OSM Session on *"Strategies for ecosystem management in a changing climate"*

by Anne B. Hollowed, Suam Kim and Manuel Barange

The co-authors of this summary co-convened Session S7 on "*Strategies for ecosystem management in a changing climate*" held April 17, 2014, as part of the PICES FUTURE Open Science Meeting. The session was co-sponsored by the ICES-PICES Strategic Initiative (Section) on *Climate Change Effects on Marine Ecosystems*.

Overview

The session explored the complex issue of implementing an ecosystem approach to management under changing climate conditions. Climate change is expected to impact the distribution and abundance of fish and shellfish through direct and indirect pathways. The temporal signature of these changes will be dominated by long-term trends and thus may require new approaches to setting biological reference points for single species management. Projection models indicate that climate change may alter the species composition within an ecosystem which, in turn, could change the structure and function of the system. New approaches may be needed to address the complex issues of defining biological and ecosystem reference points under uncertain future states of nature. For fished stocks that are projected to decline under changing climate conditions, it is unclear when or if additional precautionary approaches would sustain the populations or the fishery that depends on them.

Objectives

Participants in this session presented papers that addressed the research theme noted above by: A) exploring implementations of an ecosystem approach to management under projected climate change; B) proposing techniques that identified how uncertainty in climate and biological responses could be incorporated into biological or ecosystem reference points; C) evaluating the performance of proposed strategies under changing climate conditions; and D) defining the precautionary approach under a changing climate.

Summary

Scott Large gave the keynote talk for this session on behalf of Jason Link. The presentation, entitled "S*olutions for marine ecosystem-based management in a changing climate*", focused on Objective "A" above and identified what changes to the current approach for defining and implementing an ecosystem approach to management will be needed to adapt to changing ecosystem conditions. The speaker recommended that the "climate savvy" ecosystem approach will include vulnerability and risk assessments, enhanced data collection, next generation modeling, and skill assessments to evaluate projection performance.

The session included 10 oral presentations. The first three talks focused on Objective "A". Samuel Pooley presented several examples from the Hawaii region of how marine ecosystems could mediate the relationship between people and nature. Jake Rice discussed the information that is really needed to inform adaptation strategies to climate change. His talk considered the question of: How well does the supply of science advice meet the demand for policy support? He noted that scientists attempting to project future climate change impacts on marine ecosystems should consider the impacts of extreme events rather than focusing solely on average conditions. Biological Envelope Modeling will not be applicable to all fisheries management issues, as such projections are primarily for use for large-scale fisheries targeting mobile species. He advocated more place-based forecasts of fish communities. Manuel Barange discussed how climate impacts on fisheries production differentially affect fisheries-dependent communities.

Dr. Jake Rice (Canada) discussing adaptation strategies to climate change.

Dr. Manuel Barange (UK) discussing climate change impacts on fisheries production.

Manuel Barange, Jake Rice and Myron Peck (back to camera) talking about adaptation strategies during break?

Five talks focused on Objective "B". Paul Spencer discussed techniques for evaluating the implications of climate-induced shifts in spatial distributions on predator–prey interactions. Jacquelynne King reviewed several management approaches employed for northeast Pacific fish stocks that incorporated climate variability and change. Kirstin Holsman, presenting on behalf of Kerim Aydin, discussed a full end-to-end model that has been developed for the Bering Sea. Anne Hollowed, on behalf of Sukyung Kang and Nicholas Bond, presented results of projected production of Korean chub mackerel under past and future climate climate conditions. Tim Essington discussed the benefits of conducting meta-analyses as a technique for understanding key factors underlying fish responses to climate change.

Two talks focused on Objective "C". Kirstin Holsman presented a multispecies modeling approach that incorporates climate effects on bioenergetics. This model is formulated to allow the analyst to explore the trade-offs of different management strategies through a management strategy evaluation. Anne Hollowed and Cody Szuwalski are working on the difficult task of defining a suite of potential strategic responses that managers and stakeholders might consider in the future. None of the talks specifically dealt with Objective "D".

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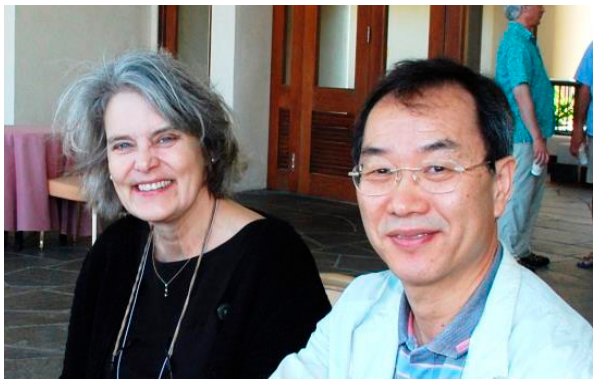

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Dr. Suam Kim (suamkim@pknu.ac.kr) is a Professor of the Pukyong National University, Busan, Korea. His areas of interest include fisheries ecology, especially recruitment variability focusing on early life histories of fish in relation to oceanic/climate changes. Suam has represented Korea in several international organizations and programs, such as PICES, GLOBEC, CCAMLR, IGBP, NPAFC and SCOR. He serves as Co-Chairman of the joint PICES/ICES Section on Climate Change Effects on Marine Ecosystems.

Dr. Manuel Barange (m.barange@pml.ac.uk) is the Deputy Chief Executive and Director of Science at the Plymouth Marine Laboratory (UK). He was Director of the International Project Office of the IOC-SCOR-IGBP core project GLOBEC from 1999–2010 and Chairman of the Scientific Committee of the International Council for the Exploration of the Sea (ICES) from 2010–2013. Manuel's expertise includes physical/biological interactions, climate and anthropogenic impacts on marine ecosystems, fish ecology, behaviour and trophodynamics, and fisheries assessment and management. In recent years, he has increasingly focused his research on the impacts of climate change and economic globalization on marine-based commodities, and on the interactions between natural and social sciences in fisheries, ecosystems and climate change, in both the developed and developing world. He co-chairs the ICES/PICES Strategic Initiative (Section) on Climate Change Effects on Marine Ecosystems and is a founding member of the Global Partnership for Climate, Fisheries and Aquaculture (PaCFA).