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Sperm Competition in Butterflies

 Springer

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Front cover: A female of the Japanese parnassian, *Parnassius citrinarius*, with mating plug feeding on the flower of the skevish, *Erigeron philadelphicus*. *Back cover: Left:* A pair of the silver-studded blue, *Plebejus argus*, copulating on the grass. *Center:* Males of the alpine black swallowtail, *Papilio maackii*, forming aggregations on soil by the roadside and showing puddling behaviour after a sudden shower in the summer. *Right:* A male of the pale clouded yellow, *Colias erate*, courting on the wing toward a perching female, as the female shows the mate refusal posture with open wings and elevated abdomen. (All photos taken in Shirouma, Nagano, Japan, by Mamoru Watanabe)

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Preface

Among insects, butterflies are exceptionally well suited to treatment as a group, although most of them are not pests to human beings. Many years ago Prof. Paul R. Ehrlich of Stanford University sent many reprints including “the population biology of *Euphydryas editha*” to me, then a graduate student, and pointed out that butterflies are suitable model insects for evolutionary ecology. Being large, active by day, and strikingly coloured, butterflies are probably better known to nonspecialists than any other insects are except dragonflies, as stated by Philip S. Corbet (1999), the famous odonatologist. Butterflies have an important role to perform in promoting awareness of the increasingly urgent need for biodiversity of the terrestrial ecosystem, such as being a basic component in the food chain during immature stages and in pollination during the adult stage, as well as being important in studies of evolution and coevolution. However, many people, particularly in Japan, know little about the biology and ecology of butterflies. Instead, the biogeography, distribution, phylogeny, and life history of most Japanese butterfly species have been clarified by researchers, collectors, and lovers of nature. The complete list of host plants for each Japanese butterfly species and the improved techniques for rearing larvae in cages have also been reported.

Butterflies, as well as dragonflies, beetles, and cicadas, are safe for Japanese children who enjoy capturing flying adults and rearing larvae indoors. Furthermore, the life cycle of the cabbage butterfly has to be learned by pupils in elementary school, but the spiritual enlightenment that butterflies offer humans might almost certainly become but a fading memory after childhood. Therefore, like that of dragonflies, butterfly evolutionary ecology is not so highly regarded among insect sciences but, rather, as the subjects of children’s interests. However, the sperm competition theory has begun to be developed partly on the basis of clarifying the mechanism of butterfly mating behaviour.

This book is concerned primarily with the behaviour and ecology of butterflies. I have tried to systematize information about integrated mating behaviour from first encounters with both sexes to the onset of egg-laying behaviour. Although the material presented in this book is limited to several taxa, mainly in Papilionidae and

Pieridae, the inclusion of the main topics within the chapters follows broadly the butterflies with similar mating systems, particularly female polyandry.

The number of publications on the behavioural ecology of butterflies has increased in recent years. A major objective of this book is to present an appraisal and review of past and current literature and to ensure that any significant observation reported here can be traced unequivocally to its source. While preparing the present book, I have sometimes viewed with concern the appearance of new literature and, I wondered whether sufficient time and space would come with the incoming tide of information. Then my determination to complete this book was sustained by my belief in the necessity of choosing literature selectively.

Tsukuba, Japan

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