NORTHERN COMMITTEE
ELEVENTH REGULAR SESSION

31 August - 3 September 2015
Sapporo, Hokkaido, Japan

MANAGEMENT STRATEGY EVALUATION FOR NORTH PACIFIC ALBACORE TUNA

WCPFC-NC11-2015/IP-08

ISC-ALBWG

Management Strategy Evaluation for North Pacific Albacore Tuna

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

ISC-ALBWG

11TH REGULAR SESSION OF THE NORTHERN COMMITTEE

31 AUGUST-3 SEPTEMBER 2015
SAPPORO, JAPAN

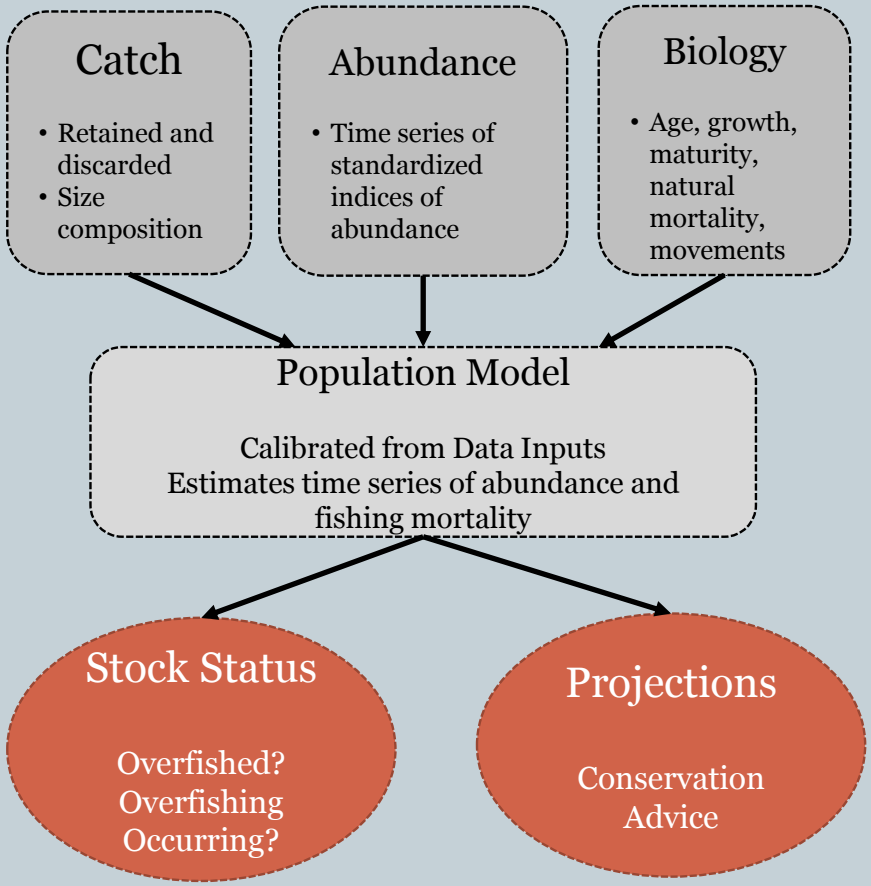
Main Points

- Science can play a role in developing a harvest strategy approach for North Pacific albacore tuna (as per CMM2014-06) using management strategy evaluation (MSE) as identified in the NC management framework
- Science could make all the necessary choices…if the sole management objective is to maximize average annual yield
- Otherwise, a structured approach is needed to:
  - Define objectives, harvest control rules, and acceptable risk from stakeholders
  - define working hypotheses for ecological and fishery dynamics
  - evaluate consequences of alternative management procedures (relative to the objectives)

Overview

- Management strategy evaluation
  - Purpose
  - Process
  - Role of Science
- Objectives in fisheries management
  - Things That Matter
  - Qualities of Good Objectives/Operational Components
  - NPALB Objectives
- ISC Workshop Proposal
  - Why?
  - What? Objectives, Performance criteria, HCRs, Operating Model Scenarios
  - When?

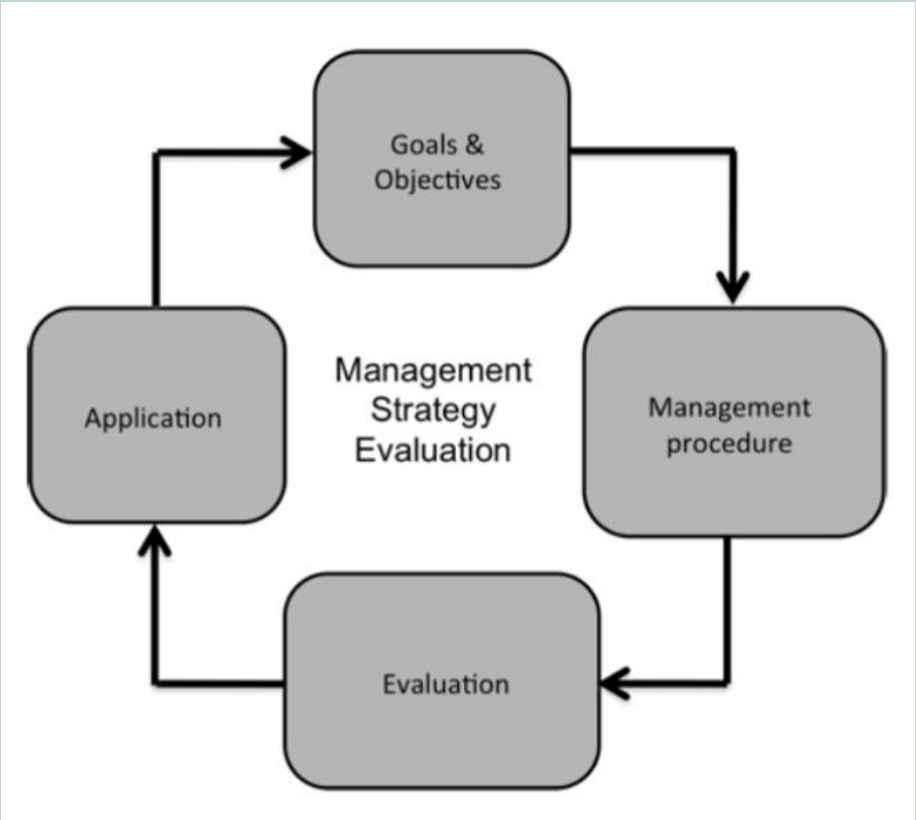
Best Assessment Approach**



- Current assessment approach
- Low engagement with stakeholders
- Confusion among managers/stakeholders

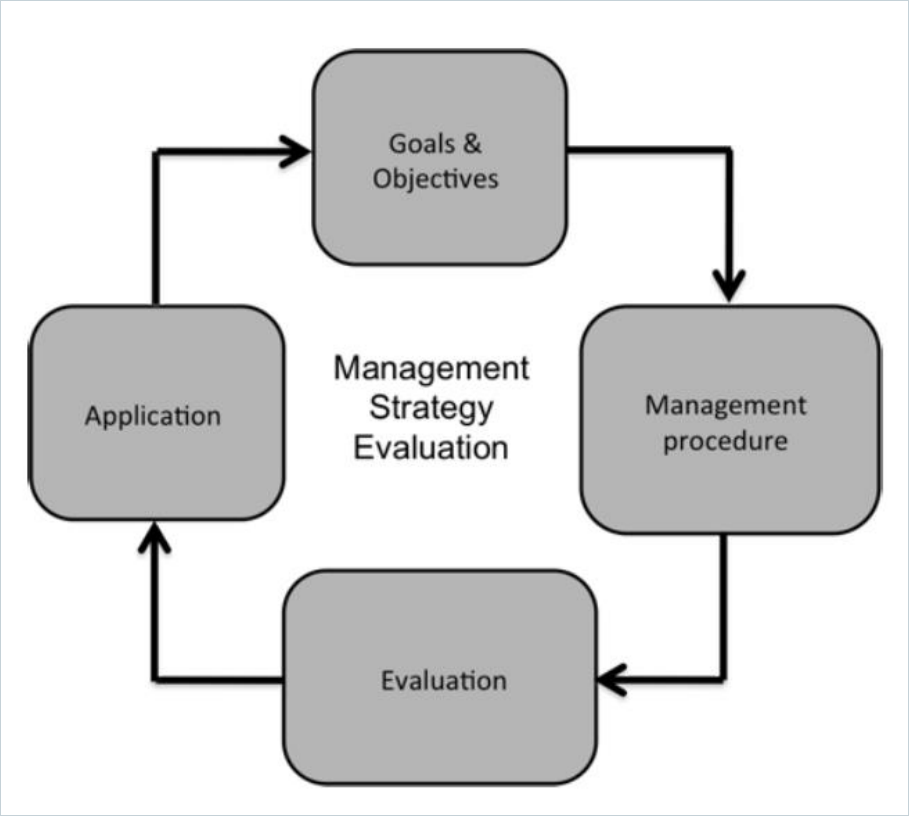
** http://www.st.nmfs.noaa.gov/stock-assessment/stock-assessment-prioritization

Management Strategy Evaluation - Purpose



- Structured approach to designing fishery management systems that are likely to meet stakeholder and manager objectives
- Accounts for scientific and management-related uncertainties
- Simulated world in which "*what if*" questions (HCRs, BRPs, fisheries dynamics, biology, management actions) can be evaluated before being considered for the "wild"

Management Strategy Evaluation



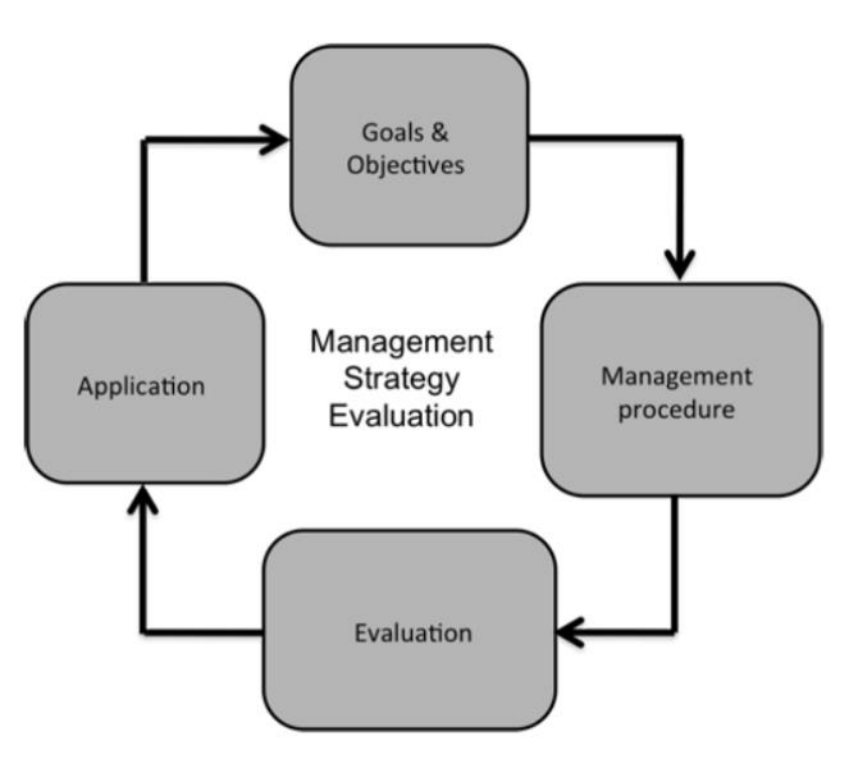
Positives

- Multiple working hypotheses
- Focus on robustness
- High stakeholder engagement
- Management-oriented

Negatives

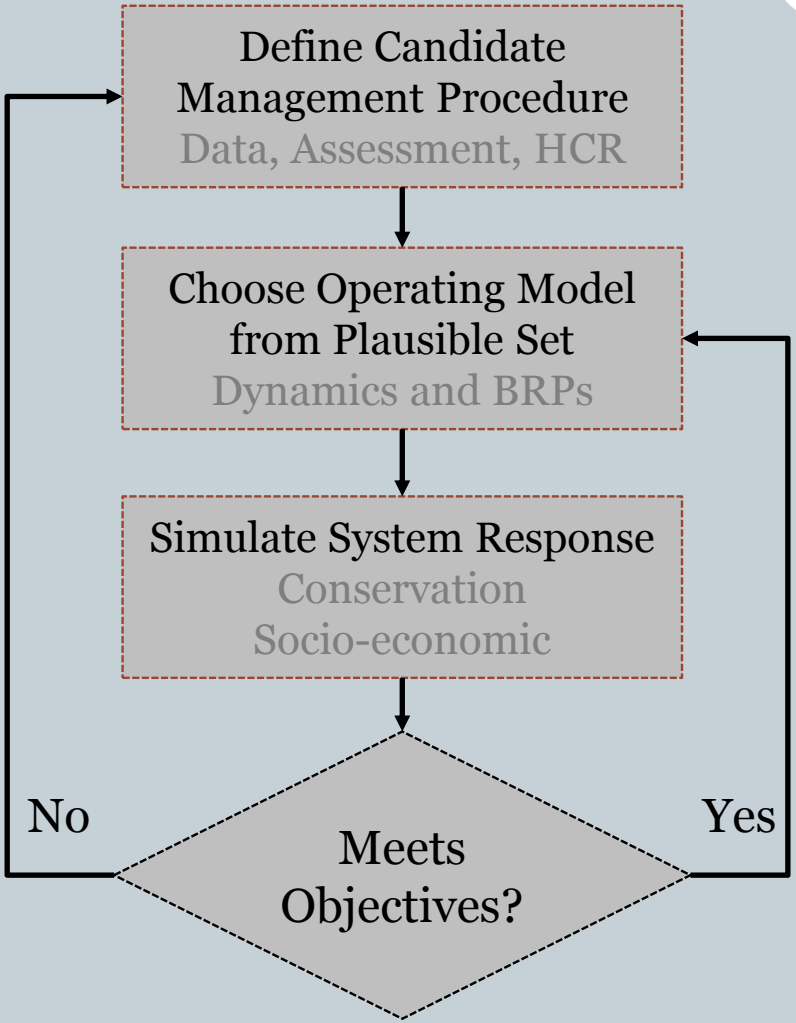
- Slow, laborious, open-ended
- Technical
- Expensive
- Management-stakeholder confusion

Management Strategy Evaluation - Process



- Identify Objectives
- Define alternative MPs
  - Data
  - Assessment
  - Harvest control rules
- Define working hypotheses for population dynamics
- Explore implications and trade-offs of alternative objectives

Management Strategy Evaluation – Evaluating TRPs



- Scientific tractability
- Manage broader range of risks
- Logical approach to resource allocation
- Yes – test for robustness across different states of nature
- No – repeat with different MP

Management Strategy Evaluation - Roles

Managers/Stakeholders	Scientists
• Identify objectives for the stock and fishery; • Identify management procedures and performance measures to evaluate MPs; • Identify acceptable risk • Make decisions on the final management procedure	• Quantify the objectives for the stock and fishery; • Identify the range of management procedure choices; • Identify uncertainties (data, assessment, management) to represent in the operating model(s); • Evaluate outcomes, and • Communicate results, highlighting trade-offs.

It Starts with Stock/Fishery Objectives

Things that Matter

- Ecological value
  - Abundance
  - Composition
  - Spatial distribution
- Social-economic value
  - Food, social, ceremonial
  - Average annual catch
  - Catch stability
- Cultural value
  - Fishing opportunities
  - Traditional use

Four Good Qualities

1. Complete
   - Nothing important is left out
2. Concise
   - 6-10 unambiguous statements of what matters
   - No duplication
3. Understandable
   - Immediately clear and understood by everyone;
   - Directly connected to what matters
4. Sensitive
   - An objective should be useful in distinguishing among alternative MPs

NPALB Objectives

Policy Goals

- "*The management objective for the NP albacore fishery is to maintain the biomass, with reasonable variability, around its current level in order to allow recent exploitation levels to continue and with a low risk of breaching the Limit Reference Point.*" (NC10 Summary Report).

Objectives for MSE

- High level policy statements need to be quantified into operational objectives for evaluation in MSE
- 3 components of good operational objectives:
  1. target or threshold value (e.g., abundance, inter-annual variation in catch, etc.);
  2. a time horizon for measurement (e.g., 2-3 generations for abundance, 5-10 yr for catch or catch variability); and
  3. an acceptable probability of either achieving the target or avoiding a threshold (e.g., 50% chance of being above a target, 5% chance below a threshold)

NPALB Objectives

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Operational Objectives

- Ecological
  - "Maintain biomass around its current level with reasonable variability"
  - "Maintain biomass with low risk of breaching the LRP ($20\%SSB_{\text{current } F=0}$)"
- Socio-economic
  - "Maintain biomass around its current level in order to allow recent exploitation levels to continue"

NPALB MSE

- Reference points are not Harvest Control Rules (HCRs)
- Reference Points are control points that tell you what HCR(s) should be used
- Limit Reference Point:
  - A threshold state of a stock (or fishery) that is undesirable based on scientific information; e.g., collapse, weak recruitment, genetic selection, irreversible changes, uneconomical fishing
  - Avoid with high probability; e.g., 80%-95% of years
- Target Reference Point:
  - A state of a stock/fishery that is considered desirable and at which management action should aim; often based on socio-economic criteria
  - Achieve with moderate probability; e.g., 50-75% of years

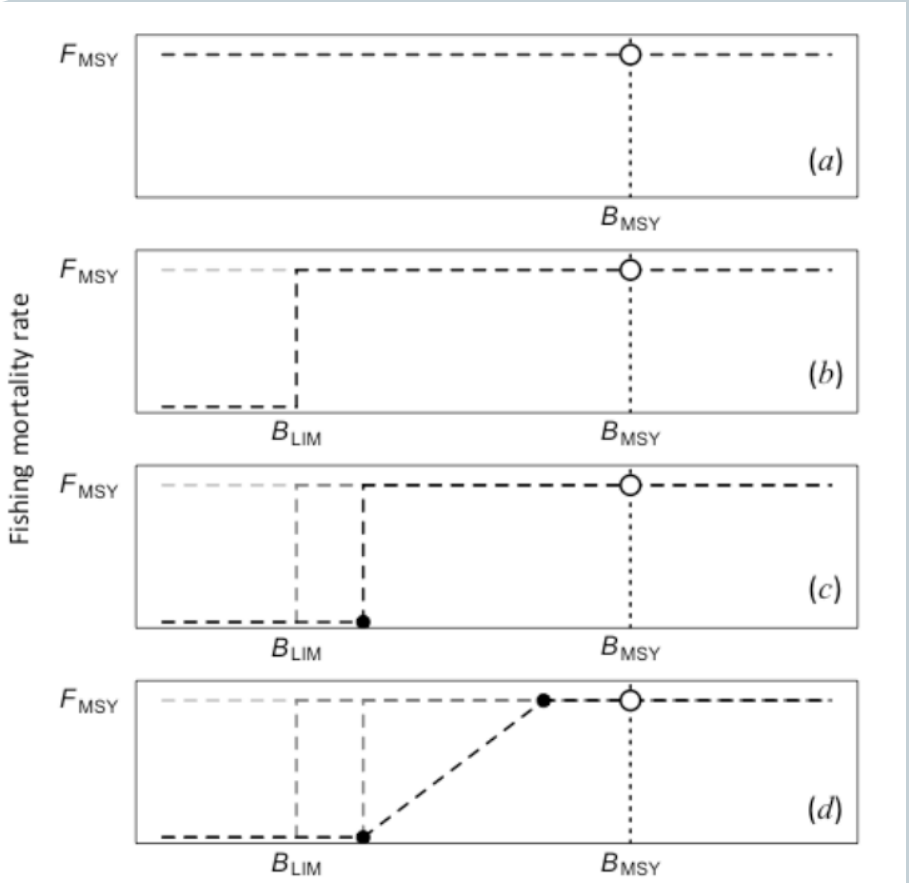
Harvest Control Rules Evolved from Reference Points**

a) Fishing at F_{MSY} would lead to biomass B_{MSY}

b) To avoid stock collapse, stop fishing at B_{LIM}

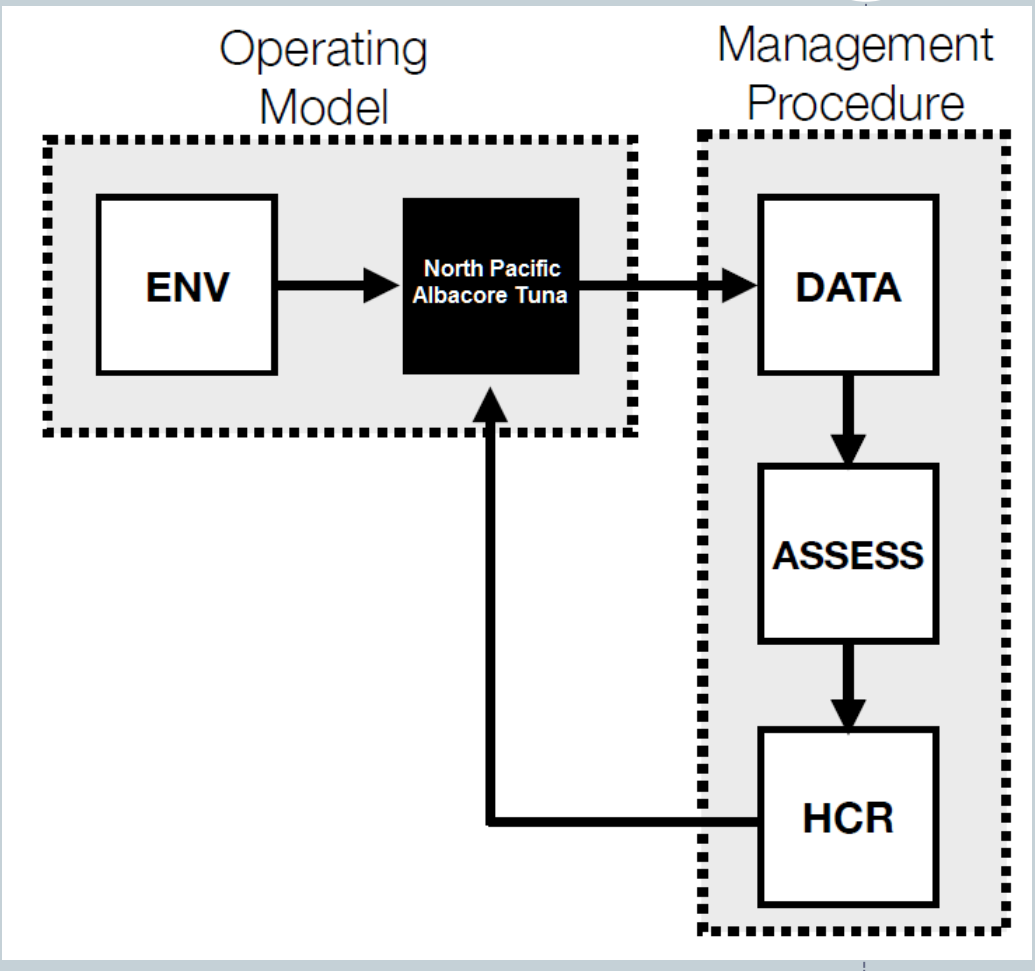
c) To avoid B_{LIM}, stop fishing above B_{LIM}

d) To avoid fishery closures reduce fishing above B_{LIM}



** Cox et al. 2013. Environmental Conservation 40(4): 318-328

Simulation Testing



- Operating Model Hypotheses (states of nature)
- Realistic Data and Errors
- Time delays
- Information feedback
- Performance Indicators (based on operational objectives)
  - Biomass
  - Catch
  - Catch stability
  - P(B < LRP)

Main Points

- The next assessment in April 2017 is the primary focus of ISC-ALBWG scientists
- An MSE analyst (person dedicated to working on MSE) is needed to make sustained progress on this project under the guidance of the ALBWG
- MSE analyst will require about 1 year to deliver prototype simulation environment
- Two timelines:
  - Optimistic? 3-yr to initial delivery of results
  - Realistic? 4-5 yr to delivery of initial evaluations

ISC-ALBWG Proposal

- Management Strategy Evaluation Workshop for Managers/Stakeholders (April 2016) (hands-on)
- Why? Results of evaluations need to be relevant to you
- Goals:
  1. Develop operational objectives (threshold values, time horizon for measurement, probabilities or acceptable risk)
  2. Performance Indicators for each objective
  3. Harvest Control Rules - model-based rely on quantities estimated by assessment model so evaluated every 3 simulated years; data-based rules using catch/effort data so evaluated every year
  4. Operating Model Scenarios (states of nature) – e.g., recruitment regimes, fishery dynamics (new players)