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# Sensory Biology of Aquatic Animals


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**Georg F. Striedter, Theodore H.  
Bullock, Todd M. Preuss, John  
Rubenstein, Leah A. Krubitzer**



## **Sensory Biology Of Aquatic Animals:**

**Sensory Biology of Aquatic Animals** Jelle Atema, 1988      *Sensory Biology of Aquatic Animals* Jelle 1987, Richard R Fay, William N. Tavolga, 1987-12-08 This volume constitutes a series of invited chapters based on presentations given at an International Conference on the Sensory Biology of Aquatic Animals held June 24-28 1985 at the Mote Marine Laboratory in Sarasota Florida. The immediate purpose of the conference was to spark an exchange of ideas, concepts and techniques among investigators concerned with the different sensory modalities employed by a wide variety of animal species in extracting information from the aquatic environment. By necessity, most investigators of sensory biology are specialists in one sensory system; different stimulus modalities require different methods of stimulus control and generally different animal models. Yet it is clear that all sensory systems have principles in common such as stimulus filtering by peripheral structures, tuning of receptor cells, signal to noise ratios, adaption and disadaptation and effective dynamic range. Other features such as hormonal and efferent neural control, circadian reorganization and receptor recycling are known in some and not in other senses. The conference afforded an increased awareness of new discoveries in other sensory systems that has effectively inspired a fresh look by the various participants at their own area of specialization to see whether or not similar principles apply. This inspiration was found not only in theoretical issues but equally in techniques and methods of approach. The myopia of sensory specialization was broken in one unexpected way by showing limitations of individual sense organs and their integration within each organism. For instance, studying vision, one generally chooses a visual animal as a model.      **Sensory Biology of Aquatic Animals** Jelle 1987, Richard R. Fay, William N. Tavolga, 2012-12-06 This volume constitutes a series of invited chapters based on presentations given at an International Conference on the Sensory Biology of Aquatic Animals held June 24-28 1985 at the Mote Marine Laboratory in Sarasota Florida. The immediate purpose of the conference was to spark an exchange of ideas, concepts and techniques among investigators concerned with the different sensory modalities employed by a wide variety of animal species in extracting information from the aquatic environment. By necessity, most investigators of sensory biology are specialists in one sensory system; different stimulus modalities require different methods of stimulus control and generally different animal models. Yet it is clear that all sensory systems have principles in common such as stimulus filtering by peripheral structures, tuning of receptor cells, signal to noise ratios, adaption and disadaptation and effective dynamic range. Other features such as hormonal and efferent neural control, circadian reorganization and receptor recycling are known in some and not in other senses. The conference afforded an increased awareness of new discoveries in other sensory systems that has effectively inspired a fresh look by the various participants at their own area of specialization to see whether or not similar principles apply. This inspiration was found not only in theoretical issues but equally in techniques and methods of approach. The myopia of sensory specialization was broken in one unexpected way by showing limitations of individual sense organs and their integration within each organism. For instance, studying vision, one generally

chooses a visual animal as a model      *Adaptive Mechanisms in the Ecology of Vision* S. Archer, M.B. Djamgoz, E. Loew, J.C. Partridge, S. Vallerga, 2013-04-17 John Lythgoe was one of the pioneers of the Ecology of Vision a subject that he ably delineated in his classic and inspirational book published some 20 years ago 1 At heart the original book aimed generally to identify inter relationships between vision animal behaviour and the environment John Lythgoe excelled at identifying the interesting questions in the ecology of an animal that fitted the answers presented by an analysis of the visual system Over the last twenty years however since Lythgoe's landmark publication much progress has been made and the field has broadened considerably In particular our understanding of the adaptive mechanisms underlying the ecology of vision has reached considerable depths extending to the molecular dimension partly as a result of development and application of new techniques This complements the advances made in parallel in clinically oriented vision research 2 The current book endeavours to review the progress made in the ecology of vision field by bringing together many of the major researchers presently active in the expanded subject area The contents deal with theoretical and physical considerations of light and photoreception present examples of visual system structure and function and delve into aspects of visual behaviour and communication Throughout the book we have tried to emphasise one of the major themes to emerge within the ecology of vision the high degree of adaptability that visual mechanisms are capable of undergoing in response to diverse and dynamic environments and behaviours      **Sensory Processing in Aquatic Environments** Shaun P. Collin, N. Justin

Marshall, 2008-04-08 Research on sensory processing or the way animals see hear smell taste feel and electrically and magnetically sense their environment has advanced a great deal over the last fifteen years This book discusses the most important themes that have emerged from recent research and provides a summary of likely future directions The book starts with two sections on the detection of sensory signals over long and short ranges by aquatic animals covering the topics of navigation communication and finding food and other localized sources The next section the co evolution of signal and sense deals with how animals decide whether the source is prey predator or mate by utilizing receptors that have evolved to take full advantage of the acoustical properties of the signal Organisms living in the deep sea environment have also received a lot of recent attention so the next section deals with visual adaptations to limited light environments where sunlight is replaced by bioluminescence and the visual system has undergone changes to optimize light capture and sensitivity The last section on central co ordination of sensory systems covers how signals are processed and filtered for use by the animal This book will be essential reading for all researchers and graduate students interested in sensory systems      **The Physiology of Fishes,**

**Third Edition** David H. Evans, James B. Claiborne, 2005-12-15 New scientific approaches have dramatically evolved in the decade since *The Physiology of Fishes* was first published With the genomic revolution and a heightened understanding of molecular biology we now have the tools and the knowledge to apply a fresh approach to the study of fishes Consequently *The Physiology of Fishes* Third Edition is not merely another updating but rather an entire reworking of the original To

satisfy that need for a fresh approach the editors have employed a new set of expert contributors steeped in the very latest research their contemporary perspective pervades the entire text In addition to new chapters on gas transport temperature physiology and stress as well as one dedicated to functional genomics readers will discover that many of these new contributors approach their material with a contemporary molecular perspective While much of the material is new the editors have completely adhered to the original s style in creating a text that continues to be highly readable and perpetually insightful in bridging the gap between pure and applied science The Physiology of Fishes Third Edition completely updated with a molecular perspective continues to be regarded as the best single volume general reference on all major areas of research in fish physiology The Physiology of Fishes Third Edition provides background information for advanced students as well as material of interest to marine and fisheries biologists ichthyologists and comparative physiologists looking to differentiate between the physiological strategies unique to fishes and those shared with other organisms

**Computational Modeling in Biological Fluid Dynamics** Lisa J. Fauci, Shay Gueron, 2012-12-06 This IMA Volume in Mathematics and its Applications COMPUTATIONAL MODELING IN BIOLOGICAL FLUID DYNAMICS is based on the proceedings of a very successful workshop with the same title The workshop was an integral part of the September 1998 to June 1999 IMA program on MATHEMATICS IN BIOLOGY I would like to thank the organizing committee Lisa J Fauci of Tulane University and Shay Gueron of Technion Israel Institute of Technology for their excellent work as organizers of the meeting and for editing the proceedings I also take this opportunity to thank the National Science Foundation NSF whose financial support of the IMA made the Mathematics in Biology program possible Willard Miller Jr Professor and Director Institute for Mathematics and its Applications University of Minnesota 400 Lind Hall 207 Church St SE Minneapolis MN 55455 0436 612 624 6066 FAX 612 626 7370 miller ima umn edu World Wide Web <http://www.ima.umn.edu> v PREFACE A unifying theme in biological fluid dynamics is the interaction of moving elastic boundaries with a surrounding fluid A complex dynamical system describes the motion of red blood cells through the circulatory system the movement of spermatazoa in the reproductive tract cilia of microorganisms or a heart pumping blood The revolution in computational technology has allowed tremendous progress in the study of these previously intractable fluid structure interaction problems The Biology of the Deep Ocean Peter Herring, 2002 The deep sea environment is the most extensive on our planet This text looks at this apparently hostile world and explains how its normally unseen inhabitants are adapted to survive and flourish within it

*Evolution of Nervous Systems* Georg F. Striedter, Theodore H. Bullock, Todd M. Preuss, John Rubenstein, Leah A. Krubitzer, 2016-11-23 Evolution of Nervous Systems Second Edition Four Volume Set is a unique major reference which offers the gold standard for those interested both in evolution and nervous systems All biology only makes sense when seen in the light of evolution and this is especially true for the nervous system All animals have nervous systems that mediate their behaviors many of them species specific yet these nervous systems all evolved from the simple nervous system of a common

ancestor To understand these nervous systems we need to know how they vary and how this variation emerged in evolution In the first edition of this important reference work over 100 distinguished neuroscientists assembled the current state of the art knowledge on how nervous systems have evolved throughout the animal kingdom This second edition remains rich in detail and broad in scope outlining the changes in brain and nervous system organization that occurred from the first invertebrates and vertebrates to present day fishes reptiles birds mammals and especially primates including humans The book also includes wholly new content fully updating the chapters in the previous edition and offering brand new content on current developments in the field Each of the volumes has been carefully restructured to offer expanded coverage of non mammalian taxa mammals primates and the human nervous system The basic principles of brain evolution are discussed as are mechanisms of change The reader can select from chapters on highly specific topics or those that provide an overview of current thinking and approaches making this an indispensable work for students and researchers alike Presents a broad range of topics ranging from genetic control of development in invertebrates to human cognition offering a one stop resource for the evolution of nervous systems throughout the animal kingdom Incorporates the expertise of over 100 outstanding investigators who provide their conclusions in the context of the latest experimental results Presents areas of disagreement and consensus views that provide a holistic view of the subjects under discussion      The Mechanosensory Lateral Line

Sheryl Coombs, Peter Görner, Heinrich Münz, 2012-12-06 This volume represents the published proceedings of an international conference on the Neurobiology and Evolution of the Mechanosensory Lateral Line System held August 31 to September 4 1987 at the Center for Interdisciplinary Research at the University of Bielefeld West Germany The goal of this conference was to bring together researchers from all over the world to share information about a major aquatic sensory system the evolution and function of which have largely remained an enigma since the 18th century The lateral line or lateralis system has been used as an umbrella term to describe what originally without the aid of modern anatomical techniques looked like a series of pits grooves and lines on the head and trunk of fishes and some amphibians For at least the past 30 years however it has been recognized that the lateralis system comprises not one but at least two functional classes of receptors mechanoreceptors and electroreceptors The relative ease with which the appropriate stimulus could be defined and measured for the electroreceptive class has resulted in an explosion of information on this submodality during the past 20 years As a result there is little ambiguity about the overall function of the electrosensory system now generally regarded as an independent system in its own right A similarly clear definition for the function of the mechanosensory lateralis system has not been as forthcoming      *Marine Mammal Biology* A. Rus Hoelzel, 2009-04-01 This book provides a general introduction to the biology of marine mammals and an overview of the adaptations that have permitted mammals to succeed in the marine environment Each chapter written by experts in their field will provide an up to date review and present the major discoveries and innovations in the field Important technical advances such as satellite telemetry and time depth

recorders will be described in boxes      Neural Mechanisms in Taste Robert H. Cagan, 2020-02-03 The purpose of NEURAL MECHANISM in TASTE is to emphasize physiological principles and reveal new insights of this most recent research This book is aimed to reach scientists within the broad area of neurophysiology as well as those in other disciplines who have interests in sensory mechanisms The focus is on two major themes peripheral mechanisms and neural processing at the central level Every chapter is written by an expert on the subject matter including definitive updates on the status of each topic This work is not only useful to researchers in taste but also to basic and applied scientists in related fields such as food technology doctoral and postdoctoral students      *Volume 2: Marine Ecology* Juan M. Molina, Gabriela E. Blasina, 2025-04-17 Marine systems face a multitude of anthropogenic stressors such as climate change recreational and commercial fishing aquaculture practices pollution and coastal urbanization These stressors exert escalating pressure on marine ecosystems leading to noticeable changes in habitat conditions as well as alterations in the abundance and diversity of their communities Understanding the impacts of these stressors proves challenging due to their interactions with various factors such as species richness environmental fluctuations system openness stressor tolerance and the occurrence rate and intensity of each stressor Therefore a comprehensive analysis of the entire ecosystem is crucial It is essential to consider the unique characteristics of each marine environment when assessing the cumulative stress that affects them This book provides insights into the functioning of marine ecosystems and their responses to both natural and human induced drivers within the framework of sustainable marine resource utilization This book will make a valuable contribution to the scientific community serving as a resource to inform decision makers and the general public about the current state of knowledge regarding the marine environment and the human footprints on our seas      **Deep-Sea Fishes** , 1997-10-01 The deep ocean is home to some of the most unusual of all fishes This book is the first Fish Physiology volume devoted to these bizarre undersea creatures Practically every organ system is affected by the constraints imposed by benthic pressure the absence of light and the relatively scarce supply of both food and mates Deep Sea Fishes demonstrates how these fishes living in extremely harsh conditions metabolize behave and evolve      Life in the Open Ocean Joseph J. Torres, Thomas G. Bailey, 2022-01-14 Life in the Open Ocean Life in the Open Ocean The Biology of Pelagic Species provides in depth coverage of the different marine animal groups that form the communities inhabiting the ocean's pelagic realm This comprehensive resource explores the physical environment foraging strategies energetics locomotion sensory mechanisms global and vertical distributions special adaptations and other characteristics of a wide array of marine taxa Bringing together the most recent information available in a single volume authors Joseph J Torres and Thomas G Bailey cover the Cnidaria stinging jellies the ctenophores comb jellies pelagic nemerteans pelagic annelids crustaceans cephalopods and pelagic gastropods invertebrate chordates as well as micronektonic and larger fishes such as sharks tunas mackerels and mahi mahi Detailed chapters on each pelagic group describe internal and external anatomy classification and history feeding and digestion bioluminescent systems and their

function reproduction and development respiration excretion nervous systems and more The first book of its kind to address all of the major animal groups comprising both the swimmers and drifters of the open sea this important resource Explains how different animals have adapted to live in the open ocean environment Covers all sensory mechanisms of animals living in the pelagic habitat including photoreception mechanoreception and chemoreception Treats the diverse micronekton assemblage as a community Includes a thorough introduction to the physical oceanography and properties of water in the pelagic realm Life in the Open Ocean The Biology of Pelagic Species is an excellent senior level undergraduate and graduate textbook for courses in biology and biological oceanography and a valuable reference for all those with interest in open ocean biology

**Electroreception** Theodore Holmes Bullock, Carl D. Hopkins, Richard R. Fay, 2006-09-28 Electroreception has become one of the most revealing areas in the study of the neural basis of behavior and neurobiologists recognize it as a model sensory system for experimental study Through studies of electroreception researchers have gained extensive knowledge about a complete sensory system from molecular biology to computation communication and behavior The book Electroreception will examine the behavior structure and function of the electrosensory systems of fish and other vertebrates As a comprehensive volume on the subject the book will serve as both an introduction to the study of electroreception and a reference and review volume for researchers in related fields

**The Lateral Line System** Sheryl Coombs, Horst Bleckmann, Richard R. Fay, Arthur N. Popper, 2013-10-23 The Lateral Line System provides an overview of the key concepts and issues surrounding the development evolution neurobiology and function of the lateral line a fascinating yet somewhat enigmatic flow sensing system The book examines the historical precedence for linking the auditory and lateral line systems its structure and development use of the lateral line system of zebrafish as a model system physical principles governing the response properties of the lateral line the behavioral relevance of this sensory system to the lives of fish and an examination of how this information is shaped and encoded by the peripheral and central nervous systems Contents The Gems of the Past A Brief History of Lateral Line Research in the Context of the Hearing Sciences Sheryl Coombs and Horst Bleckmann Morphological Diversity Development and Evolution of the Mechanosensory Lateral Line System Jacqueline F Webb The Hydrodynamic of Flow Stimuli Matthew J McHenry and James C Liao The Biophysics of the Fish Lateral Line Sietse M van Netten and Matthew J McHenry Sensory Ecology and Neuroethology of the Lateral Line John Montgomery Horst Bleckmann and Sheryl Coombs Information Encoding and Processing by the Peripheral Lateral Line System Boris Philippe Chagnaud and Sheryl Coombs The Central Nervous Organization of the Lateral Line System Mario F Wullimann and Benedikt Grothe Central Processing of Lateral Line Information Horst Bleckmann and Joachim Mogdans Functional Overlap and Nonoverlap Between Lateral Line and Auditory Systems Christopher B Braun and Olav Sand The Hearing Loss Protection and Regeneration in the Larval Zebrafish Lateral Line Allison B Coffin Heather Brignull David W Raible and Edwin W Rubel

**The Biology of Sea Turtles, Volume III** Jeanette Wyneken, Kenneth J. Lohmann, John A. Musick, 2013-03-25 Since the



first volume of *The Biology of Sea Turtles* was published in 1997 the field has grown and matured in ways few of the authors would have predicted particularly in the areas of physiology behavior genetics and health Volume III presents timely coverage of emerging areas as well as the integration of approaches and information that did not

The Evolutionary Biology of Hearing Douglas B. Webster, Richard R. Fay, 2012-12-06 To develop a science of hearing that is intellectually The five day conference was held at the Mote Marine Laboratory in Sarasota Florida May extensive body of comparative research into an 24 1990 The invited participants came from the evolutionary context The need for this integrative fields of comparative anatomy physiology biophysics and a conceptual framework in which it could encompass animal behavior psychophysics evolutionary be structured were demonstrated in landmark biology ontogeny and paleontology Before the papers by van Bergeijk in 1967 and Wever in 1974 conference preliminary manuscripts of the invited However not since 1965 when the American papers were distributed to all participants This facilitated even encouraged discussions through Society of Zoologists sponsored an evolutionary conference entitled *The Vertebrate Ear* has there out the conference which could be called among other things lively The preview of papers along been a group effort to assemble and organize our current knowledge on the evolutionary as with the free exchange of information and opinion opposed to comparative biology of hearing also helped improve the quality and consistency of In the quarter century since that conference the final manuscripts included in this volume there have been major changes in evolutionary In addition to the invited papers several studies concepts e g punctuated equilibrium in systems were presented as posters during evening sessions

**Fishes of Antarctica** Guido di Prisco, Eva Pisano, Andrew Clark, 2012-12-06 The Antarctic fish fauna has evolved over a long period of geographic and climatic isolation In the course of this evolution Antarctic fish have developed specialized adaptations some of which characterize these organisms as unique In strong contrast to the continental shelf faunas elsewhere the Antarctic shelf ichthyofauna is dominated by a single highly endemic group the Notothenioidei This group of perciform fish probably first appeared and diversified in the early Tertiary The development of the Polar Front referred to as the Antarctic Convergence in the older literature resulted in a natural oceanographic barrier to migration in either direction and thus became a key factor in the evolution of Antarctic fish The dominance of the Antarctic continental shelf fauna by a single taxonomic group of fish provides a simplified natural laboratory for exploring the wealth of physiological biochemical and ecological adaptations that characterize the fauna Understanding of the patterns of adaptation in this highly specialized group of fish can tell us much about of evolution

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