facing slopes are the most difficult for the establishment and regeneration of plant communities (Ferrer et al., 1995; González-Hidalgo *et al.*, 1996).

Because bromeliads of the subgenus *Tillandsia* exhibit principally atmospheric habits, these plants depend on various decisive factors for the maintenance of their hydric economy: humidity, temperature, and wind (Lange and Medina, 1979). They have developed numerous characteristics, such as a very low stoma/trichome index, CAM-type metabolism, and highly sclerotic leaves, in order to survive in arid environments (Medina, 1974). Other factors



that influence the establishment and growth of bromeliads are light, frequent fog, types of support trees, crown size, and competitive interactions (Grubb and Whitmore, 1966; Hietz and Hietz-Seifert, 1995).

In an intertropical semi desert area of central Mexico, the distribution and abundance of *Tillandsia recurvata* L. (Bromeliacea) growing on *Cercidium praecox* (Ruiz and Pavón) Harms (Leguminosae) were analyzed in order to determine the relationships between height and cover's tree and epiphyte abundance in three sites with different slopes orientation.

## Methods

The study was conducted in the "Helia Bravo" Botanical Garden located in the Zapotitlán Valley, Puebla, Mexico (18°20' N, 97°28' W). The area is found within the Tehuacán-Cuicatlán Biosphere Reserve, which has a high diversity of flora, 30% of which is endemic (Villaseñor et al., 1990). The climate is dry with summer rains from June to October. Mean annual rainfall is 400 mm and mean annual temperature 21.4° C (García, 1973). The soil is rocky, being derived from sedimentary marine rocks from the Cretaceous Period (Brunet, 1967). The vegetation in the study area is microphyllous scrublands with abundant columnar cacti such as *Neobuxbaumia tetetzo* and *Cephalocereus columna-trajani* (Montaña and Valiente-Banuet, 1998).

*C. praecox* is a deciduous tree that reaches a height of 4m and maintains photosynthetic parenchyma in branches and trunks (Szarek and Woodhouse, 1978). Its branches can tolerate a varying density of *T. recurvata* (Fig. 1), a small plant with a rudimentary root and shoot system that sustains 5-8 leaves, forming a rosette covered with absorptive trichomes (Benzing, 1980). Adult plants develop multiple ramets that can completely surround small *C. praecox* branches, creating a spherical tussock of up to 12 cm.

On the north and south slopes and top of the hill located within the "Helia Bravo Botanical Garden", on 1995 a transect was established during the dry season that measured 10 m x 100 m divided into 10 m x 10 m blocks. On each, the number of *C. praecox* individuals was registered along with crown diameter, height, and distance between plants. For all trees, the number of bromeliad tussocks was recorded on different height (0-1 m, 1-2 m, 2-3 m, and 3-4 m strata). Using the Clark-Evans method, a spatial distribution pattern was determined for *C. praecox* on each of the sampling sites. Kruskall-Wallis analysis was employed to compare the height and cover of *C. praecox* individuals and the number of tussocks registered on the sampling sites. Furthermore, Pearson correlation analysis was used to relate the number of *T. recurvata* tussocks to *C. praecox* cover and height on each site (Zar, 1996).

## Results and Discussion

The spatial distribution of *C. praecox* in the three areas is random (R=1.59, P>0.05 north slope; R=1.26, P>0.05 hilltop; R= 1.64, P>0.05 south slope). This result indicates that microenvironmental differences between sites do not affect the spatial distribution of the plants. They do, however, seem to influence density, as the number of *C. praecox* individuals on the south slope was much lower (50 ind.ha$^{-1}$) than that registered on the north slope and hilltop, 170 ind.ha$^{-1}$ and 140 ind.ha$^{-1}$, respectively. Significant differences were not registered for the height of *C. praecox* individuals between sites (H=3.14, P=0.28). As for the number of *T. recurvata* tussocks per *C. praecox* individual, significant differences were registered between the south slope and the other two sites, but not between the north slope and hilltop (U=90, P>0.05). The average number of *T. recurvata* tussocks per *C. praecox* individual for the south slope was 0.4, while the north slope and hilltop registered much higher, with an average of 23.5 tussocks per *C. praecox* individual. In contrast, distribution of tussocks on *C. praecox* individuals was not uniform: on the north slope, average tree height was 3.26 m ±0.9, with 68% of the tussocks found at a height of 1-2 m. On the hilltop, 74.5% of the tussocks were recorded for the same section; the height of *C. praecox* individuals was 2.77 m ± 0.34. Significant differences in the cover of *C. praecox* individuals were registered between the three sampling sites (H=7.32, P<0.05). On the north slope, estimated cover was the highest, at 328.8 m2 ha$^{-1}$ as compared to the hilltop and south slope at 172.1 m2 ha-1 and 73.2 m2 ha$^{-1}$, respectively. The correlation between *C. praecox* cover and the number of tussocks was significant only for the north slope (r=0.62, P=0.01), although a similar association was observed for the hilltop (r=0.59, P=0.07).

Although this study did not include measurement of air humidity, temperature, and radiation on the sites, it was evident that differences in slope orientation caused marked differences in the three variables. It is well known that these microenvironmental factors affect the establishment and development of *C. praecox*, and differences in the abundance and cover of *C. praecox* individuals between the three sites was noteworthy. The abundance of the epiphyte *T. recurvata* is, in turn, affected.

Due to orography, environmental variations in the Zapotitlán Valley occur on a limited scale (Zavala-Hurtado, 1982), permitting the identification of conditions favorable to bromeliad presence. Thus a greater abundance of *T. recurvata* tussocks was recorded on the north slope, with an observable gradient in the number of *T. recurvata* tussocks from the N-S orientation, a fact that is significantly associated with a decrease in *C. praecox* cover.

In this same study area, Montaña et al. (1997) demonstrated the negative effect of *T. recurvata* on the dynamics of *C. praecox* shoots, an interaction considered to be structural parasitism. Although the proximate cause was not investigated, the authors considered a possible explanation to be that



photosynthesis on the green tissue of *C. praecox* branches is inhibited because they are hidden by bromeliads. The intensity of the structural parasitism that *T. recurvata* causes in *C. praecox* due to possible photosynthetic inhibition would, then, depend on the density of bromeliad on the tree. The study demonstrates that there is a positive association between bromeliad density and *C. praecox* cover, which reaches its highest value on north slopes where microenvironments conditions permit better plant development. This relationship seems to indicate that structural parasitism occurs with greater intensity on larger trees, which would explain why the negative effect of bromeliads on *C. praecox* budding does not influence the size of individuals.

Figure 23. *Tillandsia recurvata* tussocks on *Cercidium praecox* in the semiarid scrub in Zapotitlán de Salinas, Puebla, México.

Orographic characteristics such as altitude and slope orientation affect a set of variables that are frequently correlated, such as radiation, temperature, and humidity. These variables combine to influence community structure. Thus the semiarid valley of Zapotitlán, Puebla, presents a quite heterogeneous mosaic of microenvironmental conditions that affect the abundance and distribution of *T. recurvata*.

ACKNOWLEDGEMENT

This research was accomplished during the 'Ecology Field Course-1995' as part of the graduate program of "Instituto de Ecología, A.C". I am grateful to R. Ortíz-Pulido for critical commentary.

REFERENCES

Benzing, D.H. 1980. The biology of the bromeliads. Mad River press. Eureka, California.

Brunet, J. 1967. Geologic studies. In Bayer, D.S., editor. The prehistory of the Tehuacán Valley I. Environment and subsistence. University of Texas Press, Austin and London. pp. 6-90.

Dubayah, R.C. 1994. Modeling a solar radiation topoclimatology for the Rio Grande basin. Journal of Vegetation Science 5:627-640.

Ferrer, D., J. Calvo, M.A. Esteve-Selma, A. Torres-Martínez, and L. Ramírez. 1995. On the use of three performance measures for fitting species response curves. Journal of Vegetation Science 6:57-62.

García, E. 1973. Modificaciones al sistema de clasificación climática de K^ppen. Instituto de Geografía, Universidad Nacional Autónoma de MÈxico, MÈxico.

González-Hidalgo, J.C., A. Bonet, and M.T. Echeverría. 1996. Efecto de la orientación de la ladera sobre algunas comunidades arbustivas del semiárido central de la depresión del Ebro. Mediterranea. Serie de estudios biológicos, pp. 21-31.

Grubb, P.J., and T. C. Whitmore. 1966. A comparison of mountain and lowland rain forest in Ecuador, II. The climate and its effects on physiognomy of the forest. Journal of Ecology 54:303-333.

Hietz, P., and U. Hietz-Seifert. 1995. Composition and ecology of vascular epiphyte communities along an altitudinal gradient in central Veracruz, Mexico. Journal of Vegetation Science 6:487-498.

Lange, O.L., and E. Medina. 1979. Stomata of the CAM *Tillandsia recurvata* respond directly to humidity. Oecologia 40:357-363.

Medina, E. 1974. Dark $CO_2$ fixation, habitat preference and evolution within the Bromeliaceae. Evolution 28:677-686.

Montaña, C., R. Dirzo, and A. Flores. 1997. Structural parasitism of a epiphytic bromeliad upon *Cercidium praecox* in an intertropical semiarid ecosystem. Biotropica 29: 517-521.

Montaña, C., and A. Valiente-Banuet. 1998. Floristic and life-form diversity along an altitudinal gradient in an intertropical semiarid mexican region. The Southwestern Naturalist 43:25-39.

Oke, T.R. 1987. Boundary layer climates. Methuen, Londres.

Szarek, S.R., and R.W. Woodhouse. 1978. Ecophysiological studies of Sonoran desert plants. III. The daily course of photosynthesis for *Acacia gregii* and *Cercidium microphyllum*. Oecologia 35:285-294.

Villaseñor, J.L., P. Davila, and F. Chang. 1990. Fitogeografía del Valle de Tehuacán-Cuicatlán. Boletín de la Sociedad Botánica de MÈxico 50:135-149.

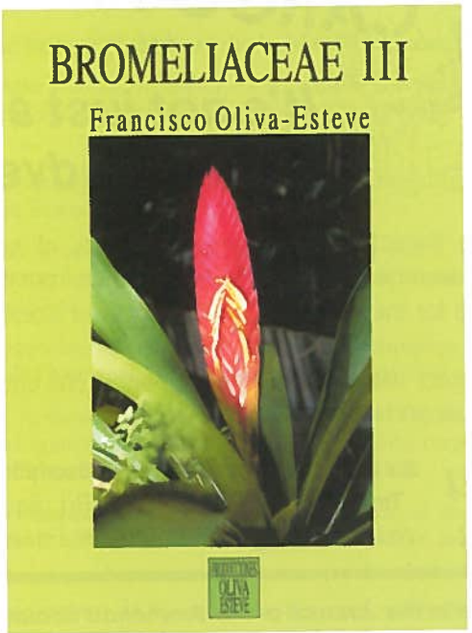
Zavala-Hurtado, J.A. 1982. Estudios ecológicos en el valle semiárido de Zapotitán , Puebla. I. ClasificaciÚn numÈrica basada en atributos binarios de presencia o ausencia de las especies. Biótica 7 (1): 99-120.

Zar, H.J. 1996. Biostatistical Analysis. Prentice-Hall, Englewood Cliffs, New Jersey.

Introducing

***"Bromeliaceae III"***

By: Francisco Oliva-Esteve




This handsome new book on bromeliads, published by Producciones Oliva-Esteve in Venezuela, is richly illustrated and printed on high-quality coated paper. 9¾ x 13 inches (32 x 25 cm). Photos (564 color). Hard Cover. 275 pp. English and Spanish editions. ISBN 980-07-7310-X.

The opening chapter, "A Short Venezuelan Historical Review of the First Explorers," is followed by text and color photos describing 29 genera. Among these are 108 Tillandsias, 38 Guzmanias, 34 Aechmeas, 17 Pitcairnias, and 15 Vrieseas. This book adds new species to those covered in Oliva-Esteve's previous works.

*Bromeliaceae III* is priced at $95 plus shipping and handling and applicable sales tax (Florida 7%). To order a copy, send payment to the book's distributor:

**Selby Botanical Gardens Press**
**811 South Palm Avenue**
**Sarasota, Florida 34236-7726**

You may also order by email at sbgpress@selby.org, or by telephone at 941-955-7553 x10, or fax at 941-951-1474. For an online SBG Press Order Form, visit www.selby.org.

# The Bromeliad Society International

The purpose of this nonprofit corporation is to promote and maintain public and scientific interest in the research, development, preservation, and distribution of bromeliads, both natural and hybrid, throughout the world. You are invited to join.

## OFFICERS AND DIRECTORS

President – Tom Wolfe, 5211 Lake LeClaire Road, Lutz, FL 33549
First Vice-President – Jack Reilly, 248 Lawrence St., Illiopolis, IL 62539
Vice-President, World Conference– Joyce Brehm, 5080 Dawne St., San Diego, CA 92117-1352
Editor – Chet Blackburn, 720 Millertown Road, Auburn, CA. 95603
Membership Secretary – Carolyn Schoenau, P.O. Box 12981, Gainesville, FL 32604
Secretary – Rusty Luthe, P. O. Box 1556, Honoka'a, HI 96727
Treasurer – Don Garrison, 1119 Lisa Lane, Kingwood, TX 77339
Directors –

2000–2002 – Keith Golinski, *Australia;* Dan Kinnard, *California;* Martha Goode, *Central;* Dennis Cathcart, *Florida;* William Frazel, *Florida;* Moyna Prince, *Florida*; Stuart Strutin, *Northeast;* Bill Soerries, *Southern,* John Atlee, *Western;* Luiz Felipe Carvalho, *International;* Peter Waters, *International.*

2001–2003 – Oscar Allen, *California*

2002–2004 – Joyce Brehm, *California;* Ed Doherty, *Texas;* Gary Gallick, *Texas;* Ken Marks, *Florida;* Fred Ross, *Louisiana;* Hiroyuki Takizawa, *International.*

## HONORARY TRUSTEES

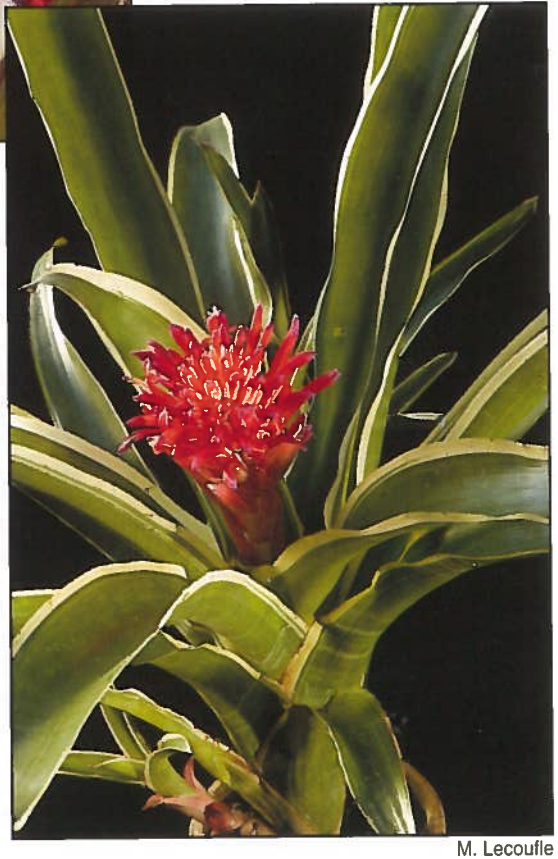
David H. Benzing, *United States;* Nat DeLeon, *United States*; Olwen Ferris, *Australia;* Grace M. Goode, *Australia;* A.B. Graf, *United States;* Roberto A. Kautsky, *Brazil;* Marcel Lecoufle, *France;* Elton M. C. Leme, *Brazil*; Elmer J. Lorenz, *United States;* Harry E. Luther, *United States;* Harold Martin, *New Zealand;* William Morris, *Australia;* Robert W. Read, *United States.*

## DIRECTORY OF COMMITTEE CHAIRMEN AND SERVICES

Affiliate Shows: Charlien Rose, 4933 Weeping Willow, Houston, TX 77092.
Affiliated Societies: Gene Schmidt, 9228 Vinland, Duluth, MN 55810
Conservation: Rolfe W. Smith, Longwood Gardens, P.O. Box 501, Kennett Square, PA 19348.
Cultivar Registration: Derek Butcher, 25 Crace Rd., Fulham, SA, Australia.
Finance & Audit: John Duos, 3415 Kenwood Dr., Orange, TX 77630.
Judges Certification: Betty Prevatt, 2902 2nd St., Ft. Myers, FL 33916
Membership and subscriptions to the JOURNAL: Please see inside front cover.
Mulford B. Foster Bromeliad Identification center: Send specimens and contributions to Harry E. Luther, at the Center, The Marie Selby Botanical Gardens, 811 South Palm Ave., Sarasota, FL 34236. FAX: 941-951-1474.
Publication Sales: George Allaria, 2265 W. 239th Street, Torrance, CA 90501.
Research Grant: Gerald Raack, Mosel STR 10, Eckental 90542, Germany.
Seed Fund: Harvey C. Beltz, 6327 South Inwood Road, Shreveport, LA 71119-7260.
Slide Library: Christopher Krumrey, 5206 Robinsdale Lane, Austin, TX 78723
Web Site: Ken Marks, 22690 Lemontree Lane, Boca Raton, FL 33428.

*Billbergia* 'Foster's Striate'
See text beginning on page 172.

M. McMahon



*Billbergia pyramidalis* 'Kyoto', a colorful but tender cultivar of this popular species.

M. Lecoufle