

## **Fish Welfare**

Edited by EJ Branson (2008). Published by Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK. 300 pp Hardback (ISBN 978-1-4051-4629-6). Price £99.50, US\$134.40.

The rising concern about the welfare of farmed fish has been concurrent with an increase in scientific investigation on the subject. The increase in scientific papers has however not been matched by publications that offer practical advice to aquaculture students and the industry. There has thus been a vacuum for a book that offers guidance on the welfare-critical operations, how to monitor and assess welfare and the optimum levels of various farming parameters that result in the best welfare. This book does not fill this vacuum, but goes a long way towards setting foundations on which such a book may follow. It contains the contributions to a meeting on fish welfare that was organised by the UK Fish veterinary Society (SVS).

The first part of the book deals with general animal welfare and introduces the ethical, legal and scientific basis for the concern for farmed fish welfare. The philosophical debate on the relationship between man and animals under his care is briefly outlined followed by a description and comparison of the natural lives, feelings and function-based approaches to animal welfare. These concepts are then developed with examples of how aquaculture may impinge on fish welfare. Strategies including selecting fish for resilience, changing husbandry systems and regulation of the industry are suggested as means of mitigating the effects of farming on fish welfare.

The topical subjects of stress, pain and suffering in fish receive a thorough and balanced review. The primary, secondary and tertiary stress responses are discussed as well as the laboratory methods for assessing them. Although behaviour is mentioned as a means of assessing stress, there is no discussion of how this potentially useful method of assessment may be used at farm level despite it being the most readily available means for the aquaculture industry. Nevertheless, the discussion introduces the available techniques that may be useful for both undergraduate and post-graduate researchers interested in the stress response in fish. The section on pain and fear includes a comprehensive review of 155 papers. The central issue of sentience and consciousness is discussed in a rather general manner throughout the chapter. Evidence for fear, pain and suffering from comparative anatomy, ethology and neurophysiology is presented in a concise and logical manner and was surprisingly easy to read. However, the arguments opposing fear and pain in fish are not strongly presented. The brief section on legislation outlines UK law as it relates to animal welfare. The text does not emphasise the differences in how the law affords more guidance and, hence, protection to terrestrial, farmed animals when compared to fish. Although the section discusses the European Union influence on legislation, it does not discuss European legislation in any detail. A comparison of fish welfare laws from other European countries would have strengthened the discus-

sion, as some significant differences in the protection afforded to fish by the law exist within the EU countries.

Whereas the first part of the book forms the foundation by laying down the philosophy and science of fish welfare, the second part builds on the first by providing practical application of welfare principles in the aquaculture industry. The section begins with a farmer's perspective on fish welfare. The chapter draws on trout farming experience but is largely applicable to any other fin-fish culture establishment. It is largely a record of farmers concerns, how they have worked to improve welfare, the challenges they experience and what they expect other stakeholders to be contributing towards fish welfare. The text concludes by setting objectives for all stakeholders to follow in order to increase the pace of change in fish welfare and is mostly concerned with increasing government interest, adoption of proactive rather than reactive fish health management, better fish breeding objectives and constructive relationships with critics and campaign groups. It also highlights the need for farm-gate welfare assessment tools.

Stocking densities have in the past received attention from campaigners. This book describes the complex interactions that affect welfare under different stocking densities. What the chapter does not do is attempt to prescribe figures for any system. The authors encourage a more holistic approach to welfare in general and the effects of stocking density in particular. No attempt is made to provide a guide for assessing or determining stocking densities.

In contrast, the chapter on water quality is more comprehensive, with some pointers on current recommended levels. The interactions between dissolved oxygen, ammonia, nitrate, nitrite, carbon dioxide, suspended solids, pH, temperature, heavy metals and other parameters with fish welfare are discussed. Sources and dynamics of the different constituents are discussed and tables for recommended levels for trout are provided. This chapter forms a very useful reference for farmers, scientists, students and other interested parties alike. The pros and cons of the environment-based and animal-based approaches to monitoring water quality are clearly discussed. Practical management options are suggested as remedial actions where water quality is compromising welfare. The chapter concludes by acknowledging the paucity of information on the subject, recommending tools for farmers and suggesting the prescription of some water quality limits as ranges rather than static values.

Fin erosion, a problem that occurs predominantly in salmonids, is given a thorough treatise from its occurrence, species affected, its causes and factors that predispose fish to the condition. An attempt is made, in terms of injury, disease and functional impairment, to demonstrate the adverse effects of fin erosion on welfare. However, what emerges from the discussion is that there is need for more scientific understanding of the effects of fin erosion on welfare. Different methods that have been used in literature to assess fin erosion are discussed but these are mostly useful for scientific study rather than routine husbandry monitoring. The complexity of the conditions termed fin

erosions are acknowledged by the authors as is the limited scientific understanding of the effects on fish well-being. Common methods of assessment are advocated to aid farmers in adjusting their husbandry practices to reduce the incidence of fin erosion.

A discussion of fish welfare during transport sets out the principles on how transport is likely to affect the welfare by road, air and on water. The legislation and guidance available in the UK is listed, as are the impacts on the Five Freedoms. The discussion provides little practical guidance and is only useful for familiarising oneself with general issues of fish welfare during transport. In contrast, the section on welfare during harvest is a mixture of the scientific principles, on-farm applications and some guidance on current industry best practise. The chapter logically addresses the harvesting operation from planning until the animals are dead. Feed withdrawal, crowding, removal from cages, transport to slaughter, stunning and killing receive adequate attention with an emphasis on on-farm procedure rather than the scientific principles. This chapter would provide a good overview for undergraduate students and a good guide for farmers. Unlike most of the chapters in this section, the information is not specific to salmonids and is thus likely to be useful to a larger audience in aquaculture.

A short chapter on diseases and medicine highlights the effects of disease on welfare, the lack of fish medicine choices in the UK and how treatment regimes can affect welfare. Sea lice, furunculosis and production diseases are used as examples of the constraints to treating fish. The chapter would have benefited from some discussion of health management and disease prevention especially in light of the previous chapter from a farmer's perspective that sets out that veterinarians should be more involved in health plans to prevent disease. The aetiology of soft tissue and spinal deformities is discussed with husbandry practices that may increase incidence of the conditions being highlighted. The chapter raises the interesting question of whether aquaculture should be actively selecting out fish with natural deformities, as they would normally be removed from populations through natural selection.

A final chapter in the second section of the book is a report on a series of focus group meetings conducted with stakeholders in the UK to discuss the interactions between water quality and welfare in farmed rainbow trout. This chapter provides a rare but very useful insight into how the different interest groups perceive farmed fish welfare and what the expectations from the different parties involved in safeguarding fish welfare are. Particularly useful were the results of the farmers and the veterinarians' focus groups as they resulted in pragmatic operational welfare indicators. The topic will be of interest to those responsible for formulating fish welfare policy; those that audit fish welfare and scientists researching farmed fish welfare.

The last section of the book is a chapter on ornamental fish welfare. This is a very welcome chapter as it adds to the information available on the subject and also feeds into farmed fish welfare on topics such as transport and diseases.

It covers issues at all stages from production, transportation and ownership. The chapter includes information on training and OATA recommendations for fish transport.

This book covers a lot of the extensive field that is fish welfare and has contributions from across the field, including leading scientists, veterinarians and farmers. It is a good introduction to general issues in fish welfare and has a bias towards farmed salmonids. Apart from the general information on stress, pain and fear, and general topics on water quality there is little information that is directly relevant to laboratory fish welfare. Information is presented that is a foundation for operational indicators of fish welfare. The book is an indispensable reference for students of aquaculture and animal welfare. Although the book focuses on studies in the UK, most of the information is relevant to all aquaculture activities in many countries.

*Ambrose Tinarwo*  
*Bedford, UK*

### **The Animal Ethics Reader, First Edition**

Edited by SJ Armstrong and RG Botzler (2003). Published by Routledge, 2 Park Square, Milton Park, Abingdon, Oxon OX14 4RN, UK. 588 pp Paperback (ISBN 0-415-27589). Price £22.99.

I was extremely pleased to have the opportunity to review this book. It is a structured collection of articles, extracts and papers from a variety of authors, from a variety of viewpoints and in a variety of styles bringing together a hugely readable collection of thoughts and analyses on animal ethics and welfare — a real emporium of interesting snippets for those with a passion for and involvement in human-animal interactions.

A rather large tome (not unusual for this subject), it begins with a foreword by Bernard Rollin. So enthusiastically written in Professor Rollin's straight-talking style, it creates the first spark in motivating the reader, especially the novice reader, to grasp this enormous volume and bury one's head in the rich offerings contained therein. There follows a general introduction which, although brief, contains a thorough overview of the history of human thinking towards animals from the earliest interactions with animals in the primitive hunter-gatherer societies to the current views and moral thoughts on how we treat animals. It provides a flavour of the wide-ranging animal use challenges in contemporary western society which are to be presented in the various thematic parts of the book.

The book comprises ten thematic parts each focusing on particular areas of animal use or human animal interaction. Each part begins with an introduction that succinctly and eloquently provides an overview of the theme and balances any contentions arising. We start with the theories of animal ethics and contributions from well-known writers such as Tom Regan, Peter Singer and David DeGrazia. Part two explores animal capacities: pain, emotion and consciousness. This is perhaps one of the most adversarial sections