

HANDBOOK OF FISH BIOLOGY AND FISHERIES
Volume 1

Also available from Blackwell Publishing:

Handbook of Fish Biology and Fisheries

Edited by Paul J.B. Hart and John D. Reynolds

Volume 2 Fisheries

Handbook of Fish Biology and Fisheries

VOLUME 1 FISH BIOLOGY

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 **Blackwell
Publishing**

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BLACKWELL PUBLISHING
350 Main Street, Malden, MA 02148-5020, USA
108 Cowley Road, Oxford OX4 1JF, UK
550 Swanston Street, Carlton, Victoria 3053, Australia

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First published 2002
Reprinted 2004

Library of Congress Cataloging-in-Publication Data has been applied for.

Volume 1 ISBN 0-632-05412-3 (hbk)
Volume 2 ISBN 0-632-06482-X (hbk)
2-volume set ISBN 0-632-06483-8

A catalogue record for this title is available from the British Library.

Set in 9/11.5 pt Trump Mediaeval
by SNP Best-set Typesetter Ltd, Hong Kong
Printed and bound in the United Kingdom
by TJ International Ltd, Padstow, Cornwall.

The publisher's policy is to use permanent paper from mills that operate a sustainable
forestry policy, and which has been manufactured from pulp processed using acid-free and
elementary chlorine-free practices. Furthermore, the publisher ensures that the text paper
and cover board used have met acceptable environmental accreditation standards.

For further information on
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<http://www.blackwellpublishing.com>

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Preface

The goal of the two volumes of the *Handbook of Fish Biology and Fisheries* is to help integrate the study of fish biology with the study of fisheries. One might not expect these two subjects to need further integration. However, strong declines in many fish stocks around the globe, combined with growing concerns about the impact of fisheries on marine and freshwater biodiversity, are raising new questions about aspects of fish biology that have traditionally dwelt outside mainstream fisheries research. Thus, fisheries biologists and managers are increasingly asking about aspects of ecology, behaviour, evolution and biodiversity that had traditionally been studied by different people who attend different conferences and publish in different journals. By bringing these people and their subjects together in the two volumes of this *Handbook*, we hope to foster a better two-way flow of information between the studies of fish biology and fisheries.

A tradition runs through the prefaces of the other volumes in this series whereby the editors distance themselves from a literal translation of the word 'Handbook'. In keeping with this tradition, we wish to make clear that this is not a cookbook of recipes for how to study and manage fish populations. Instead, we have tried to produce a pair of reference books that summarize what is known about fish biology and ecology, much of which is relevant to assessment and management of fish populations and ecosystems. Of course, much of the material in the first volume may never find applications in fisheries, and that is fine with us. We encouraged our authors to provide a wide

coverage of fish biology simply because the topics are interesting in their own right, and because the borders between pure and applied research are fuzzy. We therefore decided not to restrict information according to its direct relevance to fisheries as this subject is understood today. We hope the result will be of value to undergraduates and graduates looking for information on a wide variety of topics in fisheries science. The books are also aimed at researchers who need up-to-date reviews of topics that impinge on their research field but may not be central to it. The information should also be useful to managers and decision makers who need to appreciate the scientific background to the resources they are trying to manage and conserve.

In the first volume, subtitled *Fish Biology*, our introductory chapter explores the underpinnings of fisheries biology and management by basic research on fish biology. Part 1 then examines systematics and biogeography of fishes, including methods for determining phylogenetic relationships and understanding spatial patterns of diversity. Part 2 examines production and population structures of fishes, beginning with chapters on physiology and growth, followed by recruitment, life histories, migration, population structure and reproductive ecology. Part 3 considers fishes as predators and as prey, making use of conceptual advances in behavioural ecology to link predator-prey interactions to the environment. In Part 4 we scale up from individual interactions to communities and ecosystems. The chapters include comparisons of freshwater and marine

communities, as well as interactions between fishes and parasites.

In the second volume, subtitled *Fisheries*, we begin with a chapter that considers the human dimension of fisheries management. Part 1 then gives background information for fisheries, including fishing technology, marketing, history of fisheries, and methods of collecting and presenting data. Part 2 provides fundamental methods of stock assessment, including surplus production models, virtual population analyses, methods for forecasting, length-based assessments, individual-based models and economics. We have also tried to consolidate this information by reviewing the various options available for modelling fisheries, including the pros and cons of each. Part 3 explores wider issues in fisheries biology and management, including the use of marine protected areas, conservation threats to fishes, ecosystem impacts and recreational fishing.

We are very grateful to our 54 authors from 10 countries for their hard work and patience while we attempted to herd them all in the same general direction. We also thank Susan Sternberg who first suggested that we take on this project, and Delia

Sandford at Blackwell Science who has overseen it. The final stages of production have been greatly helped by two people. Valery Rose of Longworth Editorial Services worked patiently and efficiently to shepherd the book through the copy editing and production stages, and Monica Trigg, did an excellent job with the gargantuan task of constructing the two indices. Paul Hart would like to thank the University of Bergen, Department of Fisheries and Marine Biology, for providing him with space and support during the final editing of the manuscript. John Reynolds would like to thank his many colleagues at the University of East Anglia and at the Centre for Environment, Fisheries, and Aquaculture Science (Lowestoft) who have helped build bridges between pure and applied research.

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Paul J.B. Hart and John D. Reynolds
Leicester and Norwich

Abbreviations

AFLP	amplified fragment length polymorphism	MSVPA	multispecies virtual population analysis
CPUE	catch per unit effort	NTP	nucleotide triphosphates
CV	coefficient of variation	OFT	optimal foraging theory
EPIC	exon-primed intron-crossing PCR	PCR	polymerase chain reaction
ESD	environmental sex determination	RAPD	randomly amplified polymorphic DNA
FAO	Food and Agriculture Organization	RFLP	restriction fragment length polymorphism
GFR	glomerular filtration rate	RQ	respiratory quotient
GSI	gonadosomatic index	SCFA	short-chain fatty acids
IBI	indices of biotic integrity	SSVPA	single-species virtual population analysis
ICES	International Council for the Exploration of the Seas	TMAO	trimethylamine oxide
ICLARM	International Center for Living Aquatic Resources Management	VBGF	von Bertalanffy growth function
IFD	ideal free distribution	WCMC	World Conservation Monitoring Centre
JAM	judicious averaging method	WRI	World Resources Institute
MPA	marine protected area	YOY	young of the year
MSA	mixed stock analysis		