New NMFS Scientific Reports Published

The publications listed below may be obtained from either the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; from the Publications Services Branch (E/AI13), National Environmental Satellite, Data, and Information Service, NOAA, U.S. Department of Commerce, 3300 Whitehaven St., Washington, DC 20235; or from the National Technical Information Service, Springfield, VA 22151. Writing to the agency prior to ordering is advisable to determine availability and price, where appropriate (prices may change and prepayment is required).

NOAA Technical Report NMFS Circular 451[1]. Matsumoto, Walter M., Robert A. Skillman, and Andrew E. Dizon. **"Synopsis of biological data on skipjack tuna, *Katsuwonus pelamis*."** January 1984, iv + 92 p., 77 figs., 20 tables.

ABSTRACT

This synopsis of biological data on skipjack tuna, *Katsuwonus pelamis*, includes information on nomenclature, taxonomy, morphology, distribution, reproduction, nutrition, growth, behavior, physiology, population structure, exploitation, and management of the species. Over 600 of the more important published and unpublished reports up to 1980, including some published in 1981, were consulted.

[1]In 1983 the NOAA Technical Report NMFS series was established to replace two subcategories of the NOAA Technical Report series, the "Special Scientific Report—Fisheries" (SSRF) and the "Circular." Thus, Circular 451 is the final number published in its subcategory. SSRF 783, now in press, will be the final number in its subcategory. The new series will begin with number one again, which is NOAA Technical Report NMFS 1, "Synopsis of biological data on the blue crab, *Callinectes sapidus* Rathbun" by M. R. Millikin and A. B. Williams.

NOAA Technical Report NMFS SSRF-779. Kajimura, Hiroshi. **"Opportunistic feeding of the northern fur seal, *Callorhinus ursinus*, in the eastern North Pacific Ocean and eastern Bering Sea."** February 1984, iv + 49 p., 38 figs., 12 tables, 13 app. figs., 1 app. table.

ABSTRACT

The Pribilof Island population of northern fur seals, *Callorhinus ursinus*, feeds on a variety of prey throughout its subarctic

The Fishes of the Upper Midwest Region

"Fishes of Wisconsin" by George C. Becker has been published by the University of Wisconsin Press, 114 North Murray Street, Madison, WI 53715, with the support of the University of Wisconsin Sea Grant Program under a grant from NOAA's Office of Sea Grant. Becker is Emeritus Professor of Biology and Curator of Fishes at the University of Wisconsin at Stevens Point.

At 1,052 pages, the volume gives thorough and comprehensive treatment to the almost 160 species of Wisconsin's waters and, indeed, will be a valuable reference for much of the upper midwest region. With thousands of lakes and miles of streams and bordering Lakes Superior and Michigan, Wisconsin's fishes and fisheries are diverse and important. The State's Lake Michigan sport fishery alone produces an estimated $30 million annually.

Far more, the book provides a geological history of Wisconsin's waters and their uses and pollution. Another chapter covers fishery research and management in the State, the role of nongame fishes in ecosystem integrity, numbers of species and general fish distribution, introduction of exotic species, and endangered and extinct species. Common fish parasites are discussed in another short chapter. The author also provides suggested management changes for fish resources that may be troubled, and his brief glacial history tells why many Great Lakes fishes are related to species of the Mississippi River basin.

Becker recognizes 157 species of fish in Wisconsin waters: 137 in the Mississippi River basin, 131 in the Lake Michigan basin, and 74 in the Lake Superior basin. The key to the families and the family keys are clear and very well illustrated. Dual trout and salmon keys are provided for adults and for young up to 125 mm. Quality of the color plates varies as some photos are of museum specimens, some of fresh specimens, and some are of drawings.

But the bulk of the volume, 783 pages, is devoted to the species accounts. Each is led off with excellent black and white illustrations of the species, scientific and common names, a thorough description of the species and data on its distribution, status, habitat, biology, importance, management, and, where appropriate, systematic notes. The author also provides original information relating to age, growth, and ultimate size of the species, as well as behavioral data dealing with prespawning, spawning, nest construction, egg care, and behavior toward the same or other species. Maps show North American distribution for the species and the range in Wisconsin. An extensive list of references is provided.

In sum, the author has drawn together virtually all pertinent data on Wisconsin's fishes and produced a comprehensive, well illustrated and easily readable volume of great value to fisheries biologists, researchers, and managers, students, and anglers not only in Wisconsin, but through much of the upper midwest. Introductory explanations of the species accounts, keys, distribution maps, abbreviations, acronyms, signs, and an extensive glossary will aid non-

range from California to the Bering Sea. A total of 53 species of fish and 10 species of squid has been identified from the stomachs of fur seals taken during 1958-74. Some fur seal prey species are commercially fished while others are not of commercial importance but are important forage food for many other predators including other marine mammals, seabirds, and fishes. The season and location are important considerations, as are the migratory characteristics of forage species, when studying the diet of fur seals in the eastern Pacific. Evidence suggests that fur seals are opportunistic feeders preying on the most available species throughout their range.

NOAA Technical Report NMFS SSRF-780. Scheffer, Victor B., Clifford H. Fiscus, and Ethel I. Todd. **"History of scientific study and management of the Alaskan fur seal, *Callorhinus ursinus*, 1786-1964."** March 1984, iii + 70 p., 14 figs.

(No abstract.)

NOAA Technical Report NMFS SSRF-781. Wass, Richard C. **"An annotated checklist of the fishes of Samoa."** May 1984, v + 43 p.

ABSTRACT

All fishes currently known from the Samoa Islands are listed by their scientific and Samoan names. Species entries are annotated to include the initial Samoan distributional record, synonyms used in earlier publications dealing with Samoan fishes, and comments relating to taxonomy, ecology, and distribution. New species records resulting from recent collections by the author and others are included. Brief diagnoses are provided for undescribed and unidentified species. The list totals 991 species representing 113 families; 284 of the species are previously unrecorded from Samoa and 38 of the entries are unconfirmed records derived mostly from 19th century publications.

NOAA Technical Report NMFS 1. Millikin, Mark R., and Austin B. Williams. **"Synopsis of biological data on the blue crab, *Callinectes sapidus* Rathbun."** March 1984, iv + 39 p., 10 figs., 11 tables.

ABSTRACT

This synopsis reviews taxonomy, morphology, distribution, life history, commercial hard and soft shell crab fisheries, physiology, diseases, ecology, laboratory culture methodology, and influences of environmental pollutants on the blue crab, *Callinectes sapidus*. Over 300 selected, published reports up to and including 1982 are covered.

NOAA Technical Report NMFS 2. Kendall, Arthur W., Jr., and Beverly Vinter. **"Development of hexagrammids (Pisces: Scorpaeniformes) in the northeastern Pacific Ocean."** March 1984, iii + 44 p., 16 figs., 13 tables, 10 app. figs.

ABSTRACT

Larvae of *Oxylebius pictus*, *Zaniolepis* sp., *Ophiodon elongatus*, *Hexagrammos stelleri*, *H. decagrammus*, *H. lagocephalus*, *H. octogrammus*, and *Pleurogrammus monopterygius* are described and illustrated from field collections which were supplemented by laboratory reared specimens of some species. Larvae hatch at a rather large

---

technical readers. Hardbound, the book costs $75 and is available from the publisher.

A Guide to Lake Superior Fishes

"Fishes of Isle Royale," by Karl F. Lagler and Charles R. Goldman, is not as limited in scope as the title might imply. In fact, it is a handy, authoritative, and inexpensive field guide to common Lake Superior fishes. The authors are well-known fishery scientists with extensive experience in the region. Lagler is with the University of Michigan and Goldman is now with the University of California at Davis.

The book is a more popular version of the author's technical work and includes a discussion of fish habitats, the types of fish, and an excellent pictorial key to their identification. Also included is an annotated list of 52 species in 14 families, data on basic fish anatomy and fishery resource conservation, and a map of local fishing waters.

The 58-page paperbound handbook has been published by, is available from, the Isle Royale Natural History Association, 87 N. Ripley St., Houghton, MI 49931-1895 for $4.45 plus $0.90 for postage and handling. It is well written, attractively illustrated, and provides references to both technical papers and bulletins on fish preservation and cooking.

West Coast Clams

"Pacific Coast Clam Fisheries" by Timothy D. Schink, Katherine A. McGraw, and Kenneth K. Chew has been published as Technical Report WSG 83-1 by the Washington Sea Grant Program, University of Washington, HG-30, Seattle, WA 98195.

Annual U.S. clam harvests averaged about 100 million pounds during the 1970's, and while the Pacific Coast clam industry totals only about 1 percent of that figure, it is locally important and has potential for growth. Washington tallies about 95 percent of the region's commercial clam production and Alaska accounts for most of the rest. Oregon and California have much less habitat, and recreational clam harvesting takes most of their clam production. Alaska's lengthy coastline holds ample clam resources, but harvests are restricted by paralytic shellfish poisoning (PSP) and socio-economic factors.

Thus, this report reviews, by state, the region's principal commercial clam species, and the industry's history, current trends, and anticipated developments, plus data on recreational harvests. It also assesses industry problems in each state with harvesting and marketing, regulations and jurisdictional conflicts, management and technology, and such environmental problems as water quality, PSP, siltation, predation, and climatic conditions.

Two appendixes provide yearly data on Pacific Coast clam production and clam anatomy and biology. The 72-page paperbound volume provides a fine review of the region's clam resources and fisheries and is available from the publisher for $4.50.

size (3-9 mm), are heavily pigmented, and undergo direct development to an epipelagic prejuvenile stage. Larvae of the five genera are separable on the basis of body shape, pigmentation, and meristic characters. Larvae of the four species of *Hexagrammos*, which are quite similar in appearance, are separable on the basis of a combination of several pigmentation characters. Developmental evidence indicates that *Oxylebius* and *Zaniolepis* are similar to each other and are more similar to presumed primitive cottids than the other included genera. *Ophiodon* is dissimilar to the other four genera. *Pleurogrammus* and *Hexagrammos* have similar appearing larvae. Among the species of *Hexagrammos*, a progression of increasing larval pigmentation can be seen from *H. stelleri* to *H. decagrammus*, *H. lagocephalus*, and *H. octogrammus*.

NOAA Technical Report NMFS 3. Watson, John W., Jr., Ian K. Workman, Charles W. Taylor, and Anthony F. Serra. **"Configurations and relative efficiencies of shrimp trawls employed in southeastern United States waters."** March 1984, iii + 12 p., 12 figs., 11 tables, 8 app. tables.

ABSTRACT

Common shrimp trawl designs employed in the southeastern United States shrimp fishery are the flat, balloon, semiballoon, jib, and super X-3. Recent innovations in trawl design and rigging, including the twin trawl rigging and tongue trawl design, have improved the efficiency of shrimp trawling gear. A description of the construction techniques for the different designs indicates differences which affect gear performance. Measurements of horizontal spread and vertical opening for 76 trawl configurations indicate the relative efficiencies of the different designs. Maximum horizontal spreading efficiency was achieved by the "twin" and "tongue" trawl designs followed by the super X-3, jib, balloon, and semiballoon designs. Designs having the greatest vertical openings were the tongue and flat trawl designs followed by the semiballoon. Maximum total gape dimension was demonstrated by the "Mongoose" tongue trawl. Comparison of trawl spreading efficiency and door area with headrope length ratio indicates that a range of 70-80 inches^2 (per door) of door area is required for each foot of trawl headrope length for maximum efficiency with conventional trawl designs and 60-75 inches^2 per foot of headrope of tongue trawl designs.

Puget Sound Plankton and Coast Environment

"The Fertile Fjord: Plankton in Puget Sound" by Richard M. Strickland, published by the University of Washington Sea Grant Program, 3716 Brooklyn Avenue, N.W., Seattle, WA 98105, is the fourth in the excellent series of 14 "Puget Sound Books" that are sponsored in part by two NOAA agencies. The author has done oceanographic and planktonic research and is now a teacher and writer. Foreword is by Joel Hedgpeth.

The first four chapters provide a primer on plankton, their types, habitats, importance, and studies on them. Basic, but well written, they set the stage for nontechnical readers. Chapter 5 then delves into the phytoplankton in Puget Sound, primary production in the main basin and at sills, river mouths, shallow inlets, etc. Chapter 6 explores the Sound's zooplankton and food chain structure, synchronization, and efficiency.

Chapter 7 examines the types of pollution affecting Puget Sound—oil, pulp mill wastes, heavy metals, synthetic organic chemicals, sewage, etc.—and their effects on plankton, as well as the effects that plankton can have on pollution. Chapter 8 relates the history and effects of red tides in the Sound, and the final chapter discusses the possibilities in marine ranching and farming within the Sound.

The volume is not a field guide to plankton, but a well written and up-to-date look at the vital role of plankton in the Puget Sound ecosystem. The author provides a handy glossary and pronunciation guide; bibliographic notes are arranged by chapter. Indexed, the 145-page paperbound volume costs $8.95 and is available from the publisher.

The fifth volume in this series of books is **"The Coast of Puget Sound, Its Processes and Development,"** by John Downing, a senior scientist with a Seattle-area oceanographic consulting firm, and whose graduate studies dealt with sand transport along beaches.

Puget Sound's 2,000 miles of coastline vary widely from rugged, exposed shores in the north to more sheltered areas in the south, and from tall rocky cliffs to tidal mud flats and smooth sandy or rocky beaches. Thus, it shares many features with other temperate shores around the world. This volume provides an intensive look at the Sound's important coastal zone from its geological origins to the processes which have and are at work today on them, including glaciation, sedimentation, and wave effects, etc., all of which help determine the character and complexity of the Sound's resources. The author also describes engineering for coastal structures and how coastal development will continue to affect the Sound's aquatic resources.

In initial chapters the author traces the geological origins of the coastal zone and describes river deltas in the Sound, waves and nearshore currents, and sedimentation. Chapter 5 presents a more detailed look at beaches, including gravel-cobble beaches, coastal sediments, and other major and minor coastal features. Wave climate in the Sound—wind patterns, storm effects, and wave generation areas—is discussed in Chapter 6, while Chapter 7 examines such coastal hazards as landslides, soil liquefaction and subsidence, and oil on beaches. Chapter 8 then relates human effects on the coastal zone and progress and problems, including data on engineering for shoreline development and control of coastal erosion. Thus, the volume is an effective addition to the series. Indexed, the 126-page paperbound volume costs $8.95 and has a useful glossary and provides a bibliography of cited literature. Overall, the series has maintained a high standard of writing, editing, production, and technical accuracy. Earlier volumes in the series are "The Water Link: A History of Puget Sound as a Resource" by Daniel Jack Chasan; "Governing Puget Sound" by Robert L. Bish; and "Marine Birds and Mammals of Puget Sound" by Tony Angell and Kenneth C. Balcomb III.

To Manage the North Pacific Marine Region

"The Management of Marine Regions: The North Pacific," by Edward Miles, Stephen Gibbs, David Fluharty, Christine Dawson, and David Teeter, has been published by the University of California Press, 2223 Fulton Street, Berkeley, CA 94720. It includes contributions from William Burke, Wlodzimierz Kaczynski, and Warren Wooster.

The volume analyzes issues relating to marine fisheries, transportation, scientific research, and multiple use conditions and conflicts (especially offshore oil development and marine pollution). Such issues as military and recreational uses and unconventional energy development are mentioned only briefly. But the primary focus is on fisheries and research in the North Pacific, defined as the north temperate zone of the Pacific Ocean, ranging from about lat. 30°N to the northern extremity of the Bering Strait and from East Asia to North America.

Fisheries, say the authors, is the one major regional problem in the North Pacific, and the book reflects that emphasis. The volume is divided into five parts, and Part I, "Living Resources in the North Pacific," is the longest at 267 pages. Part II, marine transportation, runs 105 pages; Part III, marine scientific research, 37 pages; and Part IV, multiple use conditions and conflicts, runs 56 pages.

In Part I, major living resources of the region are first identified and the fisheries are briefly outlined. Then the traditional regime for international fisheries management in the North Pacific is described. Third, the region's major fisheries conflicts of the past two decades are summarized and the trends leading to unilateral extensions of coastal state jurisdiction are analyzed. Fourth, a detailed comparative analysis of the coastal state acts is presented, and fifth, the major international fisheries policy problems generated by extended jurisdiction are analyzed.

In examining marine scientific research, the authors introduce the idea of a new regional science organization, the Pacific International Council for the Exploration of the Sea, or PICES, modeled after the ICES of the North Atlantic region. PICES, which is envisioned as an organization for facilitating or coordinating, broadly, marine science research in the region, could also aid in broadening data bases for fisheries and marine science, provide a mechanism for facilitating the systematic collection of data, help coordinate fisheries research, and provide for greater international cooperation in getting and exchanging environmental and ocean use data, the authors say.

Thus, the authors believe PICES could provide a useful service to national and international fishery management in the region while helping to coordinate climate studies or data, pollution and transportation issues, and the management of multiple uses. In sum, the volume analyzes marine policy problems in the North Pacific, describes trends in patterns of ocean use, describes and explains marine use conflicts, and assesses ways that technology and jurisdictional changes have impinged upon marine policy and management.

The volume has extensive references and footnotes, is indexed, and provides nine appendixes on fisheries agreements, allocations, and conventions, and on laws on coastal zone resources. The book is the result of the North Pacific Project established in 1976 at the University of Washington's Institute for Marine Studies in Seattle and funded by the Rockefeller Foundation. It and a separate Atlas complete the Project's first phase. Thorough and well-written, the hardbound volume will be of interest to those concerned with the future and regulation of North Pacific resources. It is available from the publisher for $50. Future volumes will attempt to formulate and evaluate alternative policies, organizational networks, and criteria for achieving optimal marine resource management for the region.

One Hundred Years of Fishery Food Science

"Development of Food Science and Technology as Applied to Fish by the Government of the United States," by Maurice E. Stansby, has been published by the NMFS Northwest and Alaska Fisheries Center as NWAFC Processed Report 83-19. Stansby is well known as one of the pioneers in fisheries technology and especially in regard to his research on fish oils.

This new report traces the beginning of fishery food science and technology by U.S. Government agencies from its beginnings during the 1870's to 1970, and an appendix (B) relates Federal Government research in Seattle, Wash., between 1966 and 1983 on food science and technology as applied to fish. Appendix A lists Federal employees who were prominent in the fisheries food science studies from 1870 to 1930 and the division and branch chiefs and laboratory directors of the old Bureau of Commercial Fisheries and predecessor agencies located in Washington, D.C., from 1888 to 1970.

Part I of the report relates general chronological developments in the field while Part II details specific developments in fisheries technology by both geographical area and types of operations (composition and nutritive values of fish products, handling of fish, canning and curing of fish, fish meal and oil, oxidative deterioration of fish oils, and exploratory fishing and gear research). A number of figures show early laboratories and field stations, and experimental equipment. Further information is available from the author, Maurice E. Stansby, Northwest and Alaska Fisheries Center, 2725 Montlake Boulevard East, Seattle, WA 98112.

The Cultivation of Salmonids

"The Salmon Handbook" by Stephen Drummond Sedgwick, subtitled "The life and cultivation of fishes of the salmon family," has been published by Andre Deutsch, 105 Great Russell Street, London, England WC1B 3LJ. Drummond, who has also authored the "Trout Farming Handbook" and is the

former Chief Inspector of Salmon and Freshwater Fisheries for Scotland, is a fish culture consultant.

The author sees the future of salmon ranching as both attractive and exciting, but "clouded by failure of nations to manage or regulate marine harvests," and he considers that salmon offer the best economic return for aquatic farming in the cooler waters of the world.

The first few chapters provide a brief and basic overview of the biology, habitat and ranges, behavior, identification, reproduction, biological needs, senses, etc., for various salmon, trout, and charrs. Chapter 5 takes a look at the rainbow trout, several charrs, and the coho, Atlantic, and pink salmon from the fish farmer's point of view. Chapter 7, "Oceans, Seas, and Lakes," discusses those salmonid habitats and then delves into the basic hydrographic features that pertain to location of marine salmon farms.

The planning of salmon farm facilities, both freshwater and saltwater, is reviewed in Chapter 8, while Chapter 9 deals with the feeding and nutrition of salmonids. Basic fish husbandry —stock selection, its improvement, and hatchery practices—are treated in Chapter 10. Salmonid diseases and their control and hatchery hygiene are discussed in Chapter 11 while Chapter 12 deals specifically with the elements of salmon ranching. Finally, economics—markets, costs, and profits—of salmon ranching are discussed in Chapter 13. A rather lengthy bibliography is categorized by subject. In sum, the author provides a well-rounded overview of the various salmonids, their biology, habits, and culture. Indexed, the 247-page hardbound volume is available from the publisher for £12.95.

A Basic Guide to Ropes

Publication of **"Fibre Ropes for Fishing Gear"** by Gerhard Klust has been announced by Fishing News Books Ltd., 1 Long Garden Walk, Farnham, Surrey, England. The volume is an FAO Fishing Manual, as is the author's previous "Netting Materials for Fishing Gear." There is some overlap between the two, but generally they are complementary.

The author provides comprehensive coverage of both vegetable (natural) and synthetic fibers; steel wires are discussed only as a component of combination ropes.

The first two chapters are relatively short and introduce technical terms and definitions and the natural and synthetic fibers and rope yarns employed by fishermen. The third chapter details the manufacture and construction of laid ropes, braided ropes, and parallel filament ropes and the finishing operations before delivery (marking, preservation of natural fiber ropes, and special treatment of synthetic fiber ropes).

Properties of the ropes are discussed in Chapter 4, including sizes, breaking strength and length, elongation, elasticity, and toughness, as are the influences of twist, and use on ropes. Also covered is the effect of wetting, light, temperature, and chemicals on the different ropes' properties and their resistance to abrasion.

Chapter 5 covers the materials, construction, and properties of fiber-steel combination ropes. Chapter 6 provides basic rules and guidance on the handling and care of fiber ropes—coiling (and kinking), whipping, knotting, and splicing—types of damage, and proper methods of storage. Finally, the selection of fiber ropes, in view of cost, length of service, properties, environmental conditions, and types of fishing is discussed in Chapter 7. Examples are also given for rope selection for various gear types.

Well illustrated, the volume provides many tables of fiber properties for comparison purposes and should be a good reference for fishermen and net makers. The 200-page paperbound book is not indexed, but provides many references, and is available from the publisher for £9.50.

Other Publications

Copies of the publication **"Basic Information on Fisheries Joint Ventures:** The Transfer of U.S. Caught Fish to Foreign Flag Processing Vessels" are now available. This pamphlet answers the questions most frequently asked about joint ventures when raw U.S.-caught fish are transferred to foreign flag processing vessels under the MFCMA, 16 U.S.C. 1801 et seq. To obtain a copy send a self-addressed, 9×12″ envelope, stamped with $0.37 postage, to National Marine Fisheries Service, P.O. Box 3266, Terminal Island, CA 90731.

The Mid-Atlantic Fisheries Development Foundation has recently published a book entitled **"A Basic Guide to Exporting Seafood."** The 112-page looseleaf notebook sets forth a step-by-step approach to exporting seafood products. The guide costs $35 and can be ordered from the Mid-Atlantic Fisheries Development Foundation, 2200 Somerville Road, Suite 600, Annapolis, MD 21401.

The U.S. Embassy in Caracas has prepared an 11-page report on **"The Venezuelan Fishing Industry."** The report has sections on fisheries catch, tuna fishing, shellfish, fishing fleet, the significance of the fishing industry in the national economy, government involvement, and international fishery relations. It also includes four statistical tables. A copy can be purchased for $7.00 by ordering Report PB-84-155043 from NTIS, the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

Brazilian fishermen caught 1.1 million t of fish and shellfish in 1982, over a 30 percent increase from the 0.8 million t taken in 1981. Exports in 1982 reached a recorded $162 million, a 3 percent increase over the $157 million exported in 1981. Catch data for 1983 was not yet available, but exports will be substantially below the Government's goal of $200 million, largely because of declining lobster shipments.

The U.S. Embassy in Brasilia has prepared a 40-page report on **"The Brazilian Fishing Industry."** The report includes sections on foreign trade, cod, shrimp, lobster, shrimp culture, catfish, the IADB fisheries loan, U.S.-Brazil relations, and vessel leasing as well as 20 statistical tables. A copy of the report can be purchased for $8.50 by ordering report number PB-84-156843 also from NTIS.