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Anaesthetic and Sedative Techniques for Aquatic Animals. 3rd Edition

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Source: Journal of Wildlife Diseases, 45(2) : 552-554

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-45.2.552

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Journal of Wildlife Diseases, 45(2), 2009, pp. 552–554
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BOOK REVIEWS

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The following reviews express the opinions of the individual author(s) regarding the value of the book's content for Journal of Wildlife Diseases readers. The reviews are subjective assessments and do not necessarily reflect the opinions of the editors, nor do they establish any official policy of the Wildlife Disease Association.

Anaesthetic and Sedative Techniques for Aquatic Animals. 3rd Edition. By Lindsay G Ross, Barbara Ross, and Bryony Ross, Blackwell Publishing Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK. 2008. 222 pp. ISBN 978-1-4051-4938-9. US $139.99 (hardback).

Review by David A. Jessup

Professor Ross began *Anaesthetic and Sedative Techniques for Aquatic Animals* with a set of course notes developed in 1983 and, later, expanded and heavily referenced his work in a second edition published by Blackwell about 10 yr ago. In this third edition, Lindsay G. Ross—with his wife, Barbara Ross, and daughter, Bryony Ross—has further expanded and updated the material, covering a field that has grown increasingly controversial and challenging within the last decade. It has taken some time—years in fact—for the fish-and-wildlife–management and scientific communities to accept the fact that sedation and anesthesia (American-English spelling will be used in this review) of fish, invertebrates, amphibians, and reptiles is not only humane and good practice, but also desirable, and that some techniques are applicable to larger-scale operations such as hatcheries. On the down side, the resources required for many advances made in aquatic animal anesthesia are not yet widely available, or the procedures are prohibited due to food-safety concerns on food fish, but more on this later.

The authors note that this book is the "only substantial reference work on fish anaesthesia," and although this is perhaps true as stated, it is not the only source of information on the subject, given that several current large works on fish medicine and care contain good chapters on anesthesia. *Anaesthetic and Sedative Techniques for Aquatic Animals*, however, is substantive, with 15 chapters including the following: "Defining Stress in Aquatic Animals"; "Pain in Aquatic Animals"; "The Nature of Anaesthesia, Sedation and Analgesia"; "The Features of Anaesthetic Agents"; "Anaesthesia and Legislation"; "Factors Affecting the Response of Aquatic Ectotherms to Anaesthesia"; "Anaesthesia of Fish I: Inhalation Anaesthesia"; "Anaesthesia of Fish II: Inhalation Anaesthesia Using Gases"; "Anaesthesia of Fish III: Parenteral and Oral Anaesthesia"; "Anaesthesia of Fish IV: Nonchemical Methods"; "Anaesthesia of Aquatic Invertebrates"; "Anaesthesia of Amphibians and Reptiles"; "Transportation and Anaesthesia"; and "Concluding Remarks."

If you have missed all the sound and fury in the last decade or two over whether "fish feel pain," whether and how they manifest stress, and the effects of pain and stress on fish health, along with numerous other issues, you might wonder about the need for several of the first six or seven chapters. As a veteran and survivor of these controversies, Dr Ross lays a pretty solid base for the fact that fish do indeed feel pain (or at least noxious stimuli that cause avoidance) and that aquatic animal anesthesia and sedation is not just for the weak-at-heart. The authors write: "Indeed, because these specific receptors (nociceptors) and their axons can be readily identified in invertebrates, they have been widely used as models in neurophysiological research for many years." Although "fish feel pain" may seem like common sense and is now pretty widely accepted, the citations supporting this were relatively few and old, which I find a disturbing oversight. This is probably an area where newer citations should have been added to bolster classical papers on the subject.

On the subject of stress, the following quote seemed somewhat overstated: "The response to these hormones is fairly consistent and, although their release adapts an animal to respond to an environmental change, there is

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strong evidence that even a minute increase in blood cortisol, when given by injection, ultimately has a deleterious effect in fish." In many subsequent sections and discussions, however, the adaptive significance of stress and role of cortisol are noted, so the meaning of that passage is not entirely clear to this reviewer. Other than these quibbles, I found that the first half of this book provides strong and reasoned support for stress reduction in aquatic animals by various means, particularly the use of anesthetics and sedatives.

Beginning with Chapter 8, the authors describe the specific uses of various chemical agents and some nonchemical means to achieve various levels, depths, and durations of anesthesia and sedation. The casual reader might be surprised at the wide variety of options for inhalation anesthesia available to a non–air-breathing patient. The practice of fish anesthesia is apparently still in a phase in which practitioners are regularly developing and improving on delivery equipment. The simple foam-block fish holder shown in a figure of Chapter 8, and the recommended use of disposable sterile sheets between patients to prevent transfer of infectious organisms, are examples of practical and adaptable tips useful for new and uninitiated practitioners.

In reviewing the anesthetic agents and various methods of application discussed, one is struck with how basic and well established some of the most useful fish anesthetics are. Within these pages, interesting morsels of information can also be found. I was surprised to learn that MS222, which has been the mainstay of amphibian and fish anesthesia for nearly four decades, was developed by Sandoz in their search for a cocaine substitute. Benzocaine and clove oil (active ingredient, eugenol) are presented as widely used and practical alternatives. Newer drugs are also discussed, such as AQUI-S, a commercial isoeugenol product manufactured in New Zealand. Use of quinaldine, etomidate, metomidate, and various barbiturates are well covered, and discussion of some old favorites such as chloroform, chloral hydrate, tribromethanol, and sodium cyanide prove that the few remaining brain cells from the veterinary anesthesia classes this reviewer took in the early 1970s are still of some use. Humor aside, many of the advances in anesthesia and patient monitoring that have been introduced in companion-animal medicine have not yet been applied in aquatic animals, which may reflect a lack of financial incentive. But the lack of cutting-edge procedures for aquatic animals is not an indication that fish anesthesiologists are backward or lacking in sophistication—far from it. Although it is possible that "necessity is the mother of invention," it's also possible that desperation is that maternal source of problem solving. Some of the uses of simple carbon dioxide, sodium bicarbonate, and electroanesthesia described in this book may have their limitations, but come close to a simple form of genius.

Chapter 10, on parenteral and oral anesthetics, includes a few drugs that are widely used in companion-animal practice (such as ketamine, xylazine, etorphine, and acepromazine), but the presentation makes clear how relatively inferior and impractical they are compared to the drugs and applications described in Chapters 8 and 9. One also shudders at the vision of trying to inject a large squirming fish in hand with a relatively high dose of etorphine. Give me a dart gun any time. The discussion of alphaxalone–alphadalone (Saffan) in this chapter is brief and somewhat impressive, but the reader is also reminded how hard it is to acquire and use this drug.

This book largely addresses the situation in the United Kingdom, but issues of availability, withdrawal times, legal restrictions, and other subjects of importance to North American readers of *Journal of Wildlife Disease* need some comment. It is not easy to get some of the small-market drugs from Europe and Australasia (AQUI-S, Saffan) into the United States for use on client-owned animals. Legalities of importation and use of many of the drugs mentioned in *Anaesthetic and Sedative Techniques for Aquatic Animals* are difficult. When one moves from client-owned aquatic animals to animals used for food, the situation becomes even more dicey. For the last year or so AQUI-S has been available under an Investigational New Animal Drug permit, but it is my understanding that evidence indicating isoeugenol is carcinogenic has resulted in that permit being revoked. The approval of clove oil as a food additive is creative but, according to the US Food and Drug Administration, does not justify its use as a fish anesthetic. According to Dr Dan Mulcahy, the US Fish and Wildlife Service is attempting to get MS222 approved for a zero-withdrawal time, but, as it currently stands, the only legal way to anesthetize food fish and immediately release them is with carbon dioxide. This severely limits the usefulness of MS222. Another controversial subject I did not find covered in the book is the disposal of volumes (sometimes in the gallons) of anesthetic solution in which fish have been dipped or that has been used in flow-through anesthesia.

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Another small point of contention comes from the book's nearly exclusive use of Latin names. The appendices include a useful glossary of technical terms, a subject index, and an index of the Latin names of fish species referred to in the book, with nearly 300 aquatic animal genus and species names. Throughout the book the authors use Latin names of the animals—sometimes four or five to a sentence—and only occasionally is the common name also given. This leaves the uninitiated reader either flipping back and forth relentlessly or giving up on knowing which fish has been referenced.

Despite this reviewer's whining (the authors would probably say whinging) the third edition of *Anaesthetic and Sedative Techniques for Aquatic Animals* is a very good book. It is adequately, not lavishly, illustrated in black and white—primarily with drawings and tables, as opposed to many pictures. It pretty well nails the issues and the state of the art of aquatic animal anesthesia; it is well referenced, and, as noted, has a number of practical and useful tips. The purchase price of $139.99 does not seem too excessive.

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