

Books and links on fish behaviour

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Books for the general public:

- 1) Reeb, S.G., 2001, Fish Behavior in the Aquarium and in the Wild, Cornell University Press, Ithaca.

I hope I can be forgiven for starting with my own book. I wrote it to introduce aquarists and fish aficionados to the work of professional fish ethologists (ethology is the study of animal behaviour). The present web site is a companion to the book; it covers some of the topics that were not included in the book because of a lack of space. The book chapters are: Olfaction; Hearing; Lateral Line; Electricity and Magnetism; Learning; Telling Time; Individual Recognition; Gauging Predators and Adversaries; Mate Choice; Shoal Choice; and Making Compromises. The emphasis is on the results of experimental studies. The book is written in a style accessible to non-scientists, but serious students will also find much valuable information, including 575 references to the primary literature.

- 2) Barlow, G.W., 2000, The Cichlid Fishes: Nature's Grand Experiment in Evolution, Perseus Publishing, Cambridge MA.

An easy-to-read, engaging, and well researched book on cichlid biology, written by a reputable expert. Many behavioural aspects are very well covered, relating particularly to reproduction (aggression, mate choice, parental care). The great number of references to the primary literature will please the serious student. Highly recommended.

- 3) Wilson, R., and Wilson, J.Q., 1992, Pisces Guide to Watching Fishes: Understanding Coral Reef Fish Behavior, Gulf Publishing Company, Houston.

Again, a delightful book, easy to read, non-technical but well supported by references to scientific studies. There are chapters on foraging, sensory perception, reproduction, social life, territoriality, symbiosis, and diurnal versus nocturnal activity. Of interest to any fish lovers, not just coral reef divers.

- 4) DeLoach, N, and Humann, P., 1999, Reef Fish Behavior: Florida, Caribbean, Bahamas; New World Publications, Jacksonville FL.

A well-written, well produced, and lavishly illustrated book on the behavioural biology of reef fishes. The approach is descriptive. The authors are experienced divers and often give personal observations, but they also cover the scientific literature. About two-fifths of the book is devoted to general topics: reproduction, life cycle, feeding, colours and camouflage, symbiosis (mostly cleaning), senses and sound communication, and marine life management. Descriptions of the behaviour of a great many individual species occupy the rest of the book.

- 5) Grubb, T.C. Jr., 2003, The Mind of the Trout, University of Wisconsin Press, Madison.

The opening line is “This book is about how and why trout think”. The writing style and presentation are more academic than the books above, but still light enough to be understood by anglers from all walks of life. There are chapters on sensory perception, motivation, attention, learning, memory, cognitive maps, and other aspects of cognition in salmonids. Studies with non-salmonids are sometimes included.

- 6) Ward, A., 2007, Questions and Answers on Freshwater Aquarium Fishes: Everything You Need to Know to Successfully Raise Healthy Fish, TFH, Neptune City.

Don't be fooled by the subtitle. This book is not so much about raising fish as it is about informing the public about the behavioural ecology of fishes, in the form of short answers to a multitude of questions (I counted 318) about schooling, fighting, avoiding predation, finding food, learning, and mating. As befits a TFH production, the book is enlivened by great colour photographs and illustrations. Very interesting.

- 7) Zupanc, G.K.H., 1988 (original German edition 1982), Fish and their Behavior, Tetra Press, Melle (Germany).

An accessible writing style covers fish behaviour with a physiological (mostly sensory) slant. It also describes the research program of individual scientists, which is a nice touch. Lots of colour photographs and illustrations. This book is a great complement to the one by Ward above, both in terms of material covered (sensory ethology rather than behavioral ecology) and age of the literature covered (older here).

- 8) Adler, H.E., 1975, *Fish Behavior: Why Fishes do What They Do*, TFH, Neptune City.

An older TFH offering. Large format (8.5 x 11 inches), hardcover, and a picture on almost every page (mixture of colours and black-and-whites). Easy-to-read material covers the basics of many topics, including: vision, hearing and sound production, lateral line, taste and smell, feeding, fighting, fleeing and hiding, courtship and care of young, social life, learning, electroreception and electrolocation, orientation. A bit dated, but very nice nonetheless.

- 9) Smith, C.L., 1994, *Fish Watching: An Outdoor Guide to Freshwater Fishes*, Cornell University Press, Ithaca.

I hesitated slightly before including this book in the list because it is more about fish diversity and ecology than behaviour. However, the author's enthusiasm for fishes and their natural habitat is contagious and won me over. I also appreciated the exhortation to get out there and observe the behaviour of freshwater fishes directly in their habitat (though I have reservations about how easily this can be done in practice). If you like fishes and their natural history, then this is a good book for you.

- 10) Paxton, J.R., and Eschmeyer, W.N. (consultant editors), 1994, *Encyclopedia of Fishes*, Academic Press, San Diego.

A well produced, nicely illustrated and informative overview of all fish orders. The material covered falls under the banner of general biology, and that includes some behaviour.

- 11) Parker, S., 1990, *Eyewitness Books: Fish*, Alfred A. Knopf, New York.

A very well illustrated and fun-to-read small book on the natural history of fishes and their fascinating adaptations, including their behaviour.

Ichthyology textbooks:

- 1) Helfman, G.S., Collette, B.B., and Facey, D.E., 1997, *The Diversity of Fishes*, Blackwell Science, Malden MA.

Undergraduate textbooks are easy to understand, even by non-specialists. The behavioural content of this one is more extensive than usual, probably because its first author has a lot of experience in fish ethology.

- 2) Bond, C.E., 1996, *Biology of Fishes*, Saunders College Publishing, Fort Worth.

A very complete textbook. The chapter on behaviour is somewhat short, but there are lots of behavioural tidbits in other chapters on senses and ecology. In its new incarnation this book is now sold by Brooks Cole Publ under the title “Bond’s *Biology of Fishes*, 3rd ed”, Michael Barton, author.

- 3) Moyle, P.B., and Cech, J.J., Jr., 2004, *Fishes: An Introduction to Ichthyology*, Prentice Hall, Upper Saddle River NJ.

General readers will appreciate the interesting sidebars in this textbook.

Academic books:

- 1) Keenleyside, M.H.A., 1979, *Diversity and Adaptation in Fish Behaviour*, Springer-Verlag, Berlin.

A descriptive account of the many interesting behaviours of fishes. As academic books go, this one is fairly easy to read.

- 2) Brown, C., Laland, K., and Krause, J. (eds.), 2006, *Fish Cognition and Behavior*, Blackwell Science, Malden MA.

Chapters written by researchers on the learning of foraging skills, learning about predators, learning in fish orientation, social learning, social organisation, cooperation, machiavellian intelligence, and applied aspects of fish learning skills.

- 3) Sloman, K.A., Wilson, R.W., and Balshine, S. (eds.), 2006, *Behaviour and Physiology of Fish*, Elsevier, Amsterdam.

Chapters written by experts on cognitive abilities, communication, anti-predator behaviour, effects of parasites on behaviour, social interactions, circadian rhythms, fish migrations, alternative reproductive tactics, pheromones, and the effects of contaminants on behaviour, all with a slight emphasis on physiological aspects.

- 4) Godin, J.-G. (ed.), 1997, Behavioural Ecology of Teleost Fishes, Oxford University Press, Oxford.

Twelve chapters on various subjects such as migration, habitat selection, territoriality, foraging, avoiding predators, mating systems, sexual selection, parental care, and individual variation.

- 5) Pitcher, T.J. (ed.), 1986, Behaviour of Teleost Fishes, Chapman & Hall, London.

Nineteen chapters under the following themes: bases of behaviour, sensory modalities, behavioural ecology, and applied fish behaviour.

- 6) Hoar, W.S., and Randall, D.J. (eds.), 1971, Fish Physiology, Volume VI: Environmental Relations and Behaviour, Academic Press, New York.

Learning and memory, ethology of fish behaviour, biological rhythms, and orientation constitute the behavioural components of this older book.

Web links:

<http://www.fishbase.org/home.htm>

Excellent for the taxonomy and general biology of all known species of fish.

http://www.sciencedaily.com/news/plants_animals/fish/

The latest press releases about scientific studies dealing with fishes.

<http://www.livescience.com/fish/>

More press releases on the latest findings in fish biology.

<http://www.amonline.net.au/fishes/>

The Australian Museum Fish Site. Lots of neat information on fishes.

<http://www.nefsc.noaa.gov/faq/>

Short answers to frequently asked questions about fishes.

<http://www.national-aquarium.co.uk/databases/FAQsLibrary/>

A long list of frequently asked questions from the foremost UK aquarium.