Management Strategy Evaluation for the anchoveta fishery

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What is management strategy evaluation? (MSE)

- Systematic testing of
- Alternative ways of managing the fishery
  - What data to collect
  - How to assess the stock
  - The Harvest Control Rule
- Against alternative hypotheses about the biology of the ecosystem and the behavior of the fishery

Management Strategy Evaluation for Fisheries

Informing the selection of harvest strategies

> " A [harvest strategy] is analogous to an autopilot, with the associated advantages. However, this does not mean that the aircraft should be left without a pilot. The pilot must remain on board to look out for unexpected major course deviations that may not have been factored into the design, including appreciable changes in scientific perceptions concerning the resource."
>
> **Doug S. Butterworth,** *University of Cape Town*[2]

Why MSE?

- Sustainable development goal 14.4

- *By 2020, effectively **regulate harvesting** and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to **restore fish stocks** in the shortest time feasible, at least to **levels** that can **produce maximum sustainable yield** as determined by their biological characteristics.*

The managers annual question to science

- If I set the quota at xx tons will it be sustainable or will the stock collapse?

- The appropriate answer to this is "it depends on what you do next year"

- We can't evaluate the "risk" of a decision this year without knowing how decisions will be made in the future

Why MSE?

MSC Fisheries Standard v2.01

SA2.5   Harvest control rules and tools PI (PI 1.2.2) ‼

Table SA5: PI 1.2.2 Harvest control rules and tools PISGs

Component	PI	Scoring issues	SG60	SG80	SG100
Harvest strategy	Harvest control rules and tools **1.2.2**	(a) HCRs design and application	**Generally understood** HCRs are in place **or available** that are **expected to**	**Well defined** HCRs are **in place** that **ensure** that the exploitation	The HCRs are expected to keep the stock **fluctuating at or above** a target level

COMMON MANAGEMENT CYCLE
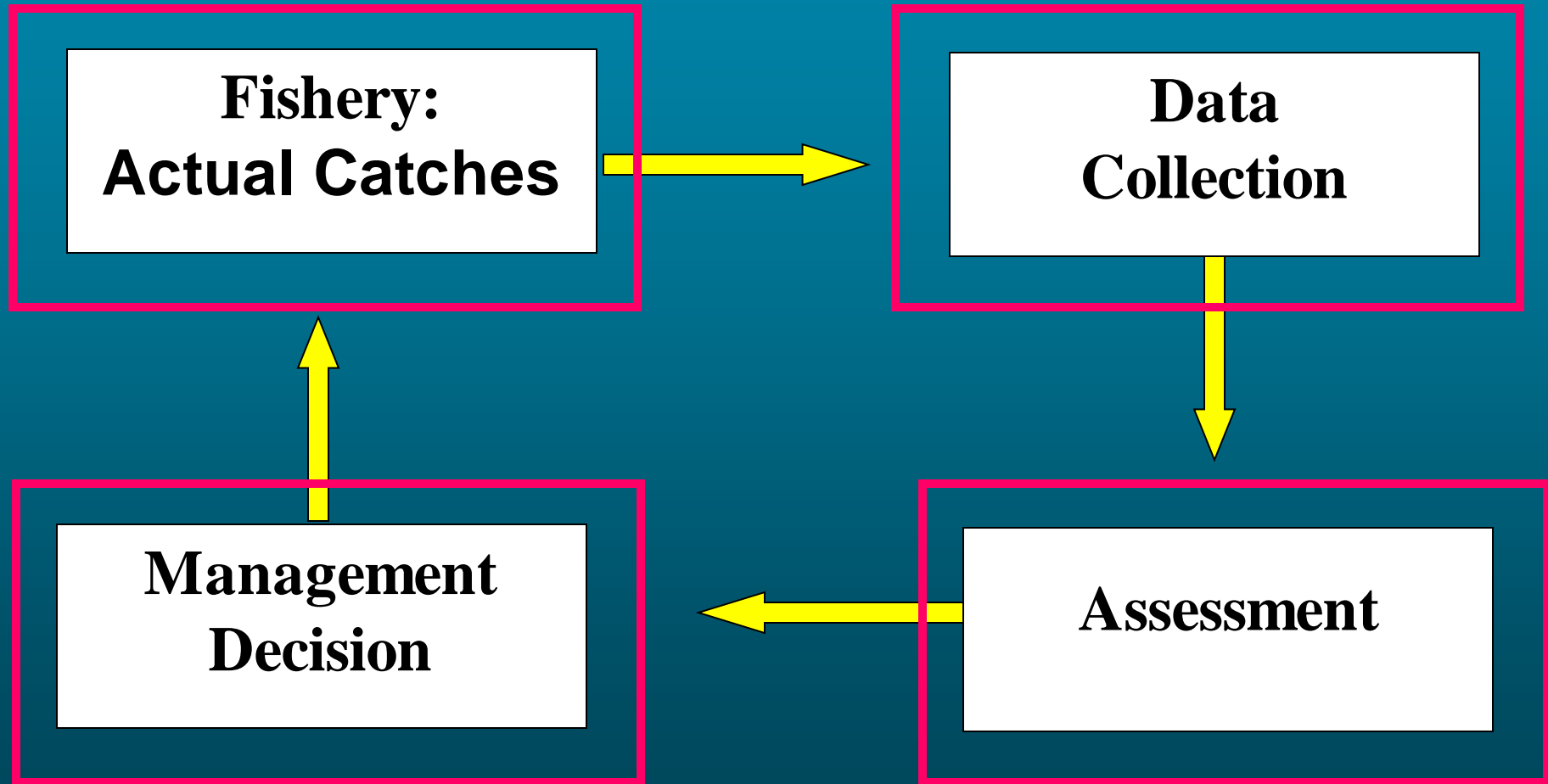
This system is unsatisfactory for the industry

- Stock status is uncertain, and can easily change with new interpretation of data or change of models
- There are no rules about how quotas will be set and thus no transparency and understanding of what will happen
- There are no rules about what model assumptions will be used and thus no transparency of understanding of what will happen

This system is unsatisfactory for managers because

- With no rules about how quotas will be set, there is no way to determine the long term consequences of the quota set for any individual year
- The assessment process is not transparent to managers
- At best "risk" can be evaluated by calculating impacts of constant catch levels
  - But we know that we wouldn't hold the catch constant if data changed dramatically
- Thus managers have no way of evaluating the probability of achieving objectives

Management Strategies:
A way forward

Elements of a management strategy

- A list of data that will be collected
- Rules about how the data will be used to determine the regulations for the next year
  - The rules may be data based: if CPUE is going up raise catches, if going down lower catches
  - The rules may be model based – but the details of the models will be specified and not subject to annual changes

Key steps in MSE

- Defining objectives
- Defining performance measures
- Identification of uncertainties to consider
- Construction of operating models
- Identification of candidate management strategies
- Testing each candidate strategy against each operating model
- Presentation of results and selection
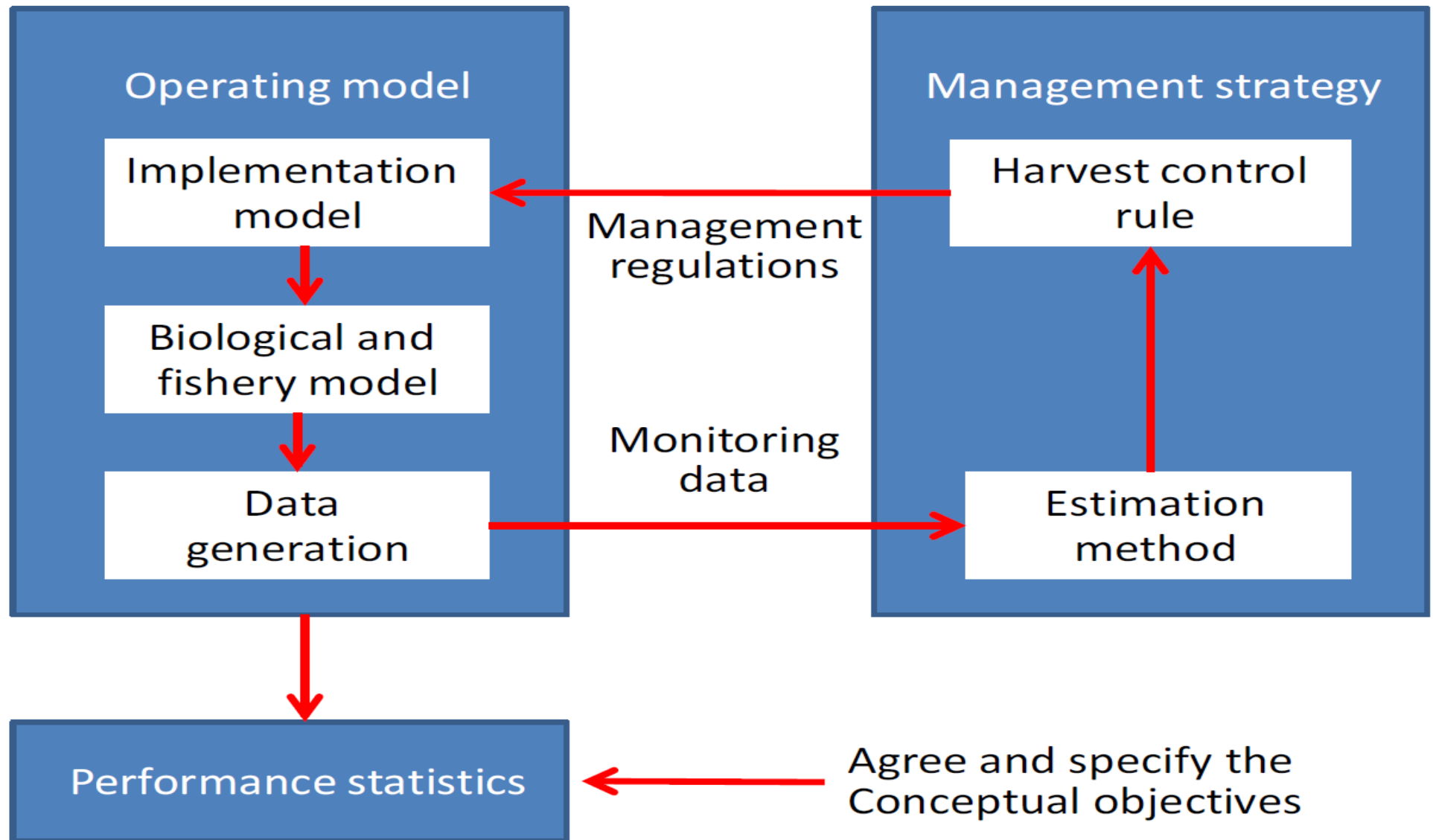
Figure 1 Conceptual overview of the management strategy evaluation modelling process.

Time line for project

- January 2016 Initial Workshop
- January 2018 Second Workshop
- December 2019 Presentation of results

Harvest strategies tested

- Different combinations of target harvest rate
- And
- Minimum stock size thresholds

Operating models

- Different productivity of anchoveta
- Different "regimes" of productivity
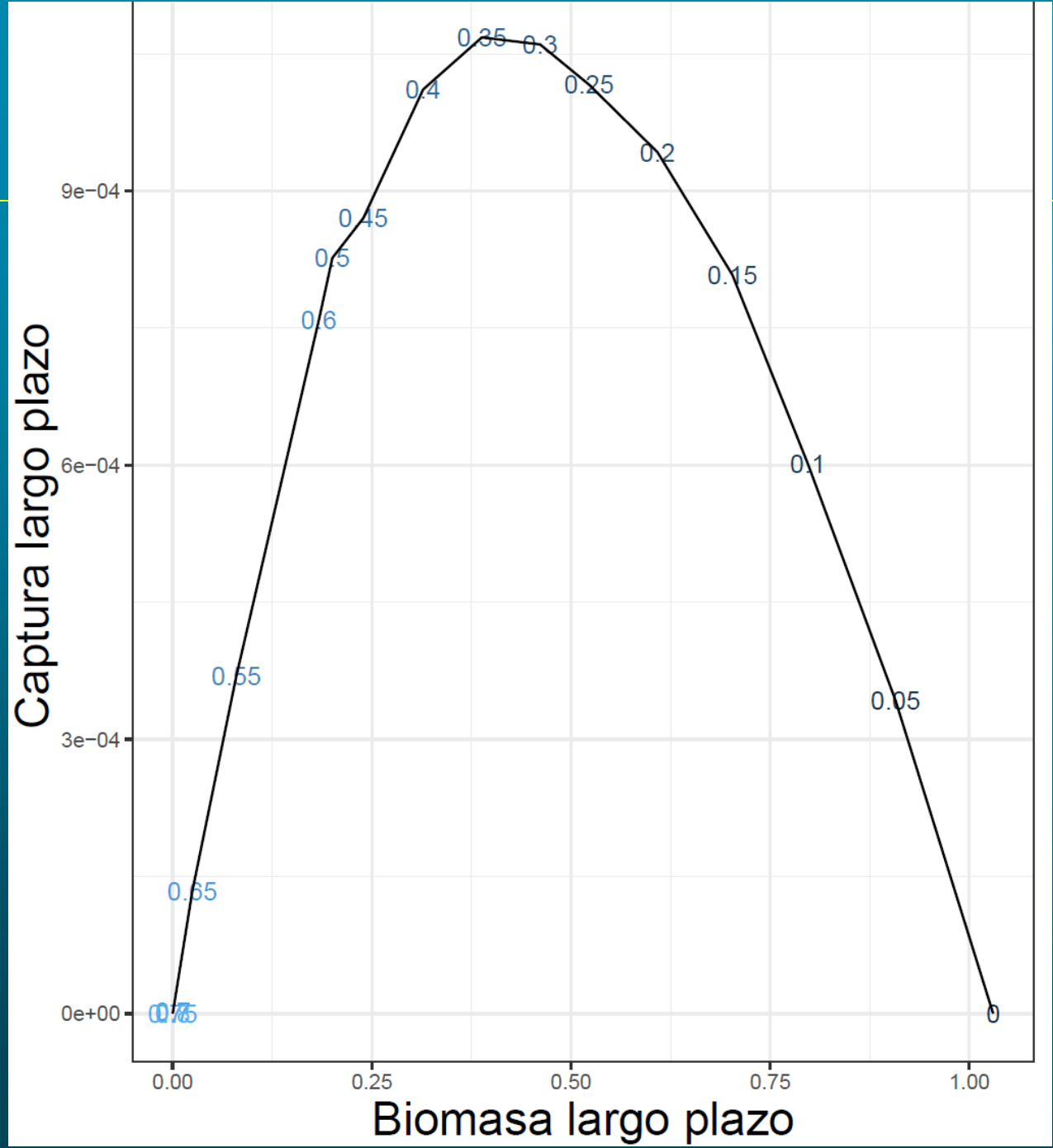
Where we are

- Defining objectives ✓
- Defining performance measures ✓
- Identification of uncertainties to consider ✓
- Construction of operating models ✓
- Identification of candidate management strategies ✓
- Testing each candidate strategy against each operating model ✓
- Presentation of results ✓
- Discussion of "exceptional circumstances"
- Selection of a strategy

Next steps

- For IMARPE to add more harvest strategies and operating models
- General discussion of alternative strategies
- Adoption of a strategy

Key Lessons

- MSE provides scientific guidance and transparency in ways that no other approach can offer
- The process takes time and the more stakeholders involved the slower the process
- The complexity of the process depends on the range of uncertainties considered