

Fish Nutrition (Third Edition)

J.E. Halver, R.W. Hardy (Eds.).

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The first edition of Fish Nutrition, edited by J. E. Halver, was published in 1972. It brought together reviews from specialists across a broad range of basic and applied topics relating to the feeding and nutrition of fish. Publication coincided with a resurgence of interest in aquaculture and the book became established as a key reference source in a rapidly expanding field. An enlarged second edition was published in 1989. In producing a third edition, the editors have sought to incorporate selections of the most important new information produced since 1989. A single additional chapter has been contributed by the editors and there are new emphases and treatments in several chapters, which reflect reworking and changes in authorship.

The book opens with a chapter contributed by Bureau, Kaushik and Cho, which deals with the topic of bioenergetics. This chapter has been rewritten and expanded to reflect the growth of research activity in this field. Emphasis is on fish bioenergetics in an aquaculture setting and topics lead the reader in a logical sequence from historical review through to current perspectives and limitations. The contents of Chapters 2-6 follow those of earlier volumes giving detailed descriptions of the nutrient requirements of fish. Vitamin requirements are reviewed by Halver in Chapter 2, amino acid and protein requirements by Wilson in Chapter 3, lipid requirements by Sargent, Tocher and Bell in Chapter 4 and mineral requirements by Lall in Chapter 5. These are all solid contributions from leading specialists in their fields and these opening chapters form the core of the book. Whilst

much of this basic information is now widely available in books and reviews elsewhere, the authors have performed a useful task in their review of recent literature. The chapter dealing with lipid requirements deserves special mention. Written in an engaging style, the authors have reviewed the topic in depth and expanded the sections dealing with the lipid requirements of marine fish and larvae.

In Chapter 6, Dabrowski and Guderley review intermediary metabolism. This is a contribution by new authors who examine in detail the metabolism of carbohydrates and proteins. Nutritional physiology is reviewed by Rust in Chapter 7. The diversity of form and function of the fish digestive tract is described and an expanded section covering larval fish is included. Liberal use is made of b/w photographs whilst readers are directed to a URL for color versions. Nutritional pathology is reviewed by Roberts in Chapter 8. The content follows very closely the contribution of Roberts and Bullock to the second edition. Whether or not this reflects a paucity of recent research in this field during the last decade is left for specialists to decide. Chapter 9, by Hardy and Burrows, leads the reader through the applied aspects of diet formulation and manufacturing techniques. Expanded sections dealing with larval feeds and low-pollution feeds have been added. The treatment is thorough and the coverage of formulation methods and chemical and biological evaluations of feeds will be of particular value to new researchers in the field. Readers of this journal will welcome the prediction, that 'research and production of feeds formulated specifically for use in recirculation systems will be a growing sector of fish nutrition in the next decade'.

Chapter 10 is a review of adventitious toxins in feeds by Hendricks. Most of the material is familiar from the previous edition, with added discussion of the roles of recently encountered toxins e.g. the mycotoxin fumonisins. Chapter 11 is a short review by Piggot and Tucker of special feeds with a focus on some of the key major ingredients. Chapter 12 is a review by Gatlin of nutrition and fish health, and in particular the relationships between diet and immune function. This is new material added since the previous edition in what is now clearly an expanding field of investigation. Diet and fish husbandry, are reviewed by Lovell in Chapter 13. This follows the same format as in the previous edition, with details of the nutrient requirements and feeding practices for channel catfish, salmonids, tilapias and penaeid shrimp. The chapter brings into a practical perspective some of the previous material presented. A final

chapter contributed by the book's editors, Halver and Hardy, briefly summarizes patterns of nutrient flow and retention. An appendix lists examples of feed formulations, nutrient content of ingredients, examples of feeding charts and the scientific names of some aquaculture species.

The editors took on a formidable task in compiling a book of this scope and overall they have done it successfully. The book is comprehensive, there is little unnecessary repetition and the topics follow a logical sequence. Some short chapters may have best been combined with others e.g. information in the chapter dealing with special feeds could have been incorporated readily into the chapter dealing with diet formulation, which already covered most of the same topics. Isolated references to crustacean nutrition are found in three chapters. Readers may more usefully have been referred to specialized publications on this topic (e.g. D'Abramo et al., 1997). The information presented is well referenced at the end of each chapter, although the omission of journal article titles in reference lists will frustrate some readers. Whilst new glossy covers have been added, the use of the same design and layout for the text and inclusion of many of the same figures and illustrations as in the previous edition do give the book a somewhat dated feel. There are few typographical or production errors for a book of this length although this reviewer's copy had Table 13.4, which lists diet formulations for salmonids, duplicated at the expense of Table 13.12, which should have listed formulations for practical shrimp diets. The inclusion of a single color diagram (Fig. 12.1) is curious given that other flow charts were apparently submitted to the publishers as color slides where clarity could have benefited from color reproduction.

Since the publication of the previous edition of *Fish Nutrition*, numerous reviews, book chapters and both general and specialized books dealing with fish nutrition have been published. There is now a choice of texts available, with more accessible information, to support undergraduate courses in fish nutrition and aquaculture (e.g. De Silva and Anderson 1995, Lovell 1998, Guillaume et al. 2001). This new edition of *Fish Nutrition* will however continue its role as a leading source of reference for a wide readership, drawn from educators, researchers, aquaculturists and feed manufacturers.

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