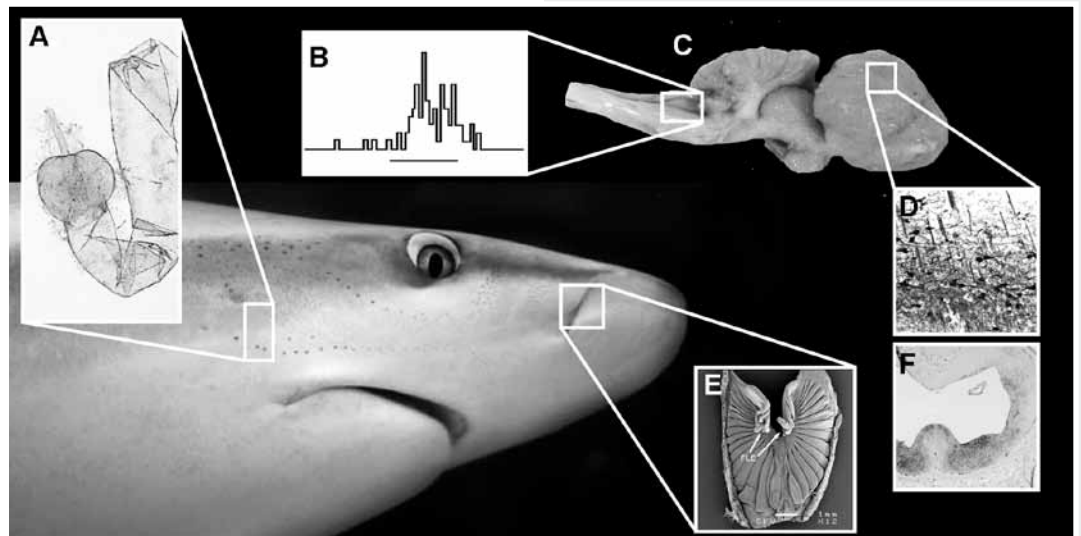


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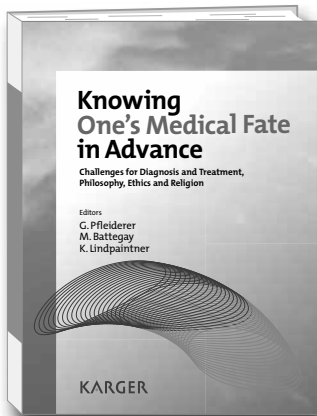
## The Nervous System of Cartilaginous Fishes

23rd Annual Karger Workshop,  
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# Knowing One's Medical Fate in Advance

Challenges for Diagnosis and Treatment,  
Philosophy, Ethics and Religion

**Editors**  
**Georg Pfeleiderer**  
**Manuel Battegay**  
**Klaus Lindpaintner**

General Medicine, Genetics, Philosophy/Ethics,  
Social Medicine, Sociology

Modern medicine is now in a position to make advanced prognoses that chart the entire course of illness and recovery. Paradoxically, this is coupled with a new dimension of uncertainty for the patient, i.e. coming to terms with discovering they have an increased risk of a particular disease and deciding what appropriate steps to take. In this publication, renowned experts in their fields discuss these issues. The certainty and uncertainty of one's fate are discussed from both methodological and epidemiological perspectives, using examples of diseases for which treatment and prognosis have dramatically changed. Despite profound insights into the human genome, personalized genetically tailored medicine still lies in the future. Religious, spiritual and philosophical dimensions are discussed, as are the ways in which they may help people cope with these new insights into their future, e.g. the promise of an afterlife. This publication aims to bridge the different fields dealing with this area by addressing the challenges faced and encouraging dialogue. It will be of interest to all readers who deal with ethical problems of prognosis, particularly in medicine, as well as to theologians and sociologists.

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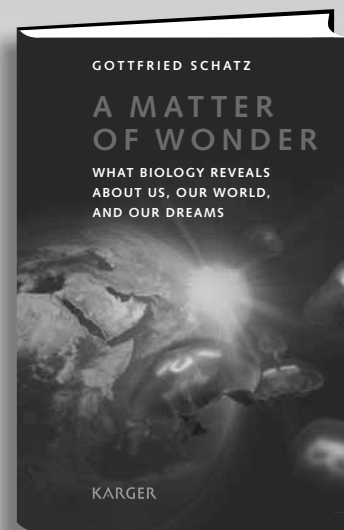
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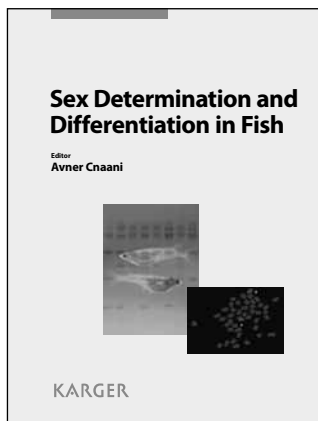
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Sexual development in fish is characterized by extraordinary variation, including genetic and environmental sex determination, male and female heterogamety, single gene and polygenic systems, protandry, protogyny and simultaneous hermaphroditism, social influence on sexual determination, and many combinations and variations between and within these systems. In recent years, major breakthroughs have been made in studying sexual development in fish, attracting the attention of researchers in other fields such as developmental biology, genetics, evolution, ecology, conservation and aquaculture.

This special issue brings together some of the recent hot topics in this field and provides an overview of the broad range of scientific aspects that benefit from knowledge on sexual development in fish. It presents ten reviews by international experts who explore the genetic basis of sex determination, gonadal differentiation, environmental effects on sexual development, evolutionary views and application in fisheries and aquaculture.

An excellent source of up-to-date information, this publication is highly recommended to researchers and students interested in the evolution of sex determination, fish genetics and breeding.

An excellent source of up-to-date information

# Sex Determination and Differentiation in Fish

**Editor**  
**Avner Cnaani**

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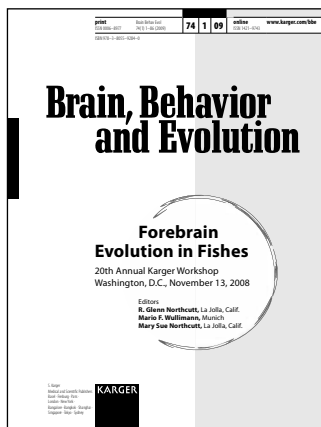
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# Forebrain Evolution in Fishes

20th Annual Karger Workshop,  
Washington, D.C., November 2008

**Editors**  
**R. Glenn Northcutt**  
**Mario F. Wullimann**  
**Mary Sue Northcutt**

Neurology, Neurobiology, Zoology, Behavioral Research,  
Evolutionary Biology, Molecular Biology

Much of the remarkable progress made recently in the understanding of forebrain organization and evolution in fishes is due to new molecular markers revealing new insights into forebrain development and organization, which is reflected in this publication. The authors present papers covering research of all major groups of fishes. Topics include the segmental organization of the forebrain in lampreys, new perspectives on the organization of the telencephalon in elasmobranchs, and an evolutionary interpretation of teleostean forebrain molecular anatomy. Further papers deal with an immunohistochemical approach to lungfish forebrain organization and with the comparisons of forebrain organization in the basal ray-finned fishes and the teleosts, and finally, the structural organization of the forebrain in fishes is summarized. The papers in this publication are based on the 20th Annual Karger Workshop held in Washington, D.C., in 2008, which was conceived to honor Professor Rudolf Nieuwenhuys, who celebrated his 80th birthday and who is the most eminent living comparative neurobiologist.

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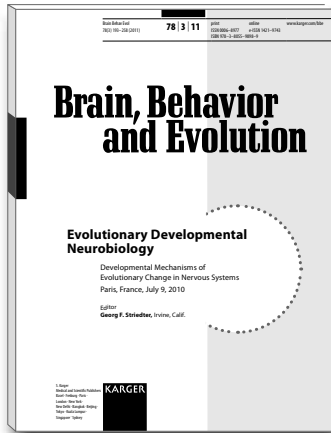
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# Evolutionary Developmental Neurobiology

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**Georg F. Striedter**

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Illustrating the causal links between neural development and evolution, this special topic issue offers an authoritative perspective on this young and growing field. First, the publication provides new information on the developmental basis of eye reduction in invertebrates, especially *Drosophila* larvae, and links it to the more general topic of nervous system miniaturization. The following papers focus on vertebrate nervous systems and the similarities and differences in forebrain development among various vertebrates, including a special focus on the amygdala and its profound evolutionary change. Recent discoveries on brain development and evolution in teleost fishes are reviewed, emphasizing the mechanisms by which some species evolved a larger telencephalon while others lost their eyes. Finally, the publication reviews developmental changes underlying brain evolution in mammals and birds, with a focus on issues surrounding developmental constraints and evolvability. Collectively, this special topic issue provides a cutting-edge panorama of how the evo-devo approach illuminates nervous system evolution.

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# Brain, Behavior and Evolution

## The Nervous System of Cartilaginous Fishes

Cartilaginous fishes are comprised of nearly 1,200 species and occur in diverse ecological niches. Though once thought to have empirically simple brains, cartilaginous fishes possess a battery of highly developed sensory systems, a complex range of innate behaviors, and relatively enlarged and complex brains, which, unlike many other vertebrate systems, continue to grow throughout life. Their nervous system represents an early, yet remarkably complete stage in the evolution of the vertebrate brain, thereby allowing for establishment of the general rules that underlie brain evolution across vertebrates. Using a variety of approaches, ranging from traditional histological methodologies, to immunohistochemistry and electrophysiology, to more novel applications of magnetic resonance imaging, this publication explores the diversity in peripheral and central development across this group, while simultaneously defining the neural commonalities that evolved at least as early as the cartilaginous fishes and have been conserved across all vertebrates.

This publication will be of interest to a wide variety of evolutionary biologists, neuroanatomists, as well as fish biologists, sensory physiologists, and ecologists.

### Cover illustration

The nervous system of cartilaginous fishes. (A) A single ampulla, the electroreceptive structure of cartilaginous fishes, of the narrow sawfish, *Anoxypristis cuspidata* [for details see Wueringer, pp. 97-107]; (B) Peristimulus time histogram showing the strong ascending efferent neuron response to an electrical dipole stimulus [for details see Montgomery et al., pp. 152-165]. (C) Lateral view of the brain of the whitetip reef shark, *Trienodon obesus* [for details see Yopak and Lisney, pp. 108-126]; (D) Photomicrograph of labeled fibers and retrogradely labeled cells in the telencephalon of the thornback guitarfish, *Platyrhinoidis triseriata* [for details see Hofmann and Northcutt, pp. 142-151]; (E) Representative sensory structure: Scanning electron micrograph of the olfactory lamellae of the dwarf spotted wobbegong shark, *Orectolobus parvimaclatus* [for details see Collin, pp. 80-97]. (F) A transverse section through the embryonic telencephalon of *Scyliorhinus canicula*, in situ labeled for Dlx2 [for details see Quintana-Urzainqui et al., pp. 127-141]; Animal photo credits: S.P. Collin (sandbar shark, *Carcharhinus plumbeus*).