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**Addressing Disproportionate Burden: A framework for implementation
Summary Report of a Workshop Convened in Honolulu,
Hawaii, September 18-20, 2014**

**Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400
Honolulu, HI 96813
USA**



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1. Introduction

This document reports on a workshop held 18-20 September 2014 to address Disproportionate Burden (DB) in the implementation of the obligations stemming from the WCP-Convention¹ and of conservation and management measures established by the Western and Central Pacific Fisheries Commission (WCPFC). The workshop discussed principles underlying the definition for disproportionate burden and a process to evaluate the distribution of the conservation burden and how to offset it. This document assumes that the primary purpose of any measure under consideration is to satisfy an agreed upon conservation objective.

2. Definition

Article 30(2)c of the WCP-Convention states that in establishing conservation and management measures (CMM), members of the Commission shall ensure that measures do not result in transferring a disproportionate burden of conservation action onto developing States, territories and possessions. This obligation has been interpreted by States Parties in CMM2013-06 as a positive obligation on the Commission to ensure that any CMM does not result in a disproportionate burden.

The concept of disproportionality is not well defined in international law, but some guidance may be found from looking at the concept of proportionality, which is well established as a metric for equity and fairness. Disproportionality can be defined as the deviation from proportionality.

Proportionality can be broadly defined as each country paying a fair share of the costs of meeting the conservation goal. More formally, the costs incurred by member i (individual State or group of States) would be viewed as imposing a proportional burden if:

$$C_i = S_i^* (\sum_i C_i),$$

where S_i^* is the percentage share deemed to be fair for member i (see discussion in #8 below). C_i is the cost incurred by member i , and $\sum_i C_i$, is the summation of costs (i.e. the total cost) incurred across all members of the Commission. A member for whom the cost of the proposed management action exceeds its proportional share, i.e. for whom

¹ Convention on the Conservation of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean

$$C_i > S_i^*(\sum_i C_i),$$

would potentially qualify as experiencing a disproportionate burden. Whether the magnitude of the deviation is sufficiently large to be viewed as an actual disproportionate burden is a decision for the Commission.

3. Whose Benefits and Costs are to be Considered?

The benefits and costs of all members of the Commission need to be measured and valued when considering where the burdens of a conservation measure are distributed. However, the need to avoid transferring a disproportionate burden of conservation action applies only in the case of Small Island Developing States (SIDS), territories and possessions.

4. What is the Process?

There is a need to develop a formal process to assess whether there is a burden, whether it is disproportionate, and to provide different options to address/compensate it. Such a process may be timely and costly but necessary; for these reasons, it should focus on the most important management measures, and be conducted as a collective exercise, with clear steps and procedures.

Elements to consider in the development of the process should include:

- Who has the responsibility of demonstrating DB
- Evidentiary standards
- Dispute settlement
- Best available science to include independent expert panel and expert peer review
- Transparency and stakeholder engagement

5. What is the Baseline?

Evaluating DB requires analyzing the difference between net benefits with and without management action, based on the recommendation from the stock assessment model. The “without” scenario is the baseline from which the action’s benefits are compared. The baseline, or counterfactual, refers to the outcomes that would have occurred in the absence of additional conservation and management measures. A population dynamic bio-economic model, informed by fishery and socio-economic data, is the preferred way to assess the economic tradeoff of the fishery, with the starting baseline date to be determined by the Commission. Models used to determine the baseline should be fit to observed data, and all projections should indicate measures of statistical uncertainty.

6. How and What Do We Measure?

Measurement of benefits and costs for governments, fishing fleets, consumers (accounting for domestic consumption and food security), and value chain activities is

required for evaluation of the DB. Benefits and costs can be analyzed from two different informational perspectives. A financial analysis measures costs and benefits in existing market prices, and is undertaken and evaluated from the perspective of firms and consumers. An economic analysis evaluates the costs and benefits from the perspective of the national economy, considers benefits and costs that are not valued by market prices, and accounts for any market distortions in the economy.² Internationally accepted best practices for measuring costs and benefits should be employed.

The net value of benefits and costs from a conservation and management measure may occur over a period of years. This creates a timing issue in the calculation of DB that can affect its magnitude at various points in time. For this reason, measurement should be undertaken either period-by-period or as a net present value over the relevant time period. During the initial years after a management measure, costs often exceed benefits, so that net benefits are negative before they turn positive at a later date. A member can thus incur a DB for some period before the member eventually enjoys the positive net benefits that occur in later periods.

7. Decision Rule and Offsetting Payments

A primary objective shall be to avoid DB. DB can be avoided in the first place through the choice of management measures, or alternatively offsetting payments can be made for least-cost or other measures that impose a DB. Avoidance of DB can lead to selecting conservation and management measures that are not least-cost. Economic efficiency may then be foregone in an effort to avoid the DB or to prioritize equity (an equity-efficiency trade-off). The use of avoidance and offsetting payments to address DB can not only change the allocation of impacts but also affect incentives, and in turn the overall costs of meeting the conservation goals. Measures that avoid DBs are more likely to gain acceptance by all parties than measures that impose DB on one or more parties.

8. What is a “Fair” Distribution of Costs?

There are various ways to define fair distributions of costs, based on different principles regarding who should pay the costs of a given measure. For example, the “beneficiary pays principle” states that those who benefit most should pay the most. Alternatively, the “polluter pays principle” states that those who are responsible for the damages imposed on others should bear the costs. A “means-based principle” states that those who can “afford” to pay should pay. Who pays not only affects the potential magnitude of DB, but also the incentives of members and hence the economic efficiency of conservation measures.

The Commission will have to determine what combination of factors or principle(s) to use in defining a fair distribution of costs, which may vary by context. The principle(s)

² Market distortions include quotas, taxes, subsidies, unemployment, excess capacity in the economy, labor paid in kind, external costs and benefits, and the like. There are well-established international best practices for measuring the economic value (shadow prices) that accounts for these distortions and indirect effects such as additional employment and incomes.

chosen will determine the cost shares to be used in defining disproportionate burden (see #2 above). For example, if a “beneficiary pays principle” is adopted, the cost shares would be based on each member’s share of benefits. Formally, let B_i denote the gross benefit received by member i (individual State or group of States). Then the fair cost share under this principle for member i would be defined as $S_i^* = \frac{B_i}{\sum_i B_i}$, where $\sum_i B_i$ is the sum of gross benefits across all members.³ If a SIDS’ actual cost share exceeds this definition of its fair cost share (see #2 above), application of this principle would imply that this SIDS member would need to receive an offsetting payment to ensure that it does not bear a disproportionate burden.

In cases where the benefits are difficult to identify on an individual basis, a different cost sharing principle or combination of principles may be more appropriate for use in defining a member’s fair cost share.

For example, under an “ability to pay” cost-sharing principle, the share deemed fair for member i might be defined as $S_i^* = \frac{W_i}{\sum_i W_i}$, where W_i is a measure of the national income or wealth of member i and $\sum_i W_i$ is total income or wealth over all Commission members. Alternatively, under a “polluter pays” cost sharing principle, the share deemed fair for member i might be defined as $S_i^* = \frac{H_i}{\sum_i H_i}$, where H_i is a measure of the harm imposed by member i on all other members, and $\sum_i H_i$ is a measure of the total harm across all Commission members. The measurement of harm would differ across contexts. For example, in the context of bigeye tuna bycatch, H_i might be a measure of the bigeye bycatch attributable to member i . If a SIDS’ actual cost share exceeds this definition of its fair cost share (see #2 above), application of this principle would imply that this SIDS member would need to receive an offsetting payment to ensure that it does not bear a disproportionate burden.

9. How Do We Pay?

There are multiple ways to make offsetting payments, including payments in cash, in kind, or through a regulatory exemption approach. There are costs to offsetting payments, including administrative, information, and transaction costs, as well as disincentive effects upon the paying parties and losses in economic efficiency incurred when raising the funds. Examples of regulatory approaches include the distribution and implementation of transferable property rights or credit systems (for bigeye catch and/or bigeye bycatch). Proceeding in this fashion may be facilitated by a loan fund to mitigate short-term costs that SIDS incur during the initial phases of a measure when costs often

³ The fair cost share S_i^* is defined here in terms of gross rather than net benefits, so that the fair cost share is always positive ($S_i^* > 0$), where as $NB_i = B_i - C_i$ is the net benefits to member i , which can be positive, negative or zero.

exceed the benefits, such as periods of reduced purse seine harvests of bigeye during which bigeye stocks are allowed to rebuild. The way that offsetting payments or related adjustments are paid for and financed can affect incentives in ways that contribute to, or distract from, the achievement of a particular conservation goal.

**Participants in the WPRFMC Disproportionate Burden Workshop
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**Biographical Summaries of
Participants in the WPRFMC Disproportionate Burden Workshop
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Western Pacific Regional Fishery Management Council
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Megan Bailey

Dr. Bailey received her PhD from the UBC Fisheries Centre in 2012. She is currently a postdoctoral researcher at Wageningen University in the Netherlands, in the Environmental Policy Group. Her research focusses on the consumption or downstream end of the value chain, and the incentives that the market offers to help govern sustainability of fisheries. She also contributes to integrated and interdisciplinary science, combining fisheries ecology, economics and governance aimed at improving the management of international shared fisheries resources, specifically tuna, through the lens of cooperation. For more information see meganbailey.ca and besttuna.org.

Paul Callaghan

Paul Callaghan, Ph.D., MBA, MS is Professor Emeritus of Economics at the University of Guam where he taught for 30 years, primarily in the areas of finance, managerial economics, and marine resource economics. He chaired the Western Pacific Regional Fishery Management Council's Scientific and Statistical Committee for twenty five years, and is currently the chair of the Western and Central Pacific Fisheries Commission's Finance and Administration Committee. He has been involved with fisheries development and management in the Pacific for almost fifty years as a fisherman, agency director, government advisor, fisheries consultant, manager, and researcher.

Ray Clark

Ray Clarke is a Supervisory Fishery Biologist with the NOAA Fisheries Pacific Island Regional Office, International Fisheries Division. He has held a variety of positions with the NOAA offices in Hawaii over the past 30 years. He attended Humboldt State, University of Hawaii and University of Washington. His current focus is on U.S. participation in regional fishery management organizations – with the Western and Central Pacific Fisheries Commission being of considerable interest. In addition to RFMO work, Ray is one of the principle managers of the South Pacific Tuna Treaty – a multilateral access agreement with 16 Pacific Island nations and 40 U.S.-flagged distant water purse seine vessels.

Paul Dalzell

Paul Dalzell is senior scientist at the Western Pacific Regional Fishery Management Council. The Council has jurisdiction over federally managed fisheries in Hawaii, Guam, Commonwealth of the Northern Marianas, American Samoa and the Pacific Remote Island

Areas. Dalzell began his professional career in Papua New Guinea working on tuna baitfish stock assessment and later the biology and stock assessment of reef fish. He worked in the Philippines on an assessment of the nation's small pelagic fishery resources before returning to the Pacific Islands to work as a coastal fishery management specialist for the Secretariat of the Pacific Community based in New Caledonia (SPC). While at the SPC Dalzell co-authored a comprehensive review of Pacific Island coastal fisheries, including estimates of coastal fisheries production. He moved to Hawaii in 1997 to work in the pelagic fisheries section of the Council.

Charles Daxboeck

Charles Daxboeck holds a B.Sc. and M.Sc. from the University of Toronto and a Ph.D. in Zoology from the University of British Columbia. After leaving UBC he relocated to Hawaii to head the Pacific Ocean Research Foundation, collaborating with local and international scientists on studies of tuna and marlin biology. Dr. Daxboeck is a 30 year member, and current chair, of the Scientific and Statistical Committee of the Western Pacific Regional Fishery Management Council. He presently lives in French Polynesia where he heads BioDax Consulting, specializing in seafood safety and fisheries related socio-economic feasibility studies throughout the Pacific region.

Bob Deacon

Robert T. Deacon is Professor of Economics Emeritus at the University of California, Santa Barbara. His research specialties are natural resource and environmental economics, with special emphasis on the role of political institutions. His research has been published in leading general interest and specialty professional journals for economics, including the American Economic Review, Journal of Political Economy, Journal of Law and Economics, Journal of Environmental Economics and Management, Public Choice, and Land Economics. He has served on editorial positions for several journals and was Managing Editor for the Journal of Environmental Economics and Management. He has held fellowship or visiting faculty positions at universities in the U.S. and abroad and is University Fellow at Resources for the Future. He has held fellowship or visiting faculty positions at several universities in the U.S. and abroad. He has also served as an adviser or consultant to domestic and international research institutions, conservation organizations, private firms and government agencies.

Svein Fougner

Svein Fougner holds a B.A. in Economics from Valparaiso University and an MPA in Natural Resource Management from the University of Washington. He currently serves as policy analyst and advisor to the Hawaii Longline Association (HLA), a position he has held since 2005. Prior to that Svein worked for the National Marine Fisheries Service in various levels of fishery management, including preparation of fishery management plans and associated documents (regulatory impact reviews, environmental impact statements and assessments, regulations, decision documents) in collaboration with the Pacific and the Western Pacific Regional Fishery Management Councils. He is expert in all documentation requirements

for U.S. domestic fisheries management, including evaluation of impacts and of the distribution of impacts of fishery management measures. Svein has served as Executive Director of the Western Pacific Regional Fishery Management Council. He participated in early negotiations leading to the establishment of the Western and Central Pacific Fisheries Commission and has attended almost all meetings of the Commission and its subsidiary bodies since the Commission's establishment.

Quentin Grafton

Quentin Grafton is Professor of Economics, Chairholder UNESCO Chair in Water Economics and Transboundary Water Governance, Fellow of the Academy of Social Sciences of Australia, ANU Public Policy Fellow, Fellow of the Asia and the Pacific Policy Society, and Director of the Centre for Water Economics, Environment and Policy (CWEPP) at the Crawford School of Public Policy at the Australian National University. He served as Chief Economist and Foundation Executive Director of the Australian Bureau of Resources and Energy Economics (2011-2013) and has published more than 100 scholarly articles in some of the world's leading journals in economics and the life sciences (such as *Science* and *Nature Climate Change*), more than 30 chapters in books and 15 edited or co-authored books. Quentin has served in numerous advisory roles and expert panels in Australia and overseas, including as Chair of the International Geothermal Expert Group (2013-14), the Social and Economics Reference Panel of the Murray-Darling Basin Commission (2008-2009) and a member of the National Council on Education for Sustainability (2008-2010).

Quentin Hanich

Dr Quentin Hanich leads the Fisheries Governance Research Program at the Australian National Centre for Ocean Resources and Security (ANCORS), University of Wollongong. Dr Hanich has a strong research and consulting background in ocean governance, fisheries management and development, and marine conservation, and has led numerous projects throughout the Asia Pacific region. He is recognized as a regional expert on international fisheries governance and development, and more broadly on various aspects of oceans governance and environmental management and development. Dr Hanich is a member of the Wageningen University's BESTtuna Advisory Board, an assessor for the Australian Research Council, and a regular peer reviewer for various academic journals focusing on fisheries, marine law, and food security. In addition to his research and project activities, he has chaired international working groups at treaty meetings, facilitated inter-governmental workshops, and advised Ministerial meetings and national delegations. He also lectures and writes on oceans governance, marine conservation, and fisheries development in the Asia Pacific. In 2013, Dr Hanich led the establishment of the Fisheries Equity Research Network (FERN) to encourage international research into the multi-lateral distribution of conservation limits in trans-boundary oceanic fisheries. FERN is an international multi-disciplinary partnership that aims to support the establishment of transparent and equitable rules and frameworks for assessing and distributing conservation burdens in transboundary fisheries.

Hussain Hassan

Dr. Hussain Rasheed Hassan is from the Maldives. He is a fisheries economist by training and has an extensive background in fisheries. He was the Minister of State for Fisheries and Agriculture from 2008 to 2013 with his main responsibility being to oversee the development and management of the fisheries sector. Prior to becoming the Minister of State for Fisheries, he served in the Ministry in various capacities ranging from being a fisheries extension officer to Director responsible for economic research and statistics. Dr. Hussain was instrumental in Maldives becoming a full member of the IOTC and in transforming the fisheries management regime in the country from a free and open-access fishery to a managed licensed fishery that is in compliance with EU-IUU fisheries Regulations. Dr. Hussain is a notable advocate of sustainable small-scale fisheries, and RFMO-based fisheries conservation and management. He has over 12 years working experience in the civil service and in the academia. He has also worked as a researcher and a lecturer at the Centre for the Economics and Management of Aquatic Resources (CEMARE), the University of Portsmouth, UK. Dr. Hussain holds a Bachelor of Applied Science (Fisheries) from the Australian Maritime College, an MSc in Fisheries Economics, and a PhD (World Production and trade in tunas) from the University of Portsmouth. Dr. Hussain is a Trustee and a member of the Scientific & Technical Advisory Committee (STAC) of the International Pole and Line Foundation (IPNLF). He was also the Chairman of IPNLF from June 2012 to May 2013.

Eric Kingma

Eric Kingma is currently International Fisheries, Enforcement, and NEPA Coordinator for the Western Pacific Regional Fishery Management Council, where he has worked since 2003. Born in Hawaii, Eric has an undergraduate degree in biology, a master's degree in public administration, and is currently a Ph.D. candidate at the University of Wollongong Australian National Center for Ocean Research and Security.

Pierre Kleiber

Pierre Kleiber holds a bachelor's in Biochemical Sciences from Harvard College and a Ph.D. in Zoology from University of California – Davis. He is recently retired from the National Marine Fisheries Service, Southwest Fisheries Science Center, after a long and distinguished career during which he held positions with the South Pacific Commission, the University of British Columbia, and the Institute of Ecology and Genetics at Aarhus University, Denmark. Dr. Kleiber's research interest and expertise lie in the fields of movement behavior, population dynamics, stock assessment, computer modelling, and data analysis. He presently serves on the Scientific Committee of the Western and Central Pacific Fisheries Commission, the Scientific and Statistical Committee of the Western Pacific Regional Fishery Management Council, and the Pelagic Plan Team of the Western Pacific Fishery Management Council. Dr. Kleiber has authored or coauthored more than twenty eight peer reviewed journal articles and has many consultancies and research papers to his credit.

Gary Libecap

Gary Libecap is Professor of Corporate Environmental Management, Bren School of Environmental Science and Management and Department of Economics, University of California, Santa Barbara. He also is an Associate, National Bureau of Economic Research, Cambridge, Massachusetts. His Ph.D. is from the University of Pennsylvania. His research focuses on how or under what circumstances property rights to natural and environmental resources can be defined and enforced to address the problems of open access and how or when markets might be developed as options for more effective resource management and allocation. He examines the bargaining and transaction costs involved in collective action to establish property institutions and markets. His work encompasses economics and law, economic history, natural resource economics, and economic geography. Gary Libecap has authored or co-authored over 200 scholarly papers in peer-reviewed journals, including the *American Economic Review*, *Journal of Political Economy* and *Journal of Economic Literature*. He also has chapters in academic volumes, and research reports as well as a series, *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth* has 22 volumes, where he served as Editor 1985-2011. His latest books are *Owens Valley Revisited: A Reassessment of the West's First Great Water Transfer*, Stanford University Press, 2007, *The Economics of Climate Change: Adaptations Past and Present*, co-edited with Richard Steckel, University of Chicago Press and NBER, 2011, and *Environmental Markets: A Property Rights Approach*, with Terry L. Anderson, Cambridge University Press, 2014.

Michael Lodge

Michael W. Lodge is Deputy to the Secretary-General and Legal Counsel for the International Seabed Authority (ISA). He received his LLB from the University of East Anglia, and has an MSc in marine policy from the London School of Economics and Political Science. He is a barrister of Gray's Inn, London, and has served as legal counsel to agencies including the ISA, the OECD Round Table on Sustainable Development and the South Pacific Forum Fisheries Agency. Michael Lodge was Executive Secretary of the MHLC that led to the adoption of the WCPF Convention, and subsequently served as head of the secretariat for the Preparatory Commission and Interim Executive Director of the WCPF Commission.

Angela Martini

Angela Martini is a long standing career official of the European Commission, which she joined in 1994. After many years being in charge of EU immigration and asylum policy subjects, she is currently the EU head of delegation to the three RFMOs dealing with Fisheries in the Pacific, namely WCPFC, IATTC and SPRFMO. She holds a degree in International Relations from the University La Sapienza of Rome and a Master degree in European Studies from the College of Europe.

Peter Miyake

Makoto P. Miyake, PhD Biologist, currently is the Visiting Researcher, National Research Institute of Far Seas Fisheries, Shimizu, Japan. He specializes in assessments and management of fish stocks (particularly of tunas). Specialized fields include organizing statistical systems, stock assessments, fisheries management specifically regarding catch and trade documentation systems, global management of fishing capacity, IUU problems, tuna farming and its trade and marketing. He has authored many scientific papers during a professional career that includes: Councilor of the Japanese Fisheries Agency, Assistant Director of the International Commission for the Conservation of Atlantic Tunas (ICCAT), Scientific Advisor to Japan Tuna (longline association), Associate of the Organization for Promoting Responsible Tuna Fishery (OPRT).

Wez Norris

Wez Norris is the Deputy Director-General of the Honiara based Forum Fisheries Agency (FFA). FFA undertakes a diverse range of tasks at the national, regional and global level with the challenge of delivering robust fisheries management arrangements that achieve sustainability objectives. At the same time, its fundamental focus is on paving the way or opening opportunities for domestic development or other benefits within Small Island Developing States and Territories. The overwhelming reliance of FFA members on fisheries resources for government revenue, employment and food security highlight the importance of getting this balance right. Wez' primary role is to oversee and integrate work delivered by the three technical Divisions of the Agency in order to ensure that coherent and comprehensive advice and services are delivered to members individually and collectively. Determining ways to use management frameworks to exert additional control over, and achieve optimum returns from fisheries in the region is a key area of focus. Prior to assuming the post at FFA, Wez managed a range of fisheries from tuna to prawns in the Queensland and Commonwealth Governments in Australia, including through the introduction of several quota management systems.

Minling Pan

Dr. Minling Pan received her PhD from the Department of Natural Resources and Agriculture Economics, University of Hawaii at Manoa, in 1998. She joined NOAA Fisheries in 2002 and currently serves as a chief economist in the NOAA Pacific Islands Fisheries Science Center. Dr. Pan also is a committee member of the Scientific and Statistical Committee of the Western Pacific Regional Fishery Management Council and an affiliate faculty member of the Department of Natural Resources and Environmental Management at the University of Hawaii. Dr. Pan conducts economic research and oversees economic data collection programs in support of fisheries management in the U.S. Pacific Islands areas, including Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. Dr. Pan established five continuous economic data collection programs in the main commercial fisheries of the Pacific islands area and she applied the data collected to assess the economic viability and stability of the fisheries. Dr. Pan's recent publications focus primarily on the evaluation of fishery policies and regulations related to protected

species interactions with fisheries, such as: the spillover effect of sea turtle conservation, trade-off analysis between the economic return of commercial fisheries and protected species conservation, and the implications of a catch share program in the Hawaii longline fishery. Dr. Pan served as guest editor for two special issues published by the journals *Aquaculture Economics & Management* (Volume 16, Issue 2, 2012), and *Marine Policy* (Volume 44, 2014).

Chris Reid

Dr Chris Reid holds a PhD in Economics from the University of Queensland and specialises in Fisheries Economics with over 20 years of experience in the field. Dr Reid currently works as an economist for the Forum Fisheries Agency (FFA) providing economic advice to its membership in relation to the management of the tuna fisheries of the WCPO and the development of domestic tuna and related industries.

Kathy Segerson

Dr. Kathleen Segerson is a Board of Trustees Distinguished Professor and Alumni Association Distinguished Professor of Economics at the University of Connecticut. She is an environmental economist, with a strong interest in collaborative interdisciplinary work. Dr. Segerson holds a BA in mathematics from Dartmouth College and a PhD in agricultural and resource economics from Cornell University. She is a fellow of the Association of Environmental and Resource Economists (AERE) and of the American Agricultural Economics Association (AAEA). She is past-president of AERE, and has served as Vice-President and a member of the AERE Board of Directors. She is currently a co-editor of the *Journal of the Association of Environmental and Resource Economists* and has previously served as a co-editor and an associate editor of the *American Journal of Agricultural Economics* and an associate editor of the *Journal of Environmental Economics and Management*. Dr. Segerson has been a member of the Chartered Board of the U.S. Environmental Protection Agency's Science Advisory Board (SAB), and has served on several SAB committees, including serving as vice-chair for the Committee on Valuing the Protection of Ecological Systems and Services. She is also currently a member of the Board on Agriculture and Natural Resources of the National Research Council (NRC) of the National Academy of Sciences. Past service also includes several advisory committees for the NRC and the National Science Foundation, including recent service on the NRC Panel on the Review of the National Climate Assessment. She also serves on the Centre Advisory Panel of the Nordic Center on Research on Marine Ecosystems and Resources under Climate Change and the External Advisory Board of the National Socio-Environmental Synthesis Center (SESYNC).

Kitty Simonds

Kitty Muller Simonds has been the executive director of the Western Pacific Regional Fishery Management Council since 1983. A native of Maui, HI, she joined the council in its early months after serving on the staff of U.S. Senator Hiram L. Fong in his Washington, DC, and Honolulu offices. Under her direction the Council has successfully undertaken innovative marine resource management. It has pioneered in the regulation of

controversial gear, such as drift gill nets and bottom trawls. Further, under her leadership, the Hawaii longline fishery has become a global model for environmentally responsible pelagic longline fishing. This includes high rates of observer coverage, pioneering the use of satellite-based vessel monitoring systems in the US, and gear modifications that markedly reduced sea turtle, seabird and shark interactions and mortality. She also convened several major international Fishers Forums to provide a mechanism for fishermen to share their ideas on minimizing longline bycatch. In addition, the Council's Coral Reef Fishery Ecosystem Plan was the nation's first fishery management effort of its kind, and later the Council transformed all of its fishery management plans into ecosystem plans. In parallel with this initiative, she convened a series of workshops to capitalize on local and traditional ecological knowledge which could be adapted into a modern fishery ecosystem management framework.

Dale Squires

Dale Squires is Senior Scientist with NOAA Fisheries in La Jolla, California, Adjunct Professor of Economics at the University of California San Diego, and on the Scientific Advisory Committees of the International Seafood Sustainability Foundation and International Pole and Line Foundation. He has co-authored or co-edited eight books and monographs and about 110 peer-reviewed journal articles and book chapters. He has worked with Regional Fishery Management Organizations, World Bank, FAO, OECD, WorldFish Center, European Commission, CLIOTOP, Pacific, Western Pacific, and New England Fishery Management Councils, and NGOs, universities, fishing industry, and governments around the world. His current research interests are the conservation and management of large pelagic ecosystems and technological change.

Jenny Sun

Jenny Sun presently serves as a Senior Marine Resource Economist in the Gulf of Maine Research Institute and as Graduate Faculty of the Interdisciplinary Doctor of Philosophy at the University of Maine. The primary focus of Dr. Sun's research is the application of quantitative research and policy analysis relating to market incentives-based management of marine resources and ecosystems. She is experienced and knowledgeable regarding global fishery industries, institutions, and coastal community economics. Her interests in fisheries economics cover a number of topics, including bioeconomics, climate change, welfare analysis, and rights-based management, especially regarding the economic incentives of global tuna conservation measurement. Jenny has published 29 journal articles, 9 book chapters, and more than 70 conference papers, coordinated more than 70 projects, and serves as advisor for more than forty graduate students. While she was a Research Scholar at the Inter-American Tropical Tuna Commission in 2009-10, she chaired the workshop "Global Tuna Demand, Fisheries Dynamics and Fisheries Management in the Eastern Pacific Ocean," La Jolla, CA on May 13-14, 2010. The Workshop studied ways to analyze, facilitate and manage the economic tradeoffs between the tuna purse-seine and longline fishery in the East Pacific Ocean (EPO). Dr. Sun currently serves as Co-PI for two collaborative NSF (CNH and Coastal SEES) grants to explore the impacts of economic, regulatory, and oceanographic conditions as determinants of the spatial-temporal

dynamics of international tuna purse-seine fleet in EPO, and in the lobster and groundfish fisheries in Gulf of Maine.