

## Editors' note

Pollination biology provides a framework to test a diverse array of paradigms in several subdisciplines of biology: coevolution, behavioural ecology, community ecology, population genetics, mutualism, kin selection, sexual selection, parent-offspring conflict, speciation and evolution. Plant-pollinator interactions are also vital for maintaining the structural and functional integrity of natural ecosystems. Thus, the global concern about deforestation and degradation of ecological communities makes pollination an important area of research in the field of conservation biology. Pollination also plays a critical role in the formation of seeds and fruits. Successful production of seeds and fruits is necessary to meet the food requirements of growing human populations, and, one might argue, for human welfare.

Emphasis on pollination biology in the tropics is justified for at least three principal reasons. First, tropical communities display an unparalleled richness in plant-pollinator interactions and the role of such interactions in the evolution of biota and ecology and communities is far more important in the tropics than elsewhere. Second, it is well known that tropics are experiencing high rates of deforestation. Effective strategies to conserve biodiversity in the long run would require basic information about key plant-pollinator interactions. Third, seed and fruit production of crops, including tree crops for timber and non-timber products, must be enhanced to meet the needs of rapidly burgeoning populations in the tropics. Success in efforts to increase the productivity of many existing and potential crops may be contingent upon a thorough understanding of pollination biology.

This special issue is devoted to pollination biology. Its publication coincides with the International Symposium on Pollination in Tropics, which will be held in Bangalore from 8 August to 13 August 1993. The papers in this issue cover a diverse array of contemporary problems in pollination.

Despite the immense theoretical and practical importance of pollination biology, the subject has traditionally received little attention in India. This is surprising because as traced by V. V. Belavadi (page

193), Indians in ancient times had a clear knowledge of events involved in pollination, including fertilization. In recent times, P. Maheswari and his associates at the University of Delhi established a strong school of plant embryology almost half a century ago. Nevertheless, the larger field of pollination biology has remained neglected. The reasons for lack of attention to the subject by Indian biologists are explored by R. Uma Shaanker and K. N. Ganeshaiyah (page 195), and more recent contributions of Indian biologists are summarized by R. Vasudeva and R. Loksha (page 198).

The ecology and evolution of plant-animal interaction in natural communities can be explored to address several conceptual issues in biology. W. J. Kress (page 253) discusses coevolution between non-flying mammals and plants in Madagascar. S. Subramanya and T. R. Radhamani (page 201) have analysed factors contributing to the predominantly generalized relationship among bird pollinators and their plants. Figs and fig-wasps constitute the most celebrated case of tight coevolution. A. Patel, M. Hossaert-McKey and D. McKey (page 243) review the fig pollination research in India and list the factors that make Indian figs uniquely suitable to address some important questions. Insect pollination in natural communities is the subject of several other papers. T. N. Ananthakrishnan (page 262) provides a general perspective on pollination by thrips. R. B. Primack and D. W. Inouye (page 257) provide interesting data on variation in visitation rates in a range of communities scattered in different parts of the world and relate variation in visitation rates to variation in seed production.

Plants commonly abort a large number of seeds and fruits. Abortions have been attributed to a number of factors ranging from shortage of pollinators and resources to parent-offspring conflict and sibling rivalry. B. B. Casper and R. A. Niesenbaum (page 210) review the role of pollination and resources in seed production and K. S. Murali (page 270) discusses a specific example. The pattern of ovule and seed abortion within fruits in the light of gamete competition and selection is the subject of the paper by M. E. O'Donnell and K. S. Bawa (page 214). The effect of neighbours in

shaping the positional pattern of seed development is analysed by N. V. Joshi, Uma Shankar and K. N. Ganeshaiyah (page 234).

It has been only recently recognized that many features of plant breeding systems are directly linked to selection exercised by pollinators. P. Koul, N. Sharma and A. K. Koul (page 219) discuss the elaborate strategies that facilitate out-breeding in the members of Apiaceae. J. H. Cane (page 223) explains the significance of sterile pollen in the pollination of dioecious species. R. Lokeshia and R. Vasudeva (page 238) suggest that resource allocation to sexes in monoecious species is shaped by the relative success of male and female gametes.

Deforestation and forest fragmentation in the tropics are likely to have many deleterious effects on plant interactions. B. J. Rathcke and E. S. Jules (page 273) show that the effect of forest fragmentation depends on the degree to which plant-pollinator interactions are specialized. In general, pollinator abundance and pollinator diversity decrease in forest fragments.

The role of pollinators in production of seeds of crop plants and in natural communities is reviewed by D. P.

Abrol (page 265). S. W. T. Batra (page 277) reviews the diversity of Indian bees, their role in pollinating the crop plants and the need to conserve them. Analysing the physiological and biochemical bases of pollen-stigma interactions, K. R. Shivanna and H. Y. Mohan Ram (page 226) offer instances to illustrate the extension of basic work to solve specific problems such as breaking the stigma barriers in interspecific crossing programmes and producing 'true seeds' in potato.

The publication of this special issue, the symposium on pollination in tropics, and post-symposium interaction meeting on pollination and dispersal ecology will, we hope, foster more research on plant-pollinator interactions in India. The tropical communities are characterized by unique biotic interactions that have been scarcely investigated. Apart from simple scientific curiosity, the twin requirements of conservation and sustained food production make it imperative that we learn more about the biology of such interactions.

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