Marine Resource Economics, Volume 21, pp. 337–340
Printed in the U.S.A. All rights reserved
0738-1360/00 $3.00 + .00
Copyright © 2007 MRE Foundation, Inc.

Topical Problems in Fishery Economics: An Introduction

USSIF RASHID SUMAILA
University of British Columbia, Vancouver

ANTHONY CHARLES
Saint Mary's University, Halifax

GIL SYLVIA
Hatfield Marine Science Center

This special issue contains a selection of papers presented at the 2005 North American Association of Fisheries Economics (NAAFE) Forum, which took place on May 25-27 at the University of British Columbia, Vancouver, Canada (http://oregonstate.edu/Dept/IIFET/NAAFE/2005Forum.html). In all, six peer-reviewed papers were accepted for this issue. They cover a variety of issues in fisheries economics, and together, represent recent developments to help address some of the difficult problems plaguing fishery management in the 21st century.

Crothers and Nelson (this issue) look at the important problem of managing high-seas fisheries. Many of the fisheries in crisis today are inshore and within Exclusive Economic Zones (EEZ). The fisheries in the high seas, which constitute about 56% of the entire world's ocean area, have yet to reach the same state. Nevertheless, there is ample evidence of overfishing of the high seas, as excess capacity spills offshore. The challenge facing the global community is avoiding an international "Tragedy of the Commons" (Hardin 1968), where nations claim the right to participate freely and unhindered in utilizing the resources of the high seas.

Since UNCLOS (Law of the Sea Convention) and the Fish Stocks and Compliance Agreements, a complex and evolving web of binding and non-binding international instruments has emerged with the objective of balancing conservation of high-seas resources and the interest of individual states in the use of these resources (Molenaar 2004; UN 2005). Currently, attempts to achieve sustainable management of high-seas fisheries have been primarily through the development of Regional Fisheries Management Organizations (RFMOs) which target cooperative management between those who choose to participate (Lodge 2004). RFMOs are not

---

Ussif Rashid Sumaila is an associate professor and director of the Fisheries Economics Research Unit, Fisheries Centre, University of British Columbia, Vancouver, Canada, email: r.sumaila@fisheries.ubc.ca. Anthony Charles is a professor in Management Science and Environmental Studies at Saint Mary's University, Halifax, NS, Canada, email: tony.charles@SMU.CA. Gil Sylvia is a professor and superintendent of the Coastal Oregon Marine Experiment Station, Hatfield Marine Science Center, 2030 SE Marine Science Drive, Newport, OR 97365 USA, email: Gil.Sylvia@oregonstate.edu.

We are grateful to the numerous sponsors of the 2005 NAAFE Forum, including: the US National Marine Fisheries Service, NOAA; the University of British Columbia (the Faculty of Graduate Studies); the Sea Around Us Project; the Fisheries Economics Research Unit; Hampton Research Endowment Fund; Aquatic Ecosystem Science Section, Province of British Columbia; Canadian Sablefish Association; Octaform Concrete Forming Systems; and the Natural Resources Defense Council. Finally, we thank the reviewers, whose input has definitely contributed to the quality of this special issue.

entirely successful for reasons summarized by Sumaila *et al*., (2007). The focus of Crothers and Nelson on the need for accountable governance arrangements to successfully manage high-seas fisheries is a good point. The paper proposes replacing the current right of open access to high-seas fisheries with defined property rights issued to nation states and managed within a governance framework designed to optimise environmental and economic outcomes from the use of high-seas fisheries. The proposal in the paper is a good starting point, which has the potential to contribute to the suite of proposals for the successful management of the high seas.

The paper by Zeller, Booth, and Pauly (this issue) considers the economics of small-scale fisheries in developing countries. It takes an innovative approach to analyzing fishery data (in this case, fish landings and associated economic data) for valuing small-scale fisheries (Berkes *et al*., 2001; Charles 1993; Durand, Lemoalle, and Weber 1991). The authors argue that contributions of small-scale, non-commercial fisheries to developing country economies are being systematically underestimated. They note, by way of motivation for their analysis, that in developing countries, official statistics, national accounts, and economic development initiatives generally focus on commercial, often export-oriented fisheries, which are perceived to be the major economic contribution of fisheries. While small-scale, non-commercial fisheries, especially near-shore subsistence fisheries, have been recognized as fundamental for social, cultural, and food security reasons, their catches are seldom accounted for in official statistics; thus, their contributions to GDP are often not taken into consideration.

To assess the extent of this phenomenon, the authors built on their previously published catch reconstructions by applying a valuation approach to reconstructed catch data for non-pelagic species to estimate total near-shore fisheries contributions to national GDP, using value-added estimators for each fisheries sector in combination with available price data. The results for case studies of subsistence and recreational fisheries of two Pacific islands suggest that the contributions of small-scale fisheries to GDP may have been underestimated by a factor of over five, and indicate that the non-commercial sector plays a more significant role in national accounts as contributors to GDP than currently assumed. In addition, the authors argue that fisheries such as these may have a far more fundamental economic role that is not reflected in present GDP measures; thus, the underestimation of their value may be problematic. The authors suggest that their analysis should challenge our perspective of the importance of various fisheries sectors to the economies of Pacific islands and other developing countries and should give international development agencies and lending institutions, as well as local governments, pause to rethink their prioritization of fisheries development support.

The use of marine protected areas (MPAs) is rapidly growing, thus requiring a greater need for understanding costs and benefits versus other conservation and management goals, and economic implications of specific MPA design options (size, location, *etc*.). Many of the economic issues around MPAs have been the subject of recent attention (*e.g*., Sumaila and Charles 2002). An important element in assessing costs and benefits is the potential impact on the fishing sector of placing an MPA in a specific location—which, in turn, depends on the choice of fishing locations preferred by fishers. While the location of a new MPA may be chosen on a largely ecological basis, the choice cannot be made effective without also taking into account fishing location preferences.

This issue provides the rationale for the methodologically oriented paper by Berman (this issue), who seeks to provide a tool for addressing the economic impact of spatial closures in marine fisheries by modeling the choices made by fishers in selecting fishing grounds. He focuses on developing and applying a new methodology based on Random Utility Models (*e.g*., Bockstael and Opaluch 1983; Smith

2005; Smith and Wilen 2003). The rationale for this new approach is based on an observation that in examining the impacts of spatial closures on fisheries, problems can arise if the analysis depends on aggregation of potential sites into large contiguous blocks. Berman's approach follows the assumptions of the conditional multinomial logit model for spatial choice in commercial fisheries. However, use of a Poisson approximation in the model permits the specification of a choice set of almost unlimited spatial detail. The author suggests that the approach models location choice within the large geographic scope and spatial detail of ocean fisheries while also responding to management needs. The methodology is examined through an application to the North Pacific groundfish fishery.

Larkin, Sylvia, Harte, and Quigley (this issue) address the economics of rebuilding of fish stocks in different countries. This is an important issue given that many of the world's fish stocks are currently in depleted states (Pauly *et al*. 2002; Christensen *et al*. 2003). The authors state that although rebuilding strategies are almost universally directed by the available biological information, approaches vary depending on fishery laws, management objectives, and technical guidelines. They investigate potential economic costs to the fishery that result by limiting the U.S. manager's flexibility in choosing a recovery trajectory. Using numerical models for moderate- and long-lived stocks, the analysis reveals that depending on productivity of the stock and the discount rate, extending the rebuilding timeframe can substantially increase annual catches and economic benefits. The results underscore the importance of economic analysis in crafting flexible rebuilding schedules that account for the unique characteristics of the fisheries, including economic and social needs. Larkin *et al*. make valid points, especially in situations where all the benefits of restoration, including both commodity (fish catch) and amenity values, are captured (Berman and Sumaila 2006).

In response to concerns about overcapitalization and the development of optimal fleets, the literature on technical efficiency in fisheries is growing rapidly. Holloway and Tomberlin (this issue) extend previous work on stochastic production frontiers by developing a Bayesian hierarchical approach that yields both efficiency estimates and probabilistic rankings of the relative technical efficiencies of fishing boats. They use an estimation algorithm based on recent advances in Markov Chain Monte Carlo methods and apply the method to a sample of 10,865 fishing trips by the shore-based U.S. Pacific whiting fishery during 1987–2003. They found systematic differences between efficiency rankings based on sample mean efficiency estimates and those that exploit the full posterior distributions of boat efficiencies. While this paper is a valuable contribution to the fishery technical efficiency literature, the authors note that more work is needed to address the differences in production frontiers among vessels.

Aquaculture is rapidly becoming an important source of fish protein for the world's population. Neira and Quagrainie (this volume) assess the risk-shifting behavior in the catfish market between processors and farmers. The study uses time-series regression techniques, incorporated into the classic principal-agent model, to examine the risk behavior of catfish processors. They found that catfish processors do not shift risk, but rather bear all market risk. It appears that catfish processors maximize expected payoff by offering lower prices to farmers and extracting trade gains from bearing the market risks. Farmers may implicitly be paying high risk premiums by receiving lower prices. This work also has implications to the capture fishery market which is characterized by similar working relationships.

These six papers together provide up-to-date analyses of high-seas fisheries management; the economics of small-scale fisheries; the economic impact of spatial closures in marine fisheries; economics of rebuilding overfished stocks; stochastic production frontiers; and the economics of catfish farming.

References

Berkes F., R. Mahon, P. McConney, R. Pollnac, and R. Pomeroy. 2001. *Managing Small-Scale Fisheries: Alternative Directions and Methods*. Ottawa, ON, Canada: International Development Research Centre (also available at www.idrc.ca/booktique).

Berman, M. 2006. Modeling Spatial Choice in Ocean Fisheries. *Marine Resource Economics* 21:375–94.

Berman, M., and U.R. Sumaila. 2006. Discounting, Amenity Values and Marine Ecosystem Restoration. *Marine Resource Economics* 21(2):211–19.

Bockstael, N., and J. Opaluch. 1983. Discrete Modelling of Supply Response under Uncertainty: The Case of the Fishery. *Journal of Environmental Economics and Management* 10:125–37.

Charles, A.T. 1993. Economic Research in Small-Scale Fisheries: Information Needs and Analytical Techniques. *Bulletin of the Special Interest Group on Traditional Management and Knowledge of Marine Systems* (South Pacific Commission, New Caledonia) 2:11–14.

Christensen, V., S. Guénette, J.J. Heymans, C.J. Walters, R. Watson, D. Zeller, and D. Pauly. 2003. Hundred Year Decline of North Atlantic Predatory Fishes. *Fish and Fisheries* 4(1):1–24.

Crothers, S., and L. Nelson. 2006. High-Seas Fisheries Governance: A Framework for the Future? *Marine Resource Economics* 21:341–53.

Durand, J.R., J. Lemoalle, and J. Weber, eds. 1991. *Research and Small-Scale Fisheries*. Paris, France: ORSTOM.

Hardin G. 1968. The Tragedy of the Commons. *Science* 162:1243–48.

Holloway, G., and D. Tomberlin. 2006. Bayesian Ranking and Selection of Fishing Boat Efficiencies. *Marine Resource Economics* 21:415–32.

Larkin, S.L., G. Sylvia, M. Harte, and K. Quigley. 2006. Optimal Rebuilding of Fish Stocks in Different Nations: Bioeconomic Lessons for Regulators. *Marine Resource Economics* 21:395–413.

Lodge, M.W. 2004. Improving International Governance in the Deep Sea. *International Journal of Marine and Coastal Law* 19:299–316.

Molenaar, E.J. 2004. Unregulated Deep-Sea Fisheries: A Need for a Multi-Level Approach. *International Journal of Marine and Coastal Law* 19:223–46.

Neira, I., and K. Quagrainie. 2006. Analysis of Risk Behavior in the U.S. Farm-Raised Catfish Market. *Marine Resource Economics* 21:433–43.

Pauly, D., V. Christensen, S. Guénette, T.J. Pitcher, U.R. Sumaila, C.J. Walters, R. Watson, and D. Zeller. 2002. Towards Sustainability in World Fisheries. *Nature* 418:689–95.

Smith, M.D. 2005. State Dependence and Heterogeneity in Fishing Location Choice. *Journal of Environmental Economics and Management* 50(2):319–40.

Smith, M.D., and J.E. Wilen. 2003. Economic Impacts of Marine Reserves: The Importance of Spatial Behavior. *Journal of Environmental Economics and Management* 46:183–206.

Sumaila, U.R., and A.T. Charles, eds. 2002. Economic Models of Marine Protected Areas. Special Issues of *Natural Resource Modeling* 15(3&4).

Sumaila, U.R., D. Zeller, R. Watson, J. Alder, and D. Pauly. Potential Costs and Benefits of Marine Reserves in the High Seas. *Marine Ecology Progress Series*. Forthcoming.

United Nations (UN). 2005. Oceans and the Law of the Sea. Report of the Secretary-General. Addendum. A/60/63/Add.1. New York, NY: United Nations General Assembly.

Zeller, D., S. Booth, and D. Pauly. 2006. Fisheries Contributions to GDP: Underestimating Small-scale Fisheries in the Pacific. *Marine Resource Economics* 21:355–74.