

The Bromeliad Flora of the San Martín Tuxtla Volcano, Veracruz, Mexico

Thorsten Krömer & Amparo Acebey¹ photographs by the authors.

Introduction

We conducted botanical sampling of selected plant groups, including aroids, bromeliads, orchids, and ferns along an elevational gradient in the region of Los Tuxtlas (18°05'–18°43'N, 94°35'–95°25'W), in the southeast portion of the Veracruz State, Mexico (Fig. 1). The study area is located within the municipality of San Andrés Tuxtla and rises from 100–1680 m above sea level, encompassing the San Martín Tuxtla volcano and the adjacent Los Tuxtlas Biological Research Station (EBT: Estación de Biología Tropical “Los Tuxtlas”; with a 640 ha reserve), which is operated by the Instituto de Biología, Universidad Nacional Autónoma de México (UNAM). Together, these include ca. 8500 ha old-growth forest, forming one of three core zones of the new Los Tuxtlas Biosphere Reserve that was established in 1998. For a detailed description of Los Tuxtlas see González Soriano, Dirzo et al. (1997) and Guevara, Sánchez et al. (2004).

The dominant vegetation in this region was tropical rain forest, but 80–90% of the original forest extent had been cleared by the year 1990. Currently, the lower slopes of the San Martín Tuxtla volcano are covered by a vegetation mosaic of pastures, small patches of remnant trees, and different types of agricultural fields surrounded by remaining forest fragments. Among the most important tree families (genera) are Fabaceae (*Lonchocarpus* spp.), Moraceae (*Ficus* spp.), and Lauraceae (*Nectandra* spp.). At about 1000–1550 m elevation mostly undisturbed humid montane forest (*bosque mesófilo de montaña*; (Rzedowski 1986)) comprised of up to 45 m tall trees such as *Ulmus mexicana* can be found. The summit is covered by dwarf cloud forest dominated by *Oreopanax xalapensis* and *Clusia salvinii*. In the study area, most of the botanical collections have been carried out in the relatively low elevations of the EBT, and very few botanists have sampled above 900 m. The recorded vascular flora of the EBT includes 943 species in 137 families (González Soriano, Dirzo et al. 1997), whereas for the whole region of Los Tuxtlas more than 3350 species of plants have been recorded (Guevara, Sánchez et al. 2004). The estimated total of approximately 4000 species demonstrates the urgent need for more inventories as plant diversity is threatened by the continuing transformation of natural forest into pastures and plantations.

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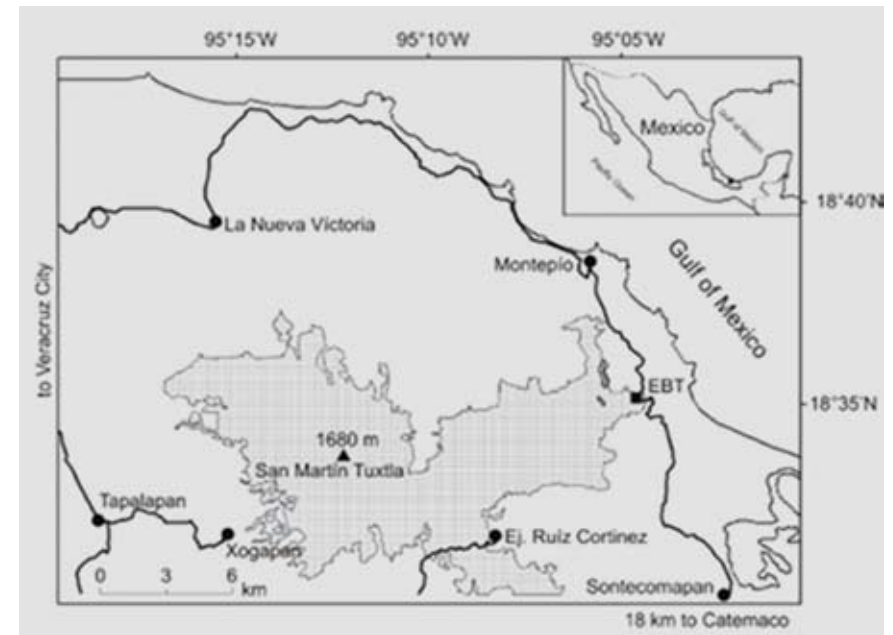


Figure 1: Map of the study area in the north-eastern region of Los Tuxtlas in southern Veracruz, Mexico. The shaded area corresponds to mostly undisturbed old-growth forest in the surroundings of the San Martín Tuxtla volcano and the Los Tuxtlas Biological Research Station (EBT).

Bromeliaceae of Los Tuxtlas

The contribution of Bromeliaceae to species richness in Los Tuxtlas is limited. A preliminary checklist of bromeliads found in the study area, based on personal collections and data from Espejo-Serna, López-Ferrari et al. (2004; Espejo-Serna, López-Ferrari et al. (2005) includes 32 species in 9 genera (Table 1). As expected, *Tillandsia* has the most species (12), while the high species numbers of *Aechmea* (5) and *Werauhia* (5) are somewhat surprising. A total of 25 bromeliads are epiphytes and only seven are terrestrial, amongst the latter are two notable species exploited by humans. One, *Aechmea magdalенаe*, known as *ixtle* or *pita* in Mexico, is found in dense clusters in the understory of the lowland rainforest. The long white fibers extracted from the leaves were traditionally utilized by indigenous groups to make rope, fishing nets, and rustic clothes, whereas today it is used for the production of expensive artwork known as *el piteado* (Ticktin 2002). In adjacent Sierra of Santa Marta, also part of the Los Tuxtlas Biosphere Reserve, this species is cultivated in secondary forests for sustainable use as a non-timber forest product. Another species, *Bromelia pinguin* is often cultivated by farmers as “living fence” to delimit cattle pastures.

In Mexico, most bromeliads listed in Table 1 show a wide elevational range of at least 1000 m, whereas most species sampled during this study were only found in one or two elevation zones of 400 m. Only the widespread *Catopsis sessiliflora* occurs along the entire elevational gradient. A total of 13 species show a rather limited distribution



Figure 2. *Aechmea nudicaulis*.

to Mexico and at least to one of the Mesoamerican countries. Seven species are found south to the northern part of South America, including Colombia, Ecuador, Venezuela, and/or the Brazilian Amazon, while another seven species reach as far south as Peru, Bolivia, and/or Argentina. Merely four species, *Greigia juareziana*, *Tillandsia flavobracteata*, *Tillandsia limbata*, and *Werauhia vanbyningii*, are endemic to Mexico. A total of nine species represent new records for the municipality of San Andrés Tuxtla, including *Greigia juareziana*, which is new to the state of Veracruz and was formerly only known from Oaxaca and Chiapas. *Werauhia nutans* is new to Mexico and was formerly only known from Costa Rica (Krömer, Espejo-Serna et al. 2005). This locally abundant species with an inconspicuous green inflorescence is night-blooming and likely pollinated by nectar-feeding bats, similar to other chiropterophilous bromeliads such as the widespread *Werauhia gladioliflora*. (Krömer 2004)



Figure 3. *Tillandsia punctulata*

Establishment of a living collection

All species of bromeliads and orchids collected during this study will be cultivated in a shadehouse (Fig. 4) with the goal to establish a complete living collection of plants from the Los Tuxtlas Biosphere Reserve. For Bromeliaceae we expect to find at least eight additional species (e.g., *Catopsis berteroniana*, *Guzmania nicaraguensis*, *Tillandsia leiboldiana*) that have been documented for the adjacent municipalities of Catemaco, Soteapan, and/or Mecayapan (Espejo-Serna, López-Ferrari et al. 2004; Espejo-Serna, López-Ferrari et al. 2005). Much more diverse is the local orchid flora, which alone for the EBT includes 118 species in 55 genera (González Soriano, Dirzo et al. 1997), many of which are rare and endangered because of illegal harvesting for commerce as well as habitat alteration.

Apart from the important *ex situ* conservation aspect, this living collection and its associated data base, documenting general information on the cultivated species, will offer students and researchers the possibility to carry out research on subjects such as anatomy and morphology of reproductive organs. Furthermore, an exhibition for the general public of mostly flowering plants with explanations on the systematics and ecology of different groups and families will fulfil the educational commitment of the EBT Research Station.

Bromeliad Species	Life-form	Elev. Zone 1	Elev. Range (m) 2	Distribution in the Neotropics 3
<i>Aechmea bracteata</i> (Sw.) Grieseb.	ep	I, II	0-1100	MEX, MES, COL, VEN
<i>A. lueddemanniana</i> (K. Koch) Mez	ep	I-III	100-1150	MEX-COR
<i>A. magdalenae</i> (André) André ex Baker	ter	I	0-600	MEX, MES, COL, ECU, VEN
<i>A. nudicaulis</i> (L.) Grieseb.	ep	I, II	0-1000	MEX, MES, ANT, BRA, COL, ECU, PER, VEN
<i>A. tillandsioides</i> (Mart. ex Schult. & Schult. f.) Baker	ep	I	0-700	MEX, MES, BOL, BRA, COL, ECU, PER, VEN
<i>Bromelia karatas</i> L.	ter		0-920	MEX, MES, ANT, BRA, COL
<i>B. pinguin</i> L.*	ter	I	0-1550	MEX, MES, ANT, COL, ECU, VEN
<i>Catopsis juncifolia</i> Mez & Wercklé ex Mez*	ep	I	100-450	MEX, MES
<i>C. nutans</i> (Sw.) Grieseb.	ep	I	0-1900	FLO, MEX, MES, ANT, BRA, COL, ECU, VEN
<i>C. sessiliflora</i> (Ruiz & Pav.) Mez	ep	I-IV	0-2250	MEX, MES, ANT, BOL, BRA, COL, ECU, PER, VEN
<i>Fosterella micrantha</i> (Lindl.) L.B. Sm.	ter		150-1200	MEX-SAL
<i>Greigia juareziana</i> L.B. Sm.**	ter	IV	1300-2700	MEX, endemic
<i>Pitcairnia imbricata</i> (Brongn.) Regel	ter	I	50-1700	MEX-NIC
<i>P. recurvata</i> (Scheidw.) K. Koch	ter	I, II	0-1450	MEX-GUA
<i>Tillandsia brachycaulos</i> Schltdl.	ep		0-1200	MEX, MES
<i>T. fasciculata</i> Sw.*	ep	II	0-1860	FLO, MEX, MES, ANT, BRA, COL, VEN
<i>T. festucoides</i> Brogn. ex Mez	ep	I	0-1400	MEX, MES, ANT
<i>T. filifolia</i> Schltdl. & Cham.	ep	I	0-1750	MEX-COR
<i>T. flavobracteata</i> Matuda*	ep	I	150	MEX, endemic
<i>T. limbata</i> Schltdl.	ep	I	0-1200	MEX, endemic
<i>T. punctulata</i> Schltdl. & Cham.	ep	III, IV	200-2200	MEX, MES
<i>T. schiedeana</i> Steud.	ep	I, II	0-2230	MEX, MES, ANT, COL, VEN
<i>T. tricolor</i> Schltdl. & Cham.	ep	I, II	250-1820	MEX, MES
<i>T. usneoides</i> (L.) L.*	ep	II	0-2700	FLO, MEX, MES, ANT, ARG, BOL, BRA, CHI, COL, ECU, PER, VEN
<i>T. variabilis</i> Schltdl.	ep	I	50-1170	FLO, MEX, MES, ANT, BOL, ECU, VEN
<i>T. viridiflora</i> (Beer) Baker	ep	II-IV	670-2260	MEX-NIC

<i>Vriesea heliconioides</i> (Kunth) Hook. ex Walp.	ep	I	80-950	MEX, MES, BOL, BRA, COL, ECU, PER, VEN
<i>Weraubia gladioliflora</i> (H. Wendl.) J.R. Grant	ep	I, II	0-1200	MEX, MES, BOL, BRA, COL, ECU, VEN
<i>W. nocturna</i> (Matuda) J.R. Grant*	ep	IV	1400-1800	MEX-COR
<i>W. nutans</i> (L.B. Sm.) J.R. Grant***	ep	II-IV		MEX-COR
<i>W. vanbyningii</i> (L.B. Sm.) J.R. Grant*	ep	IV	600-2900	MEX, endemic
<i>W. spec.</i> (THO 2207, 2507)	ep	III, IV		

Table 1: Bromeliad species occurring in the study area with notes on life form (LF; ep: epiphytic, ter: terrestrial), occurrence in four elevational zones (I: 100-499 m, II: 500-899 m, III: 900-1299 m, IV: 1300-1680 m), elevational range in Mexico, and distribution in the Neotropics (FLO: Florida, MEX: Mexico, MES: Mesoamerica, COR: Costa Rica, GUA: Guatemala, NIC: Nicaragua, SAL: El Salvador, ANT: Antilles, ARG: Argentina, BOL: Bolivia, BRA: Brazil, CHI: Chile, COL: Colombia, ECU: Ecuador, PER: Peru, VEN: Venezuela). Species marked with one asterisk are new records for the municipality of San Andrés Tuxtla, the species marked with two asterisks is a new record for the state of Veracruz, and the species marked with three asterisks is a new record for Mexico. Data from ¹this study, ²Espejo et al. (2004), ³Utley & Burt-Utley (1994).



The display will contain some highly ornamental species such as *Aechmea nudicaulis* (Fig. 2) and *Aechmea tillandsioides* as well as common species such as *Tillandsia punctulata* (Fig. 3) and *Tillandsia viridiflora* or *Aechmea bracteata* (Fig. 5) and *Tillandsia limbata*, which can often be found growing on trees along the roadside.

Figure 4. Los Tuxtlas collection in shadehouse.

Acknowledgments

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Bromeliad Society International Research Grants Program

The BSI sponsors a small granting program to support research projects dealing with just about any aspect of bromeliads. For instance, recently funded projects have dealt with ecological aspects of bromeliads in Ecuador, an inventory of Bromeliaceae for Cuba, taxonomic studies within Aechmea, and we would like to see more proposals dealing with other topics, such as horticulture, conservation, or breeding. The awards are competitive and generally limited to \$1,000 (U.S.). Applicants need to hold membership in the Society for their proposal to be considered. June 1, 2007 is the deadline for receipt of proposals for the 2007 competition.

General guidelines for proposal preparation are presented below. If you have any questions concerning these guidelines, or wish to discuss the feasibility of project ideas, please contact Greg Brown, Chair of the Research Grants Committee (gkbrown@uwyo.edu).

1. The proposal body has a 5-page limit (single-spaced, 12 pt font, 2.5 cm margins) consisting of title, project description, an itemized budget with justification, a timeline for the project, and a statement that you will submit a manuscript for review, and possible publication, to the *Journal of the Bromeliad Society* describing results from the funded research. Please note that the BSI Research Grant Program will not pay for institutional overhead (i.e., indirect costs), salary, or travel to attend meetings; all grant funds must be applied directly to the proposed research.

2. Your curriculum vitae.

3. For electronic submission, which is preferred, please submit pdf or Word files to gkbrown@uwyo.edu. For paper copy submission, mail 4 copies to:

Gregory K. Brown, Department of Botany, 1000 East University Ave., University of Wyoming, Laramie, WY 82071, U.S.A.

Once a proposal is received it is sent out for review. Funding decisions are based on reviewer evaluations. Awards will be finalized at the annual Board of Directors meeting in July, and applicants will be notified promptly.



Figure 5. *Aechmea bracteata*.