
Preface

Scientific disciplines are like the fossil record. Some taxa burst on to the scene only to disappear rapidly, others like the ammonites, evolve to a certain state and then remain unchanged for aeons, while others develop and undergo extensive adaptive radiation. The field of sperm competition has been around for 27 years, a relatively short time as scientific disciplines go, but during this time it has expanded enormously, and is now radiating into other disciplines. The factors that determine whether or not particular areas of science 'take off' are not well understood and when Geoff Parker published his ground-breaking paper on insect sperm competition in 1970, he could have had little idea of its consequences.

Within 14 years sperm competition studies, particularly on insects, were widespread, elegantly demonstrated by Bob Smith's *Sperm Competition and the Evolution of Animal Mating Systems* (1984), this volume's predecessor. Since then studies of sperm competition have continued apace, and have been undertaken in an increasing diversity of taxa. The new knowledge and understanding, and recognition of what we still need to know, in the mere 13 years since Smith's volume, are remarkable. Our aim in this volume is to document those changes and suggest avenues for future research. The present volume is divided into two parts, a general section and a taxonomic section. Before describing briefly the book's contents, it is probably worth saying something about its title. The inclusion of 'sexual selection' within the title was simply to remind people that sperm competition is a central part of Darwin's theory of sexual selection. Sexual selection does not stop at copulation, and the fact that females in virtually every animal group copulate with several males means that sperm competition is a central and ubiquitous part of sexual selection.

The general section comprises four chapters, each dealing with a fundamental issue. It is particularly fitting that Geoff Parker should write the opening chapter to both this, and Smith's volume. His sustained contribution to this field has been remarkable. In this opening chapter he presents an overview of his work during the past 13 years which provides us with a theoretical framework for the study of sperm competition. In the second chapter Anders Møller discusses the relationship between sperm competition and sexual selection. In chapter three Bill Eberhard deals with a rapidly expanding and controversial area, the role of females in sperm competition. In chapter four Jon Wright discusses another controversial issue: the relationship between paternal care and sperm competition.

The taxonomic part of the book comprises 13 chapters. Compared with Smith's volume, the taxonomic coverage here is more diverse, reflecting the expansion of the field. However, it has not been possible to be fully comprehensive in our taxonomic coverage. There are certain animal groups, such as Crustacea, where sperm competition is known to occur, but where we felt (possibly mistakenly) there was insufficient information to merit a full separate chapter. We start with plants. Lynda Delph and Kayri Havens (chapter 5) have reviewed pollen competition in flowering plants and in doing so have highlighted the similarities and differences with sperm competition in animals showing that there is much that animal biologists can learn from botanists. Don Levitan (chapter 6) then discusses animal external fertilizers – marine invertebrates, a group that have numerous parallels with flowering plants. In chapter 7 Nico Michiels considers the special sperm competition problems faced by simultaneous hermaphrodites. This is followed by Bruno Baur's review (chapter 8) of sperm competition and its potential in the molluscs. Not only is the potential for sperm competition in this group considerable, but, as Baur points out, with their multiple sperm storage structures and other bizarre features, the potential of molluscs as study organisms is also tremendous. Mark Elgar's discussion of spiders and other arachnids in chapter 9 shows the extent to which our understanding of sperm competition in this taxon has developed since the two chapters in Smith's volume. The insects caused us some problems. (Bob Smith devoted four chapters – some 200 pages and 30% of the entire volume – to this group.) After much deliberation we decided to go for a single, large chapter which dealt with more general issues in insect sperm competition: Leigh Simmons and Mike Siva-Jothy have provided a broad and comprehensive review in chapter 10. Most of the vertebrate taxa we present here were also covered in Smith's volume. However, in almost every case our knowledge of sperm competition has increased substantially; this is true for fishes (chapter 11 by Chris Petersen and Bob Warner), amphibia (chapter 12 by Tim Halliday), reptiles (chapter 13 by Mats Olsson and Thomas Madsen), birds (chapter 14 by Tim Birkhead) and mammals (chapter 16 by Montserrat Gomendio, Sandy Harcourt and Eduardo Roldán). The chapter (15) on monotremes and marsupials by Dave Taggart, Bill Breed, Peter Temple-Smith, Andy Purvis and Glenn Shimmin is new: we included it because a substantial amount of information exists on monotreme and marsupial reproductive anatomy and biology, but relatively little on their behaviour in the field. Finally, in chapter 17 we provide an overview by discussing the relationship between sperm competition and sexual selection in terms of both function and mechanism and how these translate into fitness.

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