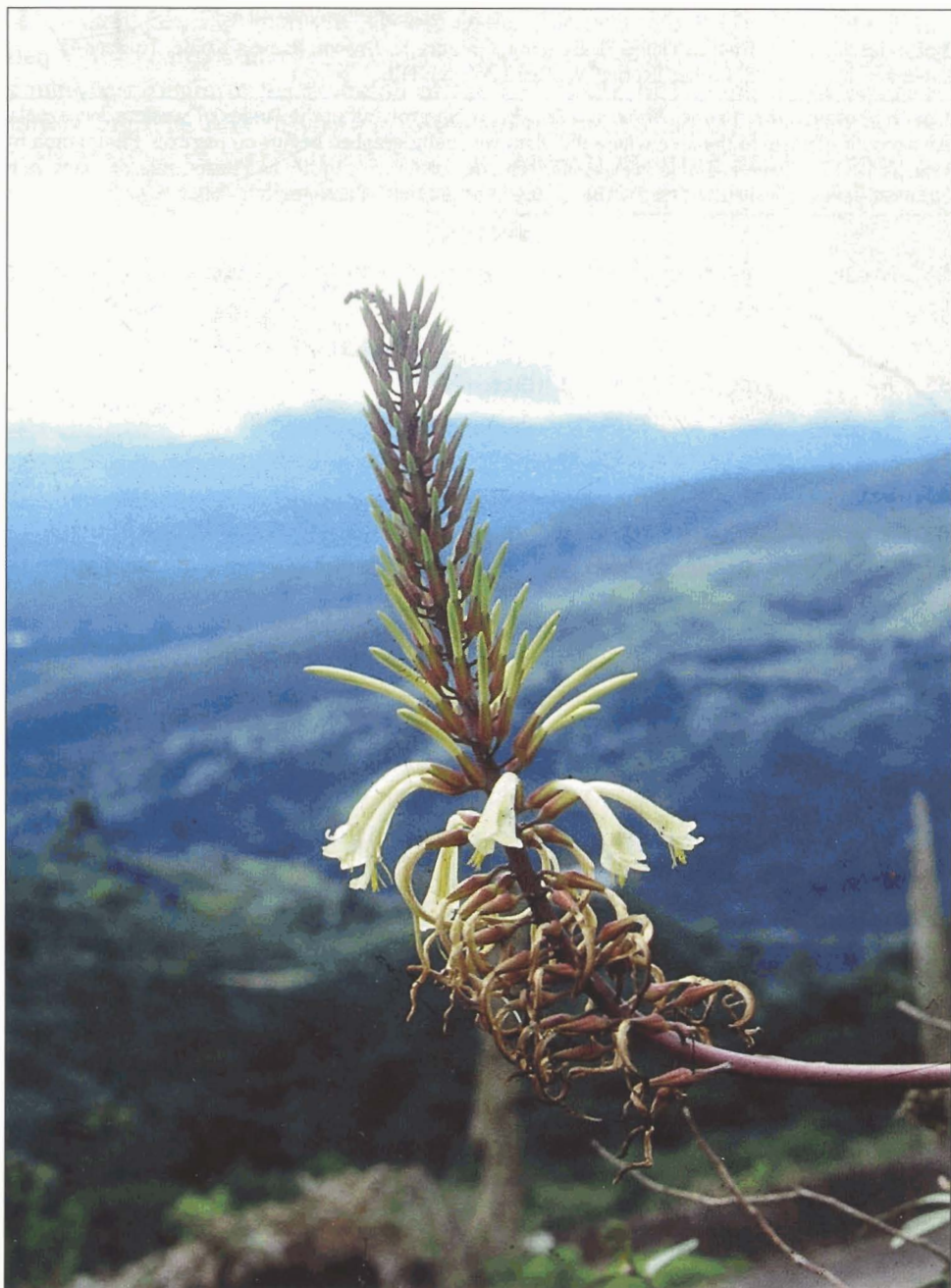


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Temporal Variation in Herbivory of a Peruvian Bromeliad

Margaret Lowman¹, Michael Brown², Arthur Desrosiers²,
and D.C. Randle²

Herbivory in bromeliads in forest canopies is reportedly rare (Benzing 1990). It is not known, however, whether this is due to the toughness of the foliage; the below-average nutritive qualities of the foliage; their mutualistic relationships with protective insects such as ants (that may ward off herbivores); the relative paucity of herbivores in tree crowns; or perhaps the logistic difficulties of accessing canopy bromeliads to measure them. All of these hypothesized explanations require extensive field data collection to reject or accept, and none have been studied to date.

Over the past ten years, canopy access techniques have been developed that solve the logistic challenges of canopy access (Lowman and Nadkarni 1995, Lowman and Wittman 1996). One of these techniques is the construction of canopy bridges and platforms so that researchers and visitors can walk through the treetops with ease (Lowman and Bouricius 1995). One such structure was built along the Amazon River in Peru by a consortium of institutions called ACEER (Amazon Center for Environmental Education and Research). This walkway extends over 400 meters in length and rises into the canopy at a height of up to 30 meters.

During 1995, the ACEER canopy walkway was used to make the first measurements of bromeliad herbivory in tropical forest canopies (Lowman, Wittman, and Murray 1996). The average leaf surface area loss to herbivores was 10.4%, which was significantly higher than the negligible amounts that had been predicted in the literature. We wondered if this were the result of an unusual insect outbreak event, or if such levels were incurred by the bromeliads each year. In order to test our hypothesis, we re-measured the same bromeliad population two years later, in 1997, to compare the levels of herbivory to our first measurements and to see whether herbivory had returned to a negligible level.

We re-sampled the same population of *Aechmea nallyi* L.B. Smith, a relatively rare epiphyte found only in patches of rain forest within the northeast corner of Peru (Luther, personal communication). This plant grows as a rosette of sclerophyllous leaves, and produces a brilliant pink and yellow inflorescence from March to May. Along the ACEER walkway, this species is relatively common and easy to measure (Figure 19). We used the same field methods in 1997 as in 1995, making visual estimates of the leaf area lost on 10 leaves of

¹ Director of Research and Conservation, The Marie Selby Botanical Gardens

² Research volunteer, The Marie Selby Botanical Gardens

Table 1.Herbivory (% leaf area mined or missing) of *Aechmea nallyi* 1997

PLANT							
LEAF	(1)	(2)	(3)	(4)	(5)		
1	7	20	5	5	4		
2	6	12	6	10	6		
3	8	8	4	12	12		
4	4	15	5	8	5		
5	6	20	3	15	8		
6	5	11	6	20	12		
7	4	8	8	9	8		
8	10	8	10	25	9		
9	9	12	8	4	8		
10	8	15	4	5	10		
MEAN	6.7	12.9	5.9	11.3	8.2	GRAND MEAN	9.0

each of five plants within close proximity to the walkway.

Herbivory in 1997 averaged 9.0% (see Table 1) which was almost identical to the 10.4% leaf area losses measured in 1995. Herbivory ranged from 5.9% to 12.9% for individual plants, which was similar to the range of 5.3% to 17.3% recorded in 1995. It would appear that this bromeliad species suffers moderate amounts of foliage loss to insects each year, and the damage recorded in 1995 was not simply an unusual outbreak event as hypothesized. Herbivory of the surrounding canopy trees averaged 5.9% (Lowman, unpublished data), so the bromeliads suffered nearly twice as much leaf damage as their host plants.

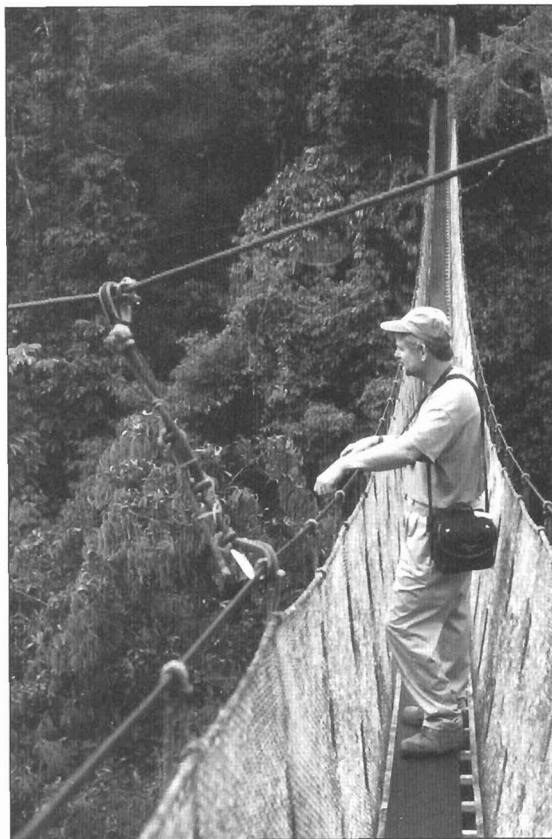
We hope to expand our study to survey herbivory in other species of bromeliads, in order to determine whether or not these moderate levels of leaf damage are characteristic of bromeliad-herbivore interactions in tropical rain forest canopies.

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Photograph by Meg Lowman

Figure 19.

The ACEER walkway in Peru provides access to the bromeliads for measurement of herbivory.

*Marie Selby Botanical Gardens
Sarasota, Florida*