THE HOST PLANT ECOLOGY OF *HELICONIUS* BUTTERFLIES

IN NORTHEASTERN COSTA RICA

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THE HOST PLANT ECOLOGY OF *HELICONIUS* BUTTERFLIES IN NORTHEASTERN COSTA RICA

by

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DISSERTATION

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PREFACE

This thesis represents an attempt to systematically investigate the host plant ecology of a genus of herbivorous insects. "Host plant ecology" may be defined as the biology of the interaction between a herbivorous insect and its host plants. Included in this definition are topics such as (1) plant chemical defenses against herbivory, (2) herbivore counter-adaptations to plant chemical defenses, (3) population regulation of herbivores and host plants, (4) herbivore foraging (or host selection) strategies, (5) structuring of herbivore-host plant communities, and (6) mutualism between host plants and predaceous insects, or "biotic" plant defense.

While some of the above topics may appear to be unrelated subjects from different areas of biology, they are in fact very closely interdependent, and the knowledge of one topic greatly enhances understanding the others. This is especially the case when a group of closely related organisms are under consideration; then, the total variation in life-history strategy is reduced in scope and the interrelationships are more clearly seen among different factors. In this study of Heliconius butterflies, I have attempted to apply a variety of existing biological theories and generalizations to a single community of herbivores and host plants. In addition, when existing generalizations were found to inadequately account for the observed results, new hypotheses have been proposed.

However, in addition to interpretation and generalization, a sound data base is required to lend credence to the conclusions, and therefore much of the thesis is descriptive.

There are six chapters which follow, The first is an attempt to outline a particularly confusing aspect of host plant ecology: the study of plant chemistry and its effect on insect herbivores. Chapter 2 ("Community Composition") describes the field site and the Heliconius community in detail, along with a quantitative assessment of the host plant (Passiflora) community. Interesting generalizations are possible even at this level of investigation, but the chief value of the material in this chapter is in interpreting the results in the later chapters. Chapter 3 ("Host Plant Selection"), Chapter 4 ("Host Plant Chemistry"), and Chapter 5 ("Predators and Parasitoids of Heliconius") quantify several aspects of these butterflies' host plant ecology and interpret some of the observed patterns. The last chapter is an overview of the study and is both a summary and a theoretical interpretation of Chapters 1-5. In addition, there is an appendix which I hope will serve as a "source book" for further studies on this topic.

I have statistically analyzed data whenever there is any possible question as to the statistical validity of conclusions. All statistical tests were derived from Sokal and Rohlf (1969).

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Appendices