Ecology, 60(3), 1979, pp. 462–467

A *HELICONIA* INSECT COMMUNITY IN A VENEZUELAN CLOUD FOREST[1]

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Abstract. An experimental study was designed to evaluate the importance of first-order species interactions, higher-order species interactions and habitat (flower bract) age on the survivorship of 4 species of insects living in the water-filled floral bracts of *Heliconia bihai* L. in a Venezuelan cloud forest. Only 3 out of 16 first-order species interactions were statistically significant and they included both competitive and symbiotic effects. A higher-order effect was found for only 1 of 4 species while habitat age was found to influence 3 of 4 species. The experimental results indicate that for 3 species survival is greater in the older habitats. These results correspond to data from field studies on non-experimental inflorescences in which insects were found most frequently in mature floral bracts.

The results of this study are similar to those of an earlier study (Seifert and Seifert 1976*a*) on 2 species of *Heliconia* from lowland Costa Rica. We propose that *Heliconia* insect communities in general show low levels of 1st-order species interactions, some of which are symbiotic, and that higher-order species interactions are not a general component of these communities.

Key words: competition; first-order species interactions; habitat age effects; Heliconia; *higher-order species interactions; insects; symbiosis; Venezuela.*

INTRODUCTION

A major objective of community ecology is to detect the dynamic factors which determine the relative abundances and distributions of species in communities and to determine if recurring, predictable patterns exist. Some patterns have been shown to exist in similar communities at different locations. For example, Pianka (1967, 1969, 1971) has shown how a complex of factors including climate, vegetational structure and competition correlate with the number of coexisting lizard species in North America, Australian and African deserts. However, it may prove difficult to make generalizations about communities of taxonomically different organisms. While Paine (1966, 1971) found that predation determined species richness of intertidal invertebrate communities, Addicott (1974), who studied invertebrates living in pitcher plant pitchers, found that this pattern could not be generalized to all predator-prey communities. Some studies of populations and communities throw doubt on the ability to make general statements about community dynamics. Brockelman (1969), studying American toad tadpoles, and Ehrlich et al. (1975), studying checkerspot butterfly populations, showed that these populations could be regulated by different factors under similar environmental conditions.

In this report we discuss the community of insects living in the water-filled floral bracts of a plant, *Heliconia bihai* L. (Musaceae), located in a mid-elevation Venezuelan cloud forest. Our study was a test for the recurrence of similar dynamic factors in structuring taxonomically related Neotropical insect communities from different locations. We designed experiments to estimate the effects of interactions among these insects and compared the results with those previously obtained from the communities of insects in the inflorescences of 2 lowland Costa Rican *Heliconia* species (Seifert and Seifert 1976*a*). We attempted to maximize the probability of finding different results between these studies by using *Heliconia* species at different elevations. The *Heliconia* insect communities in Costa Rica and Venezuela were exposed to different temperature and humidity regimes. Our design also tested the importance of higher-order interactions in the *H. bihai* insect community: that is, interactions among 4 species systems which could not be predicted from results of 2 species systems. Further, we considered the importance of habitat age by determining the mortality rates of 4 species of insects living in *Heliconia* floral bracts of different ages.

MATERIAL AND METHODS

Our research was carried out within 4 km of Estación Biológica Rancho Grande, Parque Nacional Henri Pittier, Aragua, Venezuela (10°21′N, 65°41′W; Fleming 1947) at elevations ranging from 1000 to 1200

[1] Manuscript received 12 May 1978; accepted 13 November 1978.