

SPECIALIZATION AND GENERALIZATION IN PLANT-POLLINATOR INTERACTIONS

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INTRODUCTION AND JUSTIFICATION.

The pollination of flowering plants is a critical ecological “service” in both natural and agricultural ecosystems. Pollination is not replaceable by technology, and thus is of astronomical value economically, as well as ethically and aesthetically. The majority of angiosperm species—by some estimates up to 90%—rely in whole or part on animals for pollination. Ecologists and other biologists therefore wish to understand general features of these largely-mutualistic interspecific interactions, to compare these features across ecosystems from different latitudes and biomes, and to derive predictive insights into the dynamical properties of the interactions. These efforts are especially important at a time when pollination systems are threatened by anthropogenic impacts.

How should we proceed to gain an overview of pollination systems? Although pollination by animals has been the object of scientific study since the 1700s, most efforts have been focused at the level of single species of plants or of pollinators, or of small groups of species. Detailed studies at this level have enriched our understanding of ecological, evolutionary, and behavioral aspects of pollination. A less-common alternative has been a broader community-level focus, in which patterns of interaction among all the plants and pollinators in a given area, or substantial subsets, are studied simultaneously.

In this volume we bring together studies spanning the range from single species to entire communities, and organize the discussion around the degree of specialization vs. generalization in plant-pollinator interactions. Plants and animal pollinators represent resources for each other, and the degree of specialization vs. generalization in resource use is a central issue in ecology. If we can characterize it in this specific case of pollination, we stand to gain insights more broadly into the conditions that foster more specialized vs. more generalized resource niches in ecological communities. Along the way we should also gain insights into topics as diverse as latitudinal trends in biodiversity, the nature of temporal and spatial variation in interspecific interactions, the susceptibility of different types of pollination interaction to anthropogenic change, and the evolution of plant and pollinator morphology, physiology, and cognition.

Our understanding of patterns of specialization and generalization in pollination systems has undergone a recent revolution. A dominant view has been that plant-pollinator interactions tend evolutionarily toward greater specialization, and this view is supported by striking examples of

documented specialization by individual plants or pollinators, and by apparent phenotypic convergence of flowers interpreted as shared specializations to attract and exploit specific types of pollinators. Conversely, however, ecologists in the field have increasingly reported substantial generalization in patterns of animal visitation to flowers, and considerable spatial and temporal variation in these patterns. Over approximately the last decade, several workers have brought the contrast of these views to the fore, and have called for renewed empirical and theoretical exploration to resolve them in some fashion. The result has been a great reinvigoration of pollination studies by ecologists worldwide, using methods ranging from food-web theory to phylogenetic reconstruction to experimental manipulation; and a corresponding improvement in our knowledge about plant-pollinator interactions and their dynamics.

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