



**Adapting Fisheries Management to a Changing Ecosystem**  
**7th National Scientific Coordination Subcommittee Meeting**  
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**Adapting Fisheries Management to a Changing Ecosystem**

**Session 1: How to incorporate ecosystem indicators into Stock Assessments?**

- 1) What criteria and diagnostics are needed for acceptance of an indicator into an assessment?
  - a) Strong statistical relationship with key process?
  - b) Detectable improvement in model fits?
  - c) Demonstration of forecasting skill?
  - d) Verification of relationship over time?
  - e) Strong mechanistic basis?
  
- 2) How should we address short-term events (e.g., MHW)?
  - a) Consider (ad-hoc and / or environmentally triggered?) short-term time blocks for mortality, growth or reproductive events?
  - b) Conduct full time-varying evaluation of process, with or without environmental constraint as appropriate.
  - c) Conduct multi-stage fitting of time blocks to assess appropriate location and length of the block.
  - e) What criteria should be used to incorporate continuation of recent short-term events in projections of future biological reference points?
  
- 3) What do you do if you have a stock that is assessed on a 2, 3, 4 or more year cycle if an environmental anomaly occurs?
  - a) Stay the course and hope for the best?
  - b) Conduct an emergency update?
  - c) Add a reduction in the ABC due to ecosystem uncertainty?
  - d) Employ an interim analysis with a lower threshold for data requirements?
  - e) Should economic anomalies (e.g., COVID impacts) also be considered along with environmental anomalies?
  
- 4) Some regions have attempted to formalize the indicator selection process through Ecosystem Socioeconomic Profiles, Ecosystem Status Reports or other Integrated Ecosystem Assessment activities.
  - a) Should there be a standard nationwide process that is applicable to all regions?
  - b) Does failure of an author to use an indicator reflect poorly on the research on that indicator?
  - c) Once a suite of candidate indicators have been identified, how many years should elapse between full review of candidate processes?
  
- 5) What to do under non-stationarity?

- a) How to determine whether changes in specific parameters (i.e.,  $B_0$ , relationships between MSY and  $B_0$ ,  $r$ ,  $K$ , etc) are due to extrinsic ecosystem drivers or intrinsic drivers resulting from fishing?
- b) How to identify these ecosystem indicators/drivers, and what guidance could be provided to managers regarding reference points (i.e., shifting goal posts) if they are identified?
- c) Can we quantify non-stationarity and incorporate it directly into assessments.

6) How to identify and incorporate ecosystem indicators when the stocks are assessed and managed as multi-species complex with different life histories? Apparent ecosystem indicators/drivers that impact the complex may have measurable effects on particular species on differing time scales depending on maturity schedules, age of recruitment into a fishery, and growth.

7) Are there scenarios/stocks where ecosystem indicators are not useful?

8) How are ecosystem indicators incorporated into assessments in your region?

- a) Covariates on recruitment?
- b) Used to determine time blocks for natural mortality?
- c) Informing time varying catchability?

9) How to account for time-varying catchability in multi-species fisheries if/when CPUE of 'dominant' or indicator species declines even if true abundance is unaffected?

10) How are existing management frameworks (e.g., overfishing and rebuilding timeframes) able to accommodate the type of effects considered under this topic? How could management systems be more adaptive to address short-term changes?

### **Synthesis of ideas / approaches**

## **Session 2: Developing information to support management of interacting species in consideration of ecosystem-based fishery management (EBFM)**

- 1) In cases where predation mortality is incorporated into assessments in your region, how is this accomplished?
- 2) Has your region considered a system level cap? What is the basis of the system level cap and how are individual species managed under the cap?
- 3) How are forage species assessed and managed in your region? Are fluctuations in the availability of forage species taken into account when specifying catch levels for predators?
- 4) Are the needs of non-target predator populations (e.g., marine mammals) accounted for in harvest control rules?
- 5) How are multi-species or ecosystem models in your region used in management?
  - a) To determine reference points?
  - b) To identify species interactions or ecosystem concerns that may affect reference points?
  - c) To quantify predation mortality, prey availability (and its impacts on growth) or other processes over time?
  - d) To provide model-based ecosystem-level indicators?
- 6) Are end-to-end ecosystem models or approaches suitable for deriving management advice?
- 7) How to consider EBFM approach for managing impacts to protected species instead of the more common single-species approach (i.e., management measures for one protected species may affect another)?
- 8) How are existing management frameworks (e.g., overfishing and rebuilding timeframes) able to accommodate the type of effects considered under this topic? How could management systems be more adaptive to address short-term changes?

### **Synthesis of ideas / approaches**

### **Session 3: How to assess and develop fishing level recommendations for species exhibiting distributional changes?**

- 1) How are changes in distributions of fish species that extend beyond the survey area considered in assessments?
  - a) Time varying Q?
  - b) Movement models (informed by tagging data)?
  - c) Spatio-temporal modeling of survey data combined with available data from outside the survey area?
  - d) Spatio-temporal modeling of seasonal surveys to estimate seasonal movements?
- 2) If new surveys or stations are added in response to shifting distributions, how are biomass time series revised to incorporate these new /extended surveys?
- 3) How do changes in distribution across jurisdictional boundaries affect assessment and management needs and approaches?
  - a) Interactions among Councils?
  - b) Transboundary issues (US-Canada, US-Mexico, US-Russia)?
  - c) Shared jurisdiction (e.g., State-Federal)?
- 4) Does a process like a P-star process inherently account for uncertainties in a precautionary approach when there are shifting distributions?
- 5) How to determine whether changes in specific parameters are due to shifting distributions or a 'regime shift' from climate change (non-stationarity)? In these cases, what guidance could be provided to managers in developing appropriate reference points?
- 6) How are existing management frameworks (e.g., overfishing and rebuilding timeframes) able to accommodate the type of effects considered under this topic? How could management systems be more adaptive to address short-term changes? [this question could apply to all three topics]

### **Synthesis of ideas / approaches**