What is Management Strategy Evaluation? What Do We Need from You?

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Overview

What is MSE?

- Current Assessment Process
- MSE Definition
- MSE Loop

What Do We Need from You?

- Key ingredients
- Roles
- Timing

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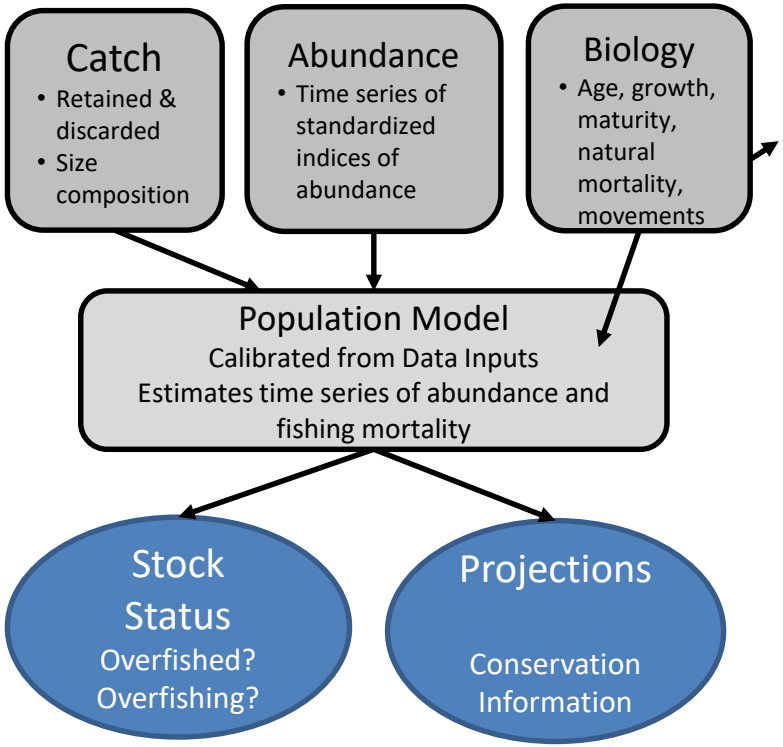
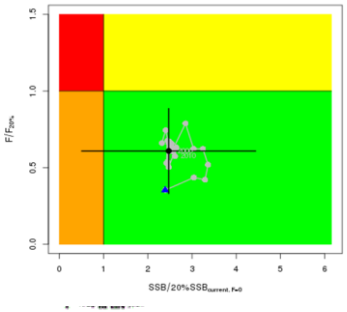
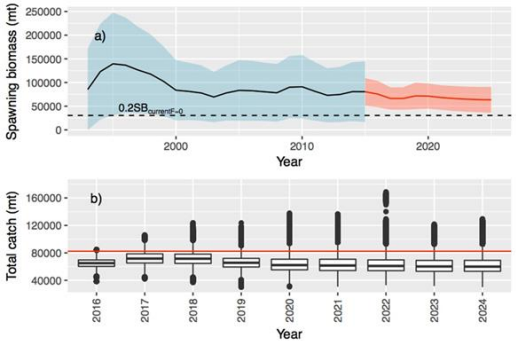
Best Assessment Approach**







- Current assessment approach
- Low engagement with stakeholders
- Confusion among managers/stakeholders
- Optimizes solution (parameters) for a single model
- Future catch is defined by a constant level of catch or a constant fishing intensity; no feedback between status & management action

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

MSE Definition

- “Use of simulation to evaluate the trade-offs achieved by alternative management strategies and to assess the consequences of uncertainty in achieving management goals” (Punt et al. 2016, Fish and Fisheries)
- “Provide decision makers with the information on which to base a decision, given their own objectives, preferences, and attitudes to risk” (Smith 1994, Australian Society for Fish Biology Proceedings)

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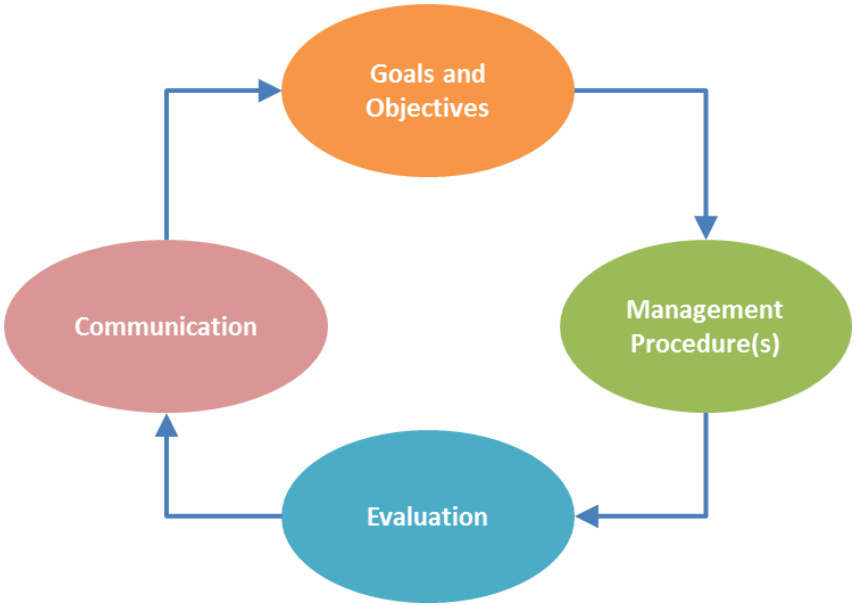
Management Strategy Evaluation - Purpose



- Management strategy evaluation (MSE) is the process of exploring the performance of management strategies relative to defined management objectives and sources of uncertainty (in monitoring, assessment, decision-making, and management action)
- Addresses two questions:
  1. Do our management decisions perform the way we expect?
  2. How can we develop management strategies that are robust to uncertainty?

- MSE is not an optimisation procedure
- MSE is a procedure that highlights trade-offs among multiple and sometime conflicting management objectives
- Iterative process – this includes the development of management objectives

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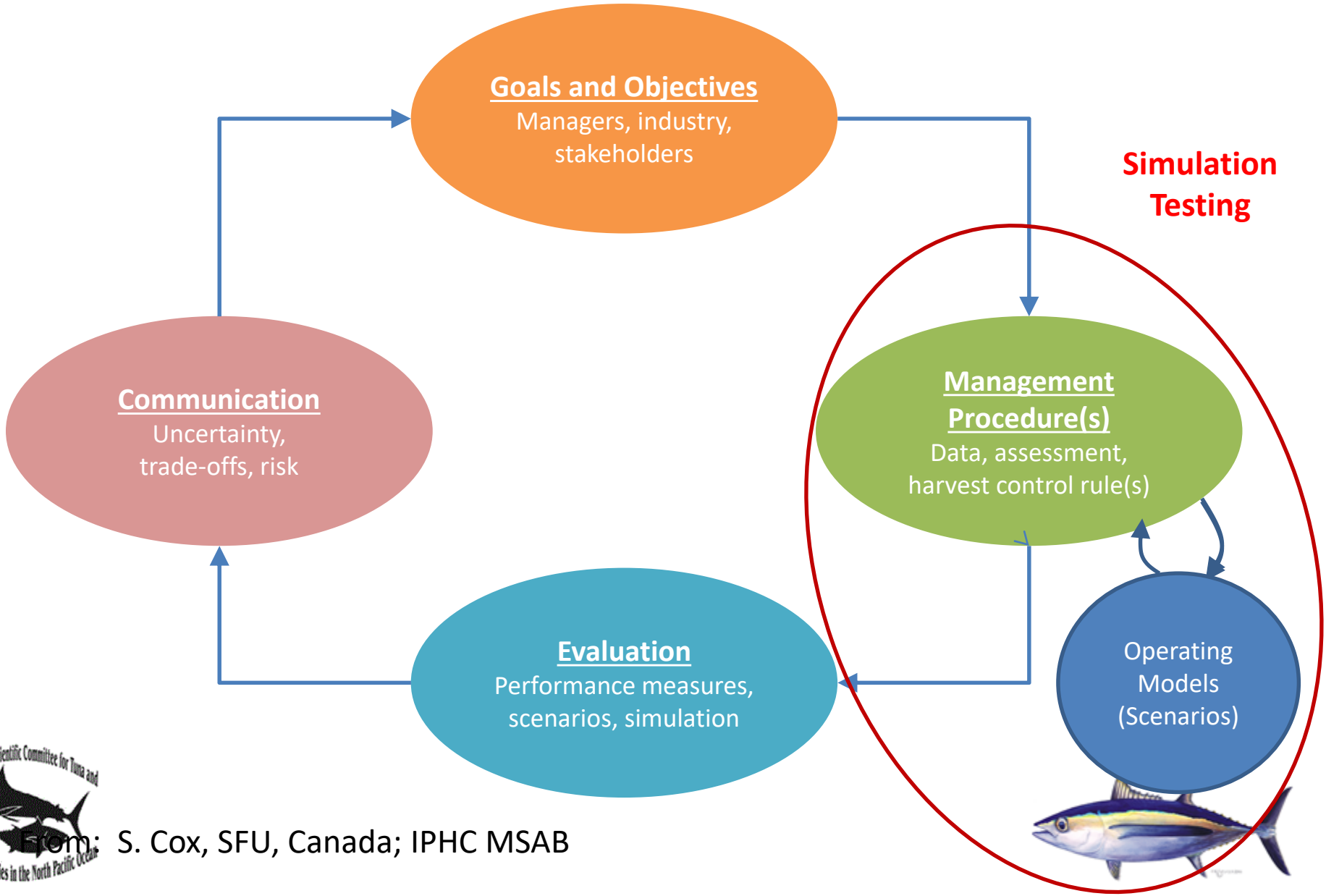
Management Strategy Evaluation Process



From: S. Cox, SFU, Canada; IPHC MSAB

Management Strategy Evaluation

- The process of evaluating the management procedures (rules) by simulation testing is **management strategy evaluation**
- **Management procedure** - set of rules that use pre-specified data to provide recommendations for management actions
- The performance of the rules is evaluated by simulation testing:
  a) To assesses their relative performances, if more than one set of rules is specified, and
  b) To evaluate their anticipated performance relative to specified management objectives.

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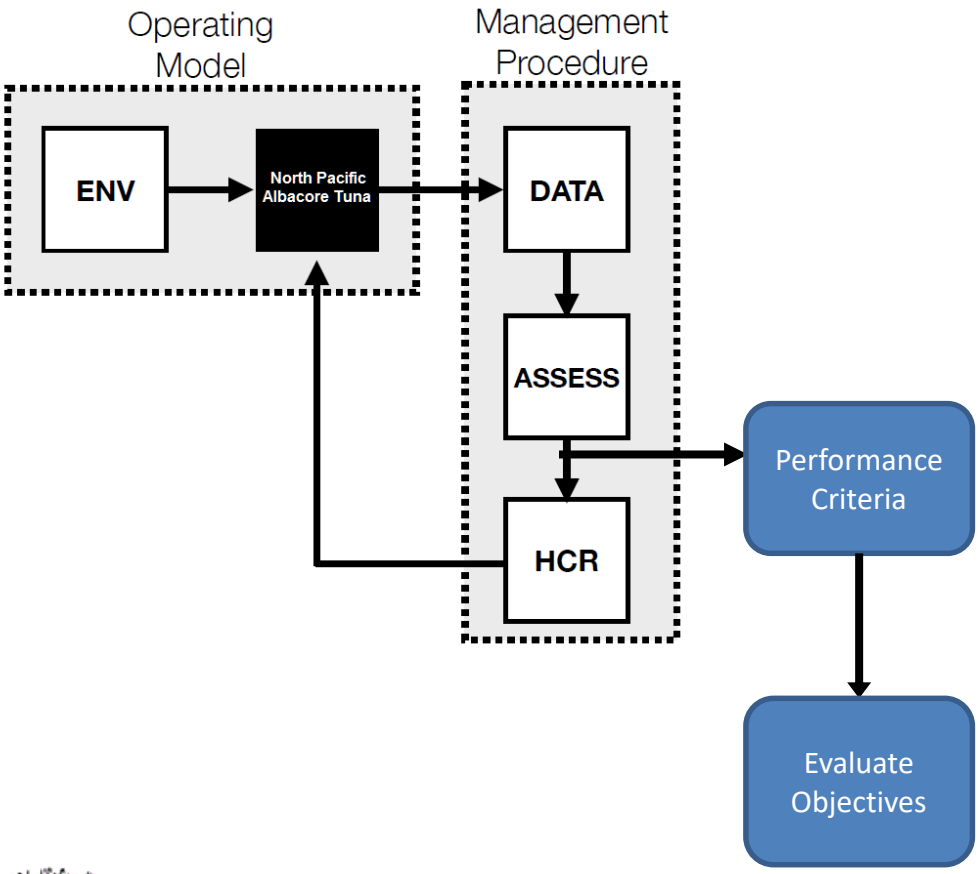
Simulation Testing



- Operating Model (hypotheses about the state of nature)
- Management Procedure – data, assessment method, harvest control rule
- Performance Indicators (to measure achievement of objectives); based on output from assessment or estimable from data itself

Sean Cox, SFU, BC, Canada

What Do We Need From You?

- Participation of Managers and Stakeholders to Develop and Evaluate Performance of Management Strategies because Performance Evaluation is Based on Your Objectives for the Stock (which you need to provide) & There will be Trade-offs that You Must Make.

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Management Strategy Evaluation - Roles

Managers/Stakeholders

- 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

Scientists

- 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.

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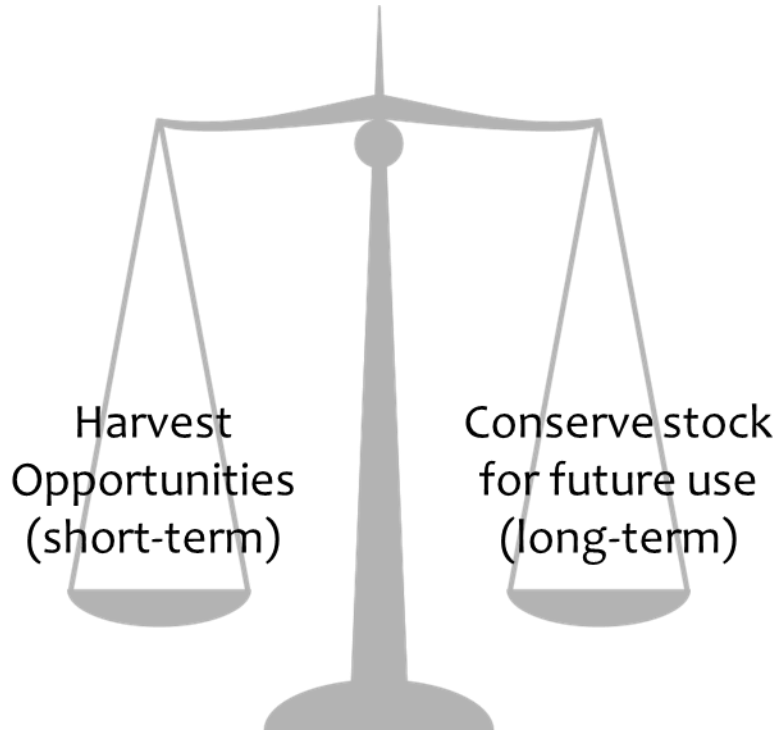
Balancing Competing Objectives



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Management 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

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Management Objectives

- MOs are statements describing expected achievements for a stock/fishery
- MOs are the benchmarks for evaluating the performance of management procedures
- **MOs need to be measurable using performance indicators**
- MO development is iterative. Some MOs will be useful, others will not be useful & should be revised/dropped

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NPALB Objectives

Policy Goal

- "*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

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

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Measurable NPALB Objectives

- 3 components of a measurable objective:
  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)

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Commonalities among Objectives

- Set of objectives cover issues that are important to all groups (industry, scientists, managers)
- A set of objectives can be as few as 4 and as many as 10
- A conservation objective relating to the danger zone for a stock (avoid it and be pretty certain you avoid it)
- A target objective speaking to the healthy zone for a stock (aim for it)
- An objective(s) identifying expected yield and other benefits and stability in achieving these benefits from a stock
- Sometimes there is an objective(s) relating to ecosystem impacts (e.g., minimize bycatch)

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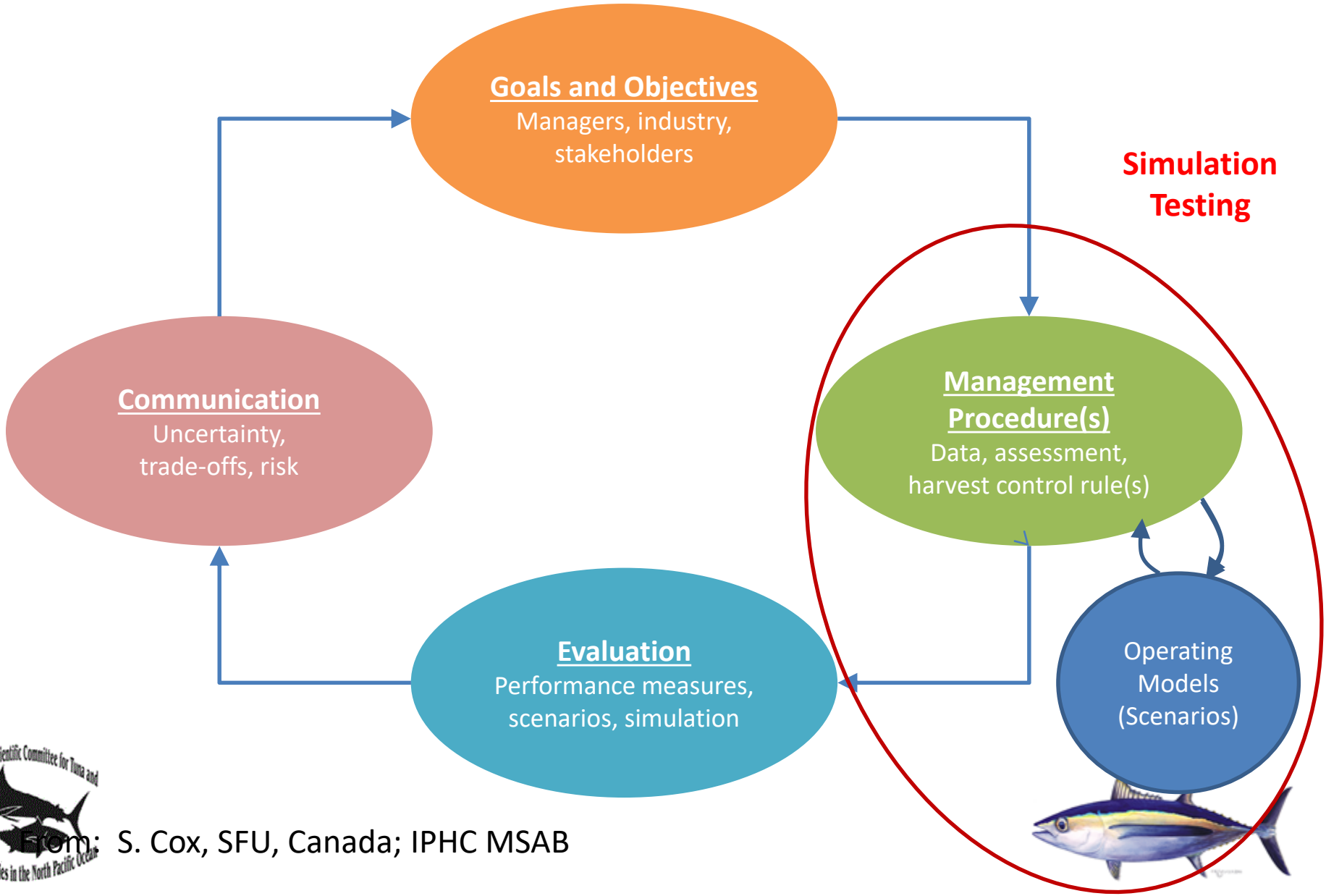
Objective-Setting Questions

1. What results do we want to achieve?
2. How are we measuring that achievement?
3. What is the time interval over which we wish to achieve the results? and
4. How badly to we want to achieve these results?

Timing



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What Do We Need From You?

Development Phase

- Measurable Objectives – basis of MSE
- Management procedures/strategies (includes reference points, harvest control rule(s)

Performance Evaluation Phase

- Evaluate tradeoffs between achieving objectives based on preferences & risk you are willing/not willing to bear in decision-making
- Risk is “the % of times a population is predicted to be below (at or above) a reference point when projected into the future under a particular management strategy” where the strategy could be simple such as a catch or effort limit or complex

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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

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