

## On Surimi and Other Engineered Seafoods

The growth in popularity and production of certain engineered seafoods has been explored in articles in the Foreign Fisheries Developments section of this issue. Here, then, are two recent publications that provide more specific information on these important products.

**"Surimi"** by Sunee C. Sonu provides an in-depth look at the history and processes of surimi manufacture and the products made from surimi. Chapter 1 presents a historical perspective on surimi, including the importance of the Japanese surimi industry to the United States, the introduction of frozen surimi technology, automation of surimi production, production of ship-processed surimi, the surimi-based imitation seafood products, and surimi from underutilized species. Also covered is the Japanese surimi industry—its production, imports and exports, prices, products, and raw material resources.

Surimi manufacturing procedures for white-fleshed fishes are reviewed in Chapter 2, including the handling of the raw material, meat separation, leaching, straining and dewatering, additives used, and freezing and cold storage. Also covered is the surimi production plant itself. Chapter 3 discusses aspects of surimi based on dark-fleshed fishes—the technical problems involved (i.e., rapid protein deterioration and the large content of sarcoplasmic protein, dark muscle tissue, and fat) and the manufacturing procedures involved. Chapter 4, on surimi quality, then discusses quality standards, test procedures, and test results. The volume is based on an extensive review of the literature, conversations and interviews with experts, and studies of surimi plant operations and is a fine review, well illustrated with 56 diagrams, photos, and flowcharts. The 122-page paperbound report is NOAA Technical Memorandum NMFS-SWR-013 and is sold by the National Technical Information Service, U.S.

Department of Commerce, Springfield, VA 22161.

Also available now is the **"Proceedings of the International Symposium on Engineered Seafood Including Surimi,"** edited by Roy E. Martin and Robert L. Collette of the National Fisheries Institute (NFI) in Washington, D.C. The symposium was held 19-21 November 1985 in Seattle, Wash., and the 63 papers present a broad range of engineered food and surimi topics with worldwide application and interest.

Following the opening addresses are five papers on resource availability for engineered seafoods—prospects in developing nations for production of surimi products, New England resources, the menhaden resource, the case for Pacific whiting, *Merluccius productus*; and trends and abundance of walleye pollock off Alaska. Another session, moderated by Lloyd Regier and John Spinelli, addresses product and technology development of engineered seafoods: History of surimi and its products in Japan, fish as the "soybean of the sea"; using frozen minced fish, effect of cod fillet holding temperature on surimi; effect of washing on the composition and functional stability of minced pollock flesh; processing requirements for preparation of minced intermediates or surimi from menhaden; surimi from Pacific whiting; proximate analysis of surimi made from black drum; use of Norwegian industrial fishes for surimi; surimi from red hake, *Urophycis chuss*; nutrients and quality of surimi-based products; and more.

Also included is the special panel discussion moderated by Spinelli on emerging technologies for producing surimi. In another session, moderated by Roland Chambers, ten papers address national and international aspects of marketing and economics of surimi-based foods. Three other papers discuss various regulatory and institutional issues, including the labeling require-

ments for engineered seafoods.

Another lengthy session provided 13 contributions on the equipment and ingredients for engineered seafoods, and was moderated by Robert Collette. Presentations ranged from discussions of machinery needed for flesh-bone separation for various species to the packaging of products, effects of ingredients on gel texture, use of isolated soy protein and soluble milk protein hydrolysates, and flavorings for the products.

Later, an international roundtable moderated by James Brooker discussed surimi prospects in Australia and New Zealand, European studies and production, Nordic work with minced fish, Korean and Thailand surimi developments and resources, and surimi overviews by participants from Japan, Canada, and the United States. The volume also includes reprints of journal articles on "Developing appropriate nomenclature for structured seafood products" by Roy E. Martin and "Surimi process technology" by Chong M. Lee of the University of Rhode Island.

The paperbound, large-format publication is 732 pages long and collectively presents a sweeping overview of topics important to the expansion and utilization of several marine fisheries. It is available from the National Fisheries Education and Research Foundation, 2000 M Street, N.W., Suite 580, Washington, DC 20036 for \$55.00.

## Recent Studies in Fish Immunology

Publication of **"Fish Immunology,"** edited by Joanne S. Stolen, Douglas P. Anderson, and Willem B. van Muiswinkel, has been announced by Elsevier Science Publishers, P.O. Box 330, 1000 AH Amsterdam, The Netherlands. The volume contains the proceedings of an International Meeting of Fish Immunology held in Sandy Hook, N.J., 8-12 September 1985. Published first as volume 12 of *Veterinary Immunology and Immunopathology*, the papers are now available in a more durable and accessible hardbound form for advanced students and scientists.

Much progress has been made in the past decade in studies on fish immunology and in its practical applications. The results of such studies often have phylogenetic significance for veterinary and clinical immunologists, for scientists studying environmental and pollution problems, and for practicing fish farmers and fish culture researchers. This volume is a good source of information on basic immunological principles and on recent fish immunology studies, and the 47 scientific papers represent contributors from 18 different nations.

Like the conference, the volume is arranged by session, with contributions discussing aspects of: 1) Fish immunoglobulins, lymphocyte populations, MHC, nonspecific factors, and soluble substances; 2) lymphocyte and macrophage structure and function—ontogeny, lymphoid organs; 3) cellular and humoral responses; 4) modulation of the immune response; and 5) immunity to disease agents.

Contributions include papers on using artificial gynogenesis in studying the carp immune system, immunological studies with channel catfish, carcharhinid sharks, and goldfish; modulation of nonspecific host defenses in fish, and studies on the alpha-precipitins of Atlantic salmon. Additional papers discuss the ontogeny of humoral immunity in rainbow trout, ontogeny of gut-associated lymphoid tissue in the dogfish *Scyliorhinus canicula*, lymphoid organs in sturgeons, immune response to PKD in rainbow trout, interactions of TCDD with immune responses of rainbow trout, pharmacokinetics of sulphadimidine in carp, and the seasonal antibody response in juvenile summer flounder to the hemoflagellate *Trypanoplasma bullocki*. Further contributions include work on the persistence of IPN virus in Atlantic salmon, immunosuppression of carp to ichthyophthiriasis using the corticosteroid triamcinolone acetone, seasonal changes in the humoral immune response and the lymphoid tissues of *Sebasticus marmoratus*, immunization and culture of rainbow trout organ sections in vitro, and others.

In all, the contributions reflect many of the studies made in the field of fish immunology in recent years and will be

a useful reference. The hardbound 443-page volume contains both author and subject indexes and costs Dfl 195.00; in the United States and Canada it is available from Elsevier Science Publishing Co., Inc., P.O. Box 1663, Grand Central Station, New York, NY 10163 for \$72.25.

### ***Bowhead Whaling in the Western Arctic***

“**Whales, Ice, & Men**” by John R. Bockstoce, subtitled “The History of Whaling in the Western Arctic,” has been published by the University of Washington Press, P.O. Box C-50096, Seattle, WA 98145-0096. The book is essentially a history of the western Arctic bowhead whaling industry, and an excellent one at that. By “western Arctic,” Bockstoce refers to all of the waters of the Bering, Chukchi, and Beaufort Seas, but excluding Bristol Bay. The large-format volume is amply illustrated with 141 photographs, plus maps and drawings, and the author has done a fine job of placing the depletion of the bowhead whale there in perspective, both economically and historically. Bockstoce is curator of ethnology at the Old Dartmouth Historical Society Whaling Museum in New Bedford, Mass., and has made extensive studies of the region’s whaling, to the extent of identifying the whaleships that cruised western Arctic waters year by year and documenting their kills as closely as possible—an immense task. Development of the book is also partly tied to the efforts to calculate historic levels of bowhead whale populations in recent years.

Chapters discuss the early development of the fishery (1849-64), Civil War strife in the Bering Strait, walrus hunting, whaling in the 1870’s when almost 60 vessels were lost, trade with the natives, the advent of steam whaling, whaling from shore, wintering over at Herschel Island, Federal support for an Arctic whaling station, disastrous whaling fleet losses in 1897, and the decline of the fishery. Other chapters relate outfitting for the voyages, the pursuit and capture of the whales, the techniques

and tools of whaling, etc. An Epilogue relates the fortunes of one C. T. Pederesen, whose vessel the *Herman* was the last to take a bowhead whale commercially, and who later turned to the Arctic fur trade.

Several appendices provide data on the chronology of major events in the western Arctic whale fishery, estimated annual and cumulative catch removal of bowhead whales and walrus from 1849 to 1914, a gazetteer of whalers’ place names in the western Arctic, a glossary, and a graph of the prices of whale oil and balleen, CPUE, and number of whaleships in the fishery from 1848 to 1914. Also provided are a key to repository symbols where data was collected, pertinent chapter notes and references; extensive literature citations are listed by topic. The book is a fine and scholarly description of the times and trials of both the whalers and the bowhead whales which is often related through the words of the actual participants. Indexed, the 400-page hardbound volume costs \$29.95.

### **THE BASICS OF FISH GENETICS**

Publication of “**Genetics for Fish Hatchery Managers**” by Douglas Tave has been announced by AVI Publishing Company, Inc., 250 Post Road East, P.O. Box 831, Westport, CT 06881. The author is with the Department of Fisheries and Allied Aquacultures, Alabama Agricultural Experiment Station, Auburn University, Auburn, Alabama, and he presents the genetic aspects of animal breeding for fish farmers, hatchery managers, and others responsible for aquaculture programs in an easy-to-read and well illustrated format.

To the uninitiated, genetics may be viewed as exceedingly complicated. The author, however, has attempted to bridge the gap between the geneticist and the fish culturist by starting at square one and presenting the information as simply as possible. In addition, he explains how this knowledge can be used to improve fish stocks and their productivity. Another purpose of the book is to convince hatchery managers that produc-

tivity depends, to a great extent, on breeding practices and how a fish population is managed genetically.

Says the author, "Productivity cannot be optimized if the biological potential of the population is not optimized." In four chapters, the author introduces a review of basic genetics, genetics of qualitative phenotypes, genetics of quantitative phenotypes, and genetics of broodstock management—how to select and achieve a more productive and disease resistant stock of fish. Discussed also is broodstock management for gamefish to be stocked in natural bodies of water, for rare or endangered species in need of rescue, and for species used either as food fish or bait fish, as well as use of a control population to evaluate the genetic strain.

This is not a textbook on fish genetics and therefore it does not cover such topics as chromosomal manipulation, molecular genetics, cytogenetics, etc. Rather, it is a well written manual for the aquaculturist on how to manage his fish population's gene pool in order to improve productivity. Appendix A lists the scientific names of fishes cited in text and tables, Appendix B describes how to describe a quantitative phenotype, and a glossary defines the terms used in the text. Selected references are provided. Indexed, the 300-page hardbound volume is available from the publisher for \$39.00.

## Rockfish and Research

**"Rockfish: A Focus for Research?,"** edited by Rosemary Amidei and published by the California Sea Grant College Program (Rep. T-CSGCP-015, 71 pages, paper), University of California, A-032, La Jolla, CA 92093, presents the portion of the proceedings of a CSGCP workshop held 3-4 April 1986 to review California's rockfish fisheries, their importance, and research needs. William Lenarz presented an overview of the fishery and a panel representing scientists, managers, and commercial fisheries interests discussed research needs, fishery development, management, and other aspects of the rockfish fisheries. Besides the general overview of the fish-

ery and its needs, the publication also contains an extensive bibliography of published works on or relating to the Pacific coast rockfishes.

## Marine Fungi and Their Biology

Publication of **"The Biology of Marine Fungi,"** edited by S. T. Moss, has been announced by Cambridge University Press, 32 East 57th Street, New York, NY 10022. The volume is based on invited papers presented at the Fourth International Marine Mycology Symposium convened at Portsmouth Polytechnic in the United Kingdom in August 1985.

Fungi are both important and ubiquitous members of the biota of marine ecosystems, and increased studies have been made into their role in the seas, their physiological adaptations, distribution, and economic importance (either as pathogens of plants or animals), and their ecological importance as degraders of organic materials. It has been some time since volumes have reviewed either the literature on marine fungi or the higher marine fungi or the literature on both the higher and lower forms of marine fungi. This volume, with experts reviewing the literature in their particular fields of expertise, is an excellent updated source of information; references are complete through 1985, and many authors have cited pertinent 1986 literature.

There are four main themes in the volume: Ecology, taxonomy, physiology, and industrial and applied biotechnology, and within them is treated a broad spectrum of subjects, including pathology of marine plants and animals, mycelial adhesion, biodeterioration, and conservation. Topics of several of the 30 papers in this volume include: Fungal growth in the sea, fungi and hydrocarbons in the marine environment, measuring fungal-biomass dynamics (in standing-dead leaves of a salt marsh vascular plant), growth and enzyme production in marine fungi, role of fungi in mangrove detrital systems, an overview of pathogenic fungi, progress of mycotic infections in marine animals,

significance of fungal diseases in the marine environment, taxonomic studies of the marine Ascomycotina and Halosphaeriaceae, biogeography and the marine fungi, lignicolous marine fungi, timber decay caused by marine fungi and wood preservation, a preliminary account of Antarctic marine fungi, and others.

Contributors are internationally known experts whose papers will be valuable for advanced students of and researchers in mycology and marine biology. Overall, the volume provides an excellent account of the present state of the subject—the biology of both lower and higher marine and estuarine fungi. Indexed, the 382-page hardbound volume is available from the publisher for \$49.50.

## Biology, Fisheries, and Utilization of Sharks

**"Sharks, An Inquiry into Biology, Behavior, Fisheries, and Use,"** edited by Sid Cook, has been published by the Oregon State University Extension Service, Corvallis, and is the proceedings of the conference of the same title held in Portland, Ore., 13-15 October 1985.

Following brief introductory comments, Jose Castro presents an overview of the position of sharks in marine biological communities, and Gregor Cailliet reviews methods of estimating age and growth in sharks. In "Human Impacts on Shark Populations," Thomas B. Thorson reviews the effects of heavy fishing on the skate, school shark, bull shark, and the largemouth sawfish.

A lengthy review of shark behavior by Arthur Myrberg, Jr., is followed by psychologist Jon Magnuson's interesting examination of the history of the shark in human myths, legends, and rituals. Yet another angle is given on sharks and the news media by newsman Steve Boyer. Sid Cook has provided a lengthy review of the science of forensic shark attack investigations. (Also included are abstracts of talks on Pacific Coast shark attacks and on recent advances in protecting people from sharks.)

Other papers discuss U.S. shark fisheries, gear, and fishing methods; devel-

opment of a Pacific angel shark fishery in California, management of the southern California pelagic shark and swordfish fishery, development of Alaska's salmon shark fishery, proper handling and quality control of shark, shoreside processing of shark, developing specialty products from frozen shark, development considerations for a mid-Atlantic coast dogfish fishery, developing minced fish products from dogfish, a brief review of deep-sea shark fisheries (primarily Japanese), the growing use of shark in restaurants and in the home, and an overview of the development of U.S. shark sport fisheries which, in several areas, have soared in popularity. (Also included are abstracts on telemetering techniques to determine shark movement patterns.)

The Proceedings provide a very good overview of U.S. shark resources and the problems and prospects in their development, and the volume will be of considerable interest to anyone interested in or involved with sharks, their harvest and utilization. The 237-page paperbound volume is available from Agricultural Communications, Publications Orders, Oregon State University, Corvallis, OR 97331-2119 for \$11.50 post-paid (make checks payable to Oregon State University).

## Fish Stocks and Their Variability

**"Dynamics of Marine Fish Populations"** by Brian J. Rothchild has been published by Harvard University Press, Cambridge, Mass. The author, a former NMFS scientist, is Professor of Environmental and Estuarine Studies at the University of Maryland, and here he explores variability in the numerical abundance of fish populations and the reasons for it.

Chapter 1, an introductory discussion of variability in fish stock abundance, leads into examples in Chapter 2 of fish stock variability—an analysis of the historical record and a look at long- and short-term records. Chapter 3 reviews the unique properties of fish populations and discusses fishery-related population dynamics theory. Thus, the author provides a background on the nature of fish

stock variability, examines the importance of understanding variations in fish stock abundance, and, in Chapter 4, establishes a structure for his subsequent analysis. Chapters 5-7 then examine nuances of the recruitment-stock relationship, egg production, and the fate of eggs and larvae in the sea, which sets the stage for the final chapter on implications of the population-dynamics process in which the author develops a foundation for his theory on fish stock variability.

The volume will likely be of interest to a fairly wide audience, including those concerned with the analysis of fish population variability, fish population dynamics, and others interested in the "evolution" of the population-dynamics-process model, etc. Hardbound, the 277-page volume is indexed, provides a lengthy list of references, and costs \$37.50.

## Surviving in Cold Water and Emergency Situations

NOAA-sponsored research into hypothermia problems has immensely helped make a dunking in chilly seawater far more survivable. And much of the resulting information is related in **"Hypothermia Causes, Effects, Prevention,"** by Robert S. Pozos and David O. Born, published by New Century Publishers, Inc., Piscataway, NJ. Pozos is Director of the Hypothermia and Water Safety Laboratory, University of Minnesota, Duluth, and a hypothermia authority, and David Born is a UM scientist and writer.

To date, much of the literature on hypothermia has been found in scientific reports or symposia or magazine articles. This excellent volume now makes it available for interested general readers, be they commercial fishermen, scientists, sport fishermen, survival instructors or whatever. It thoroughly describes the many factors that influence body temperature regulation, such as body composition, sex, race, physical handicaps, exercise, clothing, nutrition, and alcohol or drug use. In addition, the authors clearly explain the causes, effects and the prevention of hypothermia—the term for gradual chilling of the

body's core and vital organs, especially the brain, heart, and lungs, to a level where the natural production of heat can no longer keep up with the heat losses. Hypothermia is especially of concern to those who have to work in cold environments or who face the possibility of immersion in cold water.

Besides giving excellent and thorough explanations of hypothermia, and how to avoid or prevent it and deal with it if it occurs, the authors also provide numerous medical and more popular survival references for further or more detailed reading. Other important chapters discuss frostbite, and rewarming, CPR, and field rescue for hypothermia victims. In addition, an important appendix by G. Patrick Lilja outlines the emergency treatment of both hypothermia and frostbite. Indexed, the 173-page hardbound volume costs \$14.95.

A more comprehensive book on surviving outdoor emergencies is the **"Complete Book of Outdoor Survival"** by J. Wayne Fears, published by Outdoor Life Books and distributed by Stackpole Books, Cameron and Kelker Streets, P.O. Box 1831, Harrisburg, PA 17105. One of the largest books devoted purely to survival, this one covers a lot of material, some in considerable depth and some much less so. The book does have a lot of strong points, notably the many new and original illustrations that better explain survival points and particular survival techniques, etc. Its chapters on mental preparedness, the will to live, planning for the unexpected, and the search and rescue activities by the U.S. and Canadian Coast Guard units are also very good. Also useful is the material on survival medicine and safety, hypothermia, cold weather survival, firemaking, shelters, etc. The chapter on "Big Water Survival," however is very short and very basic, though it does cover signalling, marine communications, and the emergency position indicating radio beacon (EPIRB).

In addition, the author lists a variety of survival courses, some useful to fishermen, and three appendices cover 1) survival organizations 2) other books with specialized survival information, and 3) survival gear suppliers. The 484-page hardbound volume is indexed and costs \$32.95.