

The Evolutionary Biology of the Threespine Stickleback

Edited by

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Preface

The threespine stickleback, *Gasterosteus aculeatus*, has been used to address diverse problems in evolutionary biology and other subdisciplines in biology. Its wide use in biology largely reflects its favourable biological properties: its wide distribution, ecological versatility, extreme phenotypic variation, small size, and adaptability to the laboratory. However, as information about its biology has accumulated, the value of its intrinsic properties has been complemented by the accumulated knowledge which has facilitated subsequent research. Progress in our understanding of evolutionary processes is strongly dependent upon appreciation of the influences of multiple simultaneous effects, and consequently this accumulation of knowledge is crucial for the stickleback's use in evolutionary biology.

The breadth and volume of research on the threespine stickleback has stimulated previous comprehensive works on this species complex. Wootton's (1976) excellent first book has been an indispensable introduction for students and a valuable general reference for those interested in stickleback biology. A stickleback bibliography by Coad (1981) and later books by Paepke (1983, in German) and another, more narrowly focused book by Wootton (1984) have further increased accessibility of information on stickleback biology. There is even a delightful (and largely accurate) children's book on the life cycle of the threespine stickleback (Lane 1981). The importance of the threespine stickleback for biological research as well as for an early introduction to natural history has become widely recognized.

It has already been eight years since the most recent review of stickleback biology was published. There have been major developments during this time, and continued progress in the use of the threespine stickleback for evolutionary studies requires a new synthesis of our knowledge. We believe that the explosive growth of knowledge on stickleback behaviour, ecology, physiology, and evolution would make it very difficult for a single author or even a small group of coauthors to undertake a book that would adequately treat the major areas of research on evolution of the threespine stickleback. However, we also did not believe that a disconnected collection of research papers on stickleback biology would meet this need.

Accordingly, we set out to develop a volume that would combine the consistency, integration, and coverage of a single-author book with the currency, depth of knowledge, and critical judgement that specialists could bring to their subjects. Most chapters review major research areas to which the chapter authors have contributed. Although many chapters include

unpublished data or information on the authors' research that will soon appear in the journal literature, most of the chapters take a broader perspective. The individual chapters of this book are the intellectual products of the chapter authors, but we have tried to assemble a cohesive set of topics that centre on evolutionary biology and include the major developments in threespine stickleback biology. Author and subject indexes at the back of the volume represent a further attempt to facilitate use of the volume as a general introduction to the evolutionary biology of the threespine stickleback. We have also tried to impose a reasonably uniform format, style, and terminology throughout the book, and to resolve factual inconsistencies or conflicts of interpretation between chapters by different authors. Indeed, we have taken the liberty to intrude deeply into the usual prerogatives of contributors to multiauthored books. We hope that this intrusion has resulted in a reasonable level of integration and consistency of presentation.

The diversity of information bearing on the evolutionary biology of the threespine stickleback would make it difficult even to render informed editorial judgement of the chapters in this book without the assistance of numerous reviewers. Therefore, we have exploited the generosity of many colleagues who agreed to write critiques of the chapters and to make suggestions for their improvement. We are most grateful for the help of these external reviewers, who were John A. Baker, Theo C.M. Bakker, George W. Barlow, Jeffrey L. Beacham, Mark Bevelhimer, Bertil Borg, Brian W. Coad, Richard G. Coss, John P. Ebersole, Harry W. Greene, Helga E. Guderley, Anne E. Houde, G.J. Kenagy, Manfred Milinski, Gary G. Mittelbach, Guillermo Ortí, Donald H. Owings, Mark S. Ridgway, William J. Rowland, David L. Soltz, David W. Stephens, Nikki C. Tousley, David B. Wake, Jeffrey A. Walker, George C. Williams, David Sloan Wilson, and three anonymous reviewers. The reviewers often contributed extensive comments, and we are indebted to them for the numerous improvements to the book that resulted from their advice. However, their advice was not always followed by authors, and they are not responsible for the content of chapters. We are also most grateful to Nikki C. Tousley and Simon C. Nemptov, who did most of the work of verifying, organizing, and integrating citations from individual chapters into a single list of references. Editorial work on this book was completed while M.A.B. was on sabbatical leave at St Francis Xavier University, and thanks are due to the University for supporting this work and to D. Max Blouw for his hospitality.

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M. A. B.
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A central tenet of evolutionary theory is that adaptation in the wild, like artificial selection, occurs gradually through the sequential fixation of small-effect variants (1). Consequently, the independent evolution of similar phenotypes is expected to use unique combinations of genes and alleles (2). New populations, however, are often established in novel environments at the edge of an organism's range, and selective.Â Bell, M. A. & Foster, S. A. (1994) *The Evolutionary Biology of the Threespine Stickleback* (Oxford Univ. Press, Oxford). â†µ.