

**AN ANNOTATED BIBLIOGRAPHY  
OF SELECTED LITERATURE ON  
U.S. MARINE FISHERY MANAGEMENT**

**A PRODUCT OF THE  
MANAGING U.S. MARINE FISHERIES PROGRAM**

**THE H. JOHN HEINZ III CENTER  
FOR SCIENCE, ECONOMICS AND THE ENVIRONMENT  
WASHINGTON, D.C.**

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## **FISHERY STATUS AND MANAGEMENT HISTORY**

Atlantic States Marine Fisheries Commission, Gulf States Marine Fisheries Commission and Pacific Marine Fisheries Commission. 1977. A Report to the Congress: Eastland Fisheries Survey, May 1977. Portland, OR: PMFC.

*This report, commissioned by Congress, is the result of an 18-month study by the three commissions to assess the problems and needs of U.S. fisheries. It provides policy recommendations developed by national consensus at the National Conference held November 29 - December 2, 1976 related to fishery conservation and management, utilization and development, recreation, and the special needs of island territories. It also provides regional recommendations not addressed by the conference, supported by excerpts from regional reports. The report concludes with a summary of introductory remarks made at the conference.*

Bromley, D.W. and R.C. Bishop. 1977. From Economic Theory to Fisheries Policy: Conceptual Problems and Management Prescriptions. Pp. 281-300 in Economic Impacts of Extended Fisheries Jurisdiction, ed. by L.G. Anderson. Ann Arbor, MI: Ann Arbor Science Publishers, Inc.

*This paper reviews the theoretical roots of fisheries economics, in anticipation of needed policy prescriptions related to the proposed exclusive economic zone. The authors summarize management prescriptions from several major works in applied fisheries economics and analyze the prescriptions as welfare propositions. They suggest that theoretical problems have distorted economic research efforts and, in turn, the advice of economists to policymakers. They conclude with a discussion of implications for research and policy in fisheries economics, focusing on the concept of optimum sustainable yield.*

Conrad, J.M. 1987. The Magnuson Fisheries Conservation and Management Act: An Economic Assessment of the First 10 Years. *Marine Fisheries Review* 49(3): 3-12.

*This paper reviews the background and enactment of the FCMA and management policies related to the Act. It discusses the theory of open access and assesses the Act's impacts on the economic performance of the fishing industry from 1977-85. The assessment indicates that, although landings and net revenues increased significantly for the U.S. fishing industry from 1977-83, excess capacity is leading the industry toward an open access equilibrium and the ultimate dissipation of all rents. The paper concludes with recommendations to improve the situation.*

Cunningham, S. 1981. The Evolution of the Objectives of Fisheries Management During the 1970's. *Ocean Management* 6: 251-78.

*This paper describes the major biological, economic and political objectives of fisheries. It begins with a description of the bioeconomic model and a discussion of why marine fishery management is essential. Next, it describes and critiques each of various fishery management objectives considered in the 1970s, noting the advantages and problems of each. These include maximum sustainable yield, optimum sustainable yield, and static and dynamic maximum economic yield. The author briefly discusses adaptive control of fisheries and concludes with a look at the political objectives of fishery management, including income distribution, employment, balance of payments and maximization of food production.*

Dewar, M.E. 1983. *Industry Trouble: The Federal Government and the New England Fisheries*. Philadelphia, PA: Temple University Press.

*This book reviews and analyzes the role of the federal government in New England fisheries post World War II. The author examines both the rationale behind federal involvement and the effects of this involvement. She begins with a description of the structure and problems of the offshore groundfish industry. She then describes the industry campaign for government aid that led to the many federal programs of the fifties and sixties and discusses the shortcomings of the subsequent intervention that resulted from misconceptions about the industry and incorrect problem identification. Finally, she discusses the failure of government intervention in the groundfish fishery more broadly as a case study of government efforts to rescue distressed industries through pricing policy, tariffs, subsidies and regulation.*

Hargis, Jr., W.J., R.J. Baker, F. Bemiss, J.C. Cato, J.P. Harville, A.W. Haynie, H. Lyman, J.A. Mehos, J.G. Peterson, C.L. Smith and W.E. Towell. 1986. *NOAA Fishery Management Study*. Washington, DC: National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

*This report was solicited by NOAA to define the goals of marine fishery management, to consider alternative institutional arrangements and management strategies to meet these goals, to identify and prioritize activities to implement management strategies, and to specify areas of public and private responsibility and accountability. The authors recommend major conceptual and operational changes for marine fisheries<sup>3/4</sup>including a national level determination of conservation decisions and a regional level determination of allocation decisions, subject to secretarial review. Other changes relate to the number of councils within the regional council system and the process of nominations for council membership, interjurisdictional management, the need for more and better data, funding priorities, user fees and licenses, limited entry, full domestic utilization and habitat.*

Larkin, P.A. 1984. The Problem with George or The Role Of Development in Fisheries Management. *Marine Recreational Fisheries* 9: 111-115.

*This insightful article tells the story of a new fishery manager's coming to terms with the responsibility of simultaneously protecting, regulating and developing recreational fisheries. The story focuses on the consequences of unchecked development and asks the familiar question, "Is there such a thing as over-development of a fishery resource?"*

Marcelli, R.J. and R.D. Matthews (eds.). 1975. To Stem the Tide: Effective State Marine Fisheries Management. Lexington, KY: The Council of State Governments.

*This report provides an overview of the Marine Fisheries Management Act, a product of the National Task Force on Effective State Marine Fisheries Management Programs established by the Council of State Governments in 1974 to develop state legislation for the effective management of marine fisheries. Provisions related to the organization and operation of marine fisheries agencies, intergovernmental relations and fishery management, statistical information, aquaculture, and controlled entry are given special attention. Legislative and policy recommendations of the Task Force are listed. Also included are the suggested legislation and excerpts from the National Conference on Effective Management of Marine Fisheries, held in Hyannis, MA on June 24-25, 1975.*

McCay, B. J. 1987. The Culture of the Commoners: Historical Observations on Old and New World Fisheries. Pp. 195-216 in *The Question of the Commons: The Culture and Ecology of Communal Resources*, ed. by B.J. McCay and J.A. Acheson. Tucson, AZ: The University of Arizona Press.

*This essay explores the roots of historical U.S. common property law and culture to examine two key aspects of common property in America identified by the author: 1) claims for social equity, and 2) open access as the structure for laissez-faire competition. Both of these aspects are examined in the author's descriptions of historical conflicts over fishery regulations, the culture of poaching, the rise of oyster planting and, finally, the self-regulation experiment of a New Jersey fishermen's cooperative.*

National Marine Fisheries Service. 1976. A Marine Fisheries Program for the Nation. Washington, DC: National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

*This report discusses the status and future outlook of U.S. marine fisheries in 1976 and outlines the goals of the Commerce Department at that time: "to conserve and manage resources; conserve, restore and enhance fish habitats; develop and maintain a healthy commercial fishing industry; strengthen the contribution of marine resources to recreation; encourage the development of public and private aquaculture; and assure the safety, quality and identity of seafoods." The report provides recommendations in response to these goals, many of which were incorporated into the FCMA. Each recommendation references*

*corresponding sections of the Act. The National Plan for Marine Fisheries is included as an appendix.*

Pautzke, C.G. 1992. The Magnuson Act after Seventeen Years: Is it Working? Anchorage, AK: North Pacific Fishery Management Council.

*This paper, developed in anticipation of the 1993 reauthorization of the MFCMA, favorably discusses the effectiveness of the MFCMA and the regional council system in managing U.S. marine fisheries. The condition of national fisheries pre-1976, as defined by Comptroller General reports, is compared to that post-1976 and the MFCMA. The author highlights the implementation of the Act with remarks recorded at the 1976 National Conference for Regional Councils and discusses issues of authority between the councils and NMFS. Achievements of the NPFMC are outlined from 1976-92 and the paper concludes with a discussion of the strengths and weaknesses of the regional council system.*

Pearse, P.H. 1992. Fishing Rights and Fishing Policy: The Development of Property Rights as Instruments of Fisheries Management. Athens: World Fisheries Congress.

*This paper traces the evolution of property rights in fisheries, beginning with the historical tradition of free and open access and ending with the recent move toward limited entry and quantitative rights. It discusses the overexpansion and overfishing effects caused by open access to fisheries and describes how fisheries have slowly been evolving toward conservation and industrial regulation. The author considers the potential of property rights to improve not only fisheries, but the economic performance of fishing industries and user cooperation as well. He concludes with a discussion of future policy development and presents the argument for community/cooperative management over further defined rights.*

Rettig, R.B. 1987. The Magnuson Fishery Conservation and Management Act Revisited. *Marine Policy Reports* 10(1): 6-11.

*This report reviews the post-war period leading to the implementation of the FCMA and discusses U.S. fisheries under the Act in terms of controlling foreign fishing effort and establishing a new domestic fishery management regime. The complexity of state and federal roles and responsibilities is discussed and the "new" interest in limited entry briefly addressed. Controversial studies/reports related to amending the Act are highlighted and the report concludes with a brief discussion of the concept of adaptive management.*

Scott, A. 1988. Development of Property in the Fishery. *Marine Resource Economics* 5: 289-311.

*This paper considers some older institutions and ideas that may have led to the emergence of individual quota rights to fisheries. The author defines six characteristics of interest in real property: duration, flexibility, exclusivity, quality of title, transferability and divisibility and follows a brief chronology of changes in communal and common law with an examination of the incorporation of private rights into the regulatory development of*

*modern fisheries from 1950-80. He compares the rights characteristics of regulatory licenses and catch quotas and discusses obstacles to the acceptance of individual transferable quotas by industry and government. He suggests that future regulation will evolve in the direction of catch quotas, which may become like a share in the fish stock or biomass.*

U.S. General Accounting Office. 1983. Need to Improve Fishery Management Plan Process. Report to the Secretary of Commerce, January 1983. Washington, DC: U.S. General Accounting Office.

*This report assesses the progress of NMFS and the regional councils in developing, processing, and implementing fishery management plans, amendments and associated regulations and discusses the Commerce Department's plans and efforts to increase the efficiency of the fishery management plan process. Such efforts include delegation of authority and responsibility to NMFS regional directors, NMFS' framework management plan concept and pending legislation. The report recognizes areas of council opposition and concludes with recommendations for further improvement.*

Wise, J.P. 1991. Federal Conservation & Management of Marine Fisheries in the United States. Washington, DC: Center for Marine Conservation.

*This publication discusses the MFCMA's effects on U.S. marine fishery conservation and management. Important provisions of the Act are described in detail, as are the thirty-two fishery management plans active at the time of publication. Major international fisheries treaties and agreements are reviewed. The author highlights conclusions and recommendations from major U.S. marine fishery studies since 1977 and depicts the fragmentation of federal fishery management programs and budgets. He concludes with seven recommendations related to furthering the application of conservation principles in the Act. Appendices include information on fisheries population biology and management, a chronology of policy affecting U.S. marine fisheries, miscellaneous statistical tables, a list of applicable non-governmental organizations, the Dingell-Johnson/Wallop-Breaux Federal Funding for Marine and Anadromous Fisheries Projects through FY'89 and diagrams illustrating fishery management plan formulation and implementation.*

## **ASSESSING FISHERY PRODUCTIVITY**

Anderson, L.G. 1980. Necessary Components of Economic Surplus in Fisheries Economics. *Canadian Journal of Fisheries and Aquatic Sciences* 37(5): 858-70.

*This paper introduces and discusses four main types of economic surpluses resulting from the exploitation of a fishery: 1) industry profit, 2) normal factor rents, 3) consumer surplus, and 4) worker satisfaction bonus. The fourth component is discussed in detail, as are the implications of this component for fishery management and policy. The author develops a detailed model to allow for the joint consideration of these components and to show how they vary at different levels of effort.*

Arnason, R. 1991. Efficient Management of Ocean Fisheries. *European Economic Review* 35: 408-17.

*This paper describes how property rights can restore economic efficiency to ocean fisheries that have failed as a result of common property management. The author suggests that, although Pigovian taxes offer a theoretically sound solution to these efficiency problems, they have impractical information requirements. He demonstrates the economic and informational efficiency of a system based on individual transferable share quotas and discusses the ability of this method to generalize to an ecological context.*

Barber, W.E. 1988. Maximum Sustainable Yield Lives On. *North American Journal of Fisheries Management* 8(2): 153-7.

*This study examines the use of maximum sustainable yield in 142 different scientific papers from 1977-85. It reports that the concept has been used primarily in the estimation of long-term yield, the evaluation of stock condition and policy analysis. The author suggests two main reasons for the continued use of MSY in fisheries, despite its weaknesses. The first relates to the simplicity of the concept and the second, to scientific and technical restrictions. He stresses the importance of developing a protocol for using MSY in the decisionmaking process.*

Bardach, J.E. 1991. Sustainable Development of Fisheries. Pp. 57-72 in *Ocean Yearbook* 9. Chicago, IL: University of Chicago Press.

*This article identifies the interaction of climate and human influences as a prime consideration for the sustainability of fisheries resources. The author highlights the importance of achieving sustainability and suggests that the complexity of ecosystem interactions adds to the difficulty of attaining this goal. He discusses climate-induced fluctuations in stocks and subsequent species interactions, and describes major human influences as the introduction of new technologies into the fishery, pollution and dam-building. He recommends that more social and economic data be incorporated into environmental impact statements.*

Botsford, L.W., J.C. Castilla and C.H. Peterson. 1997. The Management of Fisheries and Marine Ecosystems. *Science* 277: 509-15.

*This article contends that continuous sociopolitical pressure to increase total allowable catch, along with scientific uncertainty, has kept fishery managers from sustaining the resource. The authors indicate that scientific uncertainty could be reduced by considering multiple species interactions and broad-scale physical forcing, but suggest that reducing the influence of political pressure for short-term gain holds more promise for achieving sustainability. Other suggestions include use of the precautionary approach, spatially explicit management, closures and moratoria.*

Bromley, D.W. (ed.). 1995. *The Handbook of Environmental Economics*. Cambridge; Oxford: Blackwell Publishers Inc.

*This handbook, containing contributions from more than thirty distinguished scientists around the world, provides comprehensive information on environmental and natural resource economics issues related to choices and decisions, future considerations, environmental quality, environmental stocks and flows, and valuation.*

Bromley, D.W. 1989. Institutional Change and Economic Efficiency. *Journal of Economic Issues* XXIII(3): 735-59.

*In this article, the author argues against the traditional efficiency/equity view of institutional change and offers an alternative model that augments the conventional explanation with two other types of institutional change. The first is for the purpose of reallocating economic opportunity and, the second, for redistributing economic advantage among members of society. He argues that only the latter will promote rent-seeking behavior.*

Clark, C.W. 1973. Profit Maximization and the Extinction of Animal Species. *Journal of Political Economy* 81(1): 950-61.

*This study uses a simple bioeconomic model to trace the evolution of the exploitation of a biological population under "common property" conditions. The model incorporates the population's response to harvesting pressure, the increasing harvesting costs associated with decreasing population levels, and discount rates. Results indicate that, in some cases, extinction of the species may be the most attractive policy. The author argues that this phenomenon may offer an explanation for the Antarctic blue whale fishery.*

Costanza, R., L. Wainger, C. Folke and K.G. Maler. 1993. Modeling Complex Ecological Economic Systems: Toward an Evolutionary, Dynamic Understanding of People and Nature. *BioScience* 43(8): 545-55.

*This paper discusses key issues related to modeling complex ecological economic systems, reviews several current and proposed approaches to modeling linked systems, and identifies key research questions and issues for further study. Existing approaches are described according to scale, resolution, generality, realism and precision. The authors exemplify how these model characteristics can be matched to achieve specific goals and argue that a better appreciation of the range of possible model characteristics and goals can help to more optimally match such characteristics and goals.*

Dickie, L.M. 1979. Perspectives on Fisheries Biology and Implications for Management. *Journal of the Fisheries Research Board of Canada* 36: 838-44.

*This essay describes how biological methodology can constrain the achievement of economic and social objectives. The biological concept of the "unit stock" is discussed, as well as management for stability and relations between technological and biological efficiency. The*

*author contrasts deterministic fisheries with the flexible, probabilistic view of fishermen and researchers.*

Edwards, S.F. 1990. An Economics Guide to Allocation of Fish Stocks between Commercial and Recreational Fisheries. NOAA Technical Report NMFS 94, November 1990. Woods Hole, MA: NMFS Northeast Fisheries Center.

*This report offers the non-economist a guide to the economic concepts, principles, and methods that are fundamental to understanding the economic implications of fishery allocations between competitive uses. The author defines economic value, presents the elements of both benefit-cost and input-output analyses, and compares the two methodologies in the context of fishery valuation. He then provides an example of an efficient catch allocation between the commercial and recreational sectors. Appendices include a glossary, as well as more detailed considerations of input-output analysis and valuation of fishery resources in a multi-market framework.*

Edwards, S.F. 1991. A Critique of Three “Economics” Arguments Commonly Used to Influence Fishery Allocations. *North American Journal of Fisheries Management* 11: 121-30.

*This article critiques three common economics arguments for fishery allocation: 1) the market, 2) revenues, and 3) cumulative-value arguments. The author contends that these arguments are deceptive. He explains that the market and revenues arguments reflect misunderstandings of the foundation of economic value and wrongly focus on financial matters rather than consumer and producer surpluses. Continuing, he indicates that the cumulative-value argument overlooks tradeoffs in the net economic values of commercial and sport fisheries. His argument is illustrated with a conceptually correct benefit-cost analysis of allocation between commercial and sport fisheries.*

Ecosystem Principles Advisory Panel. 1999. Ecosystem-Based Fishery Management. A Report to Congress as Mandated by the Sustainable Fisheries Act Amendments to the Magnuson-Stevens Fishery Conservation and Management Act, 1996. Silver Spring, MD: National Marine Fisheries Service.

*This report is the result of a 1996 congressional charge to the National Marine Fisheries Service to form a panel to evaluate the current application of ecosystem-based fisheries management and develop recommendations for further implementation of ecosystem-based approaches within the context of the existing fishery management system. The report identifies basic principles, goals, and policies for ecosystem-based fishery management and provides recommendations related to developing and implementing Fisheries Ecosystem Plans and the research required to support management.*

Holden, M. 1994. The Conservation Policy: Fisheries Conservation or Fisheries Management? Or Biology v. Economics. Pp. 169-85 in *The Common Fisheries Policy: Origin, Evaluation and Future*, by M. Holden. Oxford; Cambridge, MA; Ontario; Victoria: Fishing News Books.

*In an attempt to reconcile some common misunderstandings and misconceptions, this paper describes the basic biological principles—life history, growth and mortality, spawning stock biomass and year-class size—underlying fishery conservation and reviews the fisheries model on which management is based—yield per recruit models, total allowable catches and multispecies models. Both the definitions and objectives of fishery “conservation” and “management” are distinguished, as are the implications of biological and economic goals.*

Larkin, P.A. 1977. An Epitaph for the Concept of Maximum Sustained Yield. *Transactions of the American Fisheries Society* 106(1): 1-11.

*This article briefly describes the evolution of the concept of maximum sustainable yield—from development to global acceptance. It outlines the biological and economic implications of the concept and describes why MSY is impossible to achieve on a sustained basis, for single- or multi-species populations. The author introduces the concept of optimum sustained yield and describes the difficulties encountered in trying to define this term or use it as an operational basis for making decisions. He concludes with potential options for the future and a witty epitaph.*

Maier-Rigaud, G. 1991. Background to the Conflict between Economic and Ecological Ends. *Ecological Economics* 4: 83-91.

*This paper argues that environmental policy should not be formulated by trial and error. The author asserts that only a strategy of minimizing interferences with nature can lead to sustainability, noting that such a strategy would place the burden of adjustment on society. He discusses how efforts of sustainability are generally thought to be in sharp conflict with improving material wealth and argues that this misguided notion has acted as the “main brake-shoe” to achieving sustainability. He distinguishes and examines three aspects of this error: 1) the laissez-faire paradigm, 2) the income concept confusion, and 3) the macroeconomic impact error.*

May, R.M., J.R. Beddington, C.W. Clark, S.J. Holt and R.M. Laws. 1979. Management of Multispecies Fisheries. *Science* 205(4403): 267-77.

*This article addresses the need for an ecosystem approach to fishery management. The authors maintain that, while useful in relation to single, isolated populations, maximum sustainable yield cannot adequately be applied to multispecies fisheries with strong species interactions. They use simple models to explain how multispecies food webs respond to harvesting at different trophic levels, and apply biological and economic insights derived from these models to a discussion of fisheries in the Southern Ocean and the North Sea. Finally, they discuss economic considerations and provide tentative recommendations for the management of multispecies systems.*

Milon, J.W. 1987. The Economic Benefits of Artificial Reefs: An Analysis of the Dade County Florida Reef System. Report Number 90. Gainesville, FL: Florida Sea Grant College.

*This report summarizes the results of a mail survey of 3600 private boat owners<sup>3/4</sup>an effort undertaken in 1985 for the purpose of determining the recreational uses and economic benefits of artificial reefs in Dade County, Florida. The author briefly describes respondent profiles; identifies artificial reef usage rates and perceptions for sport fishermen and recreational divers; evaluates alternative methods for measuring the economic benefits of artificial reef development, including contingent valuation and travel cost methods; and estimates the economic value of the Dade County artificial reef system to private boat owners. Finally, he provides recommendations for future research.*

Mitchell, C.L. 1982. Bioeconomics of Multispecies Exploitation in Fisheries: Management Implications. *Canadian Special Publication of Fisheries and Aquatic Sciences* 59: 157-62.

*This paper discusses the primary conceptual differences between single- and multi-species economic analysis and explores their implications for fishery management. It begins with a brief discussion of species interactions and interdependencies. Management problems in Canadian east coast fisheries are used as a basis for discussion of the shortcomings of the single species approach when applied to multispecies fisheries. Both biological considerations and economic implications are discussed. Two particular types of interrelationships are considered: 1) the predator-prey, and 2) the competitively coexistent. Major requirements for developing a multispecies management regime are identified and the advantages of such a regime discussed.*

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese and F. Torres Jr. 1998. Fishing Down Marine Food Webs. *Science* 279: 860-3.

*This study reports major changes in the structure of marine food webs resulting from overfishing. The authors show a declining trend in the mean trophic level of fisheries landings from 1950-1994; one that is most apparent in the Northern Hemisphere. They argue that the continuation of this trend will lead to widespread fisheries collapses and recommend the establishment of large "no take" marine protected areas to rebuild stocks within functional food webs.*

Pauly, D. 1996. One Hundred Million Tonnes of Fish, and Fisheries Research. *Fisheries Research* 25(1): 23-38.

*This article reviews selected cases as far back as 1962 to examine different approaches to the estimation of potential yield for marine fisheries and to identify those features shared in common in yield predictions. The author notes that there is a trend for initial guesses related to the relations between optimal catches and production, conversion efficiencies between trophic levels, and the trophic level of the harvested fish to become legitimized over time. He provides a possible solution to the debate.*

Pauly, D. and V. Christensen. 1995. Primary Production Required to Sustain Global Fisheries. *Nature* 374: 255-7

*This study was undertaken to estimate the primary production necessary to sustain global fish catch and bycatch. The authors compute the primary production required to sustain each group of species identified in the reported annual world fisheries catches for 1988-91. Their results differ substantially from those of a previous study undertaken in the early '80s<sup>3/4</sup> about 8.0% of the world's aquatic primary production is found to be required to sustain the fisheries, compared to the estimated 2.2% derived from the earlier study. They conclude that there are broad limits on the carrying capacity of natural aquatic ecosystems and express concern for sustainability and biodiversity.*

Randall, A. 1987. Economic Theory: Total Economic Value as a Basis for Policy. *Transactions of the American Fisheries Society* 116: 325-35.

*This paper explains and interprets the mainstream economic concepts of value in the context of natural resource valuation and explores the potential contributions of economic value to the policy process. Total economic value is defined, and the empirical approach of estimating total economic value via contingent valuation methods discussed. The author describes benefit-cost analysis as a conceptually complete and coherent framework for public decisions, but indicates that underlying value propositions limit its role to an informative, rather than decisive, tool in a participatory policy decision process.*

Rosenberg, A.A., M.J. Fogarty, M.P. Sissenwine, J.R. Beddington and J.G. Shepherd. 1993. Achieving Sustainable Use of Renewable Resources. *Science* 262(5135): 828-9.

*This short essay was written in response to an earlier article in "Science" by Ludwig, Hilborn and Walters. The authors argue that we can indeed achieve sustained use of renewable resources and that there exists historical evidence of resource sustainability. They review the theoretical and empirical basis for sustainable yield, discuss obstacles to achieving sustainability, and suggest remedies for these obstacles. Finally, they conclude with an examination of evolving trends in scientific advice.*

Shea, K. and the NCEAS Working Group. 1998. Management of Populations in Conservation, Harvesting and Control. *TREE* 13(9): 371-4.

*This article describes fisheries science, pest control and conservation biology as one scientific discipline—population management—because all three attempt to manage population size and growth rate. The authors discuss the need for greater integration and a more frequent exchange across these disciplines in terms of examining insights, objectives and tools. They then describe three aspects of population management where a discussion across disciplines would be particularly useful: 1) decision theory as a tool for population management, 2) combining process-based models and time-series data, and 3) spatial considerations in population management.*

Sherman, K. and L.M. Alexander. 1986. Variability and Management of Large Marine Ecosystems. Boulder, CO: Westview Press, Inc.

*This book is a compilation of scientific articles related to the variability and management of large marine ecosystems. The first section describes the impact of human and environmental perturbations on the productivity of renewable resources in these ecosystems. The second section discusses strategies for measuring and forecasting the natural variability of large marine ecosystems against a background of human-induced pollution and overexploitation. And the final section reviews the institutional framework for managing large marine ecosystems.*

Silvert, W. 1982. Top-Down Modeling of Multispecies Fisheries. Pp. 24-7 in Multispecies Approaches to Fisheries Management Advice. *Canadian Special Publication of Fisheries and Aquatic Sciences* 59.

*The author contends in this article that multispecies management requires models that incorporate biological, physical, economic and sociological components of the fishery. He describes the top-down approach to modeling of multispecies fisheries, where the model is defined by system behavior rather than being used to describe behavior. He describes examples of how this approach has been used to identify system properties in several studies and concludes by summarizing the important features of this type of modeling.*

Smith, C.L. 1980. Management Provoked Conflict in Fisheries. *Environmental Management* 4(1): 7-11.

*This paper describes how the application of fishery management concepts involves social goals which lead to frustration and conflict in fisheries. The author points out the conservation preferences inherent in maximum sustainable yield and shows how acceptable amounts of variability are related to social goals. He discusses the expectations associated with capacity and describes how these result in conflict. He also stresses the need for a link between publicly-identified objectives and goals implied in management concepts.*

Toman, M.A. 1994. Economics and "Sustainability": Balancing Trade-Offs and Imperatives. *Land Economics* 70(4): 399-413.

*This article discusses the concept of sustainability from an economic, ecological and social perspective. The author provides terms that may be useful for the debate between disciplines and identifies two issues as central themes in any conception of sustainability: 1) intergenerational fairness, and 2) resource substitutability. Alternative views on these issues are examined to show how they lead to different conceptions of sustainability. Finally, these alternative conceptions are related to each other through a simple conceptual framework of resource management based on the idea of "safe minimum standard." This model allows the consideration of individual tradeoffs and social imperatives.*

## OWNING FISHERY RESOURCES

Benson, B.L. 1984. Rent Seeking from a Property Rights Perspective. *Southern Economic Journal* 51: 388-400.

*This paper explores rent seeking from a property rights perspective. The author summarizes the conclusions of prior researchers related to rent seeking and explains how these conclusions were deduced using the property rights paradigm. Finally, he discusses the implications of this type of approach to rent seeking and concludes with a discussion of rent-seeking terms.*

Bromley, D.W. (ed.). 1992. Making the Commons Work: Theory, Practice, and Policy. San Francisco, CA: Institute for Contemporary Studies Press.

*This study combines theory and international case studies to demonstrate the utility and durability of common-property resource ownership by self-governing associations of local users. The book is divided into three sections. The first section discusses common property as an institution, the second illustrates successful instances of small-scale common-property systems throughout the world, and the third concludes with research and policy implications.*

Buck, E.H. 1995. Individual Transferable Quotas in Fishery Management. CRS Report for Congress. 95-849 ENR. Washington, DC: 25 September 1995.

*This report provides an in-depth, objective discussion of individual transferable quota programs in fishery management. Presumed conservation benefits of such programs are defined and contrasted with potential problems related to capitalization and concentration, conservation, seafood market and price, safety, enforcement and administration, employment and community stability, equity and wealth creation, and cost-recovery. The author discusses the allocation of initial quota shares, quota transferability and the issue of rights versus privileges. He also provides a brief review of current national and international individual transferable quota programs.*

Burger, J. and M. Gochfeld. 1998. The Tragedy of the Commons 30 Years Later. *Environment* 40(10): 4-13; 26-27.

*This article re-examines Hardin's famous thesis about the commons in light of our increased understanding of common pool resources and the institutions governing their use. The authors identify fisheries as one of three major categories of environmental problems useful in understanding methods of dealing with common property resources. They discuss commons challenges and conflicts in fisheries and provide specific examples of successful and unsuccessful cooperative management regimes. Finally, they discuss the applicability of common-pool resource management to the design of management regimes for larger, global resources, such as air and water.*

Campbell, D. and J. Haynes. 1990. Resource Rent in Fisheries. Discussion Paper 90.10. Canberra: Australian Government Publishing Service.

*This paper was written in anticipation of a debate on rent levels and rent charges in response to a government statement indicating the intent to charge fishermen for access rights to public fish resources. The authors attempt to display the main issues surrounding resource rent. Specifically, they provide a general discussion of resource rent and the potential effects of a resource rent charge, describe specific forms of resource rent charges, and highlight some practical considerations for resource rent in fisheries.*

Christy, F.T. 1996. The Death Rattle of Open Access and the Advent of Property Rights Regimes in Fisheries. *Marine Resource Economics* 11: 287-304.

*This paper proposes that fishery research and administration associated with resolving problems of open access is wasteful and that attention should, instead, be turned toward a new paradigm of property rights regimes. The author begins with a discussion of present paradigms based on the prevailing condition of open access, and the costs to researchers and stakeholders of maintaining these paradigms. He then discusses property rights regimes as the paradigms of the future and identifies possible obstacles and imperfections. He concludes with suggestions for future research.*

Christy, F.T. 1978. The Costs of Uncontrolled Access in Fisheries. Pp. 201-10 in Limited Entry as a Fishery Management Tool, ed. by R.B. Rettig and J.J.C. Ginter. Seattle, WA: University of Washington Press.

*This paper discusses the costs of common property management and identifies three inevitable consequences of uncontrolled access to fisheries. The majority of the discussion focuses on just one of these consequences: an increase in cost of fishing to the fisherman, resulting from the imposition of regulations to prevent resource depletion under open access conditions. The potential of access controls to reduce government interference and provide fishermen with a greater degree of freedom is discussed.*

Dahl, C. 1988. Traditional Marine Tenure: A Basis for Artisanal Fisheries Management. *Marine Policy* 12(1): 40-8.

*This article is written in response to the increasing interest in incorporating features of traditional marine tenure systems into the development of artisanal fishery management regimes. Based on data from prior research on the tenure systems of four Micronesian atolls, the author identifies and analyses five social conditions believed to be essential to the maintenance of such systems. These include 1) resource scarcity, 2) definable resource boundaries, 3) group/territorial identification, 4) technology type, and 5) economic organization. The article concludes with a discussion of the possibility of using traditional marine tenure systems in managing artisanal fisheries and the role of government in this type of management regime.*

Durrenberger, E.P. and G. Palsson. 1987. Ownership at Sea: Fishing Territories and Access to Sea Resources. *American Ethnologist* 14(3): 508-22.

*This study challenges the “tragedy of the commons” assumption and argues that there are, in fact, rules of access in common property fisheries. The authors reason that limited access is a technical dimension of the organization of fishing production and that informal rules of access should not be assumed to equate to the western concept of ownership. They review various forms of access restrictions to marine resources and suggest that differences in rules of access are a function of the total socioeconomic system of which they form a part.*

Edwards, S., A. Bejda and A. Richards. 1992. Sole Ownership of Living Marine Resources. 8/30 NOAA Technical Memorandum. Washington, DC: U.S. Department of Commerce.

*The purpose of this report is to further discussion on the possibility of instituting common or individual private property in marine waters. The authors explore the meaning and application of sole ownership, explain the theory and deleterious effects of open access management, characterize both public and private forms of sole ownership, contrast sole ownership with other forms of controlled access (i.e., limited entry and individual transferable quotas), review the political economy of natural resource management, and begin a sole ownership strawman of the northwest Atlantic multispecies groundfish resources. They present four conclusions: 1) overfishing due to open access dissipates millions, if not billions, of dollars of resource value each year, 2) incentives are essential to “market failure” and “government failure,” and 3) private ownership is the only form of controlled access that provides the necessary incentives for conservation. They finish by identifying research priorities.*

Epstein, R.A. 1987. The Public Trust Doctrine. *Cato Journal* 7(2): 411-30.

*This paper provides an in-depth examination of the theory behind public and private property rights and how these relate to the public trust doctrine and the principle of eminent domain. The author suggests that the task for a unified theory of property is to develop an account of the original position which 1) allows some mix of both public and private rights, and 2) permits correction of allocative mistakes. He uses property rights related to river systems and highway construction to exemplify discussion of the first, which focuses on voluntary transactions and bargaining factors. He considers the role of government and compensation in exploring the latter. Using a two-step analyses, he illustrates the difficulties involved in the public trust case, “Illinois Central Railroad v. Illinois,” and he concludes with a discussion of constitutional issues related to the public trust doctrine.*

Feeny, D., F. Berkes, B.J. McCay and J.M. Acheson. 1990. The Tragedy of the Commons: Twenty-Two Years Later. *Human Ecology* 18(1): 1-19.

*This article critiques Hardin’s “Tragedy of the Commons” metaphor based on common-property resource management evidence collected after the presentation of Hardin’s argument in 1968. The authors begin with the identification and discussion of four*

*categories of property-rights regimes within which common-property resources are held: 1) open access, 2) private property, 3) communal property, and 4) state property. They then provide examples of management under each regime focusing first on exclusion, then on regulation of use and users. They conclude that private, communal and state property regimes are all potentially viable resource management options and that Hardin's argument overlooked the important role of institutional arrangements and cultural factors.*

Fujita, R.M., J. Philp and D.D. Hopkins. 1996. *The Conservation Benefits of Individual Transferable Quotas*. Oakland, CA: Environmental Defense Fund.

*This report reviews the conservation benefits derived from individual transferable quota systems, both nationally and internationally, including reduced catch, elimination of destructive fishing practices, improvements in compliance, and a reduction in both bycatch and ghost fishing. The authors describe the function of ITQ systems and their underlying incentives. They discuss common concerns regarding initial quota allocation and consolidation of fishing fleets and suggest that these concerns can be addressed in program design. They recommend the adoption of national ITQ guidelines to ensure that ITQ programs are equitable, socially acceptable, and capable of successfully resolving conservation problems.*

Gordon, H.S. 1954. *The Economic Theory of a Common-Property Resource: The Fishery*. *Journal of Political Economy* 62: 124-42.

*The paper applies economic theory to the fishery and demonstrates that overfishing is a function of the economic organization of the industry. The author asserts that the role of fishers has been historically neglected in fisheries research, which has instead focused on biological production factors and theories. He introduces the concept of a net economic yield and shows that fishermen's behavior can be generalized in accordance with the standard economic theory of production. He argues that the inefficiency of fisheries production and the plight of fishermen result from the common property nature of fishery resources.*

Grafton, R.Q., D. Squires and J.E. Kirkley. 1996. *Private Property Rights and Crises in World Fisheries: Turning the Tide?* *Contemporary Economic Policy* 14: 90-9.

*This paper explores the potential of privatization as a means to address the world fisheries crises. Several types of rights-based management are introduced, including territorial use rights, individual transferable quotas and cooperative/community fishery management. The authors assess the performance of ITQs with respect to monitoring and enforcement, allocation rights, economic benefits, adjustments in the fishery and resource rents. They discuss fluctuating fish stocks, straddling stocks and high seas fisheries, and the endemic poverty of many artisanal fisheries as issues unresolved by ITQs. They conclude that ITQs offer a significant improvement over many current fisheries practices but should not be considered applicable to all fisheries or as a panacea to all problems.*

Hannesson, R. 1991. From Common Fish to Rights Based Fishing: Fisheries Management and the Evolution of Exclusive Rights to Fish. *European Economic Review* 35: 397-407.

*This article reviews the role of the exclusive economic zone in establishing exclusive national rights to fish and describes four methods of ensuring the efficient utilization of state-controlled fisheries resources: 1) privatization of fish stocks, 2) taxes on landings or fishing activity, 3) fishing licenses, and 4) individual transferable quotas. The author contends that economic theory suggests a movement toward private property rights in fishing. He briefly discusses recent examples.*

Hardin, G. 1968. The Tragedy of the Commons. *Science* 162(5364): 1243-8.

*This article discusses the controversial problem of unchecked population growth in a finite world. The author predicts that the inevitable result of such growth is overexploitation and degradation. He introduces the term "tragedy of the commons" to describe competition in an unmanaged common, where each participant acts to maximize individual personal gain to the detriment of the other participants who share the negative effects of the single individual's actions. He states that "freedom in a commons brings ruin to all" and supports this statement with an example of a grazing regime, where cattle are continuously added to a pasture by herdsman despite spatial limitations. He also extends this theory to the oceans and our National Parks system. Finally, he discusses issues of conscience and mutual coercion, arguing for abandonment of the commons and a shift toward some sort of property rights.*

Hinman, K. and C. Paulsen. 1993. The Crowded Sea: An Issue Paper on Limiting Entry to Marine Fisheries. Washington, DC: National Coalition for Marine Conservation.

*This paper explores the role of limited entry in national fisheries policy. The authors begin with a discussion of open access and the negative effects of derby fishing. They describe a conservation incentive, minimized bycatch, and habitat protection as potential benefits of limited entry and the creation of property rights, decreased mobility, displaced effort, waste, bycatch and enforcement costs as potential problems. They conclude that limited entry should be used as a supplement to more traditional regulatory measures rather than considered a panacea. They describe certain basic principles that should be applied to limited entry programs and recommend the following: the development of a national policy, declaration of a moratorium, the establishment of a fee system, the ending of industry subsidies, and the reduction of conflict of interest in management decisions.*

Jones, G.R. 1983. Transaction Costs, Property Rights, and Organizational Culture: An Exchange Perspective. *Administrative Science Quarterly* (September): 454-67.

*This article argues that organizational culture is a function of the institutional arrangements developed to regulate transaction costs. The author shows that transaction patterns arise from the structure of property rights within the organization and can be predicted based on the properties of alternative methods of organizing exchanges. He asserts that this property-*

*rights structure constitutes the culture of the organization and argues that the norms and values that govern organizational action emerge from the way in which property rights are distributed, enforced and guaranteed. He examines the nature and characteristics of property rights and discusses production, bureaucratic, and professional culture as ideal-typical forms of organizational culture.*

Kaufmann, B. and G. Geen. 1997. Cost-Recovery as a Fisheries Management Tool. *Marine Resource Economics* 12: 57-66.

*This paper contends that the current failure of fishery management results from the use of public institutions to deliver fishery management services. The authors argue that the incentives for efficiency inherent in a properly designed cost-recovery policy will result in more effective institutional and operational arrangements. They discuss problems related to the implementation of such a policy, including opposition from fisheries managers, researchers and industry. They describe some of the effects of cost-recovery in Australia, provide a brief overview and comparison of existing cost-recovery regimes in Australia and Canada, and highlight important lessons from these experiences related to the design of the policy and the role of finance/treasury departments in ensuring proper implementation of the program.*

Keen, E.A. 1988. Ownership and Productivity of Marine Fishery Resources: An Essay on the Resolution of Conflict in the Use of the Ocean Pastures. Blacksburg, VA: The McDonald and Woodward Publishing Company.

*The purpose of this book is to provide the public with an explanatory study on the concept of full ownership in marine fisheries. The author maintains that a full ownership regime will provide the most effective framework for the maximization of benefits and indicates that, unlike common property management, this regime creates incentives for stewardship and increased productivity. He identifies and analyzes the benefits of full ownership within a discussion of the productivity curve, the "tragedy of the commons," overcapitalization and the concept of limited entry. He provides national examples. He also presents arguments against full ownership, as well as anticipated multi-sectoral reactions to this type of management. The book contains a glossary of fishery management terms.*

Mace, P.M. 1993. Will Private Owners Practice Prudent Resource Management. *Fisheries* 18(9): 29-31.

*This article cautions against common blanket assertions about the theoretical, biological, and economic benefits of property rights systems. The author argues that ownership alone may be an insufficient mechanism to guard against overexploitation and that government or other "publicly-accountable" control is necessary. She also cautions about the difficulty of making fundamental program (or property rights definition) changes. She recommends that government remain involved in establishing, monitoring and enforcing fishery catch limits and that program design is transitional and changes incremental. Her points are illustrated with empirical examples from New Zealand fisheries.*

Macinko, S. 1993. Public or Private?: United States Commercial Fisheries Management and the Public Trust Doctrine, Reciprocal Challenges. *Natural Resources Journal* 33: 919-55.

*This article uses the Alaskan halibut and sablefish individual fishing quota debate to explore property rights issues in the context of the public trust and to show how ideas about rights and the public trust doctrine have changed over time. It begins with an introduction to fishery privatization issues and the halibut/sablefish debate. The author then relates the two debates, suggesting that both are based on fundamental ideas about the interrelationships between natural resources, rights, equity, progress and nationhood. He expresses concern that the emphasis on distributional equity and the specificity of the early public trust doctrine has been abandoned in exchange for greater flexibility, and stresses the need to maintain both distributional equity and environmental preservation.*

McCann, M.W. 1984. Resurrection and Reform: Perspectives on Property in the American Constitutional Tradition. *Politics and Society* 13(2): 143-76.

*This paper provides a critical evaluation of judicially-created "new property" rights. The author begins with a description of property in the American constitutional tradition and a discussion of its subordination to civil-rights protection in the modern era. He describes the motivations and assumptions behind reform proposals and suggests reasons for skepticism about the adoption of new property rights. While supporting the underlying values of the rights, he questions whether they can be secured under our constitution. Finally, he proposes some alternative strategies for pursuit of these new rights.*

McCay, B. 1995. Common and Private Concerns. *Advances in Human Ecology* 4: 89-116.

*This paper describes the "tragedy of the commons" perspective as both inaccurate and wrongfully leading to arguments for strong, centralized government or privatization. The author distinguishes between common pool and common property and discusses the importance of social and community factors in understanding the interactive dynamics of fisheries. She exemplifies the fisherman's problem of interdependence and open access with a discussion of the east coast summer flounder fishery. She proposes a more progressive way in which to order the study of "the commons" and suggests a broader and more complex range of alternatives than those offered by the "tragedy of the commons" perspective. These alternatives, labeled "comedies of the commons," include communal management, co-management and user participation. Finally, she concludes with some "private concerns" about the rapid leap from limited access to private property rights.*

McCay, B. 1995. Social and Ecological Implications of ITQs: An Overview. *Ocean & Coastal Management* 28(1-3): 3-22.

*This paper begins with an introduction to individual transferable quotas and follows with examples of these systems around the globe. The author reviews important economic dimensions of ITQs, then continues with an examination of the major public issues*

*surrounding both the privatization of fishing rights and the governance of market-based management systems. These include efficiency, equity, resilience and stewardship.*

McKean, M.A. 1993. Empirical Analysis of Local and National Property Rights Institutions. Beijer Discussion Paper Series 42. Stockholm: The Royal Swedish Academy of Sciences.

*This article begins with a discussion of resources versus property rights, collective versus individual property rights, and shared versus individual private property, then proceeds in outlining some well-established findings about common property regimes. It speculates on conditions which lead to the preferability of classic individual private property, common property or co-management, or complete government ownership with only the occasional allocation of temporary use rights. Finally, it defines areas in need of continued empirical investigation, including legalization of common property, commerce and common property, and economic distribution and common property.*

Moloney, D.G. 1979. Quantitative Rights as an Instrument for Regulating Commercial Fisheries. *Journal of the Fisheries Research Board of Canada* 36: 859-66.

*This article examines the use of quantitative transferable rights in fishery management. It describes how a system of this nature might be designed and addresses areas where qualifications and modifications in the design<sup>3/4</sup>related to the terms of the rights, enforcement and the distribution of rents<sup>3/4</sup>may be necessary. Quantitative rights-based management is compared with fiscal controls such as the use of royalties or taxes on the catch. The author concludes that, although the use of quantitative rights may not be suited to all fisheries, this approach can have important economic, administrative and political advantages over alternative proposals for mitigating economic inefficiency and waste.*

National Research Council. 1999. Sharing the Fish: Toward A National Policy on Individual Fishing Quotas. Washington, DC: National Academy Press.

*This NRC report was produced in response to a 1996 congressional request to report on the social, economic, and biological effects of individual fishing quotas and other limited entry programs and to provide recommendations. It provides a comprehensive review of IFQ systems, including their history, present use, benefits and limitations. It examines the U.S. and foreign experience with these programs; looks at alternative conservation and management measures; addresses specific congressional questions about IFQs in relation to a set of "first principles," derived from the MSFCMA; and provides separate recommendations to Congress, the Secretary, the NMFS, the councils, the states and others. It concludes that IFQs are valuable management tools and<sup>3/4</sup>although they should not be considered a panacea<sup>3/4</sup>they should be made available to the councils to use at their discretion, on a fishery-by-fishery basis.*

National Research Council. 1999. The Community Development Quota Program in Alaska and Lessons for the Western Pacific. Washington, DC: National Academy Press.

*This NRC report was produced in response to a 1996 congressional request to review the Alaska community development quota program. The report provides a comprehensive review of the program and its application to the rural western Alaska region, describes strengths and weaknesses of the program, outlines operational concerns, and discusses lessons that can be applied to the development of similar programs in other areas. It indicates that the western Alaska program offers great social and economic potential for the region but that such programs may not be as effective in other areas, such as the western Pacific, where local context and goals differ. Recommendations are provided.*

Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge; New York, NY; Melbourne: Cambridge University Press.

*This book explores the institutional arrangements that lead to effective self-organization, self-governance and resource management under a common-pool management regime. The author reviews the history of commons theory, provides an in-depth analysis of several long standing and viable common-property regimes throughout the world, analyzes institutional change, and examines international cases of institutional failures. Finally, she concludes with a framework for analyzing self-organizing and self-governing common-property regimes.*

Rettig, R.B. 1989. Is Fishery Management at a Turning Point? Reflections on the Evolution of Rights Based Fishing. Pp. 47-64 in *Rights Based Fishing*, ed. by P.A. Neher, R. Arnason and N. Mollett. Dordrecht; Boston, MA: Kluwer Academic Publishers.

*This paper examines biological, sociocultural and economic characteristics of fisheries that may be influencing the adoption of rights-based approaches. The author begins with a look at historical trends in the development of global fisheries. He follows this with a comparison of the physical and biological characteristics of six different types of fisheries—sedentary species, tropical multispecies, pelagic, demersal and semi-pelagic species in temperate waters, tuna, and highly vulnerable species—and a discussion of why, or why not, these fisheries may be employing rights-based approaches to management. He concludes with an anthropological and economic view of rights-based management regimes.*

Schlager, E. and E. Ostrom. 1992. Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics* 68(3): 249-62.

*This article defines four classes of property rights holders—authorized user, claimant, proprietor and owner—based on the recognition of one or more rights of property, including access, withdrawal, management, exclusion and alienation. The authors illustrate each class with a modern-day example. They discuss de facto and de jure property rights and the incentives that result from different bundles of rights. They then apply these concepts to a discussion of the Maine lobster fishery to explain the outcomes lobstermen have achieved. They propose areas for further research.*

Scott, A. 1955. The Fishery: The Objectives of Sole Ownership. *Journal of Political Economy* 63: 116-24.

*This paper picks up an earlier discussion by Gordon that appeared in his 1954 article cited above. Building on Gordon's economic theory, the author compares competitive management of a fishery under a common property regime with management under sole ownership. He shows that, although sole ownership will better promote economic efficiency in the long-run, there is little difference in the economic efficiency of fisheries managed under common and private property management in the short run.*

Swaney, J.A. 1990. Common Property, Reciprocity, and Community. *Journal of Economic Issues* XXIV(2): 451-62.

*This article describes the "open-commons confusion" and suggests that it has led to an inappropriate trend toward private property rights that result in harmful social costs and cultural degradation. The author explains the errors of the property rights school and presents the benefits of common property institutions and interdependencies (i.e., positive interaction, problem sharing). He argues that common property, reciprocity and community development are complementary, useful constructs for institutional analysis.*

## **MANAGING FISHERIES**

Barber, W.E. 1987. The Fisheries Management Structure and Process under the MFCMA: A North Pacific Perspective. *Fisheries* 12(6): 10-17.

*This article describes the organization and process of fishery management, including the roles and responsibilities of the regional councils, the Secretary, and NMFS and state agency representatives. Based on experience with the NPFMC, the author reviews the development of fishery management plans; discusses interactions and information flow between councils, staff and research committees, and the public; and summarizes the FMP review process. The major problems resulting from this fishery management system relate to communication, goals, obtaining timely data, lobbying and regionalism.*

Bromley, D.W. 1989. *Economic Interests & Institutions: The Conceptual Foundations of Public Policy*. New York, NY; Oxford: Basil Blackwell Inc.

*This book discusses the role of economic institutions in public policy and examines the economic theory of institutional change. It is divided into three sections. The first relates to economic interests and institutions. This section reviews and critiques conventional views on institutions and institutional change and discusses the role of institutions in defining individual and group choice sets. The second section examines institutional transactions, interests and property rights and the third, objectivity, positivism and the public policy process. The author presents a model of institutional change that emphasizes institutional arrangements, policy objectives and instruments, patterns of interaction, policy outcomes, and ongoing assessment.*

Bush, P.D. 1989. The Concept of "Progressive" Institutional Change and its Implications for Economic Policy Formation. *Journal of Economic Issues* XXIII(2): 455-64.

*This article discusses the role of "non-ceremonial" cultural and environmental constraints in affecting the rate and direction of "progressive" institutional change. Non-ceremonial constraints are based on principles of recognized interdependence (the complexity of the interdependencies of behavioral patterns and the ability of persons to understand and adapt to new patterns); minimal dislocation and social value (the need to preserve continuity of life-processes); and co-evolutionary stability (the compatibility of sociosystem and ecosystem evolution).*

Cicin-Sain, B. and M.K. Orbach. 1986. Mutual Mysteries: Washington/Regional Interactions in the Implementation of Fisheries Management Policy. Reprinted from *Policy Studies Review* 6(2): 348-57.

*Based on thirty in-depth personal interviews with decisionmakers involved in producing the fishery management plan for California's northern anchovy fishery, the authors examine interorganizational differences between the national and regional levels responsible for implementing the MFCMA. Differences between organization location (formal status in the decisionmaking system) and socialization (professional background) at both levels have important impacts on implementation behavior and act to reinforce differences at each level in 1) the way laws are viewed, 2) what aspects of the legislation should be emphasized, 3) policy goals, 4) criteria for decisionmaking, and 5) perceptions of influence. This leads to confusion and misperception.*

Dudley, R.L. 1990. A Framework for Natural Resource Management. *Natural Resources Journal* 30: 107-22.

*This paper suggests a new framework for natural resource management based on the "market failure/government failure" paradigm. This "dual failure" approach provides a theoretical basis for designing the jurisdictional criteria, general principles and standards, and geographic and administrative structure to manage natural resources. Theoretical requirements for successful implementation of the framework are discussed and illustrated using the Federal Land Policy and Management Act.*

Fairlie, S., M. Hagler and B. O'Riordan. 1995. The Politics of Overfishing. *The Ecologist* 25(2/3): 46-73.

*This is the introductory article in a special double issue of *The Ecologist* titled "Overfishing: Causes and Consequences." It begins with a description of historical commons management and proceeds with a discussion of the technological advances in fisheries, overcapitalization, the commons-open access debate, limited access versus limited technology and the precautionary approach to fishery management. The authors recommend that fisheries be returned to community control. Also included in this special issue are articles on fishing gear*

*and the state of the oceans, chaos theory and fisher/scientist communication, Canadian fishery management, the New Zealand experience with individual transferable quotas, Britain and the European Union Common Fisheries Policy, foreign fleets in Indian waters and aquaculture.*

Feeny, D. 1994. Frameworks for Understanding Resource Management on the Commons. Pp. 20-33 in Community Management and Common Property of Coastal Fisheries in Asia and the Pacific: Concepts, Methods and Experiences, ed. by R.S. Pomeroy. ICLARM Conf. Proc. 45.

*This study describes common-property resource management regimes and presents a framework for the analysis of these regimes. Through a literature review, the author identifies key emerging messages in common-property resource management. He concludes that 1) the system of property rights will not determine success and failure, 2) the role of institutions is important, and 3) key elements of successful institutional arrangements include incentives for cooperation, the ability to enforce collective agreements, and the flexibility of institutional arrangements. He argues that local knowledge should be a major component of any strategy for common-property resource management.*

Feeny, D., S. Hanna and A.F. McEvoy. 1996. Questioning the Assumptions of the "Tragedy of the Commons" Model of Fisheries. *Land Economics* 72(2): 187-205.

*The authors challenge the "tragedy of the commons" argument by countering key behavioral and environmental assumptions of the Gordon-Scott model related to individual motivation, characteristics of individuals, nature of institutional arrangements, user interactions, ability of users to create new arrangements, and the behavior of regulatory authorities. They recognize individual self-interest as a powerful force, but indicate that these assumptions are misleading. They suggest that research and policy formulation consider each case unique and focus on incentives.*

Gale, R.P. 1992. Is There a Fisheries Management Revolution in Your Future? *Fisheries* 17(5): 14-19.

*This article defines five types of fishery management revolutions: 1) resources-to-the-people, 2) palace coups, 3) counterrevolutions, 4) rising expectations revolutions, and 5) bring-in-the-voters revolutions. The author describes how each revolution is instigated by a unique combination of fishery management characteristics related to the condition of the resource, economic status of the challengers, political culture, and existing decisionmaking arenas. Through an understanding of these characteristics and the ability to anticipate the revolutions to which they lead, fishery managers can monitor and react accordingly to changes that may precipitate revolutions.*

Hanna, S.S. 1998. Strengthening Governance of Ocean Fishery Resources. Pp. 257-76 in Ecological Economics and Sustainable Governance of the Oceans, ed. by R. Costanza and F. Andrade. Lisbon: SILVAS-Cooperativa de Trabalhadores Gráficos.

*This essay examines the internal workings of fishery governance and their links to fishery outcomes. The author describes fundamental weaknesses related to poor definition and organization that prohibit the achievement of fundamental requirements of governance and impede the realization of sustainability. She begins with a summarization of the biological, economic, management and equity status of ocean fishery resources; discusses fisheries as ocean indicators; analyzes the organizational scope and structure of fishery governance; and relates scope and structure to governance outcomes through a discussion of multiple objectives, time horizons, monitoring and feedbacks, legitimacy and efficiency. Finally, she describes requirements for strengthened ocean governance related to stabilizing long-term management scopes and constructing flexible management structures and identifies practical challenges to meeting these requirements.*

Hanna, S.S. 1997. The New Frontier of American Fisheries Governance. *Ecological Economics* 20: 221-33.

*This paper begins with a discussion of American resources as frontiers. The author compares the attributes of resource management under the frontier paradigm with that of the commons, and describes behavioral differences between users in each model. She then describes the conditions required to develop the institutional capital necessary to achieve sustainable governance of U.S. fisheries. These involve viewing the fishery as an integrated ecosystem, identifying all shareholders, allocating decisionmaking power and responsibility to internalize control and vest all interests, developing incentives to promote long-term management, improving management skills, and utilizing adaptive management. She concludes with an assessment of the progress of U.S. fishery management in developing institutional capital.*

Hanna, S.S. 1995. User Participation and Fishery Management Performance within the Pacific Fishery Management Council. *Ocean & Coastal Management* 28(1-3): 23-44.

*This study focuses on factors influencing user participation in fishery management and their effects on fishery management performance. The author accomplishes this through an examination of three case studies of ad hoc participation processes established by the PFMC for the Pacific groundfish fishery. These include the development of a limited license program, inter-gear sablefish allocation, and a sablefish individual quota program. She uses equity, stewardship, regulatory resilience and efficiency as indicators of performance, demonstrating tradeoffs in the three cases which reflect mixed performance results. Factors influencing the successfulness of user participation include a history of collective decisionmaking, a developmental pace that permits learning and incremental change, communication and education, common objectives, and a resource condition that allows equitable compromises.*

Hanna, S. 1992. Lessons for Ocean Governance from History, Ecology and Economics. Pp. 23-5 in *Ocean Governance: A New Vision*, ed. by B. Cicin-Sain. Newark, DE: University of Delaware.

*This paper discusses important lessons in historical commons, ecological systems, and the economic theory of resources use that could inform present-day ocean governance. These relate to incentives and the behavior of resource users. Historical experience suggests that the use of a coordinated ecosystem management approach and collective choice mechanisms will lead to sustainable governance systems. Present-day resource management does not account for large-scale variability and ocean use regulation is largely uncoordinated. Incentive systems are poorly developed and the focus is on short-term success. This present “growth-based” system of management has led to a user population that cannot be supported by the resource. The paper concludes with several research questions requiring further investigation.*

Jentoft, S. 1989. Fisheries Co-Management: Delegating Government Responsibility to Fishermen’s Organizations. *Marine Policy* 13(2): 137-54.

*This article focuses on the division of responsibility between government and the fishing industry in fishery management and the ability of fishermen’s cooperative organizations to perform regulatory functions. The author discusses the benefits, and potential problems, associated with a cooperative management approach and reviews international experiences with fishermen’s organizations. He identifies critical variables for the development of successful cooperative organizations to include legislation which enables the organizations to implement and enforce regulations, organizations small enough in scale to maintain manageability, relatively homogeneous socioeconomic membership, a tradition of cooperative and collective action, the organization’s ability to establish trust with the fishermen, and an appropriate division of responsibility between government and industry.*

Jentoft, S. 1985. Models of Fishery Development: The Cooperative Approach. *Marine Policy* 9(4): 322-31.

*Based on experiences in Norway and Canada, this article discusses the cooperative approach as a means to 1) secure a more equitable distribution of income within the fishing industry, 2) obtain better coordination between production and marketing units, 3) resolve the need for regulation stemming from the common property resource base, and 4) increase cooperative entrepreneurship and innovation by generating development in marginal fishing communities. The author argues that the cooperative approach is universally applicable and has not been significantly considered as an alternative means for solving fishery management problems.*

Jentoft, S. and B. McCay. 1995. User Participation in Fisheries Management: Lessons Drawn from International Experiences. *Marine Policy* 19(3): 227-46.

*This study, based on the findings of two international projects, examines the various ways in which user groups are incorporated in the fishery management process. The authors identify three institutional design alternatives that allow for user participation, and summarize the various degrees of user participation in fishery management and the diversity of institutional design in eleven case studies. They develop lessons and conclusions from the case studies*

*and address two questions of institutional design related to issues of representation and scale. Finally, they provide recommendations for future research.*

Johnson, J.C. and M.K. Orbach. 1990. Migratory Fishermen: A Case Study in Interjurisdictional Natural Resource Management. *Ocean & Shoreline Management* 13: 231-52.

*This paper is based on a study of small-scale migratory inshore shrimpers from North Carolina. The authors begin with a brief anthropological discussion of migration and pastoral nomadism. They identify five factors that influence interstate migration among fishermen—social structure, economics, politics, features of work and the environment—and describe these conditions for the NC shrimpers, exploring relationships between the shrimpers, their communities, fishing patterns and fishery management jurisdictions. They suggest that interjurisdictional management frameworks consider migratory fishing behavior.*

King, L.R. and S.G. Olson. 1988. Coastal State Capacity for Marine Resources Management. *Coastal Management* 16: 305-18.

*As federal leadership and financial support for ocean programs diminishes, coastal states have the potential to become major actors in ocean issues. This article identifies indicators of enhanced state capabilities in marine affairs and discusses the capacity—defined as a mature institutional structure, a high level of professional expertise, and the interest and commitment of political elites—of states to expand their involvement in coastal and marine policy issues. The authors find capability to vary greatly among coastal states, comparing the significant accomplishments of North Carolina with the failures of Texas. They discuss the roles of the Coastal Zone Management and Sea Grant College programs in expanding state institutional capabilities. Finally, they recommend further research in exploring and comparing the variable degree of effectiveness of state institutions and the establishment of networks to deal with coastal resource issues.*

Lindblom, C.E. 1979. Still Muddling, Not Yet Through. *Public Administration Review* (November/December): 517-26.

*This discussion distinguishes incremental politics from incremental analysis, which is divided into categories of simple, disjointed and strategic. The author argues that a strategic analytical approach is more productive than attempting to achieve complete scientific analyses of complex problems. He suggests that the incremental political approach is wrongly accused as “slow-moving,” and is often confused with problems resulting from the structure of veto powers and other political features characteristic of a market-oriented society. He describes partisan analysis as the most characteristic—and most productive—form of analytical input into politics. He argues that improved combinations of the three forms of incremental analysis, incremental politics, and partisan mutual adjustment and analysis can lead to more intelligent and democratically responsive policymaking.*

McCay, B.J. 1993. Management Regimes. Beijer Discussion Paper Series 38. Stockholm: The Royal Swedish Academy of Sciences.

*The author uses this article to illustrate a framework that distinguishes types of property (private property, common property and open access) and management regimes (laissez-faire, market regulation, and communal, state and international governance). She reviews common generalizations about management regimes and examines co-management in the context of various levels of participatory management, ranging from Government Power to Fisher Power. She concludes with a challenge to focus on culture and the commons.*

Miller, M.L. and C.F. Broches. 1989. Congress, Issue Networks, and Marine Affairs. *Coastal Management* 17: 263-93.

*This article describes the fragmented nature of federal authority over marine affairs, the legislative structure and process, and the working configurations of legislative committees, executive agencies and interest groups involved in marine affairs. The authors use the Arctic National Wildlife Refuge and the northeast Pacific groundfish fishery as case studies to promote the concept of a subgovernment-issue network continuum as a monitoring tool for marine policy. They report that it is crucial for those working in fishery management to understand these interactions.*

Munro, G.R. 1987. The Management of Shared Fishery Resources Under Extended Jurisdiction. *Marine Resource Economics* 3(4): 271-96.

*This paper discusses interstate cooperation issues related to the joint management of transboundary fishery resources. The author explains that primary cooperation in the form of cooperative research is relatively easy to achieve because all parties benefit from the information. But establishing joint management programs as a form of secondary cooperation is much more difficult. This involves allocation decisions, determination of an optimal management strategy, and implementation and enforcement of management agreements. He highlights the progress in cooperative management of highly migratory species fisheries in the Central/Western Pacific as a case study. He concludes that strong incentives for cooperation can help to overcome powerful barriers and recommends that parties focus on the division of net economic benefits, rather than the division of catch. He also suggests that joint management undertakings should not be faced with unreasonable demands; at the least, no more than is expected from single state management programs.*

National Academy of Public Administration. 1988. Congressional Oversight of Regulatory Agencies: The Need to Strike a Balance and Focus on Performance. Washington, DC: National Academy of Public Administration.

*This comprehensive examination of congressional oversight focuses on oversight of regulatory agencies and addresses three questions: 1) What constitutes effective oversight?, 2) How does Congress go about its oversight activities?, and 3) What can Congress, the President, and administrative officials do to ensure that oversight is less adversarial, does*

*not stymie administration, and accommodates the needs of both branches? The panel concludes that balance is key to effective oversight. They provide eighteen recommendations for improvement.*

Rose, A., B. Stevens and G. Davis. 1989. Assessing Who Gains and Who Loses from Natural Resource Policy: Distributional Information and the Public Participation Process. *Resources Policy* 15(4): 282-91.

*This article describes how publicly-administered resource allocation can be more effective and democratic when it is informed by data on the distribution of economic impacts. The authors specify three positive measures—the individual impact matrix, the community impact index, and the political articulation index—of the distribution of economic impacts and demonstrate an operational methodology that can be used to calculate these impacts. They use a case study of coal mining on public lands in the Monongahela National Forest to illustrate how even a net positive cost-benefit analysis can produce impacts that clash with citizen preferences. They conclude that successful public participation requires both the dissemination of information on individual policy impacts and the ability to predict public reaction.*

Smith, M.E. 1990. Chaos in Fisheries Management. *Mast* 3(2): 1-13.

*This study briefly reviews the structure and composition of the regional fishery management councils, and discusses how this participatory model complicates the councils' goals to sustain the stocks and optimize economic utilization. It explains how a participatory model that employs people with such widely diverse views of nature to manage fishery resources by consensus is likely to result in differing individual beliefs regarding what constitutes relevant data, how the data should be interpreted, and how appropriate management responses should be designed. It suggests that a better understanding of those factors dividing fishery managers and industry members is essential. Chaos theory and fisheries as both linear and non-linear systems are discussed.*

Steiner, R. 1993. Government, Industry and Public Management of the Seas in the 21st Century. *Marine Policy* (September): 399-403.

*This article describes the government-industry-public relationship as dysfunctional and in need of change. It is divided into three sections: 1) the problem, 2) corporate environmentalism, and 3) citizen involvement. The author argues that industry-controlled regulation favors industry at the public's expense and that an informed and participatory public, along with financial incentives provided by government, can provide industry with strong incentives for adopting an environmental ethic (i.e., CERES principles). This is necessary to transform linear industrial processes to more natural, cyclical, processes of industrial ecology.*

Turgeon, D.D. 1985. Fishery Regulation: Its Use Under the Magnuson Act and Reaganomics. *Marine Policy* (April): 126-33.

*This article discusses fishery regulation and regulatory reform under the MFCMA. The author describes how the regulatory process involves multiple stages (i.e., development of, and hearings on, fishery management plans; proposed regulations which implement fishery management plans; preparation of supporting documents by the Council; document review process) that can be subject to political intervention. She chronologues changes in the fishery management regulatory process and structure, and compares early regulatory writing and implementation processes with the later, fast-paced, system driven by the flexibility and mandated “fast track” schedule of the MFCMA. She concludes the article with a discussion of both the future direction of, and alternatives to, fishery regulation.*

World Wildlife Fund. 1995. *Managing U.S. Marine Fisheries: Public Interest or Conflict of Interest?* Washington, DC: World Wildlife Fund.

*This report details findings of a WWF investigation into conflicts of interest and the regional fishery management council system. Both the NEFMC and the GMFMC are discussed independently with respect to status of stocks, species managed and management history. Council members’ actions on specific management issues—including roll call votes, motions, and even meeting comments—are illuminated and compared with information about their backgrounds and outside interests. The report concludes that “conflicts of interest plague the council process and contribute to well-documented shortcomings in the management of U.S. fisheries.”*

## **CREATING INCENTIVES**

Alverson, D.L. and S.E. Hughes. 1995. *Bycatch—From Emotion to Effective Natural Resource Management.* Seattle, WA: Natural Resource Consultants, Inc.

*This paper briefly discusses the impacts of, and possible solutions to, bycatch and developments in bycatch policy. The authors suggest that pressure to publicize discard information has created an emotionally-charged public and has led to the evolution of policy driven by strong political pressure rather than the best available scientific information. They question the appropriateness of various potential solutions to bycatch (i.e., required retention).*

Alverson, D.L., M.H. Freeberg, S.A. Murawski, J.G. Pope. 1994. *A Global Assessment of Fisheries Bycatch and Discards.* FAO Fisheries Technical Paper No. 339. Rome: Food and Agriculture Organization.

*This paper provides a baseline reference on bycatch, reviewing both global and national bycatch, with emphasis on specific regions. The authors include the data used to create figures and tables on a disk. They discuss how public interest groups are often more affected by quality, than quantity, of bycatch, and how this results in policy focused on high-profile species and driven by emotion rather than science. They report that commercial and recreational fishermen often associate bycatch with gear types and user groups other than*

*their own and discuss how new alternatives are considering shifting responsibility to the individual level. They argue that a reduction in the fishing of overfished stocks, along with a combination of incentives and disincentives and new technology/alternatives can significantly reduce world discard levels.*

Anderson, L.G. 1989. Enforcement Issues in Selecting Fisheries Management Policy. *Marine Resource Economics* 6: 261-77.

*This article presents a framework useful in comparing fishery regulations and identifying enforcement issues important to the selection of fishery policy. The author discusses dockside versus at-sea monitoring, the ability of industry to comply with regulations, risk of noncompliance, initial versus continued compliance, degree to which benefits of compliance can be demonstrated, potential for citizen cooperation in enforcement, the likelihood of regulations to promote rentseeking behavior, and the effectiveness of enforcement with respect to management objectives. He also discusses the ease of regulations/enforcement with respect to government implementation distinguishing between mistakes, bad practice, and cheating, communicating requirements, disguising noncompliance, detecting noncompliance such that it is admissible as evidence, detecting illegal activities under various conditions, and identifying benefit-based priorities.*

Anderson, L.G. and D.R. Lee. 1986. Optimal Governing Instrument, Operation Level, and Enforcement in Natural Resource Regulation: The Case of the Fishery. *American Journal of Agricultural Economics* (August): 678-90.

*This article discusses how industry output is indirectly controlled by the reactions of industry to regulatory control variables, such as the choice of governing instrument (i.e., taxes, direct controls), the enforcement or monitoring procedure (i.e., dockside checks, at sea boardings), the penalty structure for noncompliance (i.e., fines, gear confiscation, jail terms), and the operation level of each (i.e., the size of the tax, the length of the jail term). Using a model, the authors demonstrate how industry assesses the costs and benefits of noncompliance and the ability to evade detection. They indicate that managers can find the optimum policy in the combination of these variables that yields the highest net present value of returns.*

Arnason, R. 1994. On Catch Discarding in Fisheries. *Marine Resource Economics* 9: 189-207.

*This paper discusses the economic incentives of catch discarding associated with different fisheries. The author develops and uses a model to determine discard incentives in a free access versus an individual transferable quota fishery. He shows that, in a free access fishery, the competitive profit maximizing discarding rule should be optimal. And, in turn, the ITQ fishery should create excessive incentives for discard. He attributes this to restrictions on landings instead of catch, as well as assigning quota that is not differentiated by grade. He proposes assigning ITQ by grades, taxes/subsidies, and enforcement, as potential remedies.*

Byron, R.F. 1980. Skippers and Strategies: Leadership and Innovation in Shetland Fishing Crews. *Human Organization* 39(3): 227-32.

*This paper discusses the social process of innovation in Shetland fishing technology. Two case histories are discussed with respect to shipboard social organization. The first shows the negative impact of forced social organizational change on the success of an innovative fishing technique. The second shows that, when traditional social arrangements were permitted to remain intact, the new, technological innovation became a great success.*

Costanza, R. 1987. Social Traps and Environmental Policy: Why do Problems Persist When there are Technical Solutions Available? *BioScience* 37(6): 407-12.

*This article describes the social trap phenomenon and examines ways to escape<sup>3</sup>/<sub>4</sub>or avoid altogether<sup>3</sup>/<sub>4</sub>these traps. The author characterizes these phenomena as situations in which short-term incentives are inconsistent with the long-term, best interest of the individual and society. He identifies the causes of social traps and describes four methods by which such traps can be avoided or escaped. These include 1) education, 2) insurance, 3) superordinate authority, and 4) converting the trap to a tradeoff by charging the long-run costs associated with the activity to the responsible parties in the short run. He indicates that, while the latter method has been proven most effective experimentally, it has not been sufficiently applied in the environmental arena. He argues that converting traps to tradeoffs, along with the other methods, can make the entire system more effective.*

Cunningham, S. 1994. Fishermen's Incomes and Fisheries Management. *Marine Resource Economics* 9: 241-52.

*This paper discusses reasons for low fishing incomes, describes the difference between wealth and income, and examines how both of these are affected by fishery management. It considers the extent to which fishery management can actually resolve the problem of low incomes, and examines the variable impacts of different management policies (i.e., individual transferable quotas, taxation). The relationship between incomes, opportunity costs, and exploitation is discussed. It suggests that policy measures focus on increasing opportunity incomes and providing alternative employment opportunities to fishing-dependent communities.*

Doeringer, P.B., P.I. Moss and D.G. Terkla. 1986. *The New England Fishing Economy: Jobs, Income, and Kinship*. Amherst, MA: The University of Massachusetts Press.

*This book resulted from research undertaken to assess change in socioeconomic conditions in New England brought about by a shift in the U.S.-Canadian fishing boundary. Specifically, it describes the fishing industry and labor force in the ports of Gloucester and New Bedford, emphasizing how type and extent of employment and income variation in these industries are determined by economic institutions. The authors indicate that knowledge about how industry income and employment adjust to economic change is crucial to the regulatory process.*

Fujita, R.M. and L. Zevos. 1996. Innovative Approaches for Fostering Conservation in Marine Fisheries. Oakland, CA: Environmental Defense Fund.

*This paper considers fishery management issues related to sustainability goals and objectives, maximum sustainable yield versus optimum yield, multispecies/ecosystem management and bycatch, open versus limited access, the variability of regional councils and conflicts of interest. Individual Transferable Quotas are reviewed as a new management tool; specifically with respect to incentive structure, conservation performance and social implications. The authors argue that effective management strategies require strong incentives for stewardship, such as greater accountability and more effective enforcement. They suggest that institutional reform based on incentive structure is needed and that existing institutions are inadequate. The paper concludes with a brief discussion of transferable share/voting allocations and the establishment of fish utilities modeled on electric power utilities.*

Fujita, R.M., D. Hopkins and Z. Willey. 1996. Creating Incentives to Curb Overfishing. *Forum for Applied Research and Public Policy* 11(2): 29-34.

*These writers attribute the overexploitation of fishery resources to perverse economic incentives. They describe the disincentives for resource conservation created by open access fisheries, review the limitations of limited access regimes, and identify the strengths and weaknesses of individual transferable quota systems. They suggest cooperative- or co-management regimes as possible alternatives to open access and make several recommendations: managers should be required to consider the best scientific information in decisionmaking, a precautionary approach should always be prescribed, protection of ecological integrity should be a priority goal, conservative parameters should be required in fish population assessment, and total allowable catch should incorporate scientific uncertainty and natural variability.*

Furlong, W.J. 1991. The Deterrent Effect of Regulatory Enforcement in the Fishery. *Land Economics* 67(1): 116-29.

*This paper summarizes the results of a 1985 survey of Quebec fishermen in crab, lobster, shrimp and groundfish fisheries. The survey was undertaken to provide insight into the deterrent effect of regulatory enforcement. It provides some support to the deterrence hypothesis that "individuals rationally respond to incentives for participating in illegal activities." Fishermen were questioned regarding perceived probability of arrest, prosecution and conviction; perceived net gain from an infraction; and perceived punishment if caught. Illegal activities were found to be most greatly influenced by likelihood of detection, and fines were found to result in greater deterrence than license suspensions. Results indicated that those fishermen most likely to violate regulations include relatively younger fishermen, those with previous convictions, those with high household unemployment, and those whose household is less dependent on the fishery. The author*

*suggests that further examination of the effectiveness of enforcement tools may lead to more efficient fishery management.*

Hanna, S. 1997. Institutions and the Resolution of Resource Conflicts: Principles and Practice. Pp. 325-32 in *With Rivers to the Sea: Interaction of Land Activities, Fresh Water and Enclosed Coastal Seas*. Joint Conference. 7th Stockholm Water Symposium [and] 3rd International Conference on the Environmental Management of Enclosed Coastal Seas (EMECS), 10- 15 August 1997, Stockholm, Sweden.

*This essay considers the role of incentives in resource management and conflict resolution. The author suggests that recognizing, and accommodating, the basic incentives by which people function will assist resource managers in conflict resolution. In resource settings, people are generally motivated by wanting to reduce uncertainty, manage transactions costs, and compete for advantage. She argues that managers, therefore, should work to reduce uncertainty, minimize and equitably distribute transactions costs, and manage the effects of scramble and interference competition. She indicates that clearly defined property rights can help to manage these types of behavior but may create expectations that also lead to conflict. She uses three case studies to examine the institutional incorporation of incentives and the role of community-based management in conflict resolution: the Oregon Watershed Councils, the Washington State's Willapa Alliance, and the adaptive management of the Columbia River.*

Hanna, S.S. 1998. Institutions for Marine Ecosystems: Economic Incentives and Fishery Management. *Ecological Applications* 8(1) Supplement: S170-4.

*This article describes the set of institutions and property rights regimes required for a shift to ecosystem management. It states that they should reflect the uniqueness of the ecosystem and its human users, value ecosystem services as well as commodities, and provide for broad coordination between interest groups and managers. The author argues that effective ecosystem management is dependent upon management structures and processes that can consider multiple objectives for maximizing both ecosystem goods and services values, promote organizational efficiency that minimizes transactions costs, establish socially appropriate time horizons that increase intergenerational equity, and create legitimate and flexible processes. She suggests that an understanding of the economic dimensions of these functions is critical to creating incentives that promote ecosystem objectives.*

Iudicello, S., M. Weber and R. Wieland. 1999. *Fish, Markets and Fishermen: The Economics of Overfishing*. Washington, DC: Island Press.

*This book explains how biological, economic and political components of fisheries link together to create incentives that shape fishing behavior. The authors lead the reader to understand that overfishing does not result from greed or weakness, but rather from perverse incentives. Through theory and case studies, they show how economics drives fishing behavior, how subsidies hurt, how management tools work and how economic tools can contribute to solutions.*

Milazzo, M. 1998. Subsidies in World Fisheries: A Reexamination. World Bank Technical Paper/Fisheries Series 406.

*This report describes subsidies as an important factor undermining the sustainable use of fishery resources. It examines the implications and impacts of fishing subsidies, focusing on impacts on the resource, as opposed to trade. It reviews a wide range of indirect and implicit assistance programs for the world's fishing fleets and provides estimates of the national and global impact of these programs. Both budgeted and unbudgeted (i.e., subsidized lending, tax preferences, and cross-sectoral subsidies) subsidies are examined, as well as resource rent and conservation subsidies. The report differentiates between those subsidies that tend to increase fishing effort and capacity, and those that are intended to reduce effort and capacity. The author argues that subsidies reform be integrated into broader efforts to improve the sustainability of fishery resources.*

Milliman, S.R. 1986. Optimal Fishery Management in the Presence of Illegal Activity. *Journal of Environmental Economics and Management* 13: 363-81.

*This paper explores the impacts and policy implications of the enforcement and avoidance costs incurred as fishermen try to escape detection on optimal fishery management. The author discusses the theory behind total and legal gain maximization and their effect on resulting policy. Further research related to the economic impacts of fishery enforcement on illegal markets is recommended.*

Opaluch, J.J. and N.E. Bockstael. 1984. Behavioral Modeling and Fisheries Management. *Marine Resource Economics* 1(1): 105-15.

*These authors argue that bioeconomic optimization is not a realistic goal for fishery management in the face of uncertainty. They recommend a "satisficing" approach that determines an acceptable range of target levels of effort and then reallocates effort from overutilized to underutilized fisheries. This approach requires the ability to predict the response of fishermen to economic incentives and to policies which affect these incentives, which, in turn, requires accurate modeling of fishermen's behavior at the micro level. They develop a discrete choice model and apply it to choice among fishery management alternatives faced by New England fishermen. They find that, because of the strong inclination to remain within the same fishery over time, fishermen responded to economic incentives only after they surpassed a substantial (perhaps even extreme) threshold. They conclude that effective policy will consider the important components for these thresholds.*

Ruttan, V.W. and Y. Hayami. 1984. Toward a Theory of Induced Institutional Innovation. *The Journal of Development Studies* 20: 203-23.

*Using agriculture as an example, the authors discuss institutional innovation as an economic response to changes in resource endowments and technical change. They report that social science knowledge and cultural endowments exert a strong influence on the supply of institutional change. They use a "pattern model" to show the relationships between resource endowments, cultural endowments, technologies and institutions.*

Smith, C.L. and S.S. Hanna. 1993. Occupation and Community as Determinants of Fishing Behaviors. *Human Organization* 52(3): 299-303.

*This paper reports the results of an Oregon trawl survey conducted to determine the importance of occupation and community in the culture of fishermen. The results of the study indicate a substantial amount of diversity among trawlers of different ports. The authors note this as surprising, in that occupational analyses usually reflect variability in fisherman behavior between, but not among, occupations. The results do, however, provide support for community as a major determinant of cultural behavior. Each port differed with respect to propensity to change (specialists versus generalists), timing of fishing activities, attitudes toward fishing and fishing organization. The authors explain how community facilitates*

*information transfer through face-to-face contacts and suggest that it be considered in management planning.*

Sutinen, J.G. and P. Anderson. 1985. The Economics of Fisheries Law Enforcement. *Land Economics* 61(4): 387-97.

*This article examines the relationship between exclusive rights and the costs of defining and enforcing exclusivity. The author provides a historical overview of national and international exclusivity claims and describes the costs of enforcing the extended jurisdiction of the United States. He then presents a model of fisheries law enforcement which is used to examine how fishing firms behave and fishery policies are affected by costly and imperfect enforcement of fisheries law. He concludes that enforcement costs are a major determinant of regulatory policy for nonexclusive resources.*

Sutinen, J.G. and T.M. Hennessey. 1984. Enforcement: The Neglected Element in Fishery Management. Kingston, RI: Rhode Island Agricultural Experiment Station.

*This paper discusses the importance of enforcement to fishery management. The authors describe the federal fisheries law enforcement program, including fishery regulations, observer coverage, Coast Guard air and sea patrols, and boardings in the fishery conservation zone. They present a preliminary evaluation of the federal enforcement program, which covers compliance measures, types and incidence of sanctions, and penalties assessed and collected under the MFCMA. They then provide an analysis of the trends and patterns of expenditures on federal fisheries law enforcement, both recent and projected. Projected enforcement expenditures are reported to be significantly high when compared to estimated benefits.*

Sutinen, J.G., A. Rieser and J.R. Gauvin. 1990. Measuring and Explaining Noncompliance in Federally Managed Fisheries. *Ocean Development and International Law* 21: 335-72.

*These authors state that despite its large role in the failure of fishery management programs understanding of the true nature, extent, and causes of noncompliance is generally inadequate. They briefly review the U.S. federal fishery management and enforcement system and discuss the theory of compliance behavior. Based on agency and survey data, they use this theory to describe the extent and patterns of noncompliance in the northeast groundfish fishery. Noncompliance in this fishery is attributed to a combination of poor stock conditions, increased market value, and modest penalties, further aggravated by a negative feedback loop. They recommend targeting chronic violators, concentrating enforcement measures on areas characterized by noncompliance, extending application of management measures to the post harvesting sectors, substantially increasing the severity of penalties, ensuring input from enforcement authorities early in council deliberations of new fishery management plans, and devoting resources to strengthen the use of noncoercive factors of compliance, such as social pressures, self-interest, inducement and obligation.*

Wilens, J.E. 1985. Towards a Theory of the Regulated Fishery. *Marine Resource Economics* 1(4): 369-88.

*Fishery regulators are often faced with the difficult task of developing regulations for which they cannot effectively predict the outcome. This paper discusses a tentative framework for predictive modeling related to traditional direct control regulations. The author models the interactions between regulators and industry, with regulators trying to control industry effort and industry collectively circumventing the regulations to increase short-term profits. He shows this behavior to result in a common property equilibrium that dissipates potential rents. He argues that direct control regulatory schemes do not provide incentives for efficiency, and examines several incentive schemes, including potential-effort licenses, participation licenses, and effort and landing taxes.*

Wilens, J.E. 1979. Fisherman Behavior and the Design of Efficient Fisheries Regulation Programs. *Journal of the Fisheries Research Board of Canada* 36: 855-8.

*This paper discusses the share-focused behavior of fishermen, whereby input decisions are based on trying to increase or maintain an expected share of total catch revenues. The author explains that regulation of a single component of effort is not effective because share-focused behavior leads to overcapitalization when limits are placed on just one or a few inputs. He describes two options for managers/regulators: 1) to determine and explicitly regulate all key facets of effort, or 2) to design systems that produce an incentive to combine inputs efficiently. He concludes that the second option would effectively remove the motivation for share-focused behavior and produce the incentive to fish efficiently.*

Wilson, J.A. 1990. Fishing for Knowledge. *Land Economics* 66(1): 1-29.

*This article describes how individual incentives for knowledge acquisition conflict with the "rule of capture," which creates a disincentive to share new knowledge necessary for the efficient exploitation of fishery resources. This results in withholding, distortion, and strategic use of information among fishermen. The author discusses the process of fine-grained information sharing among groups/clubs with relatively stable membership, where strong incentives for knowledge acquisition are maintained while information is communicated to a select few and free riders are effectively excluded. He describes each fishery as having unique organizational arrangements developed to maintain incentives for knowledge acquisition. He argues that an assessment of social efficiency must include detailed knowledge related to the efficiency functions of existing institutions and the search/informational/institutional effects of proposed policy changes. He suggests that incentives for the acquisition of new knowledge and information dispersal can be maintained through the creation of institutions and strategic behavior.*

## USING SCIENTIFIC INFORMATION

Aas, Ø. 1995. Constraints on Sportfishing and Effect of Management Actions to Increase Participation Rates in Fishing. *American Journal of Fisheries Management* 15(3): 631-638.

*To provide fishery managers with guidance in developing strategies to increase participation rates in recreational fisheries, this article reports the results of an investigation of barriers to recreational fishing and behavioral response to fishery actions. A sample population from Harstad, Norway was divided into groups based on both participation and interest in recreational fisheries. Results indicated that these groups are faced with a different set of constraints. Because of this, the author advises fishery managers to implement different strategies for each these groups.*

Anderson, R. 1978. The Need for Human Sciences Research in Atlantic Coast Fisheries. *Journal of the Fisheries Research Board of Canada* 35: 1031-49.

*This study was written in response to the 1976 Canadian mandate to manage fishery resources for maximum social benefit. The author identifies information needs in social science necessary to allow for the beneficial development of Atlantic Canadian fisheries. He describes the need for a qualitative structural change of decisionmaking arrangements that have historically focused on economic growth and a paternalistic, inflexible political structure. He explains that such a change would create the need for continual, systematic, socioeconomic monitoring of the state of communities, individuals and occupations as they respond to changes in the resource base and the larger system. He indicates that this type of self-determining management approach would assist in optimizing social benefits. Finally, he lists thirteen social science research priorities.*

Boggs, J.P. 1990. The Use of Anthropological Knowledge Under NEPA. *Human Organization* 49(3): 217-26.

*The National Environmental Policy Act of 1969 mandated extensive use of social science knowledge in governmental decisionmaking through the formation of environmental impact statements. This article discusses various reasons for the unsatisfactory use of social knowledge in policy decisions based on the "fools/knave position," the theoretical nature of basic social knowledge, suppression, and/or the nonexistence of a direct link between knowledge and action.*

Brown, T.L. 1987. Typology of Human Dimensions Information Needed for Great Lakes Sport-Fisheries Management. *Transactions of the American Fisheries Society* 116: 320-4.

*This paper discusses the socioeconomic information needs of Great Lakes sport fisheries. It claims that fisheries managers make little effort to use this type of information and that most believe that fishery policy should be based on biological data. Information use in recreational fishery agencies is contrasted with that in state wildlife agencies, which have shown increasing interest in the human dimensions aspect of wildlife management since the*

1970s. The author proposes that this difference is related to less pervasive conflicts in the case of fishery resources. A matrix is used to outline agency needs for human dimensions research for three categories of planning and decisionmaking, including broad, comprehensive and focused. Categories of research include surrogate biology (creel census surveys), user participation and interest profiles, administrative justification of programs (political and economic dimensions), user satisfactions and management preferences (resource and social needs), and integrated human dimensions inquiry.

Buck, E.H. 1995. Social Aspects of Federal Fishery Management. CRS Report for Congress 95-553 ENR. Washington, DC: 21 April 1995.

*This report examines the influence of federal government on the social valuation process relative to fishery management, and questions to what extent Congress should determine the emphasis given to social and cultural concerns in federal fishery management policy. The author outlines historical to present-day fishery management and natural resource legislation, with respect to direct and implied objectives for the protection and preservation of culture and society. He indicates that federal fishery management legislation places more emphasis on social considerations than many comparable renewable resource management laws. He highlights the basic conflict between the objectives of resource conservation and the need to preserve and protect the livelihood of community and sport fishermen. He describes resource allocation decisions as, perhaps, the most important social concern and briefly reviews individual quotas as one approach to resolving allocation issues.*

Charles, A.T. 1988. Fishery Socioeconomics: A Survey. *Land Economics* 64(3): 276-295.

*This article reviews and consolidates relevant literature on fishery socioeconomics to examine and discuss the role of multi-objective socioeconomic analysis in fisheries economics and management. The author reviews literature related to the multiple objectives of fishery management (i.e., employment, distributional concerns and rent generation), income distribution, critiques and examinations of both common and alternative fishery management methods, social and opportunity costs of labor, fishery labor markets, decisionmaking processes of fishermen and fishing communities, data requirements in socioeconomic analysis, and future priorities for socioeconomic research. He suggests two reasons for the difficulties in integrating socioeconomic research and economic analyses: 1) the existence of a "language barrier," and 2) difficulties in choosing fishery management objectives.*

Clay, P.M. and E.J. Dolin. 1997. Building Better Social Impact Assessments. *Fisheries* 22(9): 12-13.

*This article describes the need to better understand the behavior and motivations of fishermen and their interactions with management in order to influence future behavior. The authors explain that regulations creating social and/or economic disruption can lead to noncompliance and that the prediction of regulatory impacts using social impact assessments allows managers to consider alternative tools or increase educational efforts regarding the*

*need for management action. They argue that SIAs also assist in formulating balanced, more effective fishery management plans, but that the quality of the assessments needs to be improved by acquiring more comprehensive, relevant, and useful social and economic data and establishing more targeted, well-defined variables and collection procedures. They contend that continued funding is crucial to allow for the creation of social and economic time-series databases and that better SIAs will lead to more informed management decisions based on scientific analyses and evaluations instead of anecdotes and emotions.*

Costanza, R. and L. Cornwell. 1992. The 4P Approach to Dealing with Scientific Uncertainty. *Environment* 34(9): 12-20; 42.

*This article discusses approaches to dealing with scientific uncertainty in environmental management and policymaking. The authors extend the precautionary and polluter pays principles to devise the "4P approach," the "precautionary polluter pays principle." This approach shifts the burden of proof from the public to the resource user and creates strong economic incentives for firms to function in an environmentally-sound manner. They argue that this is a more appropriate way to recognize and incorporate uncertainty in the decisionmaking process than the current command-and-control systems. They indicate that the appropriate situations for a 4P approach and the administrative details of each particular case should be negotiated by stakeholders. Finally, they discuss the political feasibility of such an approach.*

Davis, D.L. and J. Nadel-Klein. 1992. Gender, Culture, and the Sea: Contemporary Theoretical Approaches. *Society and Natural Resources* 5: 135-147.

*This article adds to a more comprehensive publication edited by the authors and produced in 1988, "To Work and Weep: Women in Fishing Economies." It provides brief but substantive reviews of gender-related maritime literature focusing primarily on the role of women and male/female relations in industrial/commercial fisheries of the North Atlantic, and subsistence fisheries of southeast Asian and oceanic communities. Literature reviewed discusses the traditional land/sea dichotomy characterization, political economy (gender, power, production, and the state), and the cultural construction and maintenance of individual and collective identities. The authors suggest that additional studies related to human culture and the role of gender in fishing communities would contribute to a greater understanding of local fisheries.*

Ditton, R.B. 1972. The Social and Economic Significance of Recreation Activities in the Marine Environment. Sea Grant Technical Report #11. Madison, WI: University of Wisconsin Sea Grant Program.

*This paper asserts that multiple use management has neglected the recreational aspects of coastal zone use because the economic value of such activities has not been adequately determined. The author exemplifies this argument with a discussion of water quality, arguing that inadequate standards have been put in place that do not consider the social/aesthetic criteria of recreational users. He believes that reformulating water quality standards based*

*on a recreational definition would pressure managers to alleviate degraded conditions in the interest of recreational users, rather than allow conflicting uses to eliminate water recreation. He argues that this is important because the demand for recreational use of the Nation's coastal zones is increasing and the supply of resources available is decreasing.*

Edelstein, M.R. 1986. Disabling Communities: The Impact of Regulatory Proceedings. *Journal of Environmental Systems* 16(2): 87-110.

*This writer contends that the technocratic regulatory process, increasingly relied on by industrialized society, incorporates factors related to communication, expertise and acceptability of risk that adversely impact citizen perception of the regulatory process. He argues that the complex and technical questions created in this type of approach weaken the desirability for social impact assessments by effectively eliminating the citizen as a participant in the decisionmaking process. He recommends that SIAs evaluate the social impacts of a technocratic process, as well as the direct impacts of the proposed project. A case study is presented.*

Fricke, P. 1985. The Use of Sociological Information in the Allocation of Natural Resources by Federal Agencies: A Comparison of Practices. *The Rural Sociologist* 5: 96-103.

*This essay explores differences in the USFS and NMFS to explain the variation between the two agencies in the use of sociological information in resource planning and impact analysis. The author reports that, while the USFS ensures the use of social impact assessments and analyses in forest plans, this type of information is rarely included by NMFS and the regional councils in fishery management plans. He identifies two factors responsible for the exclusion of this information: uncertainty and organizational climate. These factors are discussed in relation to both agencies/councils and their use/non-use of interdisciplinary resource management teams.*

Garcia, S.M. 1994. The Precautionary Principle: Its Implications in Capture Fisheries Management. *Ocean & Coastal Management* 22: 99-125.

*This paper describes the precautionary principle and analyzes the scientific, technical, and legal implications of applying the principle to capture fisheries. The principle is examined in relation to conventional management approaches and discussed, primarily, in the international context. Issues such as use of best scientific evidence and technology, the burden of proof, the role of statistics, assimilative capacity and acceptable levels of impacts, and standards and criteria are addressed. The author suggests elements for the implementation of the precautionary approach in fishery management and argues that this approach can serve to sustain fisheries if it is interpreted and implemented in a reasonable manner.*

Groth, P.G. 1981. Effective Use of Sociocultural Data in Fisheries Management: A Case Study. *Fisheries* 6(2): 11-16.

*This article identifies important information gaps that exist with respect to meeting sociocultural data requirements of the MFCMA in the Gulf shrimp fishery. These requirements relate to patterns of historic participation, operational efficiency, and the equitable allocation of fishery access. The author indicates a need for data on personnel recruitment, business relations between harvesting/processing sectors, versatility of industry personnel, and interest group affiliations. He suggests that state fishery license data can help to illuminate the sociocultural aspects of the fishery.*

Healey, M.C. and T.M. Hennessey. 1994. The Utilization of Scientific Information in the Management of Estuarine Ecosystems. *Ocean & Coastal Management* 23: 167-91.

*This article discusses the role of science and scientists in the development and evolution of resource management policy. Three models of possible scientific contribution to the policy process are presented: 1) the Two Solitudes model, 2) the Episodic model (most common), and 3) the Active Adaptive Management model. The Episodic model is used to study the development of estuary management policy in the U.S. and Canada. The authors define the policy process to include problem identification, political relevance, policy selection, and program development and implementation. Finally, they recommend use of the Active Adaptive model, which directly involves science and scientists in all stages of policy development and promotes learning throughout policy evolution.*

Larkin, P.A. 1988. The Future of Fisheries Management: Managing the Fisherman. *Fisheries* 13(1): 3-9.

*This paper identifies three components of fishery management: habitat protection, enhancement of fish production, and regulation of fishermen. The author asserts that fishermen should be regulated in a manner that assists them in meeting their objectives, described as self-satisfaction for sport fishermen, self- and family-support for artisanal fishermen, and monetary, for commercial fishermen. He indicates that these socioeconomic objectives require a better understanding of human behavior and the marketplace.*

Lauck, T., C.W. Clark, M. Mangel and G.R. Munro. 1998. Implementing the Precautionary Principle in Fisheries Management through Marine Reserves. *Ecological Applications* 8(1) Supplement: S72-8.

*This article discusses the role of marine protected areas in implementing the precautionary principle and sustaining marine fisheries. The authors propose the inclusion of large-scale marine protected areas/marine reserves in marine fishery management strategies to serve as a "bet-hedging component" against uncertainty and management limitations. They outline the desirable features of a marine reserve program and briefly discuss practical issues relating to reserve design. They illustrate how MPAs can protect a stock while simultaneously increasing the long-term catch. Finally, they conclude with a list of the important advantages of MPAs.*

Loftus, K.H. 1987. Inadequate Science Transfer: An Issue Basic to Effective Fisheries Management. *Transactions of the American Fisheries Society* 116: 314-19.

*This author uses his personal experience with the development and implementation of the "Strategic Plan for Ontario Fisheries" to identify and describe problems in implementing natural resource policy with the objective of achieving maximum sustainable benefit for the Nation. He describes the transfer of scientific knowledge from scientists to resource managers and the public as inadequate, and suggests the establishment of communication networks to overcome scientific language barriers and institutional constraints. He asserts that policy decisions tend to focus on short-term goals that placate public concern and highlights the need for an increased understanding of the evolution of perceived public values and inferences that can lead to heightened public education and awareness. He argues that informed public participation in the policy process will promote more effective political decisions consistent with long-term resource management, as well as a more mature social perspective on values and expectations.*

Maiolo, J.R., J. Johnson and D. Griffith. 1992. Applications of Social Science Theory to Fisheries Management: Three Examples. *Society and Natural Resources* 5: 391-407.

*This paper describes three cases in which social science research directly assisted fishery resource managers in problem-solving. The first case involves an education and outreach program that was developed for recreational fishermen to promote catch of underutilized species. The second uses social network analysis to identify key opinion leaders and to better understand communication pathways of recreational and commercial fishermen. This exercise resulted in the adoption of a new protocol in the selection of advisors by the SAFMC. The third case analyzes general social and cultural aspects of the menhaden conflict. The authors argue that an understanding of societal aspects is critical to the success of fishery management. They recommend additional funding to promote social science research.*

McNabb, S. 1989. Logical Inconsistencies. *Human Organization* 48(2): 108-16.

*Based on experience with the Social and Economic Studies Program of the Department of the Interior's Minerals Management Service, this author evaluates the process by which technical and scientific data are synthesized in the environmental assessment procedure. He rebukes the assumption that risk assessments are "scientific procedures that lay the groundwork for well-informed policy," and describes how logical inconsistencies found in the categories, definitions, and rating scales of impact assigned by the program and used by scientists to assign sensitivity and impact-likelihood ratings to systems resulted in discontent, conflict and confusion. He reports that the program assessment was "not unique" and highlights the need to transform policy-oriented risk analysis into good science and policy by confronting hidden ideology and assumptions.*

Miller, M.L. 1987. Regional Fishery Management Councils and the Display of Scientific Authority. *Coastal Management* 15: 309-18.

*This article discusses the varied use of Scientific and Statistical Committees among the regional fishery management councils. The author describes the role of the PFMC SSC as essential to the fishery management plan process and, in contrast, the role of the NEFMC SSC as increasingly diminished. This is discussed with respect to the objectivity and impartiality of the NEFMC's management decisions.*

National Marine Fisheries Service. 1997. 23rd Northeast Regional Stock Assessment Workshop (23rd SAW): Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. Reference Document No. 97-05. Washington, DC: National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

*This report provides a consensus summary of assessments for goosefish, sea scallops and bluefish in the northeast region. It emphasizes the need for an improvement in quantity and quality of biological data for each species considered. Specific research recommendations are listed under each species assessment.*

National Marine Fisheries Service. 1997. 23rd Northeast Regional Stock Assessment Workshop (23rd SAW): Public Review Workshop. Reference Document No. 97-06. Washington, DC: National Oceanic and Atmospheric Administration, U.S. Department of Commerce.

*This publication reports on a public review workshop held for the purpose of initiating comments on assessment results and management advice for goosefish, sea scallops and bluefish.*

National Oceanic and Atmospheric Administration. 1994. Guidelines and Principles for Social Impact Assessment. Prepared by the Interorganizational Committee on Guidelines and Principles for Social Impact Assessment. NOAA Technical Memorandum, NMFS-F/SPO-16, May 1994. Silver Spring, MD: NOAA.

*This publication was developed to assist agencies and private interests in fulfilling social science obligations under the National Environmental Policy Act, related authorities, and agency mandates in conducting social impact assessments and in using those assessments to improve decisionmaking. It is the first systematic and interdisciplinary effort to develop operational guidelines and central principles for the preparation of technically and substantively adequate SIAs within reasonable time and resource constraints. The report outlines legal mandates and administrative procedures, illustrates a basic model, takes the reader step-by-step through the SIA process, and provides broad principles.*

National Research Council. 1998. Improving Fish Stock Assessments. Washington, DC: National Academy Press.

*This study responds to a request by the NMFS to conduct a broad review of U.S. stock assessment methods and models. Five different models are evaluated: a production model, a delay-difference model, and three age-structured models. The publication reviews data*

*collection and assessment methods, model performance, use of harvest strategies, peer review of assessments and assessment methods, and education and training of stock assessment scientists. It concludes with recommendations for new approaches.*

National Research Council. 1998. Review of Northeast Fishery Stock Assessments. Washington, DC: National Academy Press.

*This study was requested in response to concerns regarding the validity of stock assessment results that led to area closures and fishing restrictions in the northeast region. The publication reviews information collection methodologies, biological assumptions and projections and other relevant scientific information used to develop conservation and management measures for cod, haddock and yellowtail flounder. Both Canadian and U.S. stock assessments are reviewed. It reports that the science is adequate, and well within standards for assessing fish populations and effects of fishery management. It describes current survey and landings data as sufficient for stock assessments and comparable to those undertaken elsewhere. Eight recommendations for scientific improvement are listed, including greater attention to social and economic concerns. Use of a comprehensive management model that can link stock assessments with ecological, social and economic responses is proposed.*

Neis, B. 1992. Fishers' Ecological Knowledge and Stock Assessment in Newfoundland. *Newfoundland Studies* 8(2): 155-78.

*This paper discusses the importance of fishers' ecological knowledge in the scientific understanding of fisheries ecology and stock assessment. The author asserts that this knowledge has generally been dismissed by scientists as "anecdotal" or unsubstantiated" and that anthropologists have historically focused on the environmental influence on local culture rather than on the ecological knowledge that local people can contribute. She argues that these assessments lack an important historical dimension that could be contributed by experienced local fishers. She also suggests that the complexity of inshore fisheries has caused stock assessment science to focus on offshore fisheries. She recommends that more research be devoted to the historical dimension.*

Orbach, M. 1995. Social Scientific Contributions to Coastal Policy Making. Pp. 49-59 in *Improving Interactions Between Coastal Science and Policy: Proceedings of the California Symposium*. Washington, DC: National Academy Press.

*This article describes social sciences as an essential component of successful environmental policy development and implementation. The author defines two groups that primarily represent the cultural ecology of coastal and marine systems: 1) those who develop the policy that governs the system, and 2) those who are affected by the policy. He argues that social sciences are fundamental to all stages of environmental policy development because the entire process involves value-based decisionmaking. He describes three ways in which social scientists can currently contribute information to the environmental policy management process: 1) as employees of public agencies, 2) as advisors on political advisory boards, and 3) as researchers. He identifies impediments to the use of social science data related to the perceived nature of social (versus natural) sciences, limited support, and the translation of social science data into the policy process.*

Orbach, M.K. 1980. The Human Dimension. *Fisheries Management* 6: 149-63.

*This article asserts that an understanding of the human dimension is crucial to successful fishery management and decisionmaking. The author describes the primary reasons for consideration of this component as the need to recognize the social impact of potential management decisions, to assist in resource allocation decisions, and to understand how the overall system functions. He contends that, while secondary sources give fragmented information on human dimension, they are unable to provide the dynamic picture. He suggests that the human dimension can better be investigated through census surveys, attitude/opinion surveys, and ethnographic techniques.*

Peyton, R.B. 1987. Mechanisms Affecting Public Acceptance of Resource Management Policies and Strategies. *Canadian Journal of Fisheries and Aquatic Sciences* 44: 306-12.

*Using the Great Lakes rehabilitation effort as an example, this paper discusses the components of resource issues and how these are determined/affected by public involvement in the management process. The author describes the primary factors leading to natural resource conflict as the state of science, public beliefs, and public values/priorities. He contends that science is often inadequate and, therefore, not viewed as "credible" by public interest groups. In addition, he indicates that the conflicting beliefs and values of various groups are often difficult to resolve. He suggests that a better understanding of public perceptions and behavior can assist managers with the administration of public involvement processes and indicates that public participation leads to more effective resource management strategies.*

Sylvia, G. 1992. Concepts in Fisheries Management: Interdisciplinary Gestalts and Socioeconomic Policy Models. *Society and Natural Resources* 5: 115-33.

*This paper explores new directions in fishery research related to rights-based management systems, fishermen behavior, interdisciplinary research, and multiobjective modeling that can be used to improve the fisheries policy process and increase social benefits. A numerical multiobjective biosocioeconomic policy model is utilized to illustrate the value of interdisciplinary analysis and to analyze the effectiveness of the maximum sustainable yield and optimum yield concepts. The paper concludes with a discussion of the challenges (i.e., data requirements, dynamic systems) faced in developing and implementing comprehensive interdisciplinary analysis and the importance of meeting these challenges.*

Vanderpool, C.K. 1987. Sociology Theory and Methods: Social Impact Assessment and Fisheries. *Transactions of the American Fisheries Society* 116: 479-85.

*This paper defines social impact assessments and their role in the development of fishery management plans and related policy. The author argues that SIAs need to be legitimized and strengthened through clarification of objectives and limitations, an increased store of baseline data, and an assessment of costs and difficulties. He identifies the need for baseline data derived from systematic and comparative studies across different segments of the*

*fishing industry and related social organizations as the central concern of SIAs in fishery research. He argues that the historical comparisons derived from these data are essential to capturing the dynamics of stability and change in fisheries systems. He concludes with six additional priorities for sociological research.*

Wilde, G.R., R.B. Ditton, S.R. Grimes and R.K. Riechers. 1996. Status of Human Dimensions Surveys Sponsored by State and Provincial Fisheries Management Agencies in North America. *Fisheries* 21(11): 12-16.

*This study assesses the importance of human dimensions in natural resource management and provides a baseline for measuring future progress in human dimensions research and application. The authors report on the results of a mail survey conducted in 1994 to assess the status of human dimensions studies (excluding creel surveys) conducted by state, territorial, and provincial fishery management agencies. The survey focused on the frequency with which angler surveys are conducted, the amount of money spent, and the types of information that are collected.*

## **EVALUATING FISHERY PERFORMANCE**

Finch, R. 1985. Fishery Management Under the Magnuson Act. *Marine Policy* (July): 170-79.

*This paper considers the effectiveness of the MFCMA in two respects. The first relates to the unique form of management established by the Act, and the second, to the ability of fishery managers to meet the Act's objectives. The author suggests that the fishery management system is working "reasonably well," but identifies three major problems underlying the system: 1) the timeliness of the fishery management plan/amendment development process, 2) the centralization of authority, and 3) the relationship between the councils and the Secretary. He argues that managers have not been very successful in meeting conservation and stock-restoration objectives, but that development objectives have been met with success. He identifies important questions to address in the future related to furthering stock improvement and how to appropriately balance fishing capacity with resource size.*

Food and Agriculture Organization of the United Nations. 1993. Marine Fisheries and the Law of the Sea: A Decade of Change Special Chapter (revised) of The State of Food and Agriculture 1992. FAO Fisheries Circular 853. Rome: FAO.

*This report examines changes in marine fisheries during the decade following the Law of the Sea conference. It highlights global fishery resources and distribution; fishing costs and revenues; the continued investment in large-scale fishing vessels; legal, institutional and environmental developments; problems of open access; supply and demand; the growth in fishing effort on the high seas; and the difficulty of improving fishery management.*

Gale, R.P. 1985. Federal Management of Forests and Marine Fisheries: A Comparative Analysis of Renewable Resource Management. *Natural Resources Journal* 25: 275-315.

*This study undertakes a comparative sociological analysis of federal forest and marine fishery management. It begins with a discussion of common versus quasi-private property systems. Five parallels in USFS and NMFS management relate to 1) legislative chain and agency structure, 2) existence of state, local and corporate organization counterparts, 3) conceptual basis for management (i.e., carrying capacity, rotation, sustained yield, optimum yield, and allowable harvest), 4) harvester-processor range and relationships, and 5) resource-dependent communities. Forest and fishery management diverge with respect to scientific knowledge and data base, degree of professional diversity, decisionmaking and allocation systems, and involvement of the environmental movement. The author discusses possible changes for forest and marine fishery management involving political constituencies, and the structure and responsibilities of the agencies.*

Greenberg, E.V.C. 1992. The Magnuson Act after Fifteen Years: Is it Working? Presented at the 1992 National Fishery Law Symposium, 15-16 October 1992. Washington, DC: Garvey, Schubert & Barer.

*This paper briefly outlines several issues thought likely to be the center of debate during the 1993 reauthorization of the MFCMA. Issues identified include the breadth of the National Standards; lack of restrictions on the councils' choice of management alternatives; council composition; council membership, voting and conflict-of-interest; allocation of power between the councils and Secretary; analytical requirements for council decisionmaking; need for cost/benefit analyses; and the redefinition of statutory objectives. The author suggests that the inability to resolve these issues may lead to legislative paralysis and that, although there may be some "tinkering" with the issues during the reauthorization debate, fundamental changes are not likely.*

Griffith, D. and C.L. Dyer. 1996. Appraisal of the Social and Cultural Aspects of the Multispecies Groundfish Fishery in New England and the Mid-Atlantic Regions. Bethesda, MD: Aguirre International.

*This study evaluates the social and economic crises faced by fishing communities in New England and the Mid-Atlantic, as a result of regulatory changes related to the multispecies groundfish fishery. The purpose of the study is to provide managers with baseline social and cultural information that will assist in the development of regulations that minimize negative impact to fishing communities. The report assesses industry demographics and degree of community dependence on the groundfish fishery for five primary ports and nine secondary ports along the Northeast coast. In addition, it identifies social science databases that could be used as information sources for follow-up studies, as well as in predicting social impacts of regulations on fishing communities.*

Heen, K. 1989. Impact Analysis of Multispecies Marine Resource Management. *Marine Resource Economics* 6: 331-48.

*This study evaluates the impact of multispecies marine resource management on regional employment and income by combining multispecies bioeconomic modeling and input-output*

*analysis. A regional income-and-employment-impact-maximizing model of marine resource utilization is developed and implemented using data from the Barents Sea fisheries and the input-output table for North Norway. The results are compared with open access and resource rent maximization solutions.*

Iudicello, S. 1996. Overfishing Lures Legislative Reforms. *Forum for Applied Research and Public Policy* (Summer): 19-23.

*This essay evaluates the MFCMA's success in meeting fishery conservation objectives. The author begins with a review of the current state of U.S. fisheries under the Act. She then briefly describes the Act, important factors leading to its implementation, and weaknesses that inhibit the achievement of conservation objectives. These include ambiguities, the lack of specific timeframes in which to rebuild stocks, non- or mis-use of scientific information by the councils, out-of-date environmental impact statements, single-species management, and conflict of interest. She briefly discusses the role of subsidies in the overcapitalization of fishing fleets and highlights potential problems related to limited entry. Finally, she concludes with the Marine Fish Conservation Network's recommendations of amendments to address problems of overfishing, overcapitalization and conflict of interest.*

Lee, D.C. 1990. The Use of Production Indices in Planning and Evaluating Fisheries Management Programs. Discussion paper QE90-23. Washington, DC: Resources for the Future.

*This paper discusses the role of production indices in fishery program planning and evaluation and examines alternative measures of indices. The importance of using different indices for the planning and evaluation of management is discussed. Indices that estimate the production potential of future populations should be used in program planning to identify the capability of a management strategy to efficiently meet program objectives. Program evaluation indices should measure the difference in realized versus prior production levels to determine the effectiveness of a management strategy.*

Livingston, M.L. 1986. Patterns in Natural Resource Policy: The U.S. Experience. *Resources Policy* (March): 40-6.

*Based on interviews with about fifteen resource economists, this paper outlines changing patterns in national resource policy during the 20<sup>th</sup> century. Three major periods are described. The first is defined as the progressive conservation movement; the second, marked by the introduction of economics into resource policy; and the third, characterized as the environmental movement. Each period is marked by a change in policy evaluation criteria, the management tools used to implement policy, the role of government in resource policy, and/or distributional issues of the day. Potential sources of fundamental changes in resource policy are discussed, as well as the role of economists in policymaking.*

Marasco, R.J. and M.L. Miller. 1988. The Role of Objectives in Fisheries Management. Pp. 171-83 in *Fishery Science and Management*, ed. by W.S. Wooster. New York, NY: Springer-Verlag.

*This paper describes how fishery management plan objectives are formed as an outcome of the development process rather than defined at the onset. The authors define constraints of the regional councils as limited time and funding, imperfect information, limited rationality, a diversity of preferences, and ill-structured, complex problems. They exemplify this with a review of the NPFMC and the groundfish fishery. They argue that scientists should inform the management process, but sympathize with the political constraints of managers/decisionmakers who must consider input from all stakeholders. Finally, they provide four recommendations for the successful application of science in fishery management: 1) scientists should use a multi-disciplinary approach, recognizing that objectives will be driven by social and economic factors, 2) research topics should be addressed by the appropriate discipline, 3) science should not be driven by advocacy, and 4) scientists should recognize their role as researchers and not policymakers.*

National Marine Fisheries Service. 1999. The IFQ Program: 1999 Report to the Fleet. Juneau, AK: NMFS, Alaska Region.

*In addition to information for the 1999 season, this publication provides a review of the 1998 season in terms of allocations and landings, rate of harvest, location of landings, hired skipper activity, overages and underages, transaction terminals use, registered buyer information, enforcement activities and vessel safety statistics. It also assesses individual fishing quota program performance in terms of initial issuance of quota share, determinations, and appeals; quota share transfer activity; consolidation of quota share; and vessel participation. The last section contains a brief history and description of the IFQ program and a directory of useful contact information.*

National Research Council. 1994. Improving the Management of U.S. Marine Fisheries. Washington, DC: National Academy Press.

*This publication reports the results of a study undertaken to assess the effectiveness of U.S. fishery management. It discusses the MFCMA and identifies critical issues in U.S. fishery management related to overfishing, institutional structure, science and data quality and scientific approach. It outlines policy recommendations for congressional consideration during MFCMA reauthorization.*

North Pacific Fishery Management Council. 1994. Faces of the Fisheries. Anchorage, AK: North Pacific Fishery Management Council.

*This series of regional profiles, commissioned by the NPFMC in concert with NMFS, is intended to provide a snapshot of various coastal communities, highlighting their involvement in fisheries off Alaska. Community profiles were developed for western Alaska,*

*Pribilof Islands, Alaska Peninsula/Aleutian Islands, south central Alaska, Prince William Sound, Kodiak Island, southeast Alaska, Washington (Puget Sound) and Oregon.*

Norton, V.J., M.M. Miller and E. Kenney. 1984. Indexing the Economic Health of the U.S. Fishing Industry's Harvesting Sector. Presented at the Eighth Annual Seminar of The Center for Oceans Law and Policy of the University of Virginia, Cancun, Mexico, January 1984.

*This study reports on national trends in fisheries and develops a simplified method of evaluating the economic health of the fishing industry. The Industry Health Index is based on three components: 1) output price (ex-vessel price), 2) input costs (fuel, labor, repairs, etc.), and 3) productivity (catch/unit of fishing effort). The index is used to assess the economic health of eight major U.S. commercial fisheries, including scallop, Maine lobster, New England otter trawl, gulf shrimp, menhaden, surf clam, tuna, and king and tanner crab.*

Propst, D.B. and D.G. Gavrilis. 1987. Role of Economic Impact Assessment Procedures in Recreational Fisheries Management. *Transactions of the American Fisheries Society* 116: 450-60.

*This paper argues the importance of economic impact assessments in evaluating the effects of policy and investment decisions and discusses ways in which EIA results can be most useful to decisionmakers in recreational fishery management. The authors discuss appropriate uses of multipliers, the linkage between EIA and benefit-cost analysis, and methodological concerns and alternatives. They indicate that, regardless of the method or model chosen, EIAs in the natural resources field are limited by data quality.*

Sissenwine, M.P. and J.E. Kirkley. 1992. Fishery Management Techniques: Practical Aspects and Limitations. *Marine Policy* 6(1): 43-57.

*This study provides an evaluation of a wide range of fishery management techniques. The authors begin with a brief discussion of evaluation criteria, followed by a description of the practical aspects and limitations of active (catch and effort restrictions) versus passive (i.e., time/area closures and minimum size restrictions) management. The benefits of effort versus catch restrictions as means of active regulation are discussed. They consider the use of incentive/disincentive programs and price control as socioeconomic methods for influencing fishing effort, and examine various techniques that may be used to allocate catch or benefits, including trip limits, vessel allocations and controlled access. Finally, they recommend that additional methods of allocation be considered in the future.*

## **LOOKING AHEAD**

American Fisheries Society. 1993. Reauthorization of the Magnuson Act. *Fisheries* 18(10): 20-30.

*The AFS reports that, while the MFCMA has been successful in advancing the domestic fishing fleet, it has not worked to further fishery management or conservation. This paper*

*outlines the groups recommendations for the 1996 reauthorization: to strengthen the federal leadership role for long-term stewardship of marine resources, improve the trusteeship role of the regional council, and improve processes of fishery management plan development and implementation.*

Charles, A.T. 1994. Towards Sustainability: The Fishery Experience. *Ecological Economics* 11: 201-11.

*This paper presents an historical review of fundamental concepts and management practices related to ecological, socioeconomic and community sustainability. The author synthesizes these concepts in a framework described as a “sustainability triangle,” which is offered as a tool to evaluate ecological, socioeconomic, community and institutional sustainability. He concludes with an analysis of potential policy directions for sustainable development. These include the use of adaptive management, the development of integrated strategies to cope with the complex interactions between components of the fishery management system, decentralization of control and decisionmaking, the establishment of property rights system, and the combination of comprehensive fishery planning with economic diversification.*

Costanza, R., F. Andrade, P. Antunes, M. van den Belt, D. Boersma, D.F. Boesch, F. Catarino, S. Hanna, K. Limburg, B. Low, M. Molitor, J.G. Pereira, S. Rayner, R. Santos, J. Wilson and M. Young. 1998. Principles for Sustainable Governance of the Oceans. *Science* 281: 198-99.

*This article identifies the major problems facing the oceans and argues that the key to achieving optimal governance of the oceans lies in adopting management strategies that allow for uncertainty. The authors reason that this adaptive management framework should be structured around six key principles related to responsibility, scale-matching, precaution, adaptive management, full cost allocation and participation. Finally, they provide examples of institutional strategies that are capable of incorporating many of the principles simultaneously. These include share-based and co-managed fisheries, integrated watershed management, environmental bonding, and marine protected areas.*

Foster, N. 1993. The Magnuson Act: Expanding the Vision. *Fisheries* 18(10): 15-18.

*In this paper, the author describes stakeholder-identified issues believed to be important during the 1996 MFCMA reauthorization debate, including bycatch and waste; scientific, economic and social data needs; cumbersome and untimely regulatory processes; international management of highly migratory species; species-specific management; interjurisdictional conflicts; user fees; and management cost recovery. She then discusses those issues that the reauthorization process was focused on: habitat protection, a national data plan, full implementation of management measures, and support for fisheries industries in transition. She indicates that there is general acceptance of the Act and the regional council system among constituents and suggests that the strength of the Act lies in its transparency.*

Iudicello, S., S. Burns and A. Oliver. 1996. Putting Conservation into the Fishery Conservation and Management Act: The Public Interest in Magnuson Reauthorization. *Tulane Environmental Law Journal* 9: 339-47.

*This paper reviews the reauthorization of the MFCMA in terms of the public interest. The authors discuss the “common” utilization of fisheries resources, contrasting this with that of other natural resources. They highlight the increased involvement of fishery conservation and environmental groups in the reauthorization debate and describe three conservation amendments designed by a coalition of several of these groups to protect habitat, limit catches and reduce bycatch and discards. They provide an informed review of the congressional debate on these amendments and end with a brief discussion on overcapitalization and the debate on limited access.*

Mangel, M. 1999. Trade-offs between Fish Habitat and Fishing Mortality and the Role of Reserves. *Bulletin of Marine Science* (in press).

*This paper describes the role of no-take marine reserves in sustaining marine fisheries. The author develops a model to illustrate the tradeoff between essential fish habitat and fishing mortality. He argues that marine reserves are capable of promoting stock enhancement, protecting EFH and increasing catch simultaneously. He concludes with important design considerations for marine reserves.*

National Research Council. 1998. Sustaining Marine Fisheries. Washington, DC: National Academy Press.

*This report presents a holistic overview of the problems behind the decline of marine fisheries. It examines issues related to sustainability, the current state of marine fisheries and the effects of fishing on marine ecosystem structure and function. It discusses options for achieving sustainability<sup>3</sup>including ecosystem-based approaches to fishery management<sup>4</sup>and concludes with specific recommendations to significantly reduce fishing mortality. These relate to conservative approaches, ecosystem management, uncertainty, excess capacity, marine protected areas, bycatch and discards, technology, institutional structures, socioeconomic incentives, and information needs.*

Organisation for Economic Co-operation and Development. 1997. Towards Sustainable Fisheries. Paris: OECD.

*This publication begins with a statement adopted by the OECD Committee for Fisheries on the “Study on Economic Aspects of Management of Living Marine Resources,” and related to free access regimes and the use of incentives. It provides an assessment of the likely consequences of different fishery management approaches from an economic perspective. Specifically, it examines the historical background of fishery management, highlights fishery management trends since extended jurisdiction, examines fisheries and fishery management in OECD member countries, discusses the use of various management instruments (i.e.,*

*output and input controls, technical measures) and their economic, biological, social and administrative consequences, and looks at the consequences of institutional characteristics.*

Sissenwine, M.P. and A.A. Rosenberg. 1993. Marine Fisheries at a Critical Juncture. *Fisheries* 18(10): 6-10.

*This paper describes problems in fishery management (overutilization, overcapitalization and resource depletion); identifies the causes behind these problems (open access, uncertain scientific information and risk-prone fishery management decisions); and evidences ways in which the public, Congress, the NMFS, the councils, and the industry are working toward the resolution of these problems. The author identifies lost opportunities in U.S. fisheries in terms of net value and long term potential yield. He reviews national and global production trends and discusses the status of U.S. fisheries, as reported in the 1992 publication of "Our Living Oceans." He concludes with a suggestion of two critical management questions to be addressed in the future. Who will pay the cost of correcting problems? And, who will receive the benefits?*

Speir, J. (ed.). 1998. Sustainable Fisheries for the 21<sup>st</sup> Century? A Critical Examination of Issues Associated with Implementing the Sustainable Fisheries Act. New Orleans, LA: Tulane University.

*This book is a collection of essays presented in the fall of 1997 at the Tulane Law School in New Orleans. The essays examine critical issues associated with implementing the 1996 MSFCMA provisions related to overfishing, essential fish habitat, bycatch, international management and the use of individual transferable quotas. It concludes with transcriptions of three ancillary panel discussions recorded at the meeting on the subjects of coral reefs, hypoxic zones and marsh management.*

Waldeck, D.A. and E.H. Buck. 1999. The Magnuson-Stevens Fishery Conservation and Management Act: Reauthorization Issues for the 106<sup>th</sup> Congress. CRS Report for Congress. Washington, DC: 31 May 1999.

*This living document reviews reauthorization issues solicited from multi-sectoral participants in the fishery management system for the 1999/2000 MSFCMA reauthorization debate. The issues described within include individual quota management programs, regional council decisions, bycatch, marine protected areas, essential fish habitat, fishery management data collection, the definition of fishing community, the fishery management plan review process, highly migratory species, fees, and ecosystem health and long-term resource productivity.*

Walters, C.J. and C.S. Holling. 1990. Large-Scale Management Experiments and Learning by Doing. *Ecology* 71(6): 2060-68.

*This article explains that ecosystem complexity causes major resource management and policy changes to essentially act as "perturbation experiments," generating highly uncertain results. The authors discuss passive versus active adaptive management and highlight*

*challenges for designing management programs. These involve embracing/ exposing uncertainty, choosing the optimum number of experimental replicates, scale and replication, assessment of transient responses, and the prioritization of effort investment.*

World Wildlife Fund. 1997. Subsidies and Depletion of World Fisheries: Case Studies. Washington, DC: World Wildlife Fund.

*This book contains four case studies commissioned by the WWF to promote an informed discussion of future policy options with respect to fisheries subsidies: 1) Euro-African Fishing Agreements: Subsidizing Overfishing in African Waters, 2) The Newfoundland Fishery: Past, Present, and Future, 3) Theory and Practice of Fishing Vessel Buyback Programs (with special section on the New England Buyback Program), and 4) Effects of Japanese Government Subsidies of Distant Water Tuna Fleets. These reports examine the connection between government subsidies and fishing fleet overcapitalization and demonstrate the barriers presented by subsidy programs to achieving sustainable fisheries.*