

importance has underpinned an extensive research effort on the five species of salmon and on the trout that inhabit the same area. Despite this, the stocks of salmon are not in a good state, but that is more to do with controlling human behaviour than with an understanding of salmon biology.

The author writes that he hopes that the book "... will provide insights into the basic biology of salmon to a range of people, including university students and faculty, biologists working in agencies, nongovernmental organisations, and companies devoted to salmon or to some aspect of the natural or human world that interacts with them". In addition to these people with a direct need to know about salmon, "... [he] hope[s] the book will also interest members of the public who wish to learn about these fishes or become more involved in their conservation".

Salmon studies have been valuable for the testing of ideas on life history evolution, mating strategies and the role of kinship in determining competitive interactions between individuals. Mostly, though, the various species are difficult to investigate. They inhabit two different environments, they migrate over large distances and they live in water. These three features make salmon investigations hard work. Despite these difficulties, research on Pacific salmon has now been in progress for over a century with a concomitant accumulation of knowledge and this has been ably summarised in Quinn's book.

In a book of manageable length and in 19 chapters, Quinn provides information on all aspects of salmon biology. There is an emphasis on those features of their lives that are characteristic of the group, such as migration, their mating systems and their transitions from fresh to salt water and back. One chapter is entitled 'The Ecology of Dead Salmon', which is sure to draw attention from biologically orientated comedians. Monty Python and dead parrots come to mind! The chapter is of course a serious discussion of the way in which the carcasses of spawned salmon are moved out into the surrounding riparian areas, where they rot to provide essential nutrient input to an environment that is otherwise oligotrophic. To cite Quinn "This research has revealed that the entire ecosystem – from insects to bears and trees, including the salmon themselves – benefits in complex direct and indirect ways from decomposing salmon" (p. 129). This chapter more than any other illustrates how the salmon is interwoven into the fabric of the Pacific northwest.

The design of the book is likely to attract a wide range of readers. It contains many colour photographs of salmon and their environment illustrating the way in which these fish can change from their silvery marine form to the brightly coloured phenotype displayed by males at spawning time. There are numerous graphs and diagrams presenting conceptual schemes and data. Quinn's writing style is clear and without jargon so that it should be possible to reach the wide audience he hopes for in his preface. It is unlikely that this book would be used as a textbook for a course as it is specialised. It will provide many examples for students doing more general courses and it will help conservationists to reach a better understanding of the target of their concerns. The book's relatively low price is another of its attractive features which should ensure it is widely used.

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The Senses of Fish: Adaptations for the Reception of Natural Stimuli

Edited by G. von der Emde, J. Mogdans, and

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Fish possess an enormously varied and fascinating array of sensory system adaptations, more so than any other vertebrate group. The reason for this is to be found in the diversity of their habitat type and lifestyle, both factors moulded by the physically variable nature of water. Water may be clear or clouded, by different colored particles and/or solutions, and it is naturally colored even in its pure state, so over depth, the spectrum of light available for vision is restricted. Water may also be hot or cold, salty or fresh, fast moving or still, and therefore provides a multitude of different natural stimuli.

The Senses of Fish: Adaptations for the Reception of Natural Stimuli recognizes the physical driving forces behind fish sensory diversity as well as those provided by the biological diversity of fish communication types. In places there are up-to-date

summaries of new findings, and in other parts, good reviews of older ideas. *The Senses of Fish* is a wonderful book for anyone interested in fish, sensory systems, life under water and the problems of survival there. Chapters are generally arranged according to sense organ. However, to counterbalance this there are also chapters describing central processing of sensory input, the production of sound and communication, and a touching personal account of life as a sensory biologist by Mary Hagedorn, a leading light in electrosense.

The book is kick-started by an enthusiastic Foreword from V. Benno Meyer-Rochow, a man who has seemingly studied most sensory system types in most types of animal. Meyer-Rochow has given good advice for young students, worth underlining here, that books are still read and in particular they are read by smart people. *The Senses of Fish* will certainly make students smarter and it also makes a valuable reference and update for those of us already supposed to be smart. There has been a recent flurry of books on sensory systems: *Ecology of Sensing* (Barth and Schmid 2001), *Sensory Biology of Jawed Fishes, New Insights* (Kapoor and Hara 2001), *Sensory Processing in Aquatic Environments* (Collin and Marshall 2003) and *Communication in Fishes* (Laddich *et al.* 2006) being the ones with good underwater content that spring to mind. *The Senses of Fish* is both complementary and slightly overlapping with these but a keen sensory biologist now has a wealth of new information available to add to classics such as *Sensory Biology of Aquatic Animals* (Atema *et al.* 1988).

There are biases and quirks in this book that make it different from the others. It is nice to see that vision does not dominate, even though this is the largest area of study in fish sensory circles, and that the lateral line – both mechanosensory and electrosensory – is prominently featured. The recent advances in this fascinating field certainly make this worthwhile. However, I must say as a vision biologist who occasionally dabbles in lateral line, I was torn between slight disappointment at the lack of vision (in the literal sense) and pleasure at seeing other senses pushed to the fore. Chemoreception is given a well-deserved three chapters. This sense plays a much greater part in life underwater than it does on land, and because it is not very developed in humans it is often under represented. It was also

slightly disappointing to see no description of magnetic sense, especially as there have been exciting recent developments here (see e.g. chapter 3 in *Sensory Processing in Aquatic Environments*, Collin and Marshall 2003). Three chapters on hearing and one on sound production in fish make a nicely balanced look at both the reception of sound underwater and some of the ways sound is produced.

The editors have certainly achieved what they set out to do and the individual writing in chapters is generally of a high standard, although styles certainly vary considerably. I am not sure when this book was first conceived but two of the chapters have few if any references from this century. Small typographical or printing mistakes are relatively frequent and I should like to have seen more figures – especially colour figures – in almost all of the chapters. These small negatives aside, the overall presentation and feel of the book is pleasing.

The Senses of Fish manages to be both a good place to start learning about fish sensory systems and a good overview of some of the recent developments in this fascinating field. It was a pleasure to read and I certainly feel that reading it made me smarter.

References

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