

BOOK REVIEW

SHUKER D.M. & SIMMONS L.W. (EDS) 2014: THE EVOLUTION OF INSECT MATING SYSTEMS. Oxford University Press, Oxford, 339 pp., ISBN 978-0-19-967802-0 (hbk), ISBN 978-0-19-967803-7 (pbk). Price GBP 75.00/37.50.

The reviewed book was preceded by two keystone monographic publications that paved the way for the contemporary understanding of various modes of insect reproduction presented very expertly in the current volume. Entomology in the second half of the 20th century was marked by increasing interest in the staggering diversity of sexual behaviour in insects, primarily the alternative roles of the opposite sexes in mating activities. This led to the selection of this aspect of insect ethology as a symposium topic for the Behaviour Section of the 15th International Congress of Entomology in Washington D.C. in 1976. The overall quality of the papers presented, as well as a broad interest in the subject, led to the publication of the contributions in a book entitled *Sexual Selection and Reproductive Competition in Insects* (Academic Press, 1979). The papers presented at that meeting were expanded and updated and additional manuscripts by outstanding evolutionary biologists at that time were included. This volume thus presented the first comprehensive synthesis of biological concepts that emphasize intrasexual reproductive competition as a driving force in Darwinian sexual selection based on evidence that had accumulated over several preceding decades from studies on these aspects of insect behaviour.

While the above edited volume served as an inventory of the multitude of modes of insect reproductive behaviour, a book on a similar theme, *The Evolution of Insect Mating Systems*, authored by Randy Thornhill and John Alcock, which appeared just four years later (Harvard University Press, 1983), was more ambitious, namely in terms of theory. Hence this book was welcomed both by entomologists and a growing body of evolutionary theorists as the first comprehensive review and analysis of the evolution of insect reproductive behaviour. The authors presented the great diversity of insect mating systems based on a large body of literature and attempted to explain them in terms of differences between the sexes in their resource investment per gamete and differences among species in their ecological niches. It had a huge effect in shaping adaptationist approaches to the study of animal behaviour and influencing the study of evolution of reproductive behaviour in many organisms other than insects.

Even though much of the Thornhill and Alcock's book remains relevant today, a growing demand to update the empirical and conceptual scope of this landmark book enticed David E. Shuker and Leigh W. Simmons to edit the contributions presented at the Royal Entomological Society's International Symposium on "The Evolution of Insect Mating System" held in St Andrews in September 4–6, 2013 by the world's leading insect researchers, and published them under the original title *The Evolution of Insect Mating Systems*. (In my opinion it would be pertinent to affix the ordinal "II"). This recent remake of the three decade old title thus appeared as an edited collective writing of twenty contemporary experts in insect mating behaviour and evolution, who were at the beginning of their professional careers often inspired by the Thornhill and Alcock's canonical work. Even the cover photograph of this book (a male guarding an ovipositing damselfly female) is symptomatic by endorsing its origin; the original 1983

volume displayed the same scene, though only as an artist's drawing.

In fourteen chapters the contributors expand and update ideas in the original book and substantiate them with the attainments in the last three decades of empirical research. "The developments made over the last thirty years", the editors explain, "do necessitate a shift in focus in particular by moving away from male–female dichotomy in terms of descriptions of mating systems (a dichotomy that many of us see misleading), and by including some of the rich literature on behavioural mechanisms that have helped shape our view of behavioural functions. We now more fully appreciate the role of females in shaping mating systems, and evolutionary conflicts of interest between males and females are now recognized as a strong source of selection. The role of parasites in sexual selection has also become evident..."

Now to the content: The first five chapters are more or less a general introduction to the biology of insect reproduction emphasizing advances and achievements of the new generation of students of insect reproductive behaviour. The author of the first chapter (Benjamin B. Normark) recounts the recent advances in the understanding of *modes of insect reproduction*, which in insects are richer than in any other animal group, due to insects' staggering diversity and unprecedented variability in their genetic systems. Special attention is paid to all types of parthenogenesis (apomixes, automixis, gynogenesis, hybridogenesis, obligate and facultative parthenogenesis, cyclic parthenogenesis) as well as to haplodiploidy (arrhenotoky vs. parental genome elimination, exclusion of sperm).

The next chapter (David M. Shuker) introduces the reader to the concepts of *sexual selection theory*. The following two chapters provide insights into the sexual differences that underlie *mating systems* (Hanna Kokko, Hope Klug, Michael D. Jennions) and explain the contemporary advances in our understanding of *genetics* and evolution of *insect mating systems* (Michael G. Ritchie, Roger K. Butlin). They were facilitated both by an advance in the statistical methods used in quantitative genetics and by the wide range of techniques developed in genomics. Patricia J. Moore in her contribution attempts to introduce behavioural ecologists to *reproductive physiology* in relation to reproductive *behaviour* as well as update some of what has been learned in this research area in the past 30 years.

The remaining chapters are devoted to various specific topics and phenomena of insect reproductive behaviour, the study of which provides insights into a wide range of evolutionary and behavioural questions, such as the *evolution of extreme weaponry* for reproductive contests (Douglas J. Emlen), *alternative morphological and behavioural phenotypes* (Bruno A. Buzzato, Joseph L. Tomkins, Leigh W. Simmons), *mate choice and sexual conflict* in sexual selection (John Hunt, Scott K. Sacaluk), the evolution of *polyandry* (Rhonda R. Snook), *sperm competition* (Leigh W. Simmons), *cryptic female choice* (Goran Anqvist), *parental care* (Per T. Smiseth), the role of *parasites and pathogens* in sexual selection (Marlene Zuk, Nina Wedell) and the modification of mating behaviour and *sexual selection in (eu)social insects* (Boris Baer).

The two doyens of the field, R. Thornhill and J. Alcock, were invited to comment on the current collection of chapters that update their original book. Their contribution is an erudite evalu-

ation of the major advances in insect behavioural ecology that have occurred since the publication of their book in 1983. They pinpoint the main areas of research that they did not consider largely because the critical research had yet to be done at the time they were writing their book, but were addressed by their followers and documented by the contributions in the current volume. These are for instance polyandry and the role females plays in mating system (cryptic female choice), new discoveries based on innovative use of genetic technology in the study of paternity, and/or the phenomenon known as the “lek paradox”, (i.e. the question, how can females in lek systems be selected to maintain a strong preference for males with certain extreme traits when strong female choice in the past eliminated any genetic variation that underlies the preferred male traits, thereby eliminating the fitness benefits for choosy females), and some other topics.

This book will become a standard reference work on the subject for many years to come. It is suitable for both graduate students and researchers interested in insect mating systems or behaviour

from an evolutionary, genetic, physiological, or ecological perspective. This unique source of information should not be missing from the bookshelf of any student of insect behavioural ecology and due to its interdisciplinary and concept-driven approach it will also be of relevance and use to a broad audience of evolutionary biologists. I also believe that broadly interested zoologists and ecologists as well as laymen naturalists will undoubtedly find it both instructive and entertaining.

REFERENCES

- BLUM M.S. & BLUM N.A. (EDS) 1979: *Sexual Selection and Reproductive Competition in Insects*. Harvard University Press, New York, San Francisco, London, 463 pp.
- THORNHILL R. & ALCOCK J. 1983: *The Evolution of Insect Mating Systems*. Harvard University Press, Cambridge, MA, 547 pp.

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