Performance indicators for comparing management procedures using the MSE modelling framework
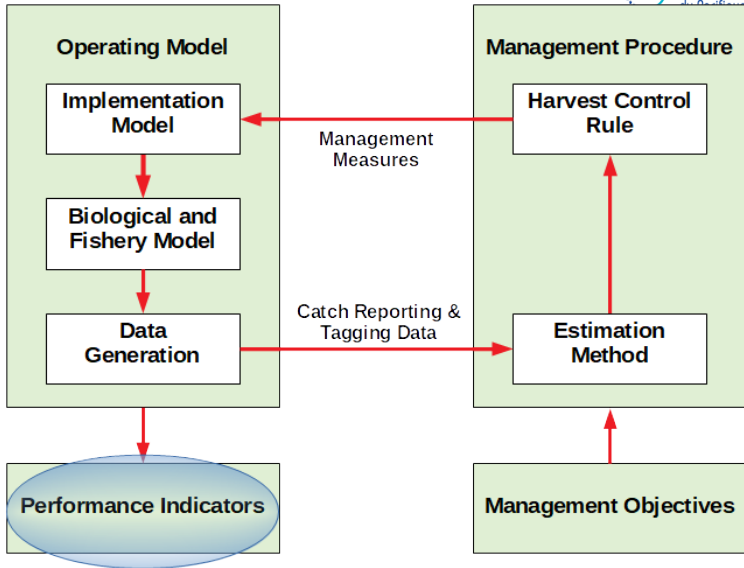
WCPFC-SC14-2018/MI-WP-04

Finlay Scott

Oceanic Fisheries Programme, SPC

MSE framework

Performance
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Introduction

- Performance indicators are used to evaluate how well a candidate Management Procedure (MP) is expected to perform in relation to the agreed fishery objectives;
- The same indicators are calculated for a range of candidate MPs;
- Enables the comparison and selection of a preferred MP from the range of candidates;
- Facilitate analysis of trade-offs when considering MP selection;
- Suite of performance indicators should be agreed by stakeholders;
- Iterative process and can change as the harvest strategy develops.

Introduction

SC14-MI-WP-04:

- ▶ Reviews the initial proposed suite of 11 performance indicators for tropical purse seine (Attachment M, WCPFC14 Summary Report);
- ▶ Indicators related to candidate objectives from Management Objectives Workshop (WCPFC10-2013-15b);
- ▶ Four categories: Biological, Economic, Social and Ecosystem;
- ▶ Presents details on how indicators can be calculated using demonstration MSE outputs based on skipjack;
- ▶ Three time periods: short-, medium- and long-term;
- ▶ Identifies proposed indicators which can not be calculated, may not be informative or which provide information that is already captured by other indicators; and
- ▶ Identifies recommendations that could be made by SC14 to WCPFC15 to inform on the use of performance indicators to evaluate the relative performance of candidate MPs.

PI 1: Probability of $SB/SB_{F=0} > 0.2$

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
1	Biological	Maintain SKJ (and YFT and BET) biomass at or above levels that provide fishery sustainability throughout their range	Probability of $SB/SB_{F=0} > 0.2$ as determined from MSE.

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PI 2: Predicted effort relative to E_{MEY}

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
2	Economic	Maximise economic yield from the fishery	Predicted effort relative to E_{MEY} (to take account of multi-species considerations, SKJ, BET and YFT may be calculated at the individual fishery level). B_{MEY} and F_{MEY} may also be considered at a single species level.

- Dependent on values for E_{MEY}, B_{MEY}, F_{MEY};
- Considering effort and biomass may not be best guide to 'maximising economic yield';
- Recommended not considered further;
- Alternative indicator based on economic rent (as used in previous SKJ HCR analysis)?

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Introduction

Calculated PIs

PIs not calculated

Presentation and
analysis

Summary

PIs 3, 4, 6, 7: More economic indicators

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
3	Economic	Maximise economic yield from the fishery	Average expected catch (may also be calculated at the assessment region level)
4	Economic	Maintain acceptable CPUE	Average deviation of predicted SKJ CPUE from reference period levels
6	Economic	Catch stability	Average annual variation in catch
7	Economic	Stability and continuity of market supply	Effort variation relative to reference period level (may also be calculated at the assessment region level)

▶ Absolute or relative catches?;

▶ What is the reference period level for SKJ CPUE and effort (e.g. 2010 as used in previous analysis)?;

▶ Variation is calculated as the absolute annual difference (lower the value of the indicator the better the performance).

PI 8: Probability of and deviation from $SB/SB_{F=0} > 0.5$

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
8	Economic	Stability and continuity of market supply	Probability of and deviation from $SB/SB_{F=0} > 0.5$ (SKJ) in the short-, medium- and long-term as determined from MSE (may also be calculated at the assessment region level)

- ▶ Status of $SB/SB_{F=0}$ relative to TRP is important (not just economic indicator);
- ▶ Two indicators: probability of $SB/SB_{F=0} > TRP$ and deviation of $SB/SB_{F=0}$ from TRP;
- ▶ Can be hard to interpret in the context of selecting between candidate MPs (HCRs);
- ▶ Indicators should be easy to understand and interpret;
- ▶ Alternative indicator could be developed (e.g. probability of being within 10% of the TRP).

PI 5: Average value of SIDS / non-SIDS catch

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
5	Economic	Maximise SIDS revenues from resource rents	Proxy: average value of SIDS / non-SIDS catch

- Individual fishing fleets are not modelled MSE framework;
- Fisheries in the model not classified by country or state;
- Not possible to attribute projected catches to SIDS or non-SIDS;
- Could make assumption about future distribution between SIDS and non-SIDS (e.g. based on historical period);
- Assumes the future distribution will be constant and related to the past;
- Indicator will strongly reflect that assumption and may not be informative;
- Alternative: look at catches from purse seines in subset of model regions (e.g. regions 2, 3, and 5)?

Retain as part of the monitoring strategy.

PI 9: Average proportion of CCMs-catch to total catch

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
9	Social	Food security in developing states (import replacement)	As a proxy: average proportion of CCMs-catch to total catch for fisheries operating in specific regions

- Fisheries in the model not classified by country or state;
- Not possible to attribute catches to CCMs;
- Could make assumption about future distribution (e.g. based on historical period);
- Assumes the future distribution will be constant and related to the past;
- Indicator will strongly reflect that assumption;
- Indicator based on proportion - careful with interpretation.

Retain as part of the monitoring strategy.

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Calculated PIs
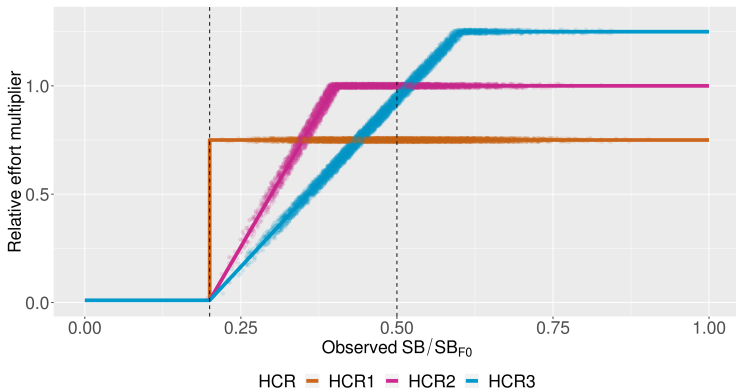
PIs not calculated

Presentation and analysis

Summary

PI 10: Avoid adverse impacts on small scale fishers

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
10	Social	Avoid adverse impacts on small scale fishers	MSY of SKJ, BET, YFT. Possible information on other competing fisheries targeting SKJ (may also be calculated at the assessment region level). Any additional information on other fisheries / species as possible.

Requires clarification:

- ▶ What does 'small scale fishers' mean (artisanal? non-purse seine?)?
- ▶ Individual fishing fleets are not modelled;
- ▶ How to interpret MSY (catches relative to MSY? SB relative to SB_{MEY})?

Retain as part of the monitoring strategy.

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PI 11: Ecosystem

PI	Objective Type	MOW4 Objective	Performance Indicator (WP14)
11	Ecosystem	Minimise bycatch	Number of FAD sets Expected catch of other species

- ▶ Number of FAD sets not included in the MULTIFAN-CL operating model;
- ▶ Not possible to make robust assumption about future FAD sets;
- ▶ Only main tuna species considered in the operating model - no bycatch;
- ▶ Note: BET and YFT evaluation will use a joint operating model;
- ▶ Suggestion to include size-based indicator for the population.

Retain as part of the monitoring strategy.

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Calculated PIs

PIs not calculated
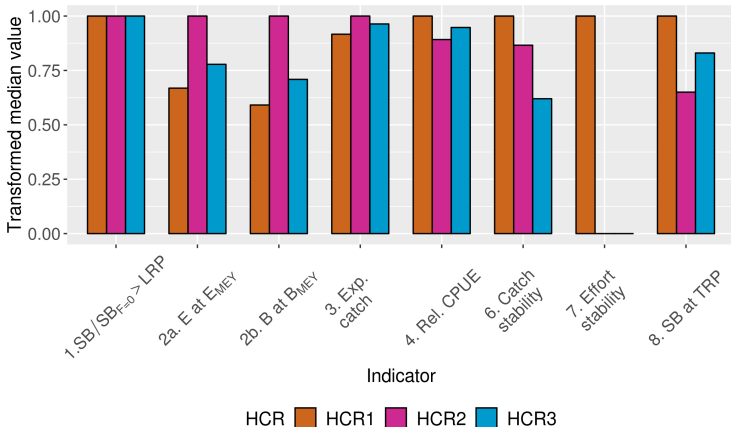
Presentation and
analysis

Summary

Presenting performance indicators

- ▶ Compare candidate MPs through the performance indicators;
- ▶ Three demonstration HCRs chosen so that the relative performance differs sufficiently and they provide contrast in the performance indicators;
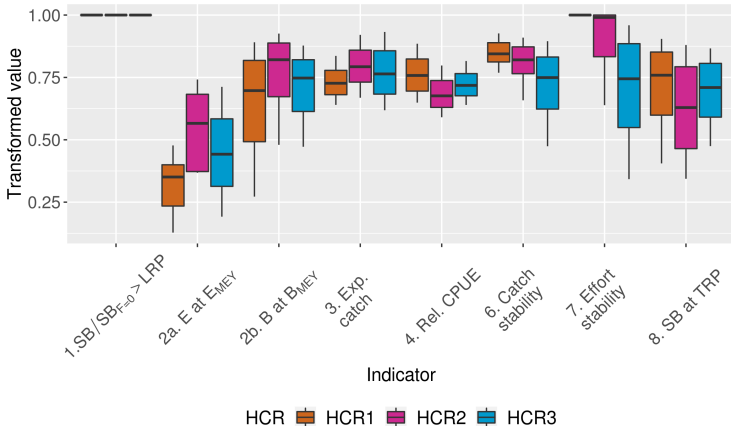- ▶ The following plots are for demonstration only.

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Calculated PIs

PIs not calculated

**Presentation and
analysis**

Summary

Bar charts

► Bar chart of median values;
► No distribution of values;
► Need to transform and scale values;
► Performance is good if small (variability), or good if big (relative CPUE);
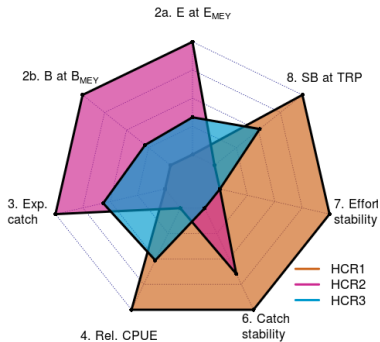► Comparing relative performance of HCRs.

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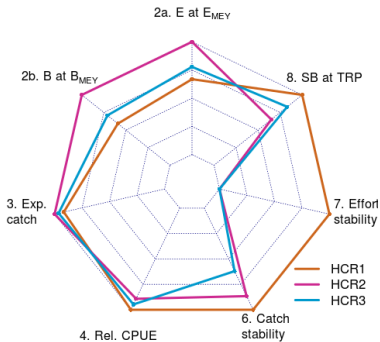
PIs not calculated

Presentation and analysis

Summary

Box plots

- Includes distribution of values;
- Useful for exploring trade-offs (better to have high median but large distribution, or vice versa?).

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Radar plots

- If the indicators have equal weighting, the HCR that covers the largest area can be thought of as being the 'best'.
- With alternate scaling the trade-offs can be clearly seen.

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Summary

- Performance indicators are used to evaluate how well a candidate Management Procedure (MP) is expected to perform in relation to the agreed fishery objectives;
- Performance indicators should be agreed by stakeholders;
- Iterative process and can change as the harvest strategy develops;
- Performance indicators should be easy to understand and interpret;
- To select the 'best' MP need to reduce the number of indicators;
- No single best way of presenting the results;
- Presentation methods will evolve during the harvest strategy process.

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We invite SC14 to:

- Agree to use a smaller number of performance indicators as this will aid in comparing the relative performance of candidate management procedures. These indicators should be based on the stock under analysis and the agreed objectives of the fishery;

- Agree that the indicators described in WCPFC13 Summary Report Attachment M that cannot be calculated in the MSE should not be considered further as performance indicators but retained in the monitoring strategy;

- Agree that the distribution of the indicator values, not just a measure of the central tendency, should be considered;

- Agree that the development of the suite of potential indicators is an ongoing process and that alternative indicators can be considered;

- Agree that the time periods over which the indicators are calculated should be based on an appropriate number of management cycles, based on the life history of the stock);

- Discuss whether indicator 6 (catch variation) should be calculated in absolute terms or relative to the mean catch;

- Provide clarification on how indicator 10 (avoid adverse impacts on small scale fisheries) should be calculated, particularly related to MSY;

- Discuss approaches for transforming indicator values and displaying results to aid the comparison of the performances of management procedures; and

- Discuss approaches for synthesising results across performance indicators to facilitate the selection of a single management procedure.

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Distribution of $SB/SB_{F=0}$