

**Annex 13****SEMINAR REFERENCE POINTS  
FOR HMS FISHERIES MANAGEMENT**

International Scientific Committee for Tuna and Tuna-like Species  
in the North Pacific Ocean

14 July 2009  
Kaohsiung, Taiwan

A seminar on biological reference points was convened by Jon Brodziak of the Pacific Islands Fisheries Science Center at the request of the ISC Chairman. The seminar included seven presentations on the theory and application of biological reference points and socioeconomic indicators for fisheries management with special consideration of highly migratory species. The presentations focused on objectives measures of sustainability, resource management in tuna RFMOs, and associated yield-based reference points, modern spawning potential reference points, and reference points for ecosystem-based fishery management.

The need for reference points to measure sustainability was the focus of the first presentation. Types of single-species population models with compensatory dynamics were also covered along with the potentially complicating factors of depensation and environmental forcing under alternative oceanographic regimes such as the Pacific Decadal Oscillation.

The second presentation focused on the history of resource management in tuna regional fishery management organizations (RFMOs). The presentation included information on the evolution of the concept of maximum sustainable yield (MSY) as a target reference point. The introduction of precautionary approach and the difficulties associated with managing multi-species, multi-fleet fisheries were also addressed. Some of the current problems in RFMOs included regulatory compliance, overcapacity, discarding practices, and illegal, unreported, and unregulated fishing.

The third presentation focused on the theory and implementation of classical yield-based reference points for fisheries management. The historical development of the traditional concept of maximizing sustainable yield was thoroughly described. The presentation also identified potential problems with the use of MSY as a reference point. These included: estimation difficulties, appropriateness of MSY as a management goal, and ability to effectively implement harvest strategies based on MSY. The evolution of MSY as a limit reference point as opposed to a target reference point was also described along with the dependence of MSY on changing fishery selectivity patterns in multispecies fisheries.

The fourth presentation considered the topics of spawning potential ratio (SPR)-based reference points and harvest control rules for fisheries management. The development of

SPR-based target and limit reference points for biomass and fishing mortality were described using the US west groundfish fishery as an example. In this case, MSY-based reference points or their proxies are mandated for fisheries management. The use of  $F_{SPR}$  instead of  $F_{MSY}$  and  $B$  relative to unfished biomass instead of  $B_{MSY}$  as reference points was advocated as a pragmatic approach due to difficulties in estimating the curvature of the stock-recruitment relationship required to estimate MSY in an age-structured assessment model.

The fifth presentation considered the theory and application of fishery economic indicators and reference points for fisheries management. The concept of maximum economic yield (MEY) was discussed along with its relation to MSY. In general, it was pointed out that the effort associated with MEY was lower than MSY, all else being equal. The application of socioeconomic indicators, such as economic rent, employment, and food supply, was also addressed. An analysis of the strengths, weaknesses, opportunities, and threats to the introduction of socioeconomic indicators was presented and the question of whether the management system was ready to include this type of information was posed.

The sixth presentation considered socioeconomic aspects of tuna fishery management. Two case studies of the economic aspects of bluefin tuna harvest in Japanese fishing communities were presented. These studies demonstrated the importance of bluefin tuna to coastal fishery communities. The presentation also considered the development of socioeconomic indicators to provide alternative measures of the performance of fishery management.

The last presentation focused on the development of indicators and reference points for ecosystem-based fishery management. Alternative types of objectives for fisheries management were described including biological, economic, societal, and political. To address potential conflicts and compatibilities between objectives, the concept of ecosystem-based fishery management was introduced as a holistic approach to maintaining ecosystem quality and sustaining associated benefits. Management strategy evaluation with multiple performance indicators using reference points as strict biological constraints for risk management was introduced as an adaptive approach to improve fishery management advice.

## Agenda

### ISC 9 Seminar on Reference Points for HMS Fisheries Management

ISC 9 Plenary Meeting Room

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- 2:00 PM Introduction: Reference points for measuring sustainability  
Jon Brodziak, Pacific Islands Fisheries Science Center
- 2:15 PM Resource management in tuna regional fishery management organizations  
Makoto Miyake, National Research Institute of Far Seas Fisheries
- 2:35 PM Classical yield-based reference points  
Yukio Takeuchi, National Research Institute of Far Seas Fisheries
- 2:55 PM Spawning biomass per recruit reference points and harvest control rules  
Kevin Piner, Southwest Fisheries Science Center
- 3:15 PM Break
- 3:30 PM Fishery economic indicators and reference points  
Gakushi Ishimura, Hokkaido University
- 3:50 PM Reference points for management of fisheries plus consumption situation  
Tsutomu Miyata, National Research Institute of Fisheries Science
- 4:10 PM Indicators and reference points for ecosystem-based fisheries management  
Jon Brodziak, Pacific Islands Fisheries Science Center
- 4:30 PM How can reference points be used to improve management advice?  
Discussion