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Cover photographs

Front—*Tillandsia turquinensis* in Cuba**.** Photo by Carlos Morici.
Rear—The Doomed Sentinel. Monocarpic *Tillandsias utriculata* looks out over a Florida swamp. Photo by Ken Marks.

Publication Information: The Journal is published bimonthly by the Bromeliad Society International. All scientific articles are peer reviewed, and author guidelines are available from the Editor. Authors are requested to delare any article they have already, or intend to, publish elsewhere.

Editorial

In This Issue

The major event in the editorial department is the agreement by Elton Leme to serve on the Editorial Advisory Board - Elton has been reviewing articles for us for some time now, and we are honored to have him join us officially.

In the Membership Survey we discuss the handling of member subscriptions, and then conclude with some news of affiliated societies.

Scientific

Lucia Hechavarria provides an overview of tillandsia in Cuba, based on her paper presented to the Tillandsia Symposium at the World Conference in June. From a review of past indexes, it appears that Lucia includes the first photos of *T. praschekii* and *T. fasciculata* var. *clavispica* to be published in the Journal. In a second paper from the Tillandsia Symposium, Walter Till and M. Barfus update their work reconstructing tillandsioidea evolution using molecula data plus observations of plant material. For non-scientific readers, it would be a good idea to review David Benzing's general article in our July-August 2006 issue before reading this technical update. For those growers who have grown found of *Racinaea* and *Viridantha*, the prognosis for your plant labels is not good!

Bromeliad pollination in nature is not a widely-kniown subject, and Claudia Hornung-Leoni reports on nectar production in *Pitcairnea imbricata* on page 260.

Cultivation

Herb Plever is renowed for his knowledge of indoor cultivation of bromeliads, and we reprint from the December, 2006 issue of *Bromeliana* his ideas on how to observe and react to varying conditions within the home environment. Newer growers can profit from carefully observing how Herb goes about the never-ending search for knowledge that can make growing your plants such fun.

General Interest

Francisco Oliva-Esteve has published a number of excellent bromeliad books, and his latest publication is advertised on page 273. Now is your chance to nominate fellow members to serve as BSI directors, and the call for nominations is on page 274. Derek Butcher reviews on page 275 a new CD-based work, the Encyclopaedia of Bromeliads version 1.0 published by the Dutch-Belgian Bromeliad Society. On page 276 Lynn Hudson enthuses over the next World Bromeliad Conference to be held "Downunder" [Australia] and on the next page President Brehm outlines the procedures for USA members wishing to bring plants back from that Conference.

Ken Marks is still out hunting Florida bromeliads, and Part 3 of his report starts on page 279, then we close with a report on the Bromeliad Society of Baton Rouge Show 2006, and the usual Events Calendar.

Our Membership Survey

Last issue I started discussing the publication schedule, and the timetable for getting it back on time. In the member survey there were a number of concerns about communication with the BSI on membership issues, and failure to send out renewal notices. Many of these problems have been caused by the late delivery of Journals, which make it very difficult for the membership secretary to do his job.

I have discussed recent progress with the new membership secretary, Dan Kinnard. Dan has extensive computer experience, and he has tightened up the systems for processing subscription and renewal payments. As a result he is now caught up on the day-to-day operations involved with members interests —so we hope you are now receiving better service from us.

We do have continuing problems when members change addresses and don't tell us, so please drop a note to Dan if you move. Every time the post office returns a Journal it charges the BSI about $3. Email addresses are an even bigger problem! When I started as the new editor I sent an email to every address in the membership directory —and 30% (nearly one third) of the addresses were wrong and the mail returned to me! Dan is having the same problem, so please remember to send your new email address to membership@bsi.org if you change it.

A word for new members joining via. the internet. Some have been expecting to receive their member password the same day they join. We can't do that!. Many internet businesses and larger non-profit organizations who supply goods and memberships over the internet can afford sophisticated automatic systems that process credit cards instantly (well, within up to two minutes usually) and then instantly send computer-generated replies with confirmations and passwords. The BSI is staffed by volunteers who have to do all this processing by hand in their "spare" time, and that includes banking credit card payments then waiting for the Banks to clear them over a day or two before we can process your order and send you an email with your password.

Renewals can be handled faster and more efficiently by our website system, compared to mail, so for those members with internet access this is the preferred option. It is not the only option, postal mail is fine if you prefer it.

We do not all have computers, and we are not all connected to the Internet. I know that, and we certainly do not want those of you without Internet, email, or computers to feel left out. A number of you feel that, and said so in the survey. It is a fact of life that email and internet are becomming more and more pervasive these days. But don't think we do not want to provide services to those of you without that access. Just write to the Editor if you want to contact one of our authors, or anything else that you want to know, please. I are happy to communicate by mail, phone or fax.

Affiliates News

Members of the Saddleback Valley Bromeliad Society like to travel, it seems. In July this year a number of them travelled to Peru to see bromeliads in their native habitat, and they are planning more bromeliad adventures in 2007. These habitat trips are organized by "Plant Adventures" and their 2007 schedule is Costa Rica May 5-13, Peru August 11-20 , also Guatemala February 2-10, 2008. I have no experience of them, but there are references on their website, for example C.D. of San Louis Obispo CA writes "I had one of the great experiences of an experience-laden life." Their website is www.plantadventures.com but sadly, no postal address.

The Bromeliad Society of New Zealand is taking out 10 BSI subscriptions and balloting them to their members (to be eligible for the membership ballot, one has to answer correctly the question: who was the first president and editor of the BSI. Do you know?) They are also holding a fund-raising night where donated plants etc. will be auctioned with proceeds going to the BSI. We certainly appreciate their generous support.

The Bromeliad Society of South Florida hosted the Florida Counciil of Bromeliad Societies 2006 Bromeliad Extravaganza on September 30. Record sales were helped by a 1½ page article in the South Florida Sun-Sentinel featuring photos of their President Jose Donayre's bromeliad collection. Thats the value of publicity! (see 56(1) page 9)

Bromeliad Society International. Membership Rates

United States Membership (includes bulk mail rate—first class add $10 per year)

	1 Year	2 Years	3 Years
Individual	$30	$58	$85
Dual	$35	$68	$100
Society	$30	$58	$85
Institution	$30	$58	$85
Commercial	$60		
Fellowship	$45		
1st class mail	+$10	+$20	+$30

International Membership (includes Airmail delivery)

	1 Year	2 Years	3 Years
Individual	$40	$78	$115
Dual	$45	$88	$130
Society	$40	$78	$115
Institution	$40	$78	$115
Commercial	$70		
Fellowship	$55		

Life Membership (*one time only fee*) $800.

Payment by check or money order payable to The Bromeliad Society International, USA members US Banks and US funds only. International members US funds only; US domestic checks, international money order, or foreign bank cheques. Credit card payments and sign-ups/renewals may be made online at www.bsi.org. Please send mail transactions to: Dan Kinnard, BSI Membership Secretary, 6901 Kellyn Ln, Vista, CA 92084-1243, USA.

Tillandsia L. (Bromeliaceae) in Cuba: an overview.

Lucia Hechavarria Schwesinger[1].

INTRODUCTION

Cuba, the largest island of the Greater Antilles, is located in the Caribbean, one of the hottest hotspots in the world (Myers, Mittermeier et al. 2000). The Cuban flora is the richest in the Caribbean region and it is considered one of the ten richest of the world insular ecosystems. It is comprised of ca. 7000 species (Vales, Álvarez et al. 1998) and it is characterized by a high degree of endemism (approx. 50–53%). More than the 30% of the Cuban flora is considered threatened according to IUCN (2001). The insular condition of Cuba makes its ecosystems highly vulnerable to habitat destruction and invasion of exotic species. The bromeliads are represented in Cuba by three subfamilies, 11 genera and 50 species. The subfamily Tillandsioideae is the most diverse and within this subfamily *Tillandsia* is the richest genus.

These plants are commonly known as Curujey (León 1946; Roig 1965; Roig 1974), which is, according to (Pichardo 1876), an Indian word. If the flowers are blue then they are called Flowers of San Pedro but when they are rosy the name is Flowers of San Juan. In the case when flowers are yellow the plants are known as Hen faeces. (Sauvalle 1873) compiled several common names for *T. usneoides*: Old Beard, Spanish Beard, Guajaca, or Guajaquillo or Guajaquilla (Roig 1965), and air flowers for *T. polystachia* as well as Mexican Agave for *T. recurvata*. In addition, *T. utriculata* is called white Curujey whereas *T. balbisiana, T. fasciculata, T. setacea* and *T. tenuifolia* are known as Beautiful Curujey (Roig 1965).

Five out of the nine use categories proposed by Bennett (2000) for the bromeliads are reported for the Cuban species of *Tillandsia* (fiber, forage, medicine, ornamental, ritual and commercial). However, compared with other parts of the continent like Mexico or South America (Beutelspacher 1989; Bennett 2000; Wolf and Konings 2001), the use of the bromeliads in general is not so widespread among our population.

Smith & Downs (1974,1977,1979) provided the most recent taxonomic treatment of Cuban Bromeliaceae where most of the species previously described are included under the synonymy of others. They registered 27 species and five varieties of *Tillandsia*, none endemic. After the publication of this monograph, additional research has been conducted and published, and consequently, many changes in nomenclature have taken place. In addition, several new species have been discovered in Cuba (*T. praschekii* Ehlers & Willinger (1989) and *T. turquinensis* Willinger & Michálek, (Willinger 1989) and

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throughout the Caribbean region (Luther & Sieff 1994 & 1997; Luther 2001 & 2002). How many and which species of *Tillandsia* are occurring at present in Cuba? Which vegetation units inhabit them? Which is their conservation status?

After the revision of more than 1500 Cuban and Antillean *Tillandsia* specimens deposited in Cuban and foreign herbaria, the revision of the original literature, the preceding treatments of the genus, as well as many field trips conducted since 1998, the following taxa are reported for Cuba: *T. argentea* Griseb., *T. balbisiana* Schult. & Schult.f., *T. bulbosa* Hook., *T. butzii* Mez, *T. canescens* Sw., *T. capitata* Griseb., *T. compacta* Griseb., *T. complanata* Benth., *T. deppeana* Steud., *T. elongata var. subimbricata* (Baker) L. B. Smith, *T. excelsa* Griseb., *T. fasciculata var. clavispica* Mez, *T. fasciculata var. uncispica* Mez, *T. fasciculata var. venosispica* Mez, *T. fendleri* Griseb., *T. festucoides* Brongn. ex Mez, *T. flexuosa* Sw., *T. hotteana* Urb., *T. juncea* (Ruiz & Pav.) Poir., *T. paucifolia* Baker, *T. polystachia* (L.) L., *T. praschekii* Ehlers & Willinger, *T. pruinosa* Sw., *T. recurvata* (L.) L., *T. schiedeana* Steud., *T. setacea* Sw., *T. tenuifolia* L., *T. tephrophylla* Harms., *T. turquinensis* Willinger & Michálek, *T. usneoides* (L.) L., *T. utriculata* L. y *T. variabilis* Schlecht. The first report of *T. butzii* in Cuba, the solution to the complex *T. fasciculata* in the Cuban archipelago and their new nomenclatural treatment, as well as the revalidation of *T. tephrophylla* and the recognition of *T. capitata* as an endemic species are the main novelties of this new taxonomical treatment (Hechavarria inedited).

Figure 1. *Tillandsia canescens*. Photograph by Ariel Rodríguez Gómez.

According to Borhidi (1991), in Cuba there are nine main vegetation groups or units. In all of them the genus *Tillandsia* is represented (Hechavarria, Oviedo et al. 2002). From the see to the mainland we found the coastal vegetation first, where the Antillean species *T. argentea* and the Cuban endemic *T. turquinensis* (Fig. 8 and front cover), together with *T. balbisiana*, *T. fasciculata* var. *clavispica*, *T. flexuosa*, *T. paucifolia*, *T. recurvata*, *T. schiedeana*, *T. usneoides* and *T. utriculata* are sharing the same habitat. In the freshwater vegetation formation *T. fasciculata* var. *clavispica* (fig. 2) is very abundant, but also are present the species *T. balbisiana*, *T. bulbosa*, *T. festucoides*, *T. juncea*, *T. polystachia*, *T.*

Figure 2. *Tillandsia fasciculata* var *clavispica*. Photograph by Brian Sidoti.

Figure 3. *Tillandsia deppeana*. Photograph by Nilia Cuéllar Araújo.

pruinosa, *T. setacea*, *T. usneoides*, *T. variabilis* y *T. utriculata*. In the Savannas and grasslands the richness of *Tillandsia* species is low; confined to the species *T. balbisiana*, *T. flexuosa*, *T. recurvata* and some specimens of T. *fasciculata* var. *clavispica*.

In Cuba the natural coniferous forests are restricted to the western and eastern extremes of the island. In Pinar del Río, western Cuba these forests are growing on siliceous sands where the species *T. balbisiana*, *T. flexuosa*, *T. paucifolia* and *T. recurvata* are present. Also we can find this typical vegetation growing on serpentine soil where *T. bulbosa* and *T. polystachia* are very common species. Nevertheless, in eastern Cuba, these forests are growing on acid soil, over the 600 m altitude, where the humidity and precipitation levels are very high and where the species *T. balbisiana*, *T. bulbosa*, *T. excelsa* (fig. 5),*T. fasciculata var. clavispica*, *T. fendleri* (fig. 4), *T. setacea* and *T. tenuifolia*.

In the dry forest and shrubwoods appears the xerophytic and mesoxerophytic species: *T. balbisiana*, *T. fasciculata var. clavispica*, *T. flexuosa*, *T. paucifolia*, *T. recurvata* and *T. utriculata*. *T. fasciculata var. clavispica* and *T. utriculata* have an important role in the hydrological control in this type of vegetation and serve as refuges to many little animals such as frogs and insects.

Figure 4. *Tillandsia fendleri*. Photograph by Ariel Rodríguez Gómez.

Figure 5. *Tillandsia exclesa*. Photograph by Ariel Rodríguez Gómez.

The tropical karstic forest is one of the biggest vegetation units in the island. More than the 60% of the Cuban soil is composed of metamorphic rocks where complexes of vegetation are growing. The typical Mogotes of Pinar del Río constitute the habitat of the saxicolous species *T. praschekii* (fig. 7), a Cuban endemic, *T. canescens* (fig. 1), *T. capitata*, *T. fasciculata var. clavispica*, *T. fasciculata var. uncispica* and *T. tephrophylla*. In Central Cuba, these karstic highs sheltered the species *T. butzii* and *T. deppeana* (PHOTO 13), which make special the biogeographic relationship between Cuba and Central America. The semideciduos forests are one of the vegetation that compose this complex and where we can found *T. balbisiana*, *T. festucoides*, *T. fasciculata var. clavispica*, *T. juncea* (fig. 6), *T. pruinosa*, *T. setacea*, *T. recurvata*, *T. usneoides*, *T. utriculata* y *T. variabilis*. *T. fasciculata var. clavispica* and *T. variabilis* are the only *Tillandsia* species that inhabit the ever green forests in Cuba, vegetation that also compose the karstic vegetation complex.

The Rain Forests are limited to the higher mountain range in central and eastern Cuba where the *Allardtia* species are found in Cuba: *T. compacta, T. complanata, T. deppeana*, *T. elongata var. subimbricata, T. excelsa*, *T. fendleri* and *T. hotteana*. These species make special the biogeographic relationship between Cuba and northern South America. This extreme restriction may be related to the marine incursions of the Quaternary

period, when the present high mountains of Cuba were island refuges and became retreats of biodiversity (López 1998).

The different Plant Red Lists (IUCN 1994; IUCN 1996; IUCN 1998; IUCN 2000) and the "Catálogo de Plantas Cubanas Amenazadas o Extintas" (Borhidi and Muñiz 1983) do not register any threatened *Tillandsia* species for Cuba. Recently, (Berazaín, Rodríguez et al. 2005), considered as vulnerable *T. pruinosa*; I do not agree with this treatment, but suggest as vulnerable those Antillean endemic species that have a local and restricted distribution, and scarce and fragmented populations (*T. argentea*, *T. canescens*, *T. capitata*, *T. praschekii* and *T. turquinensis*). The other species that have the same population characteristics, but have a more wide distribution in the Neotropic are considered as rare (*T. butzii*, *T. complanata, T. deppeana, T. elongata var. subimbricata*, *T. fasciculata var. uncispica*, *T. fasciculata var. venosispica*, and *T. hotteana*). *T. utriculata* is nowadays frequently used as an ornamental and in the Afro-Cuban religion rituals. The species suffer an indiscriminate harvesting from the wild that could cause the local extirpation of its population in the forests near Havana City. That is why we considered the species as vulnerable. An educational program must be designed for the protection of the species and for developing a sustainable use of these plants by the Cuban citizens.

Figure 6. *Tillandsia juncea*. Photograph by Nilia Cuéllar Araújo.

Acknowledgments

I thank the BSI for the invitation and financial support to participate in the *Tillandsia* Symposium, especially to: Joyce Brehm, Sue Sill, Brian Sidoti, Edward Doherty, Greg Brown, Bruce K. Holst and Harry Luther.

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To all the staff of IES, and HAC, and to Pedro Herrera for the revision and correction of the document as well as the English translation.

Figure 7. *Tillandsia praschekii*. Photograph by Lucia Hechavarria Schwesinger.

Figure 8. *Tillandsia turquinensis*. Photograph by Carlos Morici. See the front cover.

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Progress towards a new classification of Tillandsioideae

W. Till[1] and M. H. J. Barfuss

Introduction

The latest available monograph of Bromeliaceae (Smith and Downs 1974, 1977, 1979) classifies the family into three subfamilies among which Tillandsioideae comprises six genera. These are defined by the position of the ovary (superior vs. semi-inferior in *Glomeropitcairnia*) and seed appendage morphology (straight and basally elaborated vs. folded and apical in *Catopsis*) while the remaining four genera are characterised mainly by corolla morphology: free petals with basal appendages in *Vriesea*, the same but without appendages in *Tillandsia*, fused petals with appendages in *Mezobromelia* and the same but unappendaged in *Guzmania*. A few exceptions from these definitions have been found in *Vriesea* species that are without appendages or with basally fused petals. Thus the generic definitions provided by the last monographer were soon questioned. It has been demonstrated that especially petal appendages are developed late in ontogeny (Brown and Terry 1992) and that perhaps single mutations are sufficient to suppress their development. Consequently such characters are of little value to define genera.

More than 15 years ago molecular data first challenged Smith and Down's notion...

In the past two decades molecular phylogenetic studies have revolutionised the classifications of living organisms and have demonstrated that numerous characters hitherto used by taxonomists have either evolved several times in a parallel way or have independently been lost. In both ways relationships have been suggested without a natural basis, and those classifications are now recognised to be artificial.

Bromeliaceae are no exception. More than 15 years ago molecular data first challenged Smith and Down's notion that Bromeliaceae consists of just three subfamilies (Ranker et al. 1990) and *Brocchinia* was soon recognised as an early diverging lineage (Terry et al. 1997a) being sister taxon to the rest of the family. In Tillandsioideae, *Catopsis* and *Glomeropitcairnia* were identified as sister taxa to the rest of the subfamily which was called the „core" group (Terry et al. 1997b). It is this latter assemblage of genera which is still not sufficiently understood.

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Material and methods

To resolve relationships in Tillandsioideae and to define natural genera we have conducted a comprehensive molecular study at the Institute of Botany of the University of Vienna which resulted in more than 100 studied tillandsioid species (Barfuss et al. 2005). Attention was paid to include as many generic type species as possible and to select representatives from all morpholgically divergent groups. In this attempt we succeeded in most but not all cases. We focussed on the chloroplast genome which is not responsible for morphological characters and is therefore free of these functional constraints, and selected cpDNA regions with different rates of evolution (some conservative vs. more rapidly evolving ones). Technical details are found in Barfuss et al. (2005).

Results

Our results (Barfuss et al. 2005) confirm the sister taxon position of *Catopsis* and *Glomeropitcairnia* to the rest of the subfamily but they also demonstrate that none of the genera of Smith and Downs (1977) assigned to the „core group" by Terry et al. (1997b)

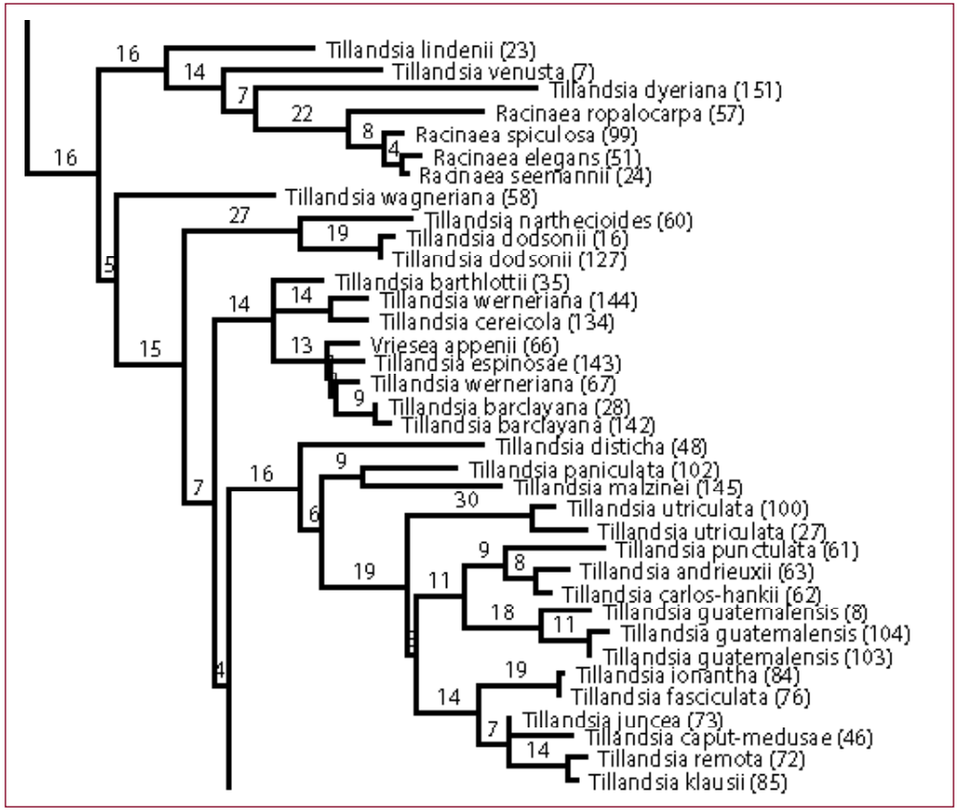

Figure 1. Section of Phylogram containing *Tillandsia* species.

is monophyletic, i.e., represents a natural group, in the circumscriptions provided by the monographer. *Vriesea* in our analysis is split into an East Brazilian and an Andean clade, but the two sections of Smith and Downs (1977) are not supported. *Alcantarea* is monophyletic and Grant's (1995) resurrection of this genus is justified. *Werauhia* is monophyletic with *Vriesea splendens* and *V. monstrum* in basal position. However, using an enlarged taxa set (Barfuss, unpubl.) these two species are removed from *Werauhia* and corroborate the monophyly of the latter. This is a good example of how insufficient sampling can influence the results. *Guzmania* appears to be monophyletic with *Sodiroa* well nested within in a terminal position. However, *G. bakeri* together with *Mezobromelia hutchisonii* froms a sister clade to *Guzmania* plus *Tillandsia* s. l. Again, sampling is insufficient in both genera involved and the pattern may change, but *Sodiroa* is not supported as a separate genus.

Tillandsia is the most complex genus and none of its subgenera is supported by the

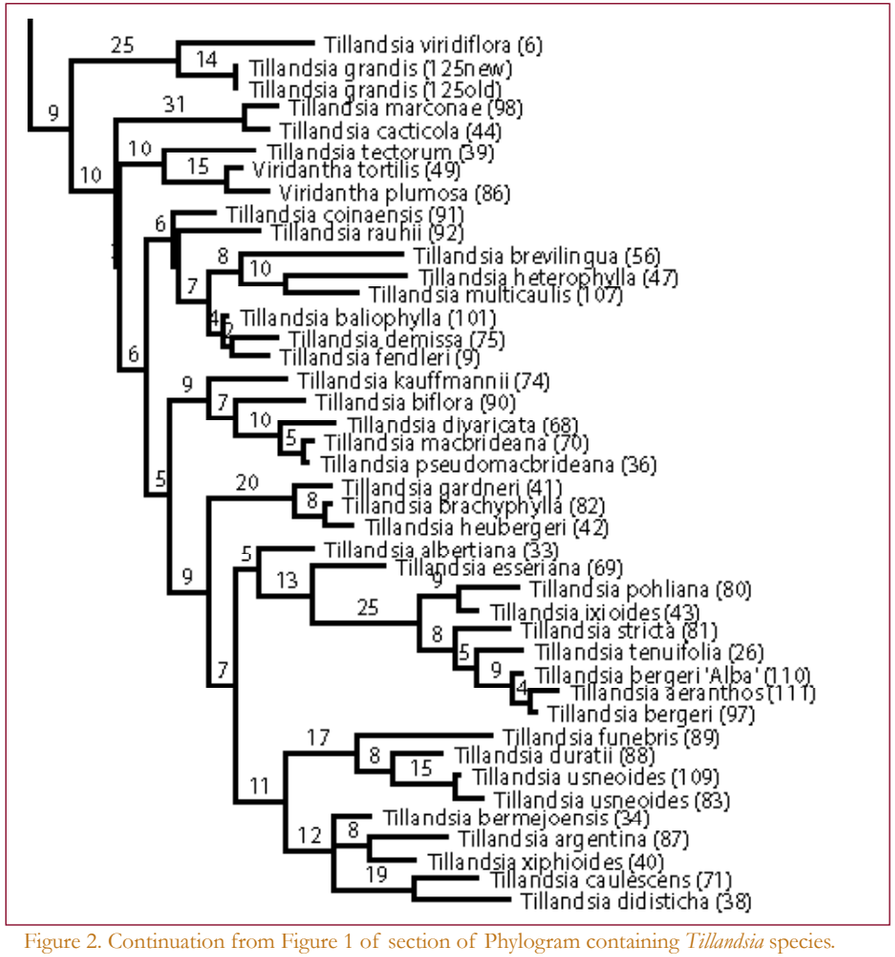

Figure 2. Continuation from Figure 1 of section of Phylogram containing *Tillandsia* species.

molecular data. Relative length of stamens and styles to the corolla, petal shapes and filament plications—characters which have been the basis for defining the subgenera of Smith and Downs (1977)—all seem to be adaptations to pollinators rather than reliable taxonomic characters. Figs. 1 and 2 (continuation of fig. 1) show the fraction concerning *Tillandsia* from a phylogram of one of several most parsimonious trees generated from 136 accessions. Albeit in general the same branching pattern as in Barfuss et al. (2005) is visible some exceptions are remarkable. For example, *T. viridiflora* is no longer sister taxon to the rest of the genus but is nested within it in a central position together with *T. grandis*. However, the remaining two species of *subgen. Pseudalcantarea* are found in completely different branches: *T. paniculata* at the basis of a clade representing nearly exclusively members of *subgen. Tillandsia* while *T. baliophylla* comes close to *T. fendleri* within a green-leaved *subgen. Allardtia* clade. These results are in conflict with the classification of *subgen. Pseudalcantarea* proposed by Beaman and Judd (1996).

Within *Tillandsia,* sensu lato mesic members of *subgen. Phytarrhiza* including *Racinaea* constitute the earliest diverging clades, far remote from the xeric members. *T. wagneriana* stands as a separate clade and this position is supported by the „wagneriana seed type" (Groß 1988). Xeric members of *Vriesea*, which have recently been classified under *Tillandsia*, form a clade of their own near *subgen. Tillandsia* which is the most homogeneous clade with the exception of *T. rauhii* and *T. multicaulis* which are nested within species of *subgen. Allardtia*. *T. marconae* and *T. cacticola* as well as *T. tectorum*, *Viridantha plumosa* and *V. tortilis* form separate clades branching off before a terminal bulk which contains the majority of *subgen. Allardtia*, all members of *subgen. Anoplophytum*, xeric species of *subgen. Phytarrhiza*, and *subgen. Diaphoranthema*. It is evident from figs. 1 and 2 that none of the subgenera is monophyletic, and new groupings have to be defined in order to name natural taxa. *Viridantha* (Espejo-Serna 2002) appears to be monophyletic with the Andean *T. tectorum* in sister taxon position but more taxa need to be studied.

We have started to map onto our phylogenetic tree characters of which we are fairly convinced that they are not, or only to a moderate degree, subjected to adaptive constraints: pollen, stigma, and ovule morphology. Our results exhibit some very interesting trends and make us optimistic that combinations of new or under-utilised morphological characters can define natural groups as they are increasingly emerging from the molecular data.

Catopsis and *Alcantarea* are well supported by the „catopsis-„ and „alcantarea-pollen type" respectively. Both have massive and more or less clear cut aperture margins but no exine fragments on the aperture itself. By contrast, the most common pollen is of the „diffuse type" where the exine is irregularly dissolved at the aperture margins and fragments of the reticulum are spread over the aperture. This kind of pollen is typical for *Glomeropitcairnia*, *Mezobromelia*, and most *Guzmania* (a few species have inaperturate pollen), in Andean *Vriesea*, in former xeric *Vriesea* and in *subgen. Tillandsia*. It is less frequent in *subgen. Allardtia*. Similarly common is the „insulae-type" which is typical

for East Brazilian *Vriesea*, *Werauhia*, *T. appenii*, and many members of *subgen. Allardtia* (including the *Viridantha-T. tectorum* clade) and *Anoplophytum*. In the latter subgenus plus in *T. alberiana* and *T. xiphioides* the „operculum type" occurs. *T. viridiflora* and *T. grandis* have their own „Pseudalcantarea-type" in which the aperture is covered by a flat and continuous reticulum thus approximating to the inaperturate pollen. Morphological progressions appear to go from firm aperture margins and naked apertures toward dissolution of the aperture margins and to covered apertures via fragments of reticulum and exine insulae which finally form a compact operculum (like a shield), or to aperture closure (inaperturate). The different pollen types are not randomly distributed but are highly group specific in the lower parts of the phylogram and less so in the terminal parts.

Stigma morphology is another promising set of morphological characters, for terminology see Brown and Gilmartin 1984, 1989. *Catopsis* is characterised by simple-erect stigma branches which may somewhat twist and then resemble the conduplicate-spiral type. *Glomeropitcairnia* has convolute-blade stigmas like East Brazilian *Vriesea* and *Alcantarea* but with less pronounced papillae. By contrast, Andean *Vriesea* has simple-erect or conduplicate-spiral stigmas, those of *Werauhia* are cupulate (a cup shaped simple-erect stigma lacking papillae). *Mezobromelia* and *Guzmania* are very similar with simple-erect stigmas, only few species of the latter have convolute-blade stigmas. In *Tillandsia* s. l. the coralliform stigma stype appears to be unique for mesic members of *subgen. Phytarrhiza* (but see also under xeric members!). As far as studied former grey *Vriesea* and *subgen. Tillandsia* uniformly exhibit conduplicate-spiral stigmas (*T. malzinei* excepted) with simple-erect ones. Stigmas of *T. viridiflora* and of *T. grandis* are conduplicate-spiral. In subgenera *Allardtia*, *Anoplophytum*, and *Diaphoranthema* and in xeric members of *sugben. Phytarrhiza* the simple-erect stigmas prevail. However, it should be stressed that this stigma type is likely to be a heterogeneous assemblage including simplifications of the convolute-blade, the conduplicate-spiral, and of the coralliform types. Although in *T. latifolia* the stigma lobes have the shape of a shoehorn and are simple-erect in the original sense (Brown and Gilmartin 1984), stigma lobes of xeric members of *subgen. Phytarriza* and of *subgen. Diaphoranthema* have lateral auricles suggesting that these stigmas actually are strongly simplified coralliform ones. It is also often hard to decide whether a stigma is still simple-erect or already conduplicate-spiral or the reverse. However, the trends are clear and in combination with other characters stigma morphology is likely to be of help in defining genera.

Finally we compared ovule morphology with our molecular data. *Glomeropitcairnia* has ovules with extremely long slender appendages on both ends which is a unique situation in the subfamily. Similarly outstanding are the ovules of *Catopsis* which are usually chlorophyllous and bear a longitudinally divided apical coma which develops into multicellular folded hairs in fruit. In the „core group" ovule appendages, if present, are always apical and undivided. In *Alcantarea* these are distinctly longer than the ovule itself. In East Brazilian *Vriesea* appendages are as long as the ovule or somewhat shorter,

and in Andean *Vriesea* the appendages are lacking or are minute as in some *Werauhia* species. *Guzmania* and *Mezobromelia* are uniform in the absence of apical appendages and their ovules are usually slenderly cylindric. Ovules of mesic members of subgen. *Phytarrhiza* and of *Racinaea* are strikingly similar to those of *Guzmania* and *Mezobromelia*. In *subgen. Tillandsia* appendages are as long as the ovule itself *T. malzinei* excepted which is lacking the appendage. Xeric former-*Vriesea* have appendages somewhat shorter than the ovule itself and contrast with *subgen. Tillandsia*. *T. viridiflora* has a minute appendage while that of *T. grandis* is about as long as the ovule. *T. marconae* and *T. cacticola* have short appendages like the xeric members of *subgen. Phytarrhiza* and *subgen. Diaphoranthema*, all being different from the unappendaged ones in mesic members of *subgen. Phytarrhiza*. In subgenera Allardtia and Anoplophytum distinctly to short appendaged ovules are the rule but some species lack appendages. Like in the previous characters, some clades, especially those in the lower part of our phylogenetic tree, are well corroborated by ovule morphology but significance decreases in the upper portion of the phylogram.

Proposed genera *Racinaea* and *Viridantha* are not supported...

These preliminary data demonstrate that there are morphological characters suited to define natural entities at the generic level. We need more taxa to be studied to strengthen the phylogenetic backbone and we need to complete the morphological datasets. There are more promising characters like seed morphology (Groß 1988), stamen morphology and filament insertion at the anther, petal appendage morphology, stigma papillae etc. However, some of these characters should be re-evaluated before being used for taxonomy

Conclusions

Several published molecular phylogenies of subfam. Tillandsioideae clearly demonstrate that the classification in the latest monograph is artificial. Traditional morphological characters fail to define the clades emerging from the DNA based studies. While *Catopsis* and *Glomeropitcairnia* as genera are out of discussion and *Alcantarea* and *Werauhia* increasingly are corroborated, *Vriesea* is clearly separated into an East Brazilian and an Andean clade, the boundaries between *Mezobromelia* and *Guzmania* fade, and *Tillandsia* s. l. remains to be the most critical group. Proposed genera *Racinaea* and *Viridantha* are not supported in their current circumscriptions, and former xeric *Vriesea* fall into *Tillandsia* s. l. but constitute a separate clade. From the six subgenera currently classified under *Tillandsia* s. l. only *subgen. Tillandsia* forms a rather homogeneous clade, all others are split. *Subgen. Allardtia* is located in the upper portion of our phylogram and includes *subgen. Anoplophytum*, the xeric members of *subgen. Phytarrhiza*, and *subgen. Diaphoranthema*, its type species *T. guatemalensis*, however, is firmly nested within subgen. *Tillandsia*. This makes *Allardtia* an obligate synonym of *Tillandsia*. *Subgen. Phytarrhiza* is split into five clades in our analysis and best indicates the dramatic rearrangement

needed in *Tillandsia* s. l. However, no nomenclatoric changes are recommended before a significantly higher number of taxa is studied and a more balanced sampling of the „core group“ has been made, including all generic type species..

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Nectar production in *Pitcairnia imbricata* (Bromeliaceae)

Claudia T. Hornung-Leoni[1] Photographs by the author

Introduction

Pitcairnia is one of the largest genera in Bromeliaceae with about 321 species (Holst, 1994) and, except for one species in Africa, it is distributed principally in the neotropics. *Pitcairnia imbricata* (Brongniart) Regel is distributed mainly in México, Belize, Guatemala, British Honduras, Honduras, Salvador and Nicaragua (Smith and Downs, 1974). In México, this species is localized in the states of Chiapas, Guerrero, Jalisco, Nayarit, Oaxaca, Puebla, and Veracruz (Espejo-Serna *et al.,* 2005). This terrestrial and saxicolous species is an herb with 1 m. long leaves, black spines near the base of the leaf, red inflorescence bracts, yellow petals (about 6.4-7.5 mm. long) and reddish floral bracts that greatly exceed the sepals (Smith and Downs, 1974, Espejo-Serna *et al.*, 2005).

In bromeliads, nectar secretions have been reported inside the flower, which is quite common, and inclusive extrafloral nectaries that attract ant visitors have been documented (Galetto and Bernardello, 1992). In the family, the nectar secreted by flowers attracts several pollinators such as birds (hummingbirds and perching birds), insects and bats (Baker and Baker, 1983; Scogin and Freeman, 1984; Benzing, 2000). The nectar is the primary floral reward for many pollinators (Simpson and Neff, 1983) and it is a mixture of sugars that reaches 90 % by dry weight. The other 10 % consists of amino-acids, lipids, antioxidants and secondary components (Baker, 1977; Lüttge, 1977). This amount of sugars (glucose, fructose and sucrose) is very important for the pollinators because it is a reward they look for in flowers. Because of these components and their energizing properties bromeliads are very attractive especially for hummingbirds, butterflies and bees (Baker and Baker, 1983; Galetto and Bernardello, 2003).

Nectar-feeding species have been correlated with both sugar ratio (concentration) and composition, suggesting that the nectar characteristics are recognizable by specific pollinators (Hainsworth and Wolf, 1976; Baker and Baker, 1983; Baker and Baker, 1990; Galetto and Bernardello, 2003). In Bromeliads, particularly in *Pitcairnia*, the nectaries are in the base of the ovary (Sajo *et al.* 2004). Plants of *Pitcairnia,* like *Pitcairnia angustifolia* and *P. flammea*, are visited mainly by hummingbirds, flies and bees (Smith and Downs, 1974; Benzing, 2000; Wendt *et al.*, 2002).

This study reports new information about floral nectar and its production in *Pitcairnia imbricata*. Comparative notes are also presented on floral nectar from other bromeliad species.

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Methodology

Nectar and floral material was collected from plants in cultivation at the Jardín Botánico de Xalapa, Veracruz-México. Nectar samples were extracted and the volume was measured with a graduated micropipette. Single measurements were obtained from separate flowers from two plants on two separate dates (from 10:00 - 12:30 pm) in 2002 and 2003. The average of nectar quantity for each plant is presented in the results obtained each year. The values represent the average of the nectar quantity collected once a day from the middle section of the inflorescence of 2-3 flowers.

The method for determining the "standing crop of nectar" suggested by Kearns and Inouye (1993) was followed. According to this method, the quantity and distribution of nectar are determined by randomly sampling patches of flowers, which provides a measure of the resource available as the average volume of nectar per flower at a single point in time. The sugar concentration of the nectar (°Brix) was measured with a hand-held Brix refractometer (model MT-032 ATC).

Figure 1. *Pitcairnea imbricata*, terrestrial plant in habitat.

Results

The terrestrial specimens of examined *Pitcairnia imbricata* plants were 1-1.3 m high with conspicuous red floral bracts, (10-14 cm long) and yellow petals 7-7.2 cm long (Figure 1).

Phenology

Apparently this cultivated plant blooms once a year principally in July, but as with other bromeliads, its flowers do not have a synchrony within the inflorescence, which means that all the flowers in the whole inflorescence are not blooming at the same time, as the flowers open from base to apex. The flowers examined were blooming in the middle of the inflorescence (Figure 2) while buds at the apex had not yet opened.

As observed, this plant was visited by hummingbirds, but the bird species was not identified.

Nectar

The nectar presents a pale translucent color. The quantity and quality of the nectar

of the *Pitcairnia imbricata* are shown in the table 1. During my research, a sticky solution was found in the external part of flowers presenting around 2 °brix.

Sample	date	year	Volume (µl) average	Nectar concentration (°brix) average
1	July 12, 2002	2002	65	20.08
2	July 30, 2002	2002	60	19.95
3	July 03, 2003	2003	70	17.5
4	July 04,2003	2003	55	17.3
Average		2002-2003	62.5	18.7

Table 1: Nectar properties of *Pitcairnia imbricata*. Each sample represents the average of 2-3 flowers measured in the same plant. Samples 1 and 3 were taken from the same plant in different years; the same occurs with samples 2 and 4.

Discussion

Pitcairnia imbricata is a polycarpic species, which means that after giving blooms and fruits, the plant produces ramets in order to repeat the cycle (Benzing, 2000). This polycarpic species blooms every year principally in July (pers. obs.). The tubular flowers with yellow long petals and red floral bracts (Figure 3) are visual signals for pollinators that could be attracted by nectar quantity and quality. There are many hypotheses about the influence of the color and the shape of flowers on the attraction of the pollinators. It is accepted that most yellow and orange flowers are melittophilous (bee-pollinated) and brightly pigmented bracts are a signal for many bird-pollinated Bromeliaceae (Benzing, 2000).

Figure 2. *Pitcairnea imbricata*,details of inflorescence.

Figure 3. *Pitcairnea imbricata*, details of flowers.

The nectar, an important source of energy for birds and other animals, has been little studied in bromeliads. Some interesting research in species of *Tillandsia* and *Puya* reveal differences in nectar concentration (Scogin and Freeman, 1984;

...continued on page 267

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Covers are listed as if numbered. Page numbers in **bold face** refer to photos or illustrations, New species are shown under the appropriate genus in both *italics* and **bold face.**

Baker and Baker, 1990; Bernardello *et al.,* 1991; Hornung-Leoni *et al.*, *in prep.*).

In *Pitcairnea imbricata* the values of concentration and volume did not vary significantly when measured in 2002 and 2003 (table 1). The nectar concentration of *P. imbricata* (18.7 ° brix in average) showed values similar to other bromeliads. The genus *Pitcarnia* has been considered to be closely related to *Puya* (Smith and Downs, 1974; Holst, 1993; Hornung and Sosa, *in prep.*) However, phylogenetic studies suggest that *Puya* is more related to Bromelioideae than to Pitcairnioidea (Terry *et al.*, 1997; Horres *et al.,* 2000; Crayn *et al.,* 2004; Barfuss *et al.,* 2005). Previous nectar studies refer that species like *Tillandsia complanata* present 21% sugar (Bernardello *et al.*, 1994). In *Puya* subgenus *Puyopsis* nectar sugar concentrations ranged from 21.6 to 33.8 % of sugars (Scogin and Freeman, 1984). However, nectar was reported more diluted (around 8.2-12.6 %) in species like *P. chilensis* and *P. alpestris*, both from subgenus *Puya* (Scogin and Freeman, 1984). One exception in this subgenus is *P. raimondii* in which a higher nectar sugar concentration was found (Hornung *et al.*, *in prep.*), similar to the concentration values documented in subgenus *Puyopsis*.

Flowers of *Pitcairnia imbricata* have a great volume of nectar and during this research extrafloral nectar (outside of sepals) was found with a 2 °brix of sugar between the floral bracts. It has been suggested that extrafloral nectar is not involved in the pollination and could be of benefit for plants by reducing the number of ants visiting the flowers (Bentley, 1977; Wagner and Kay, 2002). However the function of the extrafloral secretion in this species has not yet been studied.

Many papers deal with the influence of the nectar characteristics on pollinator visit frequency, and its relation to floral form (Hainsworth and Wolf, 1976; Pike and Waser, 1981; Baker and Baker, 1983; Eckhart, 1991; Benzing, 2000; Galetto and Bernardello, 2003). An average concentration of 26% in nectar of flowers visited by hummingbirds has been reported in tropical islands (Pike and Waser, 1981). *P. imbricata* has abundant but more diluted nectar, when compared with other bromeliads, even though the nectar of flowers visited by hummingbirds is usually diluted (Baker, 1975, Pike and Waser, 1981).The floral morphology of *Pitcairnia imbricata* (tubular flowers with long yellow petals), the observed visitors and the nectar characteristics, suggest that the principal visitor and possibly the main pollinator could be hummingbirds. As noted, one hummingbird (unidentified) actually visited the *Pitcairnia* flowers; however other animals could also be routine nectar feeders of *P. imbricata.*

In Bromeliaceae there are species with similar sugar concentrations of nectar that differ in volume and chemical composition. Due to these similarities in nectar concentration, and in order to better understand these relationships with floral visitors, it is recommended that future studies include observation of the visitors, volume and concentration of nectar, as well as the chemical composition of the nectar.

In Bromeliads, the study of the nectar is an interesting area that varies enormously and represents a scenario to be complemented by the pollination and floral visitors data.

Acknowledgments

I want to thank Philip John Brewster for the permission to study this species in Jardín Botánico Clavijero (Xalapa, Veracruz). Thanks to Anna María Leoni for reviewing the English version of this manuscript. I would also like to thank the anonymous reviewers of this manuscript for their suggestions.

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Observe and React to Changing Conditions

Herb Plever

The downside to indoor growing is that our plants cannot get the stronger light that is available from overhead sun outdoors or in a greenhouse. The upside to growing indoors is that our plants are not subject to damage from sudden frosts, hurricanes, heat waves, etc., or to the excessive costs of running a greenhouse. Our indoor conditions can be more stable and economic.

Yet even our window sills and light units do not have static conditions. Perhaps some of us are aware that the coming of winter brings a marked drop in temperature at the windows and cold window panes, but all aspects of those environments are constantly changing. In nature, only the concept of change is immutable.

In our windows and fluorescent light setups temperature, light and humidity change with the weather and the seasons; most of the time the changes are gradual, but sometimes the changes are abrupt with sudden shifts in outdoor conditions.

Guzmania #270-1 (Hill)

Take available light for example. In our northeast latitude and longitude, from mid-September to mid-March the sun seems to rise later in the east-south-east; its apex is at a low angle in the south and it sets low early in the west-south-west. The change in light from September through March is gradual; the morning sun does not stay long in an east window, and a south or west-south-west window gets many hours of sunlight before the sun sets early in the west. On the other hand, from mid-March to mid-September the sun gradually rises earlier in the east, and it is in a high apex angle at midday and sets in the far west. Thus an east and especially an east-south-east window will get sunlight the full morning, while by summer only the nearest 1½ feet in from a south window will get sunlight and a west window will get a few hours of sun.

This is only a brief account of one aspect of the more complex effects of changing light; consideration of temperature and humidity will add to complexity. To optimize the environment for our plants we must try to relate these factors to the cultural needs

of individual species and cultivars. The first step toward that goal is to observe and record the sunlight or lack of it at each window throughout each day as the seasons progress and change. We must also record the seasonal humidity and how hot it gets at the window panes in the summer and how cold it gets there during a winter freeze.

If you grow your bromeliads under fluorescent lights it may appear that the light is fixed, but there is a drop-off of lumen output as the tubes get older - and as dust and dirt accumulate on the tubes (they should be cleaned periodically). Many fluorescent light setups also receive some available light from a nearby window, and this light will change during the seasons.

Guzmania 'Nacho' (DeRoose)

I think that a combination of fluorescent and natural light is very good for growing guzmanias. The Guzmania 'Nacho' and G. #270-1 (Hill) that I bought in our spring plant order were placed in my living room plant tray and they received fluorescent light and light from the adjacent terrace door. From late August on they also received afternoon sunlight, and put up beautiful inflorescences in October. See photo of G. 'Nacho' on page 1. and photo of G. #270-1 below. Check to see if it gets too hot under the lights and use a fan to provide moving air to blow out or pull out the heat.

If you understand the cultural needs of each of your plants and know what light, humidity and temperature each growing area will receive, then, and only then, can you think about where to place a particular plant and how to grow it. Each placement is an experiment, so you will need to observe whether or not that environment is good for the plant.

I take seasonal changes into account with my billbergias. I grow them in my sunny south window during the winter and spring. From mid-June to December I move them to the east-south-east window of a back bedroom. They get full morning sun through most of this period, but the reduced light in the late fall gives them the short days they need to know it is time to flower. We rarely go into the back bedroom at night so the electric lights do not disturb the short day cycle.

I put out many plants on my south-facing terrace sometime in May These include the tougher aechmeas and neoregelias and also the more tender guzmanias and not-so-tender vrieseas. I carefully observe the amount of sun that each part of

the terrace gets and at what times of the day—and what changes occur as the spring and summer months progress. Initially, I try to place them (especially guzmanias and vrieseas) where they will have the least amount of direct sun to acclimatize them to the outdoor light.

There is always a fair amount of wind (often high winds as it is 8 stories up), but the bromeliads seem to love that moving fresh air. After a while I experiment by moving the guzmanias and vrieseas to where they can get more direct sun, making sure, however, that they are loaded with water. Sometimes, especially when it suddenly gets very hot, they still get sunburned and I learn which plants need to be more shaded. The sunburn makes a dry brown patch on the arch of a few leaves but it doesn't kill the plant.

The positions where the sun hits the terrace and the angle of the sun change as the seasons move from May through the summer and into the fall. When it is very hot I try to take care to water the plants and media more often. When fall approaches, the nights get cooler and then cold. By the time November comes, all of the terrace plants have been fully cold hardened and can remain there until the first frost even with strong winds. Many of the plants that I grew on my terrace had already flowered and I put them out to encourage rapid pup growth. Other plants I put out to develop more compactness and flowering readiness. Some of the plants were: Aechmea spectabilis, A. 'Morgana', A. 'Blue Tango', Billbergia 'Carioca', Neoregelia smithii, N. 'Morado', N. 'Break Of Day', Orthophytum navioides, x Guzvriesea 'Garden Party', Guzmania 'Neon', G. 'Georgia', G. 'Snowflake', G. #516-1 (Hill), G. 'Marjen', 6 unnamed guzmania hybrids which had bloomed, Vriesea 'Splenriet' and Pitcairnia tabuliformis. (The beautifully marked Billbergia 'Carioca' bloomed, but its inflorescence was disappointingly puny, low in the cup and all brown in 3 days.) The pups from the wind-blown, cold-hardened plants were crisper and more compact than those from my indoor-grown plants.

Billbergia 'Carioca'

Observe, record, react and experiment through trial and error. Imprint these slogans in your mind and make them part of your regimen. Don't be put off if the proposals in this article seem difficult. Be assured that the real fun is in the experiments and learning from them.

Call for Nominations for BSI Directors, 2008-2010 Term

Theresa M. Bert, Nominations Chair

The regions for which director vacancies occur are as follows:

Florida		1 director
International	(includes all areas other than Australia, New Zealand and the USA)	1 director
Louisiana		1 director
Texas		1 director

Nominations to serve on the BSI Board of Directors for the three-year 2008-2010 term will open January1, 2007. Serving on the BSI Board is both fun and interesting. The Board makes decisions that influence the direction and activities of the BSI. Board meetings are held annually, usually sometime during the summer. Board members are expected to attend these meetings and do so at their own expense. The cost need not be prohibitive because Board members can share hotel rooms. One of the Board's activities is to co-sponsor and actively participate in the semiannual world conferences. All BSI members are encouraged to participate in the nomination and election process for Board members.

Who may nominate? Any voting member of the BSI who resides in a region for which there is an opening may nominate a candidate for an opening in that region.

Who may be nominated? A nominee must have the following credentials: (1) be a voting member of BSI and have been a voting member for the three consecutive years prior to nomination; (2) reside in the region for which he/she has been nominated; (3) not have served two consecutive terms as a director immediately preceding nomination; (4) agree to being nominated; and (5) agree to serve as a director if elected and to remain a member of the BSI for the duration of his/her term. Incumbent directors who have served one term on the BSI Board of Directors may be nominated for a second term. An additional requirement for the office of President is that the candidate must have served at least one full term as a director.

Procedure for nominating: (1) obtain the consent of the prospective nominee and verify compliance with the qualification criteria; (2) mail nominations to the chairman of the Nominations Committee between January 1, 2007 and March 15, 2007, inclusive. (Nominations must reach the Chair of the Nominations Committee by March 18, 2007.) Nominations by telephone will be accepted through March 15, 2007 but must be confirmed in writing within two weeks; (3) supply with each nomination the full name, address and telephone number of the nominee, the position for which the nomination is being made, the local society affiliation, and a brief biography of the nominee.

Please mail nominations to:

Theresa M. Bert
BSI Nominations Chair
9251 13th Ave. Cir. NW
Bradenton, FL 34209
(941) 795-6012

Book review

Derek Butcher, Cultivar Registrar

Encyclopaedia of Bromeliads by Bromelia Contacgroep (BCG) the Dutch-Belgian Bromeliad Society, Version 1.0 . Cost US $24.

If you want something extra to the Binomial listings of species and have a computer this is the CD for you. Over 6900 data pages including synonyms, over 1000 pictures, several indices and checklists of species by country, will keep you busy.

And that's not all, the plan is to add to this with more data and pictures and this update should be available sometime in 2007 when you only need to pay for postage. Eventually it will need to be a DVD and after that?!

Contact: Website is at www.florapix.nl/bcg, or by mail to Botanische Tuinen van de Universiteit, Att. Bromelia Contactgroep, Postbus 80.162, 3508 Utrecht, Netherlands.

Crikey! The 18th World Bromeliad Conference goes Downunder!

Lynn Hudson[1]

The Americans named Australia 'Downunder' a long time ago. It is the large island shaped like the head of a Scotty dog, the nose points across the Indian Ocean to Africa, the ears across the Arafura Sea to New Guinea and the neck faces the Pacific Ocean separating it from South America.

Cairns is on the South American side, up top in northern Queensland, above the Tropic of Capricorn and anchored just below paradise. It is typical of tropical places – lush and green with brightly coloured fauna and flora. Cairns is where the mountains of the rainforest meet the waters of the reef full of brightly coloured coral and fishes.

Right in the centre of the City of Cairns opposite Sofitel Reef Casino is the Cairns International Hotel and this will be the base for "Bromeliads Downunder" the 18th World Bromeliad Conference from 24–29 June 2008. Have a look at this five star hotel. http://www.cairnsinternational.com.au.

Cairns International Hotel

How can you get to this beautiful place? You cannot just drive over, even an airtight VW would run out of petrol and there are no service stations in the ocean for refueling. It is too far to swim and there are creatures in those oceans that have hungry stomachs and big teeth! You could come over by cruise ship, we have large liners dock here and you could stroll to the hotel. You could come by airplane, entering on the eastern side at either Sydney or Brisbane. From there you can come up to Cairns by airplane, by sea, by train or by road - so many decisions!! We will talk about that at another time.

Once here you will easily fill any spare time, as it would take a solid month of tripping just to explore the Cairns area and most trips begin within five minutes of the hotel. To the east the colours and creatures of the Great Barrier Reef are a short boat or helicopter trip offshore plus there are fishing, diving and scuba trips. To the north is Port Douglas, the Daintree Rainforest, then historic Cooktown and the northernmost tip is Cape York. To the west is the rich volcanic soil of the Atherton Tablelands, home to dairy, fruit and vegetable production and further west the countryside gets drier. To the south the views are mainly green coloured by sugarcane, banana, avocado and pawpaw trees. The entire area is beautiful, wrapped by a backdrop of mountains of ever changing green and some areas have a blue haze.

1 47 Boden Street, Edge Hill, QLD 4870, Australia. email lynnie@ledanet.com.au

The programme for "Bromeliads Downunder" will be as past conferences. Tuesday is Director's meeting, Wednesday show plant entries, Thursday show judging and Friday to Sunday seminars. There will be a Banquet, Rare Plant Auction, plant sales and local Garden Tour.

The Kuranda scenic railway meandering up the oldest living rainforest on Earth.

Skyrail climbing high into the forest.

On Thursday there will be a full day optional tour to Kuranda combining Rail, Skyrail or Bus, see http://www.skyrail.com.au. Kuranda is up the mountain range above Cairns and the trip is picturesque whether by road, rail or Skyrail. The township has markets, a bird park, butterfly sanctuary, varied food outlets and craft shops. Other trips at reduced prices will be available and a real favourite is the wildlife sanctuary, http://www.rainforesthabitat.com.au. To readers who do not have access to the internet, let me know and I will arrange for literature to be sent to you.

Come on over, we will show you some of our beautiful home, "toss a shrimp on the barbie" and teach you our war cry of "Aussie, Aussie, Aussie, Oy,Oy,Oy". We will have lots of fun, see some wonderful bromeliads and learn more about our favourite plants.

Did You Know... About Importing plants?

Joyce Brehm, BSI President

Going to Australia in 2008 and you want to know if you can import plants? I only know about the United States, which doesn't say much about my international knowledge. However, I am sure that if you contact the agriculture department for your country they will be able to direct you to the information needed.

Here is the information I have for the US. You must have an import license which can be obtained from the United States Department of Agriculture. Be aware that you must specify what counties, what plant family and genera you wish to import. Include all of the countries, families and genera from which you might wish to import. There is a fee for this import permit but it is good for 5 years which is why it is important to specify anywhere from which you might import plants. It takes approximately 3 months to receive your Import Permit for Plants and Plant Products (license), so start early. No CITIS plants may be imported to the United States

You can contact the United States Department of Agriculture (USDA) on line at www.uda.gov then search for Import License and find the information by typing in "Import License". There is information for several countries here. Then refine your search by searching "License to Import Plants to US". This is probably the long way to get to the information you need, but it worked for me. **US** Food and Agricultural **Import** Regulations [PDF] **...** Information regarding how to **obtain** a permit is discussed **...** Miami, Fla., for commercial importation of **plant** materials. **...** approach to the marketing of **US** crops and **...** www.fas.usda.gov/itp/ofsts/usa2.pdf - 2002-01-16 - Text Version

You must carry with you your Import Permit for Plants and Plant Products (license). The country of origin of the import will issue the required Phytosanitary Certificate. Lynn and I are currently working to make this happen during the conference in Cairns in 2008. Please remember this information is for the United States. Check out your country of import and follow their rules. I am hopeful that some of you will try this and get good results for importing plants you wish to purchase in Cairns.

See you in Cairns.

Florida Bromeliads: A Modest Quest. Part 3

Ken Marks, BSI Webmaster

In Search of Blooms

The weekend after our trip north to Withlacoochee we headed in the opposite direction to revisit the southern species. The weather radar showed some thunderstorms already active early in the morning but they looked to be north of where we were going so we decided to risk it. We headed out across Alligator Alley and passed through spotty showers optimistically hoping for dry conditions further west. When we hit Route 29 and turned south toward the small town of Copeland and the Fakahatchee Strand Preserve State Park it was overcast but the weather seemed to be holding. Arriving at the park office we saw a familiar face. Mike Owen, the resident Park Biologist, was getting out of his truck to unlock his office as we pulled up. He told us that he had just returned the night before from a two week vacation visiting several national parks on a multi-state tour of the western states. Though Mike is usually not in on Saturdays (unless he is leading a swamp walk), he had stopped by this morning for a few minutes to reset the rain gauge before leaving again.

Once again luck was on our side and we were granted audience with the Oracle of the Fakahatchee. I asked Mike if the guzmanias were in bloom and if he could provide us with a location to see some. His answer on both points was an emphatic "Yes!" Anybody who has ever met Mike Owen will understand that "emphatic" is an essential element of his personality. Mike indicated on a map where a large grouping of *Guzmania monostachia* could be found right off of one of the tram roads less than a mile from the parking area. He also mentioned that the Ghost Orchid I had discovered on a swamp walk with him a few years earlier had a bloom spike emerging when he checked it a few weeks back. Mike periodically monitors the condition of the 250 or so Ghosts that he is aware of in the Fakahatchee and few things escape his vigilant attention. We'll try to stop back later in the month to see "my" Ghost in bloom.

Map and GPS in hand we drenched ourselves in bug spray and left the parking area headed along the tram road towards our quarry. As promised, at the location indicated, we were greeted with a view of nearly a hundred *monostachia*. Most of the full-sized ones were in bloom. Many of the bloom spikes were down to their final flowers near the tip — the flowers further down the spike were already brown and mushy from the recent rainy weather. After some searching we did manage to spot some less-developed inflorescences with fresh white blooms. It seemed that we got here just in time. A few weeks later and we would have been hard-pressed to find any fresh blooms.

Figure 13. *Guzmania monostachia*, Fakahatchee Strand.

Our primary objective accomplished, we poked around some more to see what else we could locate. We spotted a few *Tillandsia pruinosa* on a cypress and on a pond apple tree and we saw what appeared to be a small *Catopsis floribunda* mixed in with the guzmanias. It was too big with too many leaves to be a *nutans* and did not have the waxy white powder at the base of the leaves common to both *nutans* and *berteroniana*. When I first saw the plant I said, "Hey, it's a *floribunda*," then I backed off thinking it had to be just another guzmania since we were surrounded by them. Still I think this plant was the catopsis needle hiding in the guzmania haystack as it was a bit darker green with what appeared to be narrower, pointier leaves that were more reflexed than the small guzmania seedlings nearby.

After a quick lunch we headed back east toward Miami — this time on US 41, the Tamiami Trail. We returned to the densely populated corridor along Florida's east coast just long enough to pick up the Turnpike and head south to Homestead where we once again turned westward and soon arrived at the entrance to the Everglades National Park. Once in the park we turned on the GPS and headed for the waypoint that marked the dwarf cypress patch that was loaded with *Tillandsia paucifolia*. When I had last seen these plants they seemed to be showing signs that indicated that blooming was not far off. On this return visit months later most had already finished blooming but a few still had pale lavender flowers on their simple inflorescences. The limestone prairie was now covered with shin-deep water that had been warmed to bathwater temperatures due to its shallow depth. The sawgrass was much taller than during my last visit and the periphyton algae and several species of water plants had now covered much of the jagged limestone marl.

Figure 15. *Tillandsia* x*smalliana*, Fakahatchee Strand.

Figure 14. *Tillandsia paucifolia*, Fakahatchee Strand.

I revisited the grouping of *Tillandsia* ×*smalliana* that I had discovered on my previous trip and looked around some more to see if I could spot any *Tillandsia flexuosa* in bloom as I had seen several here before. I did find several *flexuosa* but none that were large enough to bloom. At another promising cypress head further down the road, I found a large *flexuosa* with a bloom spike but the bloom had aborted when a chewing insect had eaten partially through the spike. The storm clouds were getting darker and the thunder louder as I scanned the trees for more *flexuosa*. It looked like the rain was finally going to catch up with us. The weather report we heard on the radio had heavy showers over Miami heading west. We were in the path and it was only a matter of time. We decided to check up on the *Catopsis berteroniana* that we had located on the poisonwood trees to see if anything there was in bloom. We headed west toward our GPS waypoint with the rain on our tail.

When we got to our location we pulled off the road. The first thing that I noticed was that all of the foliage along one side of the road had been burned. Apparently a wildfire had swept through recently leaving a black scorched area in its wake. Fires are a natural occurrence in a state that sees as much lightening as Florida does. Many of the plants that grow here have evolved to be fire-resistant but it didn't look as though the native bromeliads had made great strides along these lines. It is possible that some of these charred bromeliads might still produce pups to rise from the ashes in a phoenix-like rebirth.

None of the large *Catopsis berteroniana* across the road was showing any signs of blooming. As I inspected each one along the roadside I was accompanied by the rain, a swarm of biting horse flies, and my wife in the car who was laughing at me as I swatted and swished at the flies with my hat to no avail. I finally retreated to the safety of the car and declared this trip officially concluded.

Conclusion

Our quest to locate and photograph Florida's 16 species of bromeliads (and the 2 natural hybrids) in their natural environment had been a success. It was a modest venture but it was also satisfying, educational, and fun. My presentation has been greatly improved over the course of this quest, benefiting from all the improved imagery. This program will soon be added to the BSI media program library and will be available to BSI Affiliates.

This may be the final paragraph in this story but not the final chapter in this quest. Further research has revealed that the catopsis species in Florida seem to bloom mainly in the autumn so (barring hurricanes) I have something to look forward to in September. A swamp walk at night in the Fakahatchee to catch *Catopsis nutans* blooming is already in the planning stage. If successful, look for word about the Nocturnal Nutans Caper in a future issue.

Bromeliad Society of Baton Rouge Show 2006

Carolyn Schoenau, Affiliated Shows Chair. Photos by Charles Birdsong

The Show Winners table.

Best of Show Artistic, won by Michael Young from Baton Rouge LA with "Purple Swirl"

Mulford B. Foster Best of Show Horticulture, won by Mary Kellogg from Bouge Chitta MS, with *Neoregelia* 'Zoe' (Chester Skotak hybrid)

The show sponsored by the Bromeliad Society of Baton Rouge in Louisiana was held June 3-4, 2006. Ten exhibitors placed 171 horticultural entries and 18 artistic entries. Ribbons awarded were 67 AM, 95 Blue and 27 Red. That is all the information received on the Editorial Desk!

MEMBERS ONLY SEEDBANK

Acanthostachys *strobilacea* .
Aechmea *aquilega* (*bellae*) ● *bracteata* ● *chantinii* (ebony) ● *egleriana* (pink bracts)● *luddemanniana* ● *mertensii* ● *mexicana* ● *victoriana* var *leodiensis*. ***Alcantarea*** *imperialis* (aka *Vriesea imperialis*) ● *vinicolor*
Billbergia *horrida* ● *pyramidalis* ● *rosea*. ***Guzmania*** *fuerstenbergiaia* ● *scherzeriana*.
Hohenbergia *stellata*. ***Neoregelia*** *bahiana* ● *bahiana* 'Viridis' ● *carolinae* 'Marechallii' ● *concentrica* ● *concentrica* 'plutonis' ● *fluminensis* ● *johannis* ● *magdalenar* ● *morrisoniana* ● 'Rastroeusus'? ● *uleana*.
Nidularium *marechallii* (probably *Neoregelia carolinae*).***Pitcairnia*** altensteinii (alba) *spicata*.
Tillandsia *capillaris* 'Hieronymi' ● *gardneri* ● *geminiflora* var. *incana*. ● *juncea* ● loliaceae
Vriesea ensiformia ● *fluminensis* ● *fosteriana* var. *seideliana* ● *glutinosa* ● *gradata* ● *itatiaiae* ● *jonghei* ● "Mariae' ● *platynema* var. *variegata* ● *saundersii* ● *sparsiflora* ● 'Pulchella'

Packets, at least 20 seeds, US $1 each.
Seed supplied only to BSI members, and limit 2 packets per species.

Send orders & make checks payable to:
Harvey C. Beltz,
6327 South Inwood Road
Shreveport, LA 71119-7260. USA

EVENTS CALENDAR

Australia

November 11-12, 2006 Bromeliad Society of Queensland 2006 Bromeliad Bonanza--combined show and sale of bromeliads. Venue: Mt Coot-tha (Brisbane) Botanic Gardens Auditorium. Saturday (11th) 8am-4pm Sunday (12th) 9am-3pm. Entry $3 adults, children under 14 free. Enquiries Bob Reilly (phone 07 3870 8029).

November 18-19, 2006 Hunter District Bromeliad Society Annual Show. Venue: Wesley Church, Beaumont Street, Hamilton.

April 28-29, Bromeliad Society of NSW Autumn Show. 9-11 Wellbank Street, Concord. Enquiries phone 9971-6183.

September 21-23, 2007 14th Australian Bromeliad Conference. Rydges resort Hotel, Port Macquarie. Enquiries to 47 Boden Street, Edge Hill QLD 4870 or lynnie@ledanet.com.au

June 24-29, 2008, BSI World Conference in Cairns (Australia.) Enquiries to Lynn Hudson, 47 Boden Street, Edge Hill QLD 4870 or lynnie@ledanet.com.au

New Zealand

February, 24-25, 2007. Bromeliad 'Fiesta' 2007, Mt. Eden War Memorial Hall, Dominion Road, Auckland. Contact Alan Cliffe, (09) 479-1451.

United States of America

March 15-18, 2007. Florida East Coast Bromeliad Society 'Everybody's Flower Show'. Ocean Centre, 101 N. Atlantic Avenue (AIA) Daytona Beach.

March 31, 2007. Florida East Coast Bromeliad Society, Volusia County Master Gardeners Sale.

April 14-15, 2007 Seminole Bromeliad & Tropical plant Society Spring Plant Sale. Sanford Garden Club Bldg., 200 Fairmont Drive, Sanford. Contact Sudi Hipsley 352 504-6162.

April 14-25, 2007. Broward Bromeliad Society Show and Sale.

April 21-22, 2007. Bromeliad Society of South Florida Annual Show. Fairchild Tropical Botanic Garden, 10901 Old Cutler Road, Miami.

May 11-13, 2007. Bromeliad Society of Central Florida Show and Sale. Orlando Fashion Square, Orlando.

June 30, 2007. DEADLINE for early registration (discounted rate) for the World Bromeliad Conference in Cairns (see pages 276-278 this issue) Registration forms from Dan Kinnard, **6901 Kellyn Ln, Vista CA 92084-1243.**

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.

Members-Only web site access: *Username*: Pseudaechmea, *Password*: ambigua