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Cover photographs. Front: *Billbergia* Selby, a hybrid between *B. tessmannii* and *B. eloiseae*, made by David Uguccioni while working at the display house at Selby Gardens. It is occasionally available from the Selby plant shop. Photograph by Vern Sawyer. Back: Another beautiful hybrid, *Billbergia* Space Rocket. Photograph by Bob Spivey.

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Edward C. Hummel—Plantsman and Hybridizer

Larry W. Mitich

For 43 years (1935–1978), Hummel's Exotic Gardens of southern California distributed a great variety and quantity of succulent and other xerophytic plants, bromeliads, and orchids, including numerous excellent hybrids developed at the Gardens.

Edward Charles Hummel, called Mr. Hummel by nearly everyone, including his wife, was born in Prosperity, Missouri, on July 18, 1903. When he was 7, his father Perry was killed in a mine accident. Theresa, his mother, took Edward and his younger brother to Aberdeen, California, on the eastern side of the Sierra Nevada, where he completed elementary school. Theresa had moved to the Los Angeles area and suggested that Edward come there for high school. He kept his days free for schooling, but found part-time work at the Sherman Hotel in Sherman. Since the railroad tracks near the hotel were used in movie settings, he was able to witness the making of silent movies.

Because the broken shift of school and work was strenuous, Edward took a job at the Beverly Hills Nursery during his first school vacation. At the time, there was great competition among the affluent estates to acquire the most desirable plants—cycads, orchids, palms, rare tropical plants—and young Edward was fascinated by the comments among nurserymen concerning the competition among wealthy collectors.

From Beverly Hills, Edward moved to Owens Valley, along the eastern Sierra Nevada, and worked at various jobs, including driving cattle into the mountains for summer grazing and helping his grandfather on road construction.

Edward joined the navy around 1921, mainly for its promise to provide an education. While the education differed from what he had expected, it afforded considerable variety. Shore leave during cruises along the coasts of Mexico and South America provided ample time to explore the tropical parks of the coastal cities, and he made occasional excursions inland.

Following an accident on board the battleship Wyoming and a medical discharge from the Navy in the spring of 1922, Edward returned to Owens Valley and worked at various jobs.

In 1925 he married Minnie Belle Byrne. She was born in Piedmont, Wyoming (now a ghost town), on April 14, 1904, the third of William and Cecil Byrne's eight children. Her grandfather's family, Irish immigrants, were early settlers and ranchers who grazed cattle on their own extensive holdings and on government land. Becoming dissatisfied with the encroachment of sheep



Photograph courtesy of CSSA

Figure 1.

Minnie Belle Byrne, Age 18, on a 1923 field trip. She married Mr. Hummel in 1925.

ranchers and small farmers, William Byrne moved his family to California's Imperial Valley in 1908, and to Owens Valley in 1909.

For a time following their marriage, the Hummels lived in Owens Valley, where Mr. Hummel worked on the Red Mountain Fruit Ranch, one of the valley's largest. Their children were born there: Marquette Belle, born on October 16, 1926, lives in Carlsbad, California; and Edward Myron, born on March 12, 1928, resides in Soquel, California. Ultimately Mr. Hummel went to work for the City of Los Angeles on the Tinnemaha Dam project. He worked a broken shift as a maintenance man on large equipment, and the free time enabled him to take several courses through the Extension Division of the University of California. This training helped immensely in later work.

In 1929, Mr. Hummel was transferred to Los Angeles and built a house in Inglewood for his family. They enjoyed rural living, but the City of Los Angeles decided to enforce its rule that all its employees must live within the city limits. At that time the Depression was at its worst and jobs were scarce. Compelled to leave his city job, Mr. Hummel found employment as a rigger at a Standard Oil Company plant in El Segundo.

Eventually the Hummels purchased a lot on a strip connecting the Los Angeles airport with an adjoining small town. For \$800 they built a complete two-bedroom, 800 square foot house. A Japanese friend gave them a dismantled 20 by 20 ft. lath house, which when erected, provided a place for their diverse assortment of plants. Mr Hummel resumed his job with the city.

Since they had a commercial-zoned lot, the Hummels decided to open a nursery. During the next eight years, they purchased the eleven adjoining lots, providing them with a nursery site with a 240 ft. frontage on the Imperial Highway. Being a city employee, Mr. Hummel was not permitted to have his own business, so Mrs. Hummel started the nursery.

In 1935 Mr. Hummel entered his collection of imported cacti in the Cactus and Succulent Society of America show, exhibiting several species not shown previously and winning the sweepstakes and 20 ribbons. Encouraged, Mr. Hummel decided to produce drought-resistant plants.

He obtained quantities of cactus seeds from German collectors who had been exploring and collecting extensively in Central and South America. To



Figure 2.
Aechmea Montana Rojo at
Birdrock Tropicals.

Photograph by Chet Blackburn



Photograph by Chet Blackburn

Figure 3.
Neoregelia Aztec, a popular Hummel hybrid.



Photograph courtesy of CSSA

Figure 4.

The Hummels with their children, Edward Myron and Marquetta Belle, in the family's Inglewood cactus garden. In 1935, this picture and a similar one appeared nationally in many magazines in a Quaker State Motors Oil advertisement. The Hummels were amazed when hundreds of hobbyists throughout the U.S. wrote for information.

The Hummels purchased only new seed and small plants. Plants were bought for new stock, never for immediate resale. That was always the Hummel's policy. To increase their stocks rapidly, they grafted extensively.

In 1939 Mr. Hummel resigned from his job with the City of Los Angeles to work full time at the nursery. Sales were so good that the Hummels found it unnecessary to publish a catalog. During the first few years of business, they offered mostly succulent plants, gradually adding more unusual foliage plants. The Hummels also sold plant assortments of their own selection, specializing in sales to distributors who needed only a few plants of one kind.

produce rapid growth, he grafted many of the small species, e.g., *Lobivia*, *Echinopsis* and *Rebutia*.

In 1935 Quaker State Motor Oils of Oil City, Pennsylvania, invited national magazine readers to write their experiences with Quaker State Oil. Mrs. Hummel's letter ("I Was Trying So Hard to Cut Expenses") with a picture of the Hummel family in their cactus garden was one selected for publication. They were amazed when hundreds of hobbyists throughout the United States wrote for information. After this response, they decided to operate a mail-order business and began selling small quantities of plants locally in 1935. Two years later they changed to a wholesale-only mail-order business.

The Hummels

The Hummels operated their Inglewood nursery from 1936 to 1948, when exhaust fumes from nearby Los Angeles International Airport created problems. They purchased seven acres in Rolling Hills on the Palos Verdes Peninsula and built their home there. The site was used as outdoor growing grounds. Unable to find land for a nursery site at the base of the hills, they moved to Carlsbad, where they purchased the Poindexter nursery.

In 1941, Dr. Robert W. Poindexter, a well-known cactus and succulent nurseryman, had moved his nursery from Compton to Carlsbad, but died unexpectedly in March 1943 while working at the nursery. His greenhouses were unused until his son John, a Ph.D. graduate, returned from military service in

China. Through 1951, John conducted a mail-order business and sold locally, but in 1952 he joined the faculty at Occidental College in Pasadena and sold the nursery to the Hummels. John Poindexter died in 1954.

The Hummels had planned to move immediately to Carlsbad, but their son Edward was called to military service during the Korean War. Under the supervision of Tom Almanza, their Carlsbad foreman, the plants were moved from Inglewood and Rolling Hills to their new nursery site. (Almanza, now 80, resides in Carlsbad.)



Photograph courtesy of CSSA

Figure 5.

Mr. Hummel displaying some of his trophies ca. 1942.

However, not until their son's return in 1954 were they able to transfer their total operation to Carlsbad. The Hummels built their home on the property in 1956 and expanded the nursery.

New plants were acquired from other nurseries, collectors, and botanical gardens. Visitors, many from overseas, offered and sent cuttings of worthwhile and unusual plants from their collections. The Hummels produced all the plants they sold.

The majority of plants they sold originated outside the United States, hence their business name: Hummel's Exotic Gardens. Seedlings that produced unusual numbers of offsets were especially desirable and were selected for the trade.

The Hummels hybridized extensively and were especially well known for their bromeliad hybrids, but they produced numerous cactus, succulent and

gesnerid hybrids, too. Some of their finest plants were never offered commercially but were sold with the entire plant stock in March, 1977.

The Hummels considered their business a very modest success. They had accomplished their original intent: to lead an interesting life with few worries while obtaining much pleasure from their nursery business. They were gratified that their products and services were appreciated by those they had served.

Hummel's firm was a family business and many of the immediate family worked there. Their son Edward was with them until they began to consider retirement. Theresa Wommack, Mr. Hummel's mother, helped during World War II. Iris Rae Dechambeau, Mrs. Hummel's sister, managed records, succulent propagation, and packing for thirty-two years. Several other family members helped out when needed.

For approximately four years, Mr. Hummel served as a director of the Bromeliad Society and was awarded the BSI's Certificate of Appreciation. He also served on the Committee of Nomenclature of Cacti and Succulents under chairman Robert W. Poindexter. Mr. Hummel's life-long friend, William Hertrich of the Huntington Botanical Gardens at San Marino, was consultant, and other committee members included Robert Craig, Howard Gates and Forrest Shreve.

Hummel's Victory Picture Book of Cacti & Succulents, a 40-page booklet with 270 photographs published jointly by Hummel's Exotic Gardens and the *Cactus and Succulent Journal*, was an instant success when issued in February, 1943; it was in its third edition in 1944. In the foreword, Mr. Hummel commented, "Perhaps you will wonder at receiving this free picture book which contains no prices of plants. If you enjoy a few minutes of interest and relaxation in looking it over, it will have fulfilled its obvious purpose. If your interest and curiosity are stirred to the point that you write us for further information, it will have fulfilled its hidden purpose."

Because the Hummels had become recognized nationally as expert growers of succulent plants, they were asked to contribute to the chapter on cacti and succulents in *Commercial Flower Forcing* (sixth edition, 1958, by Alex Laurie, D.C. Kiplinger, and Kennard S. Nelson, McGraw-Hill Book Company, Inc., New York; 509 pages). Their section contains 22 pages of advice on propagation and cultivation and 43 illustrations.

The Cactus and Succulent Society of America named Mr. Hummel a Fellow in 1969 for his extensive horticultural experimentation and hybridizing of succulents. In 1976, the Southern California Horticulture Institute presented him their Annual Award for Outstanding Contributions to Horticulture.

In addition to plants, Mr. Hummel had many other interests. He read constantly on travel, exploration, the history of the glass industry and its products, American Indians, and ancient Chinese art and history. He also had a large library of cookbooks from many countries and enjoyed cooking.



Photograph from BSI archives

Figure 6.

Mr. Hummel and Victoria Padilla admiring some of Hummel's hybrid aechmeas ca. 1966.

In 1978 the Hummels retired to Oceanside, California, and sold their nursery stock, but continued to grow a "few" plants on their enclosed patio. Mr. Hummel died November 29, 1979; Mrs. Hummel died January 15, 1993.

University of California at Davis

Reprinted in part from the *Cactus and Succulent Journal (U.S.)*, March–April 1993, Vol 65 (2):90–95.

NOTE: A Preliminary Listing of All Known Cultivar and Grex Names for the Bromeliaceae compiled by Don Beadle attributes more than 300 bromeliad hybrids to Mr. Hummel, including more than 125 aechmeas, 9 billbergias, 30 cryptanthus, 1 Dyckia, 16 guzmanias, 2 nidulariums, 80 neoregelias, 8 vrieseas, and 40 bigeneric hybrids. That is too many to list here but a sampling includes *Aechmea Coral Beads*, *A. Hojo Rojo*, *A. Jackson*, *A. Meteor*, *A. Mirlo*, *A. Montana Rojo*, *A. Pico*, *A. Pine Bough*, *A. Red Wing*, *A. Tam Star*, *Cryptanthus Cherry Sundae*, *C. Fudge Ripple*, *C. Madame Ganna Walska*, *C. Red Bird*, *C. Windsong*, *Dyckia Carlsbad*, *Guzmania Aerial Gardens*, *G. Memoria*, *G. Minnie Belle*, *Neoregelia Blue Vase*, *N. Fairy Paint*, *N. Painted Desert*, *N. Pink Polka Dot*, and *N. Rio Red*.

Stars and Stripes

Larry Giroux

One of the more popular bromeliads is *Cryptanthus bivittatus*. First described in 1861, and redescribed by botanists in 1861 as *Billbergia bivittata*, in 1864 as *Tillandsia bivittata*, in 1889 as *Nidularium bivittatum*, and in 1907 as *Cryptanthus moensi*, it is unfortunate that this *Cryptanthus* from Southern Brazil is probably now extinct in the wild.

There have been numerous varieties and cultivars in the trade in the past with such names as *C. b. 'bivittatus'*, *C. b. "var. minor"*, *C. b. var "major"*, *C. b. "var. luddemannii"*, *C. b. var. atropurpureus*, *C. b. 'Grande'*, and *C. b. 'Green luddemannii'*. To add to the confusion, common names like Rose-stripe Star, Dwarf Rose-stripe Star, Rosea Pictus and Roseus have been used synonymously.

Most references to *Cryptanthus bivittatus* prior to 1986 identified three varieties as generally accepted: *C. b. var. bivittatus* or *C. b. "var. minor"*, *C. b. var. luddemannii* or *C. b. "var. major"*, and *C. b. var. atropurpureus*.

C. b. "var minor", the smallest of the types, was first described as a small rosette with about 20 six-inch green tooth-edged leaf blades. As the name denoted, there are two pale vertical bands of yellow or cream. *C. b. var. atropurpureus* is distinguished by leaves which are diffused with red.

In 1986, Warren Loose, after extensive research, was unable to find any *C. bivittatus* var. *bivittatus* which did not have reddish coloration. As mentioned earlier, the plant's original location in Brazil has been destroyed, making it impossible to examine the original plant. It is his conclusion, based on color descriptions, that all *C. bivittatus* in cultivation are *C. b. var. atropurpureus*. This opinion is also shared by Harry Luther. It is his view that all *C. b. var. bivittatus* plants now in cultivation were derived from one clone of *C. bivittatus* var. *atropurpureus* which differs from the originally described *C. bivittatus* var. *bivittatus* by one gene determining the red coloration. Based on these theories, some day a mutation of this red gene may bring back into cultivation the long lost *C. bivittatus* var. *bivittatus*.

Warren Loose uncovered another mystery during his research of *C. bivittatus* "var. luddemannii". This variety of *C. bivittatus* was generally accepted since its description in 1889 as just a large variety of *C. bivittatus*. With much footwork, Warren confirmed his suspicions with studies of Harry Luther that *C. bivittatus* "var. luddemannii" was actually *Cryptanthus marginatus*, a larger, similarly striped plant, but definitely a separate species and not a variety of *C. bivittatus*.

These findings have considerably simplified our understanding of *C. bivittatus*. First, based on the original description of *C. bivittatus* var. *bivittatus* and *C. bivittatus*

var. *atropurpureus*, and on general observations of the presence of red in all *C. bivittatus* now in cultivation, we can conclude that *C. b. var. atropurpureus* is the true variety we have in our collections and therefore *C. b. var. atropurpureus* should be used synonymously with *C. b. var. bivittatus* due to their minimal genetic differences. Furthermore, there is no *C. b. bivittatus* "var. luddemannii" or *C. b. "var. major"*. This is a separate species: *Cryptanthus marginatus*.

Nature, with the help of dedicated horticulturists, has rewarded our efforts to keep alive *C. bivittatus* the species by providing us with several cultivars probably more interesting than their ancestors.

First seen in Florida in 1978, *Cryptanthus* 'Starlight' occurred as a sport of *C. bivittatus*. The border stripes of olive-green remain, but the inner stripes from outward to the center of the leaf blade changes from cream to light pink, to dark pink with faint olive-green central stripes mimicking those in the parent plant from which it mutated. Fortunately, the overall colors and pattern were uniform which allowed the quick establishment of *C. 'Starlight'* as a favorite of many. No one has accepted credit for introducing this mutation and it remains unpatented.

The story of the development of *Cryptanthus* 'Pink Starlight' is one of foresight and commercialism. At nearly the same time Paul DeCoster in Belgium and Barnell Cobia in Florida produced vegetative mutations of *C. bivittatus* having similar characteristics. After eleven years of work, Cobia perfected a uniform pattern. Cornelius Colin provided me with an intermediate form from which the current patented *C. 'Pink Starlight'* was developed. In my *C. bivittatus*, some of the leaves have the green outer stripe on one side of the leaves replaced by a pink stripe. In 1975 the uniform plant with wide light pink stripes bordering each leaf was patented by Cobia to allow for commercial sales in the United States. The European version distributed by DeCoster was called *C. 'Coster's Favorite'*. This *Cryptanthus* differs in the extent of undulation of the leaves. Fortunately the two developers have agreed to keep the patented name *C. 'Pink Starlight'* for all sales of this mutation in the United States.

The third of the known cultivars of *C. bivittatus* is *Cryptanthus* 'Ruby'. Grown in good light this plant has two colors: ruby red and dark green. Resembling *C. bivittatus* var. *atropurpureus* in size and shape, the paler area between its central and two lateral green stripes are nearly solid red rather than simply diffused with red. If you accept the early premise that the *C. bivittatus* currently in cultivation is *C. bivittatus* var. *atropurpureus*, it is easier to accept *Cryptanthus* 'Ruby' as a sport of it.

The small size, ease of adapting to a variety of growing conditions, diversity of colors, and profuse pupping of *C. bivittatus* and its cultivars make them the perfect bromeliad for the collector and for use in displays.

[Continued on page 180]

New Species of *Lindmania* and *Navia* From Southern Venezuela

Bruce K. Holst

Five new bromeliads from southern Venezuela are described below, including two species of *Lindmania* and three species of *Navia*.

Lindmania is one of the most attractive genera of Bromeliaceae that occur in the Guayana Shield of northern South America. As currently circumscribed, it contains 39 species, all endemic to middle to high altitudes of the Shield. *Lindmania* differs from its closest relative, *Connellia*, almost solely on the basis of having reduced primary bracts, which is at most a dubious generic distinction. Further study may show that the two should be combined in which case the name *Lindmania* would have priority.

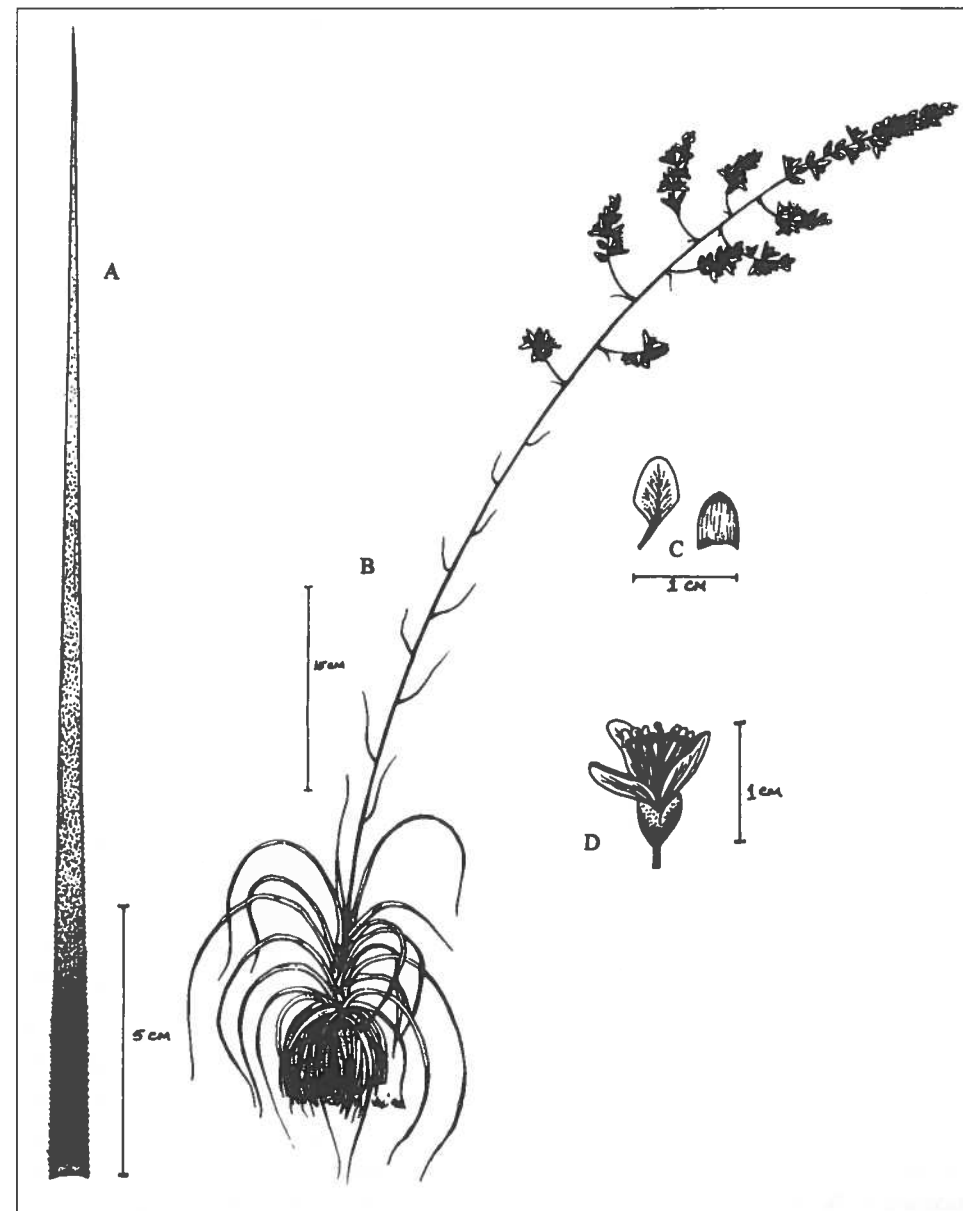
Lindmania candelabriflora B. Holst, sp. nov. (Figures 7 & 12).

Type. Venezuela. Amazonas: Dept. Atures, Serranía Parú, planicie central, SW sector, 1,200–1,250 m, 4° 25' N, 65° 32' W, 5–7 Mar. 1991 (fl), P.E. Berry, O. Huber & J. Rosales 5000 (holotype, MYF).

Haec species *Lindmania geniculatae* var. *minori* L.B. Sm. affinis est, sed inflorescentiis glabris (versus lepidotis), et petalis roseis (versus petalis albis) differt.

Plant A lithophyte, short-caulescent, to 70 cm tall in flower; stem densely covered with leaf base remnants. **Leaves** ca. 25, arching-recurved, 20–25 cm long. **Leaf sheaths** straw-colored, oblong, 13 × 10 mm, the upper surface sparsely and minutely lepidote, the lower surface glabrous. **Leaf blades** narrowly triangular, 5–7 mm wide, lower surface densely white-lepidote with entire, peltate, orbicular scales, upper surface glabrous except at base on young leaves, apex blunt, margins unevenly serrulate-spinulose in basal 1/4, the teeth to 0.5 mm long. **Scape** terminal, erect, dull wine-red, 40 × 0.3 cm, glabrous. **Scape bracts** similar in shape and vestiture to the leaves, the lower ones ca. 5 cm long, exceeding the internodes, upper ones 1.5 cm long, shorter than the internodes. **Inflorescence** 2-pinnate, 35 cm long, 12 cm wide, ovoid, glabrous; main primary bracts narrowly triangular, sparsely arachnoid-lepidote on both surfaces, entire; branches racemose, 5–7 cm long, 14–16 flowered, ascending, basal 1/5–1/2 sterile. **Floral bracts** thin, dull wine red, ovate, 1.5–2 mm long, rounded at apex, entire. **Pedicels** 2–3 mm long. **Flowers** perfect, actinomorphic. **Sepals** free, convolute, dull wine red, elliptical, 4 × 3 mm, apex rounded to emarginate, margins thin. **Petals** free, unappendaged, pink, trullate, clawed, 10 × 6 mm, spreading, apex rounded. **Anthers** dorsifixed, sagittate, ca. 1 mm long, dehiscing longitudinally. **Filaments** glabrous, 7–8 mm long, narrowed apically. **Ovary** superior, ovoid, 4 mm long; style 3 mm long; stigma dorsiventrally compressed, the tips spreading-reflexed, ca. 2 mm long; ovules ellipsoid, bluntly pointed at both ends.

Lindmania candelabriflora grows on quartzite outcrops at 1,200–1,250 m elevation on Serranía Parú, in Amazonas, Venezuela. It appears to be closest to *Lindmania geniculata* var. *minor* L.B. Sm., but differs by having a completely glabrous inflorescence and pink petals (versus lepidote inflorescence and white petals). The specific epithet refers to the candelabra-shaped inflorescence.



Drawn from Berry 5000

Figure 7.

Lindmania candelabriflora B. Holst: A, Leaf; B, Habit; C, Petal, Sepal; D, Flower.

Lindmania oliva-estevae Steyer. & L.B. Sm. ex B. Holst, sp. nov. (Figures 8, 10 & 11).

Type. Venezuela. Bolívar, Dist. Piar: Auyán-tepui, summit, in south-central region, headwaters of Río Churún, 1,700 m, 5° 51' N, 62° 32' W, 29 Mar. 1987 (fl), B.K. Holst & F. Oliva-Esteva 3755 (holotype, VEN; isotype, MO).

Haec species *Lindmania steyermarkii* L.B. Sm. affinis est, sed foliis laminis subtus stelligera-lepidotus et marginibus dense albo-ciliatis (versus glabris), foliis longioribus (30–45 cm versus 18–25 cm), vaginis marginibus coriaceis (versus membranaceis) differt.

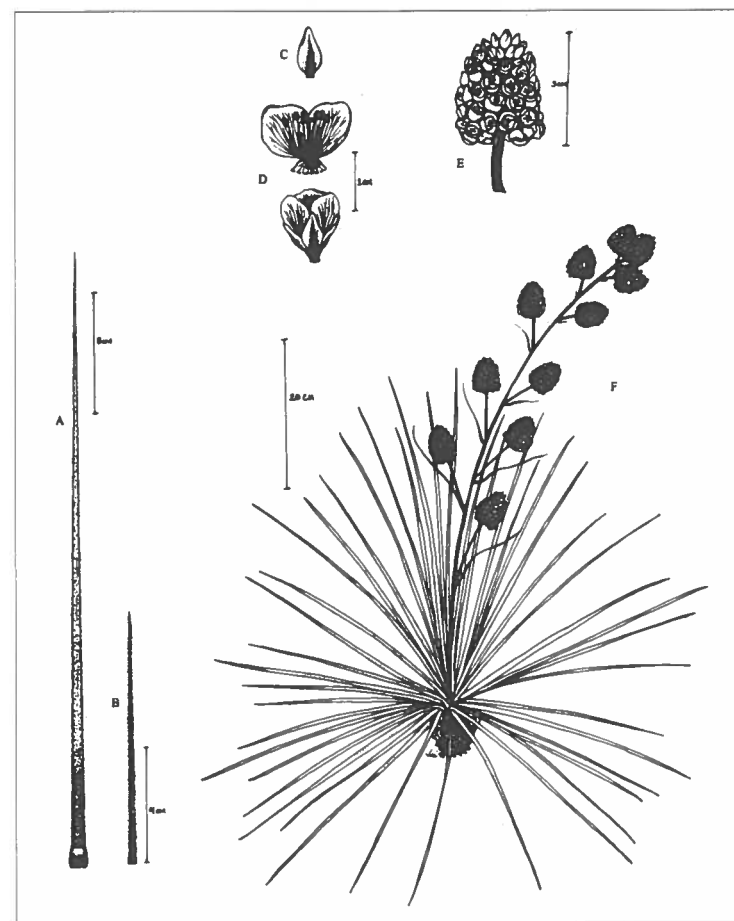
Plant A terrestrial, short-caulescent, 75–85 cm tall in flower, stem densely covered with leaf base remnants. **Leaf sheaths** to 2 cm wide, thick, stiff. **Leaf blades** stiff-coriaceous, linear-triangular, slightly incurved on the margins, finely ribbed, 30–45 × 0.6–0.9 cm, the lower surface sparsely white stellate-lepidote, upper surface glabrous, margins densely stellate-ciliate, minutely serrulate near the base, elsewhere entire. **Scape** terminal, erect or arching, 6–7 mm diameter, 30–57 cm long; lower scape bracts foliaceous, 15–27 cm long, vestite as in the leaves. **Inflorescence** laxly 2-pinnate, 27–43 cm long, 7–8 cm wide, glabrous, laxly branched, the branches terminating in a densely flowered, condensed spike; lower peduncles 5–6 cm long, upper ones 1–2 cm long; spike 2.5–3.0 × 2–2.5 cm, ovoid; lower primary bracts subulate, acute, 4–6 cm long, 1–1.5 mm wide except 3 mm wide at the broad base, the lower bracts exceeding the sterile portion of the axes, the upper ones shorter than the sterile portion and 0.8–2 cm long, densely pilose around the apex, densely white-ciliate on the margins. **Floral bracts** ovate-orbicular, obtuse, convex with inwardly curved margins, 4.5 × 4 mm. **Flowers** perfect, sessile or subsessile, actinomorphic. **Sepals** convolute, oblong-ovate, rounded at the apex, convex, 6–7 × 4–5 mm, the margins thin, dorsally verruculose except on the inwardly curved margins. **Petals** free, widely ovate, with an abruptly cuneate claw, erect and forming a cup, 10–12 × 9–10 mm, broadly rounded to emarginate at apex. **Anthers** suborbicular, dorsifixed, 1.5 × 1.3 mm, thecae parallel, introrse. **Filaments** ligulate-linear, broadened at base, 8–8.5 mm long, ca. 1 mm wide at base, 0.4 mm wide elsewhere. **Ovary** superior, lance-oblong, 5–6 × 3 mm; ovules bicaudate; style 2.5 mm long; stigmas spreading-recurved, ca. 2 mm long. **Capsules** septicidal, ovoid, 8–9 mm long. **Seeds** not known.

Lindmania oliva-estevae was first considered as a new species by Julian A. Steyermark and Lyman B. Smith who drew up an initial description in 1988. The species is named for Francisco Oliva-Esteva, bromeliad collector, author, conservationist, and co-collector of the type specimen. *Lindmania oliva-estevae* appears to be most closely related to *L. steyermarkii* L.B. Sm., which also has head-like clusters of flowers. *Lindmania oliva-estevae* can be distinguished from *L. steyermarkii* by the stellate scales on the leaves and densely ciliate leaf blade

margins (vs leaves glabrous), longer-leaves (30–45 cm long vs 18–25 cm long), and by having the sheath margins coriaceous (vs membranous).

Lindmania oliva-estevae is only known from the summit of Auyán-tepui, Bolívar State, Venezuela at 1,700–2,140 m elevation, where it forms small clumps in shrub islands on exposed sandstone outcrops.

Paratypes. Venezuela. Bolívar: Valle Encantado, lado derecho del Salto Angel, Auyán-tepui, 15 Aug 1968 (fl), *Foldats* 7082 (VEN); Cumbre de Auyán-tepui, sector suroriental, 2140 m, 5° 42' N, 62° 26' W, 26 Feb. 1978 (fl); Steyermark et al. 116062 (VEN), 2140m.



Drawn from Holst & Oliva-Esteva 3755

Figure 8.

Lindmania oliva-estevae Steyer. & L.B. Sm. ex B. Holst: A, Leaf; B, Primary bract; C, Sepal; D, Detail of flower; E, Detail of inflorescence branch; F, Habit.

Three new species of *Navia* are also being described from the same general area. They are *Navia glandulifera* B. Holst, *Navia parwana* B. Holst, and *Navia tentaculata* B. Holst.

Navia glandulifera B. Holst, sp. nov. (Figure 9)

Type. Venezuela. Bolívar: Municip. Raúl Leoni, parte norte del Macizo Guanacoco, 770 m, 4° 57' N, 63° 53' W, Nov. 1988, Angel Fernandez & Gerardo Aymard 4869 (holotype, MO; isotypes, NY, PORT, SEL).

A *Navia* speceibus, stoloniferis, bracteis florigeris lepidotis-glandulosis, differt.

Plant a small lithophytic herb, short-caulescent, forming colonies (Aymard, pers. com.), stoloniferous, the stolons to 7 cm long, 1–2 mm wide, bearing polystichously arranged, reduced leaves. **Leaves** 8–19, spreading-ascending, 4–8 cm long. **Leaf sheaths** drying light brown, broadly elliptic, 5 × 7 mm, serrate, sparsely pilose. **Leaf blades** drying dull green-brown with a distinctive, pale, silver-green, medial, longitudinal band, the band slightly impressed on the upper surface (when dry), linear to narrowly lanceolate, 5–8 mm wide, sparsely pilose with linear, multicelled, bulbous-based trichomes, blade apex evenly narrowed to a pungent tip, margins strongly undulate and densely serrulate-spinulose with ascending teeth, the teeth axils barbellate with a single stellate trichome. **Inflorescence** simple, sessile, terminal, ovoid, 4–6 mm wide, ca. 8-flowered; outer sterile bracts ovate, 8–10 × 3–4 mm, thickened in upper half, membranaceous in lower half, sparsely pilose abaxially with similar hairs as in the blades. **Floral bracts** ovate, 7 × 5 mm, sparsely pilose abaxially with 2- or 3-celled, linear, gland-tipped trichomes, margins entire, adaxial surface glabrous, margins in upper half of bract inrolled, serrate with a few teeth, the tooth axils barbellate. **Flowers** sessile. **Sepals** free, imbricate with the 2 posterior overlapping the anterior, the posterior sepals elliptic, 5.5 × 2.2 mm, strongly keeled, minutely tuberculate apically, anterior sepal oblong-elliptic, 5.5 × 1.3 mm, not keeled. **Petals** free, unappendaged, white, 10 × 1–1.5 mm, the blade oblong then slightly constricted about 3/4 of the way up, the apical 1/4 strongly recurved. **Stamens** exserted. **Anthers** oblong, 1.6 mm long, longitudinally dehiscent, attached near the short-sagittate base; filaments glabrous, 10 mm long, ca 0.1 mm wide their entire length. **Ovary** superior, 2 mm long, glabrous, ovules few, unappendaged(?), styles free (or scarcely connate?), 6 mm long, slightly broadened apically to the clavate, tuberculate, spreading stigmas. **Fruit** a loculicidal and tardily, basally septicidal capsule, ovoid, 3 mm long. **Seeds** 0.5 × 0.4 mm, ovoid, striate-reticulate, unappendaged.

Navia glandulifera is known only from Macizo (or Cerro) Guanacoco in southwestern Bolívar State, Venezuela. It is remarkable in the genus for bearing stolons, and in the family for having gland-tipped linear trichomes (whence the species name) which are most noticeable on the floral bracts.

With its unique stoloniferous habit and gland-tipped floral bract trichomes, it is difficult to identify close relatives of *Navia glandulifera*. A species with similar shape and size and that grows in the proximity of the type locality of *N. glandulifera* is *Navia caurensis* L.B. Sm. However, *N. caurensis* is known from a

single, incomplete collection (Cerro Pao near Cerro Sarisariñama; Cardona 2985, holotype, US), and the relationship may be merely superficial.

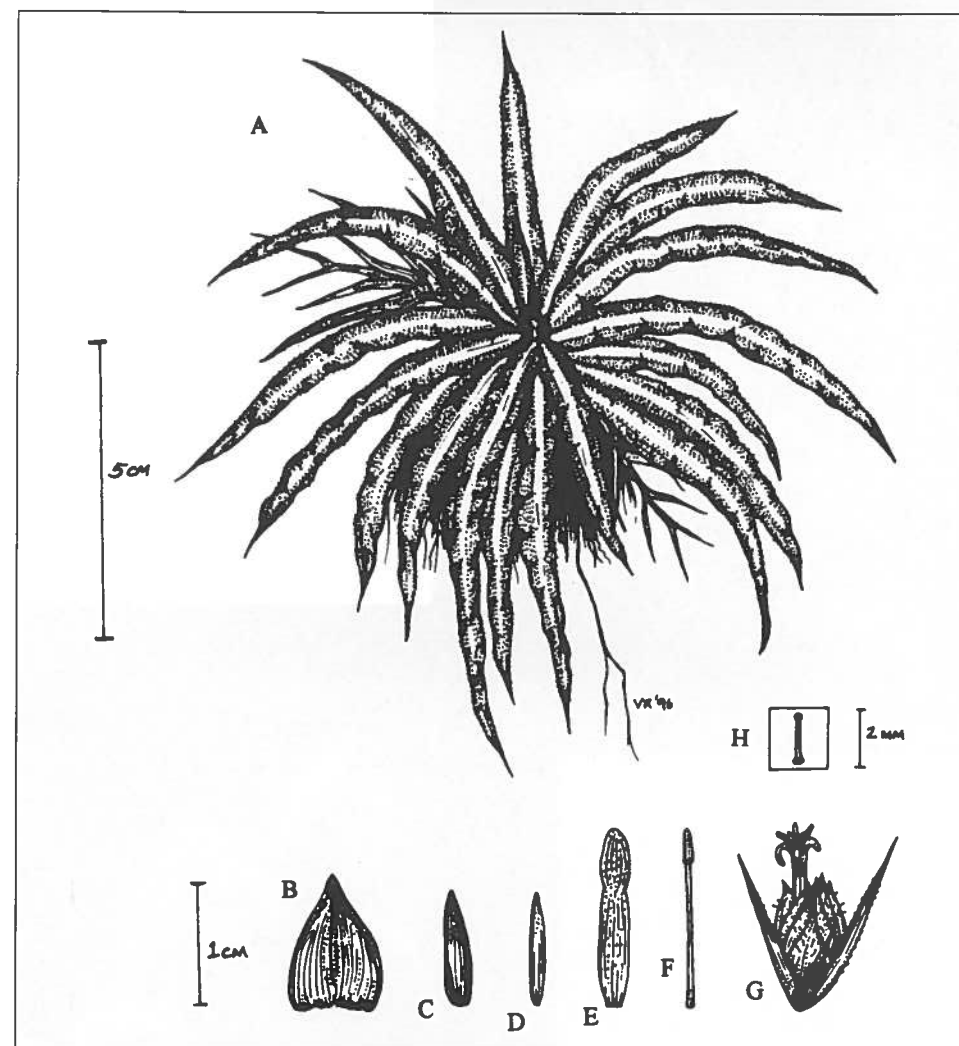


Figure 9.

Navia glandulifera B. Holst: A, Habit; B, Floral bract, adaxial view; C, Posterior sepal, lateral view; D, Anterior sepal, abaxial view; E, Petal; F, Stamen; G, Inflorescence; H, Detail of gland-tipped trichome.

Navia parwana B. Holst, sp. nov. (Figures 13–14)

Type. Venezuela. Amazonas: Dept. Atures, Serranía Parú, planicie central, SW sector, 1,200–1,250 m, 4° 25' N, 65° 32' W, 5–7 Mar. 1991, P. E. Berry, O. Huber & J. Rosales 4960 (holotype, MYF).

A *Navia stenodonta* L.B. Sm, cui affinis, bracteis primariarum interioribus longioribus quam bracteis florigeris (versus bracteis primariarum totiarum

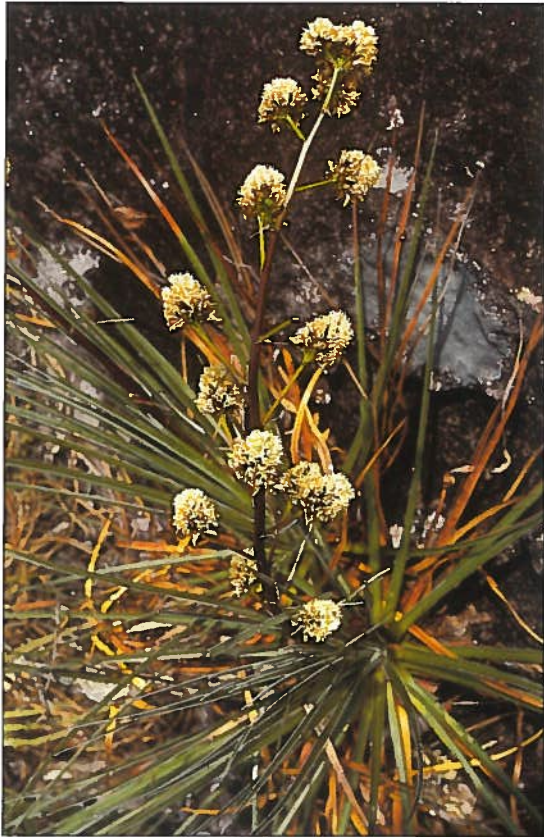


Figure 10.
Lindmania oliva-estevae
Steyerm. & L.B. Sm. ex B. Holst.

Photograph by Francisco Oliva-Esteva



Figure 11.
Lindmania oliva-estevae
Steyerm. & L.B. Sm. ex B. Holst.

Photograph by Gustavo Santana



Figure 12.
Lindmania candelabriflora
B. Holst

Photograph by Paul E. Berry



Figure 13.
Navia parwana.

Photograph by Paul Berry

exterioribus, equalae sepalis), dentibus laminarum ad 1 mm longis (versus 2–4 mm longis), bracteis florigeris albis (versus roseis), differt.

Plant A medium-sized, probably caulescent, lithophytic herb; stem unknown. **Leaves** ca. 20, widely spreading, $37\text{--}51 \times 2.7\text{--}3.4$ cm. **Leaf sheaths** imperfectly known, sparsely pilose, drying whitish, irregularly serrate. **Leaf blades** drying dull green-brown, light green when fresh, very narrowly elliptic, bearing a broad, medial, longitudinal band which is maroon-red when fresh, light brown when dry, apex evenly attenuate to a thickened, pungent tip, base slightly narrowed, margins undulate, densely serrulate-spinulose the entire length except the pungent tip, the tooth axils barbellate with stellate trichomes, glabrescent, both surfaces pilosulous with linear, several-celled, bulbous-based trichomes. **Scape** ca. 2.5 cm long, bearing 2 foliar bracts. **Inflorescence** digitately compound, nidular, 3.5×4.5 cm excluding the exserted bracts, many-flowered; primary bracts exceeding the branches, ascending with spreading-reflexed tips, light green basally, maroon apically, outer ones lanceolate to 11×2 cm, inner ones ovate-caudate, to 4.5×2 cm, trichomes and margins as in the leaves. **Floral bracts** slightly recurved, lightly green, ovate, $15\text{--}18 \times 5\text{--}7$ mm, thickened apically, sparsely pilose on both surfaces as in the blades, but trichomes shorter, margins serrate, the tooth axils stellate-barbellate, at least the outer floral bracts keeled abaxially. **Flowers** bisexual, pedicel stout, ca. 5 mm long. **Sepals** free, imbricate with the posterior sepals overlapping the anterior, sparsely pilose, entire; posterior sepals ovate, 14×4 mm, keeled entire length, acute, the anterior sepal ovate-lanceolate, 11×3 mm, cucullate. **Petals** free, strongly overlapping and forming a tube, unappendaged, white, ca. 17×3 mm, oblong with a slight constriction just above middle and slightly expanded above that into an ovate tip, glabrous. **Stamens** free, exserted; anthers 3 mm long, sagittate, the lobes slightly uneven, longitudinally dehiscent. **Ovary** superior, oblong, 4×1.5 mm, glabrous, ovules unappendaged; style ca. 10 mm long, fused basally for 8 mm, spreading; stigmas expanding, ca. 2 mm long. **Fruit and Seeds** not known.

Navia parwana is known from a single collection from 1200–1250 m elevation on Cerru Parú, Amazonas State in southern Venezuela, where it was found growing at the edge of a rock outcrop, in a patch of forest, in the shade.

Navia parwana is perhaps most closely related to *Navia stenodonta* L.B. Sm., also from Cerro Parú, but from higher altitudes. *Navia parwana* differs by having the prominent, long primary bracts borne within the inflorescence (versus primary bracts peripheral to the inflorescence), marginal teeth or spines of the blade < 1 mm long (versus 2–4 mm long), and white (versus pink) floral bracts.

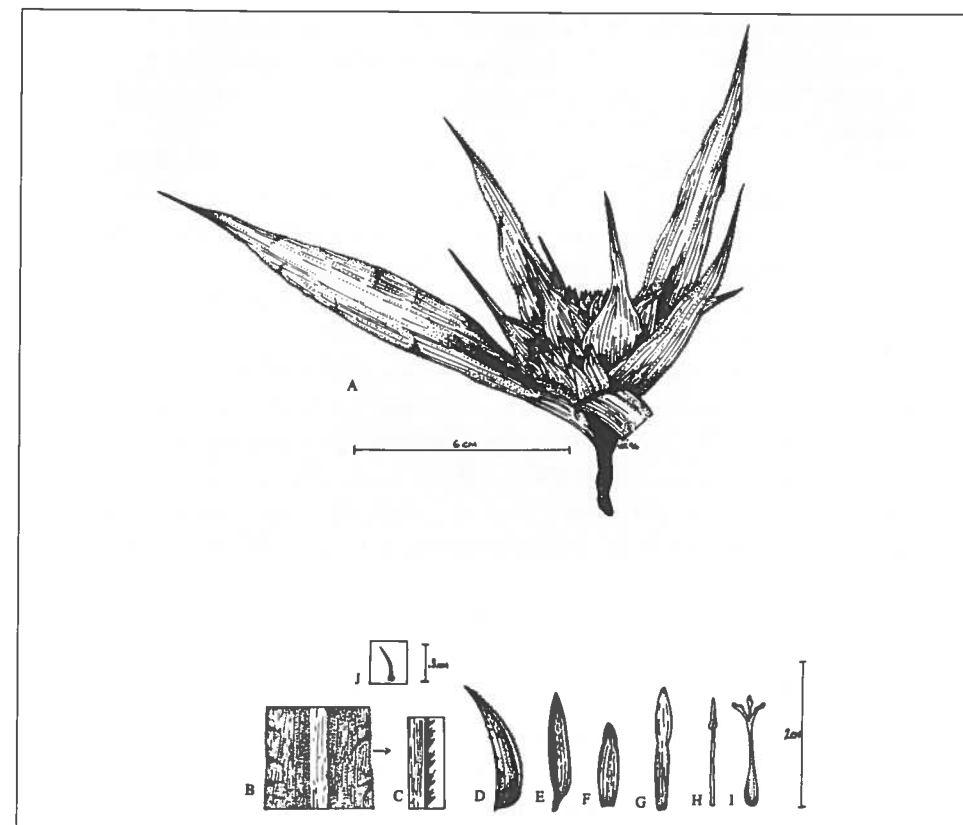


Figure 14.

Navia parwana. A, Inflorescence; B, Section of abaxial surface of leaf blade; C, Detail of leaf blade margin; D, Floral bract, lateral view; E, Posterior sepal, lateral view; F, Anterior sepal, adaxial view; G, Petal; H, Stamen; I, Pistil; J, Foliar trichome.

Navia tentaculata B. Holst, sp. nov. (Figures 15–17)

Type. Venezuela. Bolivar: Municip. Autónomo Gran Sabana, Parque Nacional Canaima, Isla Ratón, intersección del Río Auyán y el Río Churún, 500 m, 27 Aug. 1994, F. Delascio Chitty 16118 (holotype, VEN).

A *Navia wurdackii* L.B. Sm., cui affinis, bracteis florigera longior quam sepalis (versus bracteis florigera et sepalis equalae), inflorescentiis lobatus (versus convexus), differt.

Plant A lithophyte or epiphyte at the base of tree trunks, short-caulescent, medium-sized; new growth emerging from near the stem apex after flowering; stem ca. 9 cm long, 7 mm diam., naked. **Leaves** ca. 10–12, spreading horizontally, 25–35 cm long. **Leaf sheaths** ca. 2.5 cm wide, 1 cm long, glabrous. **Leaf blades** bright green and basally tinged maroon when fresh, drying dull pale green, narrowly triangular, 2–2.2 cm wide, thin, with a broad, longitudinal, basally maroon, medial stripe, sparsely lepidote with linear, bulbous-based trichomes, apex evenly acuminate, margin strongly undulate, spinulose, the spines ca. 0.5 mm

long, erect or slightly ascending. **Scape** terminal, hidden among the leaves, pilose especially apically, ca. 1.5×0.15 cm, ebracteate. **Inflorescence** nidular, simple or compound with up to 3 digitately arranged branches, 4.5–10 cm wide, 4.5–6.5 cm long; primary bracts ovate, $3.5\text{--}5 \times 0.7\text{--}1.5$ cm, sparsely pilose, apex caudate to long-caudate; branches urceoloid, $4.5\text{--}6.5 \times 4.5\text{--}6$ cm, 12–20-flowered. **Floral bracts** red to orange-red, lanceolate, $3\text{--}4.5 \times 0.9\text{--}1.5$ cm, thin, sparsely to densely pilose, apex long-acuminate, margins serrulate. **Flowers** sessile, bisexual, actinomorphic. **Sepals** free, imbricate with the posterior overlapping with the anterior, their margins and base membranous, posterior sepals elliptic, 2.4×0.6 cm, sparsely pilose with simple trichomes on the lamina abaxially and with a few stellate trichomes on the keel edge, glabrous adaxially, keel ca. 1 mm wide and bearing 2 or 3 greatly reduced teeth; anterior sepal 2.1×0.4 cm, sparsely pilose abaxially, glabrous adaxially. **Petals** free, strongly overlapping and forming a tube, unappendaged, yellow, spatulate, 3.8 cm long, 5 mm wide, glabrous, the apex rounded, recurved. **Stamens** exerted. **Anthers** longitudinally dehiscent, narrowly elliptic, 5 mm long. **Filaments** 4 cm long, 0.5 mm wide. **Ovary** superior, ellipsoid, 3.5 cm long; ovules plano-convex, unappendaged; styles connate for ca. 4 cm, the free arms 2 mm long, enrolled and forming a tube; stigma slightly thicker than the style arms, papillate apically. **Fruit** (Mature) unknown. **Seeds** (Immature) black-brown, striate-reticulate, unappendaged.

Navia tentaculata is known only from the northern side of Auyán-tepui, Bolívar State, Venezuela, at about 500 meters elevation. The specific epithet refers to the tentacle-like appearance of the leaves.

Navia tentaculata has been misidentified in the past as *N. splendens* L.B. Sm., but differs by having dull wine red leaf bases at anthesis (versus yellow and red), simple, bulbous-based trichomes (versus stellate) on the leaves, scape, and sepals. *Navia tentaculata* is perhaps most closely related to *N. wurdackii* L.B. Sm., known from higher elevations on the Chimantá Massif and Auyán-tepui, but differs by having the floral bracts much longer than the sepals (versus equaling the sepals), and the individual inflorescence spikes clearly distinct (versus forming a convex-topped inflorescence with the branches growing together and indistinguishable.)



Photograph by Armando Subero

Figure 15.
Navia tentaculata.



Photograph by Armando Subero

Figure 16.
Navia tentaculata.

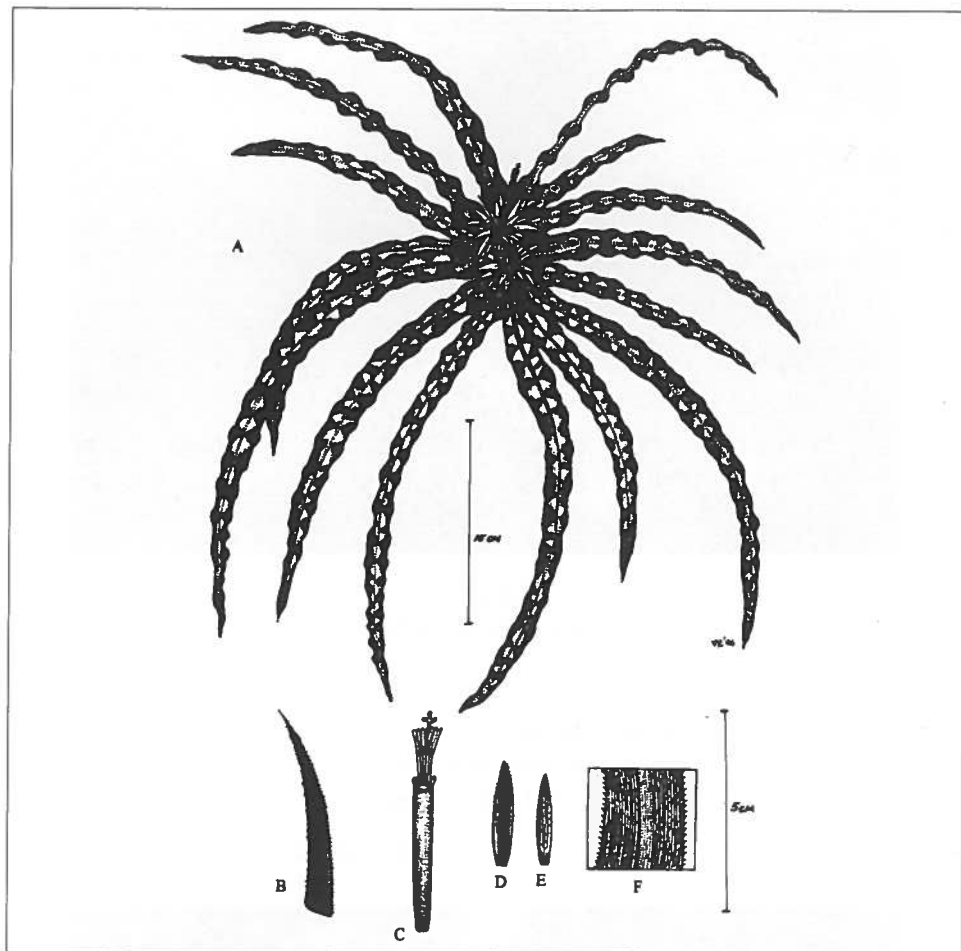


Figure 17.

Navia tentaculata. A, Habit; B, Floral bract, lateral view; C, Corolla, stamens, and stigma; D, Posterior sepal, abaxial view; E, Anterior sepal, abaxial view; F, Detail of lower surface of leaf blade.

ACKNOWLEDGEMENTS

I am grateful to Francisco Oliva-Esteva, Paul Berry, Armando Subero, and Gustavo Santana for providing the photographs, to Valerie Renard for preparing the illustrations, to Harry Luther for reviewing the manuscript, and to Edna Sieff for helping with the Latin diagnoses.

Marie Selby Botanical Garden
Sarasota, Florida

Book Review

Jason R. Grant

The Pineapple, Cultivation and Uses, by Claude Py, Jean-Joseph Lacoëuilhe, and Claude Teisson

The Pineapple, Cultivation and Uses is an English translation of the original French publication (published simultaneously) by Daphne & Jack Goodfellow. It is a technical overview of all aspects of the pineapple with specialization on cultivation. It is amply illustrated with numerous photos, tables and figures. It is the definitive work on the subject and will serve as the modern successor of the 1960 book *The Pineapple* by J.L. Collins.

The book is divided into four parts preceded by a preface, an extensive table of contents, a detailed history of the pineapple, and followed by the conclusion, an exhaustive bibliography, and index. Each part is divided into chapters of its own as follows:

Part One: The Plant and the Environment; Chapt. 1: Taxonomy – Origin – Distribution, Chapt. 2: Genetics, Chapt. 3: Botany and Physiology, Chapt. 4: Ecology, and Chapt. 5: From Biology to Cultivation.

Part Two: Cultivation; Chapt. 1: Cultivation systems – crop combinations, Chapt. 2: Choice of site – preparation of the soil, Chapt. 3: Layout of the plantation – choice planting density, Chapt. 4: Planning, plantation management, Chapt. 5: Soil preparation, Chapt. 6: Choice, preparation and planning of planting material, Chapt. 7: Fertilization, Chapt. 8: Irrigation, Chapt. 9: Plant protection, Chapt. 10: Artificial flower induction treatment (forcing), Chapt. 11: Preparation of the fruit – harvest, Chapt. 12: First ratoon crop and subsequent crops, and Chapt. 13: Vegetative multiplication.

Part Three: Uses of Pineapple; Chapt. 1: Uses of the fruit, Chapt. 2: Use of the vegetative parts of the plant (other than the fruit), and Chapt. 3: Use of the whole plant as a source of energy.

Part Four: Economic Aspects; Chapt. 1: Main stages in the development of the pineapple industry, Chapt. 2: Production and markets, Chapt. 3: Socio-economic aspects, Chapt. 4: Production costs, and Chapt. 5: Fluctuations in prices and main products.

The Pineapple, Cultivation and Uses, by Claude Py, Jean-Joseph Lacoëuilhe, and Claude Teisson, is published by Editions G.-P. Maisonneuve & Larose, Paris, France, 1989. 568 pages, 186 photos (mostly color), 75 tables, and 87 figures, soft cover, 24 cm, ISBN 2-7068-0948-5, ISSN 0497-0624. Order from the publisher or F. Fluck-Wirth, Internationale Buchhandlung für Botanik und Naturwissenschaften, CH-9053 Teufen AR Switzerland, phone 071-33 16 87, FAX 071-33 16 64, 86 Swiss Francs (or roughly US \$72).

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Horka and Fries to Go!

Chet Blackburn

Photographs by the Author

It is widely believed that the pineapple is the only member of the Bromeliad family consumed as food by humans. This appears not to be the case. For example, fruits of some *Bromelia* species are reportedly occasionally eaten by local people. Given the sourness and consistency of the fruit however, I suspect the key word in that sentence is "occasionally."

One bromeliad that is actually relished by those who have eaten it is *Tillandsia australis* Mez, formerly known as *Tillandsia maxima* Lillo & Hauman. In the parts of South America where it is found, the "heart" or growing tip, which is called "Horka" is eaten either raw or cooked. It is said to be very similar to palm heart in taste.¹

Tillandsia australis grows on rocky cliffs at elevations ranging from 3,500 to 12,000 feet in Bolivia and Argentina. As can be seen by the accompanying photograph, it is a large plant with an equally large inflorescence. It is one of those choice beauties rarely seen in cultivation, primarily because mature specimens are too large to import and seedlings are too slow-growing to be commercially viable.

My own experience has been that the plant is just about as tough as it is hard to find. It is probably the hardiest of the broad leafed tillandsias. The one in my collection has been there since 1977, enduring periodic trials of heat, cold and neglect that have done in almost every one of its contemporaries acquired during the seventies. It was a small plant when I obtained it and remained so for many years.

Then, about seven years ago the rate of growth accelerated and it started looking more like the big, broad-leafed plant it should have been. It finally produced an inflorescence in 1995, almost twenty years after it first appeared on my doorstep. It began to provide some indication that something was about to happen two years before flowering when it put out four hair "pups" at the base. Fortunately I removed all but one and potted them up because it never produced any more of them nor did it produce offsets after flowering.

The plant in the accompanying photographs is one that flowered at Shelldance Nursery in the spring of 1992. Mine was about half that size when it flowered.

As can be seen, *T. australis* deserves a better fate than that of becoming horka salad. Besides, no one seems to know which type of wine to serve with Horka.

Auburn, California

¹ Foster, Racine, 1951. "Benevolent Bromeliads". J. Bromeliad Soc. B Soc. J. 2(3) :32-33

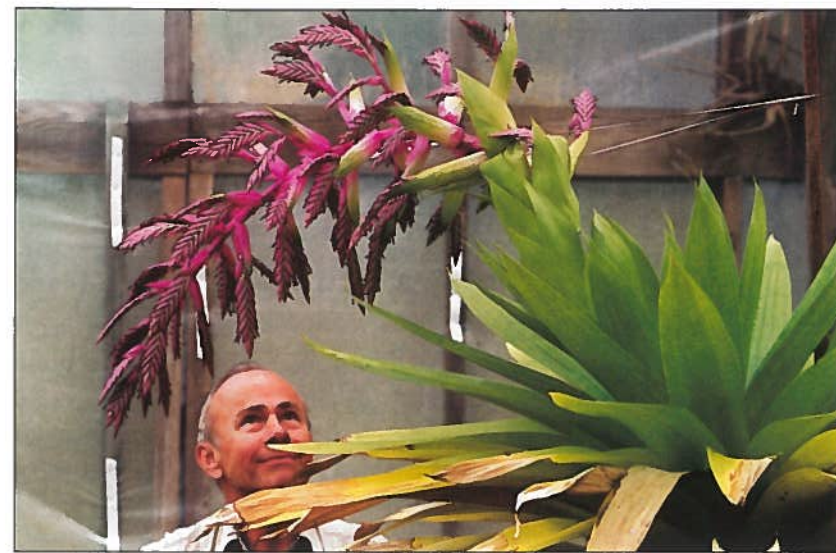


Figure 18.

A potential customer admires the massive inflorescence of *Tillandsia australis* at Shelldance Nursery in 1992.



Figure 19.

Individual flower of *Tillandsia australis*. The plant was formerly known as *Tillandsia maxima*, no longer a valid name.

Brazil

(Selections from the book BRAZIL)
by Mulford B. and Racine Foster

VII

PARANÁ

From their collecting in the Santa Thereza area of the state of Espírito Santo, the Fosters returned to Rio expecting that they would soon board the Troubadour for their return voyage home. To their surprise, there was no space available on that ship. While waiting for a cancellation or space on another ship they decided to collect around the state of São Paulo (nothing: not distances, cold or heat, or transportation problems would discourage them.) They were invited to visit Alto da Serra, the highest mountain in the Serra do Mar range, the rainiest part of Brazil with 140 to 160 inches annually, according to their statement. There, Dr. Hoehne had established a park to preserve the natural conditions. On their return to São Paulo they learned that the earliest steamship reservations would not be available for several weeks. They, then, happily arranged a trip to the state of Paraná, the southern neighbor of São Paulo. Their narrative continues (with some of the local color and various digressions omitted. Place names have not been changed.)

PARANÁ EXPEDITION BEGINS

We were off in a botanical truck the like of which probably has never before been seen. It had been designed to be a definitely functional piece of equipment to facilitate botanical study with new modern methods. It was the brilliant and practical creation of Dr. Hoehne.¹ It had long been his dream to be able to collect, press and dry the plants immediately and conveniently out in the field. Flowers and leaves retain their color and characteristics much better if dried quickly in intense heat. He himself had so many hard and difficult plant-collecting journeys under most trying conditions that as time went on he dreamed of a little cabin on wheels which could be conveniently moved from place to place, so that after a hard day's collecting, the botanist, while presses were "cooking" could rest in comfortable quarters in order to be more efficient and eager on the morrow's collecting jaunt.

The body of a Chevrolet Gigantea truck had been rebuilt with a special double seating capacity, one large seat built in back of the wide front seat. Six people could comfortably ride in these wide seats. From the back seat a little door opens into a storage closet neatly sandwiched between partitions which divide the front from the large room in back. For the best view one must go to the rear and make full inspection of the interior. It is not the interior of a modern trailer but it is comfortable enough for

men on a botanical expedition. On each side and at each end had been built leather folding seats which drop down at night so that four people could easily sleep there. The seats in front could also be converted into bunks for the night.

All kinds of presses, stoves, bags, food and necessary equipment had storage space in efficient and convenient nooks. On either outer side, towards the front, are two metal closets to be used as drying cabinets. These metal walls retain intense heat from a small gasoline stove, making possible rapid and complete drying of succulent leaves and fragile flowers a few hours after collecting, in a manner far superior to old methods.

No other foreign guests had made use of this truck and the thought of traveling into Paraná in so much camping comfort was something to look forward to. The chauffeur, Pedro Gonçalves, and Moysés Kuhlmann, Dr. Hoehne's assistant, and Mulford occupied three of the bunks in the rear, while Racine curled up in the second front seat finding very comfortable quarters for the duration of the trip.

The road out of São Paulo was a very good highway...

Our first night in camp was at kilometer 278. Early the next morning we found and collected many *Aechmeas*, *Vrieseas*, *Canistrums*, *Nidulariums*, leather-ferns and amaryllis. That amaryllis grew in trees we had been told, but now we came face to face with the incredible! Seeing those large succulent bulbs, quite the most unlikely thing out of the ground, comfortably perched in the crotches of great trees was Nature displaying what to man's eyes seemed a paradox!

Flitting to and fro everywhere were huge specimens of the brilliant metallic blue butterfly (*Morpho*) whose wings unfortunately are profligately used to decorate trays and pictures which tourists buy as souvenirs...

In the open fields bracken was the predominate growth. Over any area which had been cleared of the forest, the great masses of bracken ferns, who, ages ago, acted as protective "nurses" to the present plant life, anxiously return to this desecrated soil on "nursing" duty again in rehabilitation of the soil which was denuded...

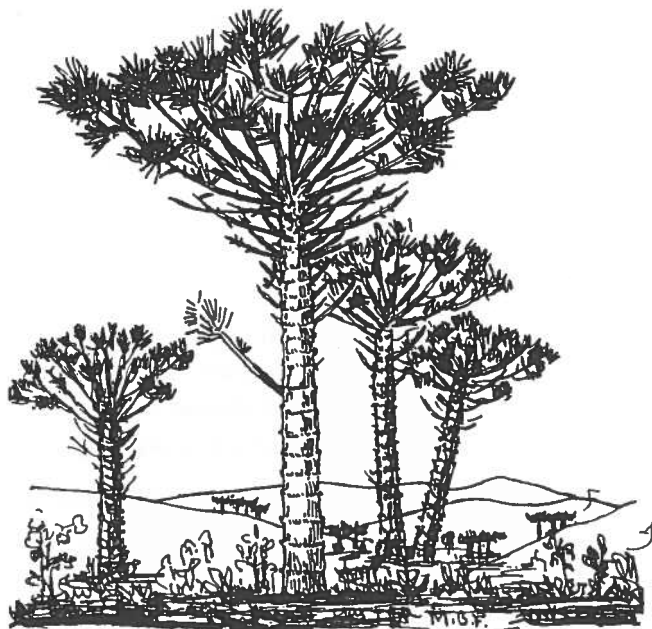
Well on our way to Curitiba, the prosperous capital of Paraná, at the highest point of the range, over 3,000 feet above sea level, we found another Alto da Serra, where we again made camp. Preparations started early as the Brazilian winter nights close down with but short notice. After a cold night we were eager to explore these heights. Nearby we found great areas of cut-down forests and found that for a time-saving device, collecting epiphytes on these cut-down trees was the best way to "climb" them. They were loaded with mosses, ferns, orchids, and bromeliads and literally by the thousands is no exaggeration. Many of the ferns and orchids can go on living on these cut-down trees, but most of the bromeliads soon die because their cups are turned down and no water can reach their vital parts at the base of the leaves and center of the plant. For anyone who loves the bromeliads this is a sickening sight. It is because of the ruthless cutting down of forests all over the

¹ Director, Instituto de Botânica. See introductory note, Part I, page 172 JOURNAL, July-August 1995.

country that a good many species of both bromeliads and orchids are being eradicated and will soon, if they have not already, become extinct...

They thought Caritiba fascinating because the appearance of the houses and the way the people dressed reminded them of northern Europe. They learned about maté tea and admired the Paraná pines—the *Araucaria angustifolia* that you have seen on the cover of the September–October 1991 issue of this journal.

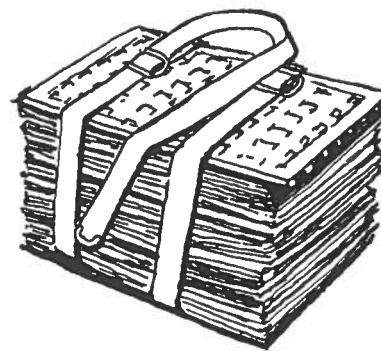
Paraná gave them many different collecting areas including the mountains of the coastal range, “vast” plains, the odd rock formations of Villa Velha, where they found seven different kinds of *Tillandsia*, including *Tillandsia crocata*. Near the coastal city of Parangua while searching through swamps in a hard rain, they found two species of *Catopsis*. One was *C. berteroniana*, common also to the mangrove swamps of southern Florida, as they remarked, and much farther south than appearances reported from the state of Bahia.



[On this occasion] the most interesting bromeliad was a “wind-blown” *Vriesia* whose flowers all point in the same direction out of a tall spike. This condition is called “secund”. When Dr. Smith identified it he wrote: “*Vriesia platzmanni* E. Morren first collection because the type was a painting, not a plant.” This was strange, we made the first collection of a plant already named! How could it be named if there existed no herbarium specimen? This was indeed an exception to botanical procedure. But sixty years ago when Platzmann, a German botanist, collected almost in this same spot, he had made a painting of this particular *Vriesia*, and either because the herbarium specimen was lost or he never made one, his painting is kept in a European museum as the type. A colored plate was published in *La Belgique Horticole*.

Our taking of this *Vriesia*, which already had a history, verifies the original collection, and gives botanists an herbarium record...

In order to save our collected material we worked late into that wet night. The regular presses were full and the improvised presses were full so we had to make bundles of the fruits and leaves, keeping them numbered in baskets until we could reach São Paulo. In making up bromeliad specimens we found that they had only one advantage over other types of specimens. While it is better to flatten out the frail, perishable flowers immediately, the flower head or inflorescence and leaves will keep in good condition for many days. Using only one sheet of the bulging press we could rapidly make up a sheet of ten or twelve envelopes of pressed flowers, each one properly numbered, corresponding to the flowers, stalk and the leaves which we tied together and stored away in the bags to be dried and completely pressed when we arrived back in São Paulo at the Instituto de Botânica where quantities of presses and excellent heat awaited us. It was good that there was some kind of compensation which we could remember in effortless moments because when the moment came to finally squeeze the big succulent and stubborn leaves along with sticky, bulky, thick flower-head and long stem into the presses too small for bromeliads, we could only cuss in a loud stage whisper, not willing to remember the compensations.



However at this point of the Brazilian expedition, we had reconciled ourselves pretty well to the inevitable necessity, unpleasant though it be, to the fact that herbarium specimens must be made. On previous trips in Mexico and Cuba we had always slighted this routine piece of work. Neither of us having been trained as botanists, we could hardly come down to earth and practical ways from the ethereal enjoyment of seeing

plants in their native habitats, from taking them home alive, from their exquisite design and beauty. We had never cared to approach plants from the angle of dead, dry stuff stored away in dark closets of a museum. How could one really learn about a plant from that dead thing? The character of a plant decidedly changes when dead; the varieties in color and manner of growth do not remain after drying. Yet we realized that our rebellion at the system would not alter it so we found it necessary to conform. We must take back the scientific proof of our findings.

And alas, what would our findings have now been worth had it not been for those early days in Bahia and Espirito Santo when we mastered our personal inclinations and pressed the finds? Although we brought back many plants alive, many of them died and from those we would have had no proof of our work. So a plant lover becomes a neophyte scientist in spite of himself.

At the end of this Brazilian expedition we found that Racine had preserved more than a thousand herbarium specimens, which, considering their bulky forms, is not a small record. The majority, of course, were bromeliads, and half of this work was left for the National Museum of Rio.

That the herbarium work was appreciated by those who know, came first in a letter from Dr. Smith which awaited us in São Paulo: "Four hundred sheets of bromels, I don't see how you and Mrs. Foster ever did it. I hope Mrs. Foster won't be holding an axe for me on account of the herbarium specimens, but I can scarcely blame her, for I know by experience what a tough job it is...If you don't have some new species in that tremendous lot of bromels, then I am the world's worst prophet."

Later back in the states Dr. M. L. Fernald, director of Gray Herbarium wrote: "I want you to realize how thoroughly we appreciate the splendid collection of bromeliads which you secured and which Dr. Smith is now working upon. The material is very fine and remarkably complete. Its scientific importance is most unusual and again I express the appreciation of the Gray Herbarium for your invaluable help."

And now, a few years later our rebellious but submissive spirits find pride in the published descriptions of our many new species. To a botanist it may be old stuff but to us it was all very exciting.

ATÉ LOGO

The news which greeted us upon our return from Paraná was that war had been declared in Europe. Germany was aggressing toward Danzig and world peace was once again tottering.

Brazilian banks called a holiday and Brazilians were lamenting the fate of their European markets.

It was a holiday for the American consulate, too, and, as so often has happened, the very day we have returned from being far out in the country, far from newspaper or mail, we found the consulate closed, and we could not get our mail. It was our American Labor Day and we have been working so hard that we had quite forgotten that laborers have a holiday.

For days we were completely absorbed in the work of wading through the great amount of herbarium material and live plants, numbering, making notes, photographing, and cleaning. And for days after that we packed plants and arranged for everything to get back to Rio, our port of departure. We were definitely going to sail on September twentieth and we had a big job ahead in Rio to finish up the hundreds of details that were necessary to get the plants safely out of Brazil. The red tape never exhausted itself. Everywhere a new yard or two of the invisible stuff turned up to be ironed out or snipped.

Arrangement after arrangement had been made about the exportation of our plants. But at the last moment the steamship could not handle our cargo of plants without the Expresso Federal delivering them to the dock. Then another company must load them on the boat, and they in turn could not deliver them until the Bank of Brazil had cleared them, and the Bank of Brazil could not clear them until the

Department of Agriculture had passed on them and the Department of Agriculture would not pass on them without the signature of approval from the committee for Scientific Expeditions. All of this after we had thought we had done everything possible to facilitate the exportation of the plants! We had known that this last signature was necessary but we thought that when we secured it everything else would follow in natural sequence but red tape doesn't run that easily.

The final windup took three full days (until the last hour before sailing) and many hundreds of milreis to clear all the obstacles of getting our plants aboard that ship. It was a final windup for us too. We were virtually nervous wrecks by the time the ship sailed, but what a relief to get on a big liner where relaxation is forced upon one and life can slow down a few paces while time seems to take a rest.

As we sailed away we knew that someday we would be returning to wonderful Brazil and that return came sooner than we had expected.

[To be continued]

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BSI Pioneer Wilbur Wood Passes Away

Wilbur Wood, one of the earliest members of the BSI, died at his home on January 20 after a rather quick decline from his relative robustness at 92.

Wilbur was an engineering graduate of Purdue University. In his engineering career he worked for various aircraft and aerospace firms. His avocation was horticulture, however, and during the depths of the depression he quit a good job in Buffalo, N.Y. to move to California because of the climate and the possibility of growing a greater variety of plants. After his retirement, he opened the Glenwood Garden Nursery which he operated for 27 years.

Very shortly after the formation of the BSI, the first BSI affiliate, the Southern California Bromeliad Society was formed. Wilbur was one of its founding members and also served as one of its earliest presidents. He was active in a number of plant organizations besides the Bromeliad Society. Among them were the Orchid Society, the Cactus and Succulent Society, the California Horticultural Society and the Rare Fruit Growers Association. He held office at one time or another in most of these groups.

Pup Removal

Odean Head

One of the neat qualities of bromeliads is that most of them will propagate themselves through vegetative offsets, known by growers as "pups". This makes it easy for us to accumulate surpluses of our favorite plants for sharing, trading, selling, keeping or doing whatever pleases us most. When our plants begin to pup we need to make some decisions about whether we want to remove the offsets or not. If so, we need to know the best time to do it and how to do it.

DECISIONS NOT TO REMOVE PUPS

If we are not particularly interested in getting as many pups as we can from a mother plant we may want to consider the possibility of leaving the pups and allowing them to form a clump. Stoloniferous plants that have stolons long enough to allow the pups to form their normal shape can create a pleasing display. Most tillandsias form pleasing clumps even when the pups are not stoloniferous. I will usually wait to split mounted tillandsias until they get very crowded.

THE BEST TIME TO REMOVE PUPS

So, when is the best time to remove pups? Pups are large enough to be removed when they have root development or when they become one-third to one-half the size of the mother plant. If the goal is to mature the pup as fast as possible, leave it on. Just be sure that it has enough room to form its normal shape and enough light to prevent leggy growth. When propagation is the main objective, take the pups off as soon as they are of adequate size. The pups will not mature as fast but the mother will produce many more pups. I prefer to let pup removal slide during the winter because it creates more pots to find space for. We also experience some dormancy in our winters so by waiting until spring it gives our newly potted pups a faster start in their root development and growth. It also helps our survival rate of pups of marginal size since they will receive more protection from extreme cold while still attached to their mother.

There are a few guzmanias and vrieseas that will only put on one or two pups which come up through the middle of the mother plant. With the small number of pups and the fact that the mother is pretty much destroyed when you harvest them, you should allow pups to be almost full sized before removing this type.

PUP REMOVAL

Removing pups can be an easy task unless you have never done it before. I have given plants to friends over the years who were not familiar with bromeliads. In most cases they came back to me for instructions when it was time to remove pups. Some would even insist that I show them before they had the nerve to try it themselves.

The pup should be severed somewhere between the pup's roots and the mother plant. Usually it is best to cut as near the mother plant as possible on pups

with little or no stolon. The pup may not have roots yet: just be sure that it is of sufficient size. Roots will form at the base of the plant (between the plant and the caudex/stem). Pups root easily when potted properly.

I use three different methods for removing pups. Most of the time I will use a pair of hand snips when they are available and there is plenty of room between the pup and mother to make the cut. Sometimes when I am in the yard without the snips and want to remove a pup I will place the thumb of one hand against the base of the mother plant and apply some side-to-side pressure on the pup with the other hand. Usually the pup will pop right off if the caudex is not too thick or hard. Be careful that you do not apply so much pressure that it breaks too close to the pup plant. When this happens you can increase your chances of saving the pup by dipping the break in a rooting hormone and letting it harden off before planting. There are times when the plant is so close to the mother that you cannot get to it with hand snips, and it does not respond to the hand removal method. In these cases you need a good sharp knife to cut it off. A serrated knife is more effective when a sawing motion is needed.

More care should be given to removing pups that grow up through the center of the plant or in the axils of upper leaves. Take a long knife with a sharp point and stick it down into the leaves until the point of the knife rests on the spot where the pup connects to the mother. Apply some pressure and with a little twisting motion try to pop the pup off. If it does not pop off after a few tries you may have to use a sawing motion to sever it. This procedure would also apply on many of the large clumps of tillandsias. *Cryptanthus* pups that grow between the leaf axils on top of the mother should be removed when of good size. A little side to side movement will cause these pups to release when they are ready. If they do not release easily, let them grow a little larger before you try again.

POTTING PUPS

The way a pup is potted plays an important role in its conformation as it matures. If we plan to grow the pup into a nice, healthy mature plant and provide its needs to do so, we would certainly want its conformation to be as near perfect as we can make it.

To start with we need to pot the pup in an upright position. This position is not always easy to determine when the pup's growth is already distorted due to crowded conditions. It is difficult to come up with a good hard and fast rule that will always apply to determine when it is perfectly upright. Take a good look at the removed pup's conformation when holding it up straight. If it already looks good you should pot it in that position. If the growth is skewed, take a closer look at the caudex just above the roots, or if there are no roots, look just above where you expect them to form. If the caudex is straight, pot the plant straight up and the conformation will correct itself.

If the caudex is crooked at this point, lean the plant in the direction that will allow the base of the caudex to be straight up. When the crook is too severe, lean the plant back a little to split the difference on the correction sought. You may want to make a further correction at a later date after some growth has occurred.

When ready to pot the pup fill the pot with mix to make it easier to hold the plant in the right position with your left thumb while adding enough mix with your right hand to completely cover to a depth just above the roots. Then press hard with both thumbs and add mix as necessary to firm the plant in the pot. This is necessary to hold the plant in place and to stimulate good root development. Dampening the mix will help you in firming the plant.

The transplanting of pups and even subsequent transplants are much easier for bromeliads than for most other kinds of plants because they are less dependent upon their root systems. In fact, many growers accumulate removed pups over a prolonged period of time before they get around to potting them. They will usually not suffer any damage so long as they can be propped up for air circulation and straight growth, and they are not allowed to become too dry. When potted properly and with sufficient moisture, new root development becomes routine during normal growing periods (warm weather). Root development during winter will be slower.

Another question often asked concerns the size of the pot to use. Not everyone will agree on the answer. Just remember that bromeliads adapted to pot culture will develop a larger, softer root system that will provide added nutrients to the plant. Usually the larger the pot, the larger the root system, which in turn will cause the plant to grow larger. Some growers try to visualize the size they want the mature plant to be and select the size pot that will attain a good balance. Other growers may prefer to intentionally put them into smaller pots to stunt growth or make the plant more compact. After the plant is mature they may want to move it to a larger pot to get a better balance. This is particularly true when entering it in a show.

Houston, Texas

Reprinted from a two-part series in the newsletter of the Houston Bromeliad Society, Vol 29 No 2 (February 1996) and Vol 29 No 3 (March 1996).

Stars and Stripes

[continued from page 155]

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Fort Myers, Florida

Reprinted from POTPOURRI, the newsletter of the Greater New Orleans Bromeliad Society, Inc. 16(3), March 1996.

REGIONAL REFLECTIONS

A Different Seed Raising Medium

John Higgins

My shadehouse is a haven for all sorts of living organisms from plants of various families to insects, birds and spiders. Native doves have taken up building their nests in hanging pots of the common birdsnest fern *Asplenium nidum*, (very appropriately named!). This has in turn raised the level of interest of our cat who is now making more frequent visits to the shadehouse in the hope of a free meal.

But this is not to do with the birds or the cat, it is about spiders and plants.

A frequent visitor is the St. Andrews' Cross Spider, *Argiope aetherea*, and it is a constant job to keep the spider webs from completely covering the pathways in the shadehouse. There are no poisons used in the shadehouse for the reason that I prefer a natural process of insect control which includes the spiders as an important element. Periodically the webs become a worry for visitors and I am obliged to at least reduce the numbers. This is accomplished very simply by taking one of the stiff branches that fall from the eucalypt trees outside and using it with a winding motion to remove the webs. A branch with a fork provides a useful tool for this purpose making it easy to gather up the web and sometimes the spider with it. The stick, with web (and spider), is disposed of by throwing it into the undergrowth below the eucalypts to become part of the general bush litter. As soon as the stick lands, the spiders disentangle themselves and run straight back into the shadehouse to begin the process all over again. This tends to make the whole activity more of a holding action and not a permanent cure. One day, while doing this job, I noticed that the web provided a light, gossamer film with a good latticework of the web surrounding the open space between the branches. Growing nearby was an unnamed *Tillandsia* which had flowered and produced seed. The pods were beginning to open and release the seed to the air so I took some of the seed and placed it on the wound web. The sticky web and the plumes of the seed were instantly united upon contact and when it was watered, this completed the process of adhesion. The stick was hung up with the seed and web at the lower end. The shadehouse is watered automatically with timer controlled sprays which operate for 10 minutes in the morning and a further 10 minutes in the early evening on each alternate day. No other watering was provided to the seeds and they were left to this process and forgotten until a few days ago. An inspection of the branch showed that most of the seeds had germinated and a large number of very healthy seedlings are attached firmly to the gossamer mat provided by the web. The web has taken on the texture of a light dry silk layer and removal of the seedlings based on a preliminary trial will present no problem when they are a little bigger.

I am pleased that the industry of spiders can be put to good use in this way and I won't feel so guilty when I have to destroy their webs in the future.

Reprinted from Bromeliaceae, Volume 28, No. 3 (May/June 1995), the bulletin of the Bromeliad Society of Queensland.

A Quick Guide to Bromeliad Problems

Peniel Romanelli

Most bromeliads are fairly trouble-free, but problems do crop up. Some of the more common ones, along with some possible causes, are listed below.

PROBLEM	LIKELY CAUSES
Pale, bleached appearance	—Too much sun
Poor color	—Too much shade —Fertilizing (Avoid fertilizing neoregelias and billbergias)
Long, floppy leaves	—Too much shade
Brown or yellow leaf ends or edges	—Plant grown too dry —Cold or heat damage —Poor ventilation —Mix or water has wrong PH (most bromeliads like an acidic mix)
Brown spots	—Watering in full sun —Too much light —Cold or heat damage —Chemical burns (possibly caused by copper or arsenic from treated wood or misuse of pesticides. Never use oil based pesticides or those containing copper or arsenic.
Quilling (inner leaves stick together)	—Little or no water in cup
Brown or mushy leaves at base	—“Wet feet” as a result of overwatering, potting too deep, or bad drainage.
Holes in leaves	—Snails, slugs, insects —Watering in full sun

Center leaves loose, withered brown, or whitish and soft, with a smell that would choke a buzzard.

—Crown rot; possibly a result of stagnant water or poor ventilation.

Crown rot can be treated by pulling out the loose leaves, thoroughly rinsing the cup with clean water, and filling the cup with a good systemic fungicide for about 1 hour. Drain, let the plant dry overnight, then refill with clean water. The plant probably won't bloom, but you should get pups.

Reprinted from the Bromeliad Advisory, bulletin of the Bromeliad Society of South Florida, 39(2), Feb 1996.

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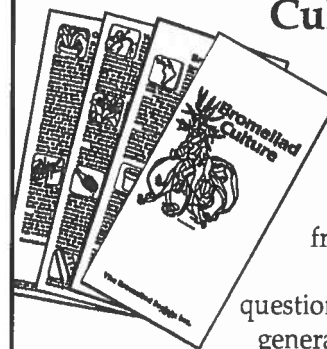
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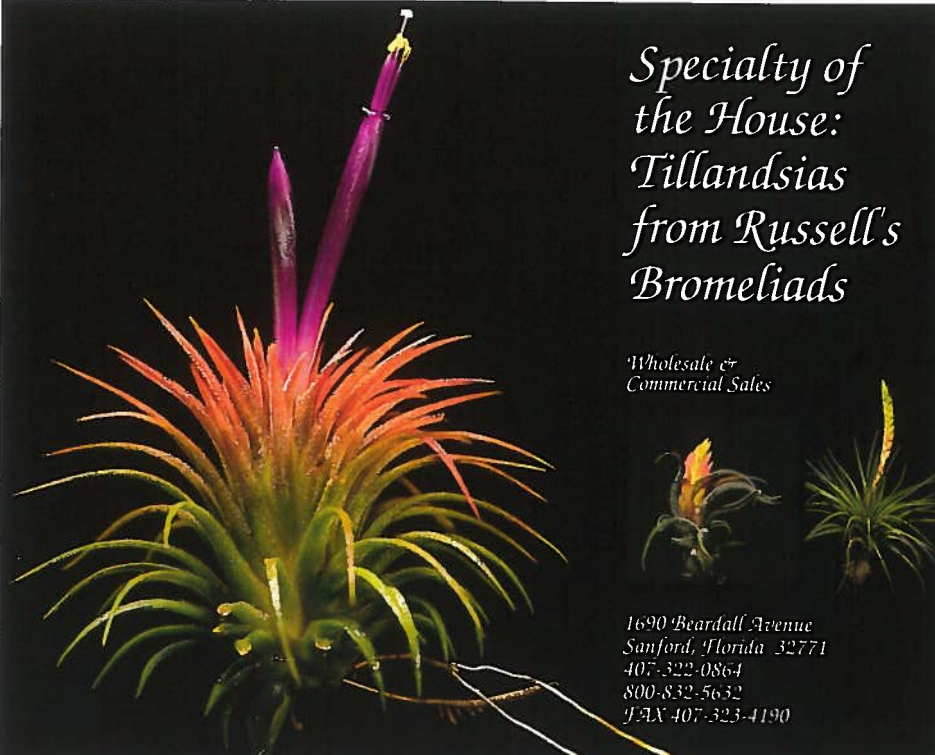
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Membership and subscriptions to the JOURNAL: Please see inside front cover.

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: Sally Thompson, 29275 N.E. Putnam Rd., Newberg, OR 97132.

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World Conference: Thomas W. Wolfe, 5211 Lake LeClaire Road, Lutz, FL 33549.



Billbergia Space Rocket, a hybrid made by Bob Spivey, first flowered in 1993. The parents are *Billbergia viridiflora* 'Rubra' × *Billbergia amoena viridis*.

Photograph by Bob Spivey

Calendar

- 3–4 Aug The South Bay Bromeliad Associates will hold their 1996 bromeliad show and plant sale at South Coast Botanical Gardens, 26300 South Crenshaw Boulevard, Palos Verdes Peninsula, California. The show hours are from noon to 4:30 PM on Saturday and 10 AM to 4:30 PM on Sunday. Plant sales on both days are from 10 AM to 4:30 PM. A \$5.00 admission fee to the botanical gardens includes price of admission to the show. Contact: Bryan Chan 818-787-4265
- 17 Aug The Seminole Bromeliad Society will hold its ninth annual Bromeliad Fantasy in the auditorium of the Volusia County Agriculture Center located on State Road 44 just east of I-4 in Deland. There will be educational programs, a non-standard bromeliad show, and a membership plant sale. Admission is free. Hours are from 9 AM to 4:30 PM. Contact: Art Hyland, 2200 Pine Hill Pl., Orange City, FL 32763
- 24–25 Aug The Bromeliad Society of Greater Chicago's twelfth annual Standard Bromeliad Show and Plant Sale will take place at the Chicago Botanical Gardens in Glencoe, Illinois. Hours are from noon to 5 PM on both days. Contact: Jack Reilly 217-486-5874
- 24–25 Aug The Greater New Orleans Bromeliad Society's 24th Annual Standard Bromeliad Show will be held at Lakeside Mall in Metairie, LA. Hours are from 1 PM to 6 PM on Saturday, and From 11 AM to 5 PM on Sunday. Contact: Mrs. C. Hertz, 418 S. Solomon St., New Orleans, LA 70119
- 26–29 Sep 1997 The WESTERN BROMANZA, Australia's ninth annual Bromeliad Conference, will be hosted by the Western Australian Bromeliad Society in Perth. Details of hours and location to be supplied in later issues of the JOURNAL.

Show chairmen and newsletter editors are requested to send notices of their society events to Chet Blackburn, 720 Millertown Road, Auburn, CA 95603