



## Review

## Parasites, behaviour and welfare in fish

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**Abstract**

In this review, three reasons are identified as to why it is important to focus on the role of parasites and the diseases they cause to understand the interrelationships between behaviour and welfare in fish. First, many of the behaviours exhibited by fish – including their habitat selection, mate choice and shoaling decisions – are likely to have evolved, at least in part, to limit exposure to deleterious pathogens, including parasites. If captive housing during husbandry for research, display or aquaculture purposes constrains a fish's ability to undertake its normal adaptive behavioural repertoire, yet does not limit the number of infective parasites present, then increased exposure to parasites is a likely outcome, and this has clear welfare implications. Second, because parasites are also known to alter the behaviours of host fish – including their locomotion, competitive ability and foraging behaviour – then welfare issues that are normally associated with the captive housing may be exacerbated for infected fish. Finally, since fish harbouring specific parasites often exhibit characteristic behaviours that may be diagnostic of the presence and/or intensity of infections, the recognition of such behaviours in captive fish may have applied use as a welfare indicator. In this review, I highlight the major interactions between parasites, behaviour and welfare for teleost fishes, and suggest some potentially valuable lines of research that could lead to significant improvements for the welfare of parasitised, and non-parasitised, fish kept in captivity.

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**Keywords:** Aquaculture; Parasitic infection; Salmonid fish; Vaccination**Contents**

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# Parasites And Behaviour

**Marco Cascella**



## **Parasites And Behaviour:**

*Parasites and Behaviour* M. V. K. Sukhdeo, Leslie H. Chappell, 1994 This volume of Parasitology takes an in depth look at parasitic behaviour *Parasites and the Behavior of Animals* Janice Moore, 2002-01-31 Moore places parasite induced behavioural alterations in an evolutionary and ecological context by examining the adaptive nature of those changes and possible constraints on them **Parasitism and Host Behaviour** C F Barnard, 1990-08-09 Recent ideas and experimental studies suggest that the relationship between parasitism and host behaviour has been a powerful shaping force in the evolution not only of behaviour patterns themselves but through them of morphology and population and community dynamics This book brings together recent work across the disciplines of parasitology and *Parasites and Pathogens* N.E. Beckage, 2012-12-06 When Nancy Beckage and I first met in Lynn Riddiford's laboratory at the University of Washington in the mid 1970s the fields of parasitology behavior and endocrinology were thriving and far flung disciplines in no serious danger of intersecting There were rumors that they might have some common ground Behavioural Aspects of Parasite Transmission Canning and Wright 1972 had just emerged with exciting news not only of the way parasites themselves behave but also of Machiavellian worms that caused intermediate hosts to shift fundamental responses to light and disturbance becoming in the process more vulnerable to predation by the next host Holmes and Bethel 1972 Meanwhile biologists such as Miriam Rothschild see Dedication G B Solomon 1969 and Lynn Riddiford herself 1975 had suggested that the endocrinological rami of parasitism might be subtle and pervasive In general however parasitic animals were viewed as aberrant organisms perhaps good for a few just so stories prior to turning our attention once again to real animals In the decade that followed Pauline Lawrence 1986a b Davy Jones Jones et al 1986 Nancy Beckage Beckage 1985 Beckage and Templeton 1986 and others including many in this volume left no doubt that the host parasite combination in insect systems was physiologically distinct from its unparasitized counterpart in ways that went beyond gross pathology **Encyclopedia of Animal Behavior** , 2009-04-01 The Encyclopedia of Animal Behavior Three Volume Set has engaged with great success the efforts of many of the best behavioral biologists of the 21st century Section editors drawn from the most accomplished behavioral scientists of their generation have enrolled an international cast of highly respected thinkers and writers all of whom have taken great care and joy in illuminating every imaginable corner of animal behavior This comprehensive work covers not only the usual topics such as communication learning sexual selection navigation and the history of the field but also emerging topics in cognition animal welfare conservation and applications of animal behavior The large section on animal cognition brings together many of the world's experts on the subject to provide a comprehensive overview of this rapidly developing area Chapters relating to animal welfare give a full view of behavioral interactions of humans with companion animals farm animals and animals in the wild The key role of animal behavior in conservation biology receives broad attention including chapters on topics such as the effects of noise pollution captive breeding and how the behavioral

effects of parasites interacts with conservation issues Animal behavior in environmental biology is highlighted in chapters on the effects of endocrine disruptors on behavior and a large number of chapters on key species such as wolves chimpanzees hyenas and sharks Clear accessible writing complements a wealth of information for undergraduate college students about the essential concepts of animal behavior and the application of those concepts across the field In depth coverage of concepts methods and exemplar organisms serves the needs of graduate students and professionals in the field From the use of behavior in assessing the welfare of pigs to the social behavior of insects from animal empathy to bat brains this authoritative reference with its in depth introductory articles rich array of illustrations interactive cross referenced links and numerous suggested readings can guide the student or the professional to an expanded appreciation of the far flung world of animal behavior An invaluable tool for teaching and a source of enrichment and detail for any topic covered in an animal behavior course the Encyclopedia of Animal Behavior is the definitive reference work in its field and will be for years to come Comprehensive work which covers the usual topics along with emerging areas of animal behavior This encyclopedia contains clear accessible writing and is well illustrated including an online video complimenting a wealth of information As an online reference this work will be subject to period updating This ensures that the work always remains current Contains in depth introductions to the material that make each well illustrated section come alive with the best the new content the discipline has to offer Glossary includes a compendium of behavioral terms that form a succinct mosaic of virtually every concept and phenomenon related to animal behavior Section editors drawn from around the world represent the best and the brightest among today s behavioral biologists and have recruited a broad range of internationally recognized experts Editors in Chief are experienced scientists and writers who between them have authored or edited eight books and teach courses in animal behavior at their respective universities

Parasite Diversity and Diversification Serge Morand,Boris R. Krasnov,D. Timothy J. Littlewood,2015-02-26 By joining phylogenetics and evolutionary ecology this book explores the patterns of parasite diversity while revealing diversification processes

Host Manipulation by Parasites David P. Hughes,Jacques Brodeur,Frédéric Thomas,2012-06-07 Parasites that manipulate the behaviour of their hosts represent striking examples of adaptation by natural selection This text provides an authoritative review of host manipulation by parasites that assesses developments in the field and lays out a framework for future research

Animal Behavior and Parasitism Vanessa Ezenwa,Sonia M. Altizer,Richard Hall,Richard J. Hall,2022 This accessible text surveys emerging research into fascinating new connections between animal behavior and the ecology and evolution of infectious diseases Chapters focus on fundamental topics at the interface of animal behavior and parasitism and authors have been selected to provide a diverse and international perspective

Behavioural Aspects of Parasite Transmission Elizabeth U. Canning,Christopher Amyas Wright,Linnean Society of London,1972

Host Manipulations by Parasites and Viruses Heinz Mehlhorn,2015-11-09 This edited volume focuses on parasite host relationships and the behavioral changes parasites may trigger in their hosts

Parasites have developed strategies which enhance their chances to find a host to survive inside its body and to become most easily transmitted to one another. Many of these parasites influence the host's behavior by various mechanisms so that the rate of their transmissions to further hosts becomes considerably enhanced in comparison to that of non-influenced specimens of the same host species. A broad number of recent studies elucidate more and more examples in an extreme spectrum of host-parasite relationships where successful transmission and/or survival of a parasite inside a host is based on parasite-derived behavioral manipulations of the hosts. In the literature an increasing number of papers appear which prove that these behavioral alterations are based on complicated psychoimmunologic, neuropharmacologic and genomically steered mechanisms. Researchers working in parasitology or behavioral sciences will find this work thought-provoking, instructive and informative.

**The Biology of Mosquitoes: Sensory reception and behaviour** Alan Neville Clements, 1992. Mosquitoes are important as transmitters of widespread major diseases and as nuisance insects. They are also one of the most studied and well-known group of insects both in the laboratory and in the field. The first volume in The Biology of Mosquitoes series is a key reference work and has received excellent reviews. This second title in the three-volume series focuses on the functioning of the mosquito sense organs that provide them with information about the environment and that enable the adult females to find and attack their vertebrate hosts. It also reviews knowledge of the circadian rhythms and other internal mechanisms that regulate the onset and timing of different behaviors. This integrated review of the sensory mechanisms and behavior of mosquitoes provides a unique insight into their biology. The contents, which are fully up to date, include much important work from the past which is often overlooked.

**The Evolutionary Biology of Parasitism** A. E. Keymer, A. F. Read, Leslie H. Chappell, 1990. **The Social Insects** William Morton Wheeler, 1928. **Aphid Parasites of**

**Czechoslovakia** Petr Stary, 1966-06-30. **Zoological Record**, 1905. Zoological Record is published annually in separate sections. The first of these is Comprehensive Zoology followed by sections recording a year's literature relating to a Phylum or Class of the Animal Kingdom. The final section contains the new genera and subgenera indexed in the volume. Each section of a volume lists the sections of that volume. **Tropical Diseases Bulletin**, 1913. **The British Journal of Psychology**, 1912. Issues for 1904-47 include the Proceedings of the society. **Animal Behaviour Abstracts**, 1999. **The Journal of the Ministry of Agriculture**, 1926. **Journal of the Ministry of Agriculture**, 1925.

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