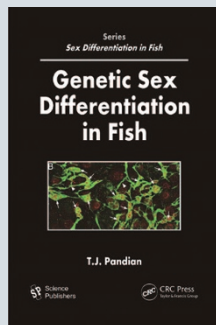


Genetic sex differentiation in fish

Reviewed by Christian Lawrence, MS



GENETIC SEX DIFFERENTIATION IN FISH

By T.J. Pandian

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Fish are far and away the largest and most diverse taxon among vertebrates. The varied array of form, function and life history strategies they display matches their widespread distribution across nearly every habitat type on the planet. Given this fact, it should come as no surprise that fish also demonstrate extreme plasticity in their sexual development. Whereas some species have master sex-determining genes analogous to the mammalian *SRY*, others' sexual phenotype is largely dictated by temperature during early development. Still others can switch from one functional sex to another during their lifetime. The multiple pathways that fish can take to become male or female wonderfully illustrate how nature often finds more than one solution to the same problem.

Author T.J. Pandian tackles this complex subject in *Genetic Sex Differentiation in Fish*, the newest volume in the author's CRC Press series. As one might imagine, the topic is dense, and so this book is not intended for the casual observer. Rather, it is a comprehensive treatment targeted towards academics interested in reproductive biology in fishes. As the author rightly points out, the subject is timely; cultured fish are an important source of animal protein for a growing global population, and some species, like the zebrafish, increasingly serve as models of human disease. The exhaustive information that this volume provides will be of critical importance to specialists in both of these emerging fields.

The book is organized into five sections. The brief introduction provides definitions and overviews of the processes of sex determination, hermaphroditism and patterns of sexual differentiation. That Pandian makes the distinction between sex determination and differentiation is vital because these terms are often confused in the literature. The introduction concludes with a nice treatment of how new molecular and cellular techniques have

impacted the study of sex differentiation in fishes. This information is presented in tabular form, which facilitates quick reference.

The second and third sections of the book comprise the bulk of the text and are devoted to the process of sexual differentiation in gonochores (species with two distinct and stable sexes) and hermaphrodites (species in which individuals may have both male and female reproductive organs, simultaneously or in sequence), respectively. These sections are exhaustive and contain numerous and up-to-date references with multiple fish species as examples. This approach works well, both to illustrate Pandian's main points and to highlight just how diverse fishes are as a group.

In the section on gonochoristic species, Pandian does an excellent job in making a clear distinction between sex chromosomes, sex determining genes and genes that impact the differentiation process. He presents these topics in a logical progression, rendering an otherwise confusing and many-layered subject easier for the non-specialist reader to understand. He also incorporates dedicated sub-sections on well-studied model species, including the medaka (*Oryzias latipes*), the Nile tilapia (*Oreochromis niloticus*), the zebrafish (*Danio rerio*) and the southern catfish (*Silurus meridionalis*). Because each of these species displays distinct modes of sex differentiation, they provide excellent illustrations of the processes as well as of the tools that researchers use to study them. As he does throughout the book, Pandian incorporates slides, figures and tables, both original and from previously published work, to present much of the supporting data.

The section on hermaphrodite fishes also is arranged logically, beginning with an overview of the different patterns of hermaphroditism and ending with an in-depth explanation of the differences between simultaneous versus sequential hermaphrodites. Also included is an interesting discussion of the costs of sex change and the various models that have been postulated to explain the phenomenon. The topic of genetic controls and the anatomical changes involved in sex change in fish, while fascinating, is enormously complex, and the average reader might struggle to get through it.

Genetic Sex Differentiation in Fish concludes with a section on sterility and mutants, followed by a brief overview of highlights and future directions. The former is of some importance to fish biologists and other readers because dysfunction often provides clues as to how processes should work. The latter serves to pull the work together and point to the frontiers of this field of active research.

In all, *Genetic Sex Differentiation in Fish* is a fine contribution to an important field of biology. While this book has a very specific target audience and covers a complicated subject, it is well organized and clearly written. As long as the information stays current, it should become a 'go-to' reference book for fish biologists, reproductive biologists and aquaculture and fisheries specialists.

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