NOAA FISHERIES

Alaska Fisheries Science Center

Management strategy evaluations
An Overview

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NMFS NOAA

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BBC TWO

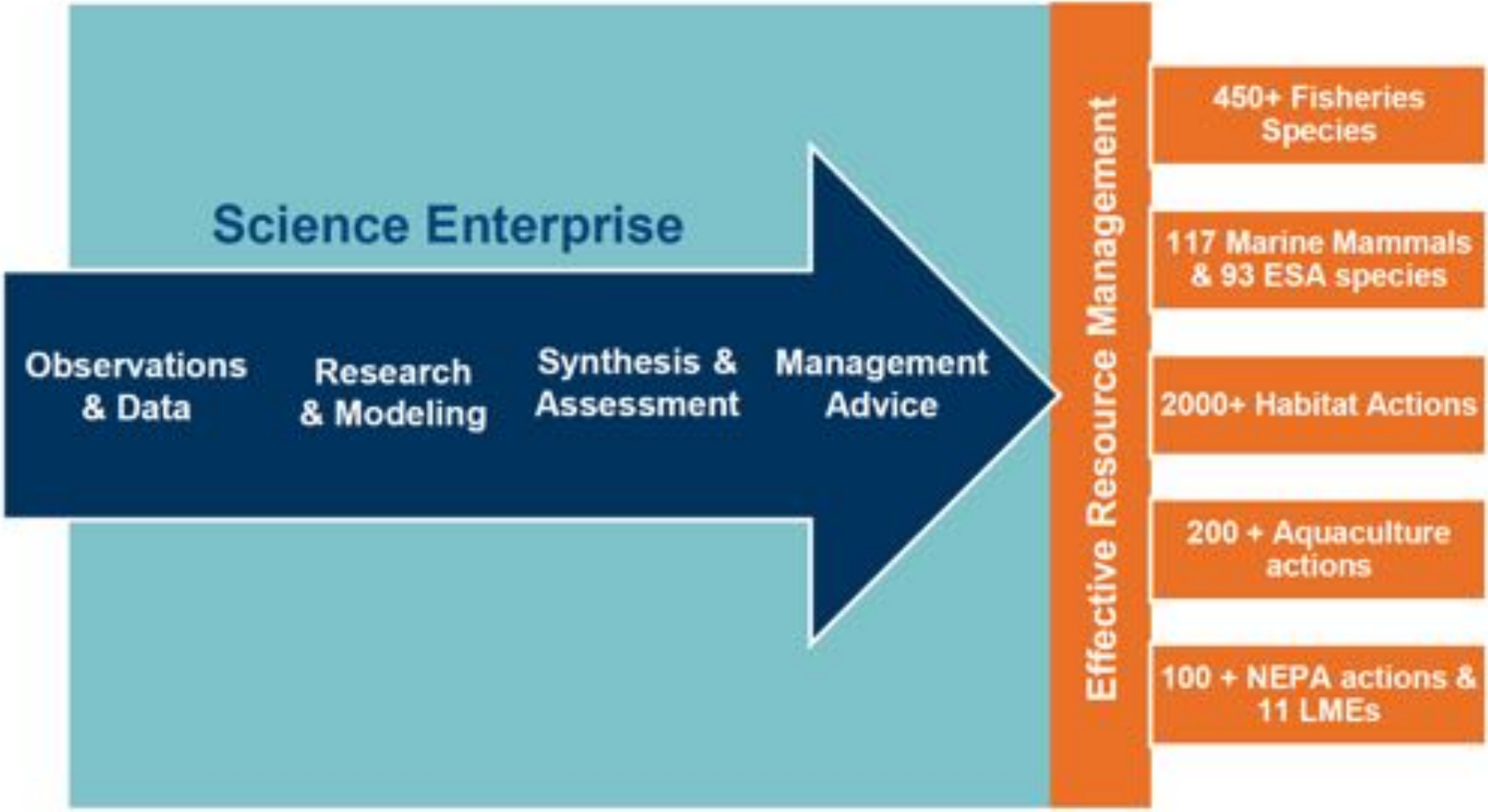
“I get to think about fish…”

"Water" by Giuseppe Arcimboldo (1527–1593). Kunsthistorisches Museum, Vienna.

“ ”

. . .

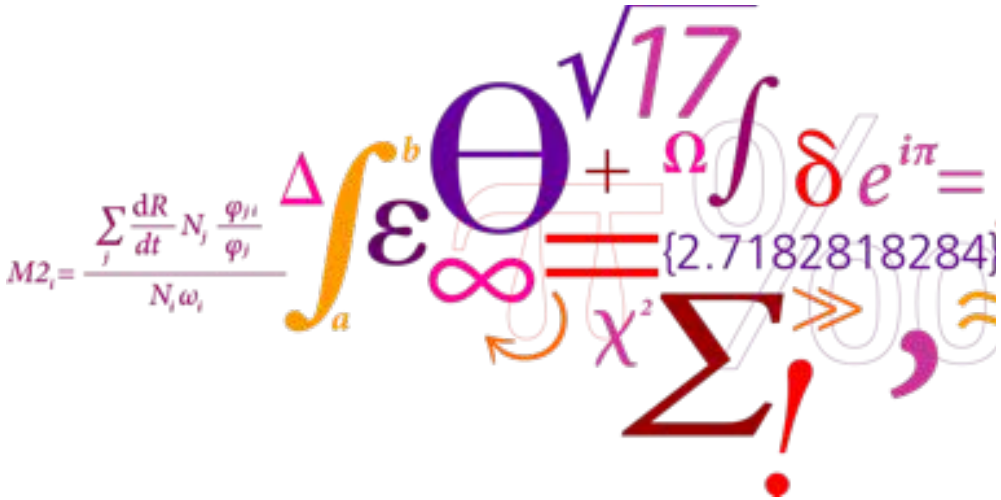
Effective resource management—our goal



Science in support of MSEs

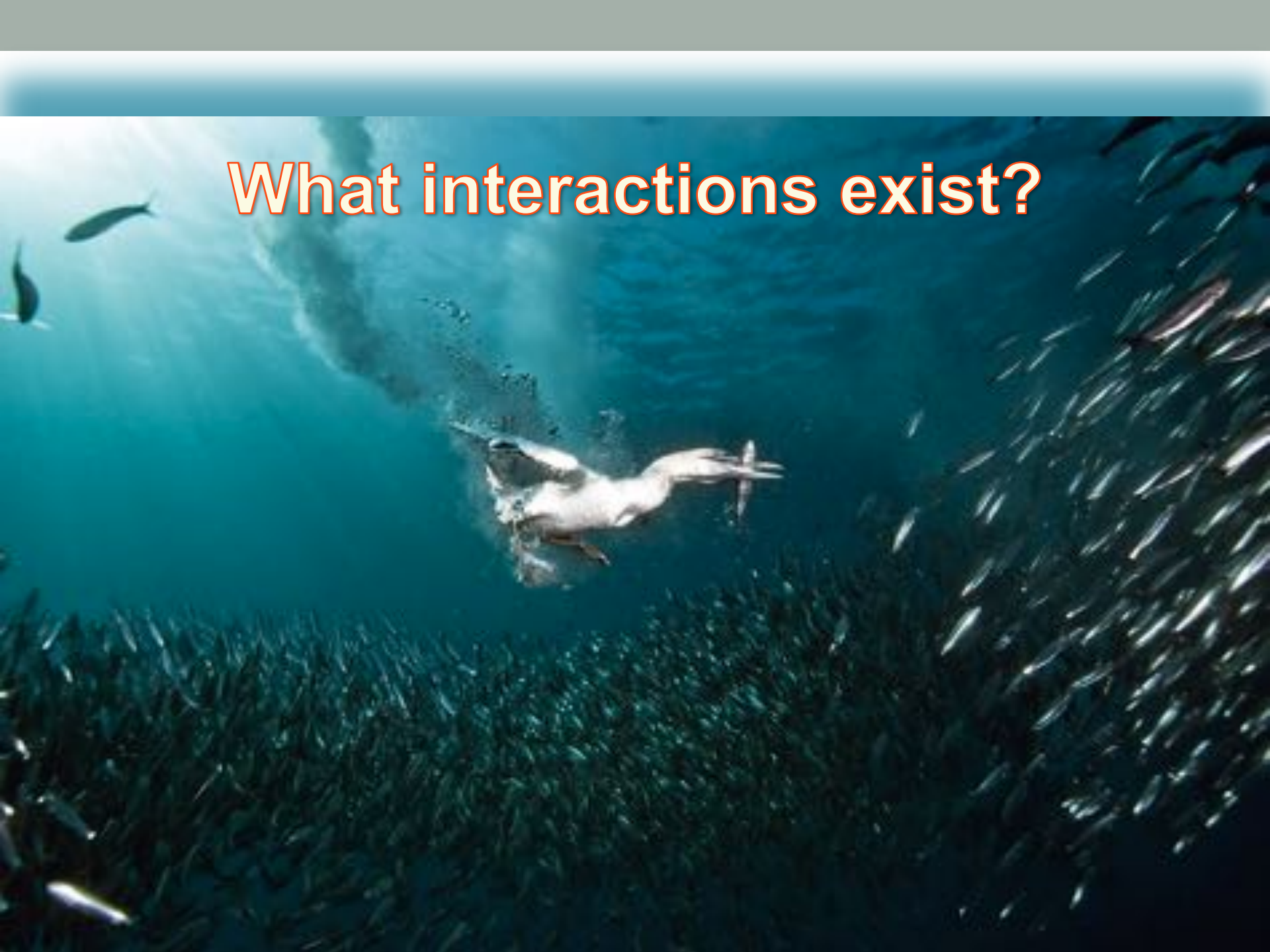
"Water" by Giuseppe Arcimboldo (1527–1593). Kunsthistorisches Museum, Vienna.

“Assessment questions for management”



How many?


function
distribution
growth
productivity
income
time
increase
output
metrics
experience
relation
input
process
value
efficient
quality
streamline
measured
economic
real
company
profitability
management
production
order
technology
annual
distinct
efficiency
series
per
total
shown
slope
combining
unit
represents
components
measure
product
figure


What interactions exist?

How bad are our assumptions?

Review…

How many?

How productive?

What status (trend)?

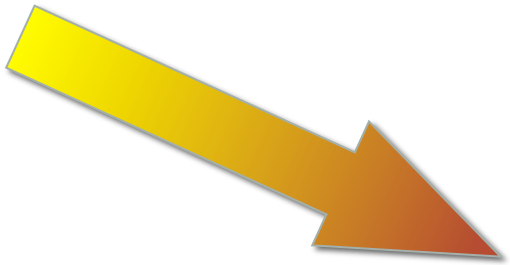
How bad are the assumptions?

How bad are our assumptions?

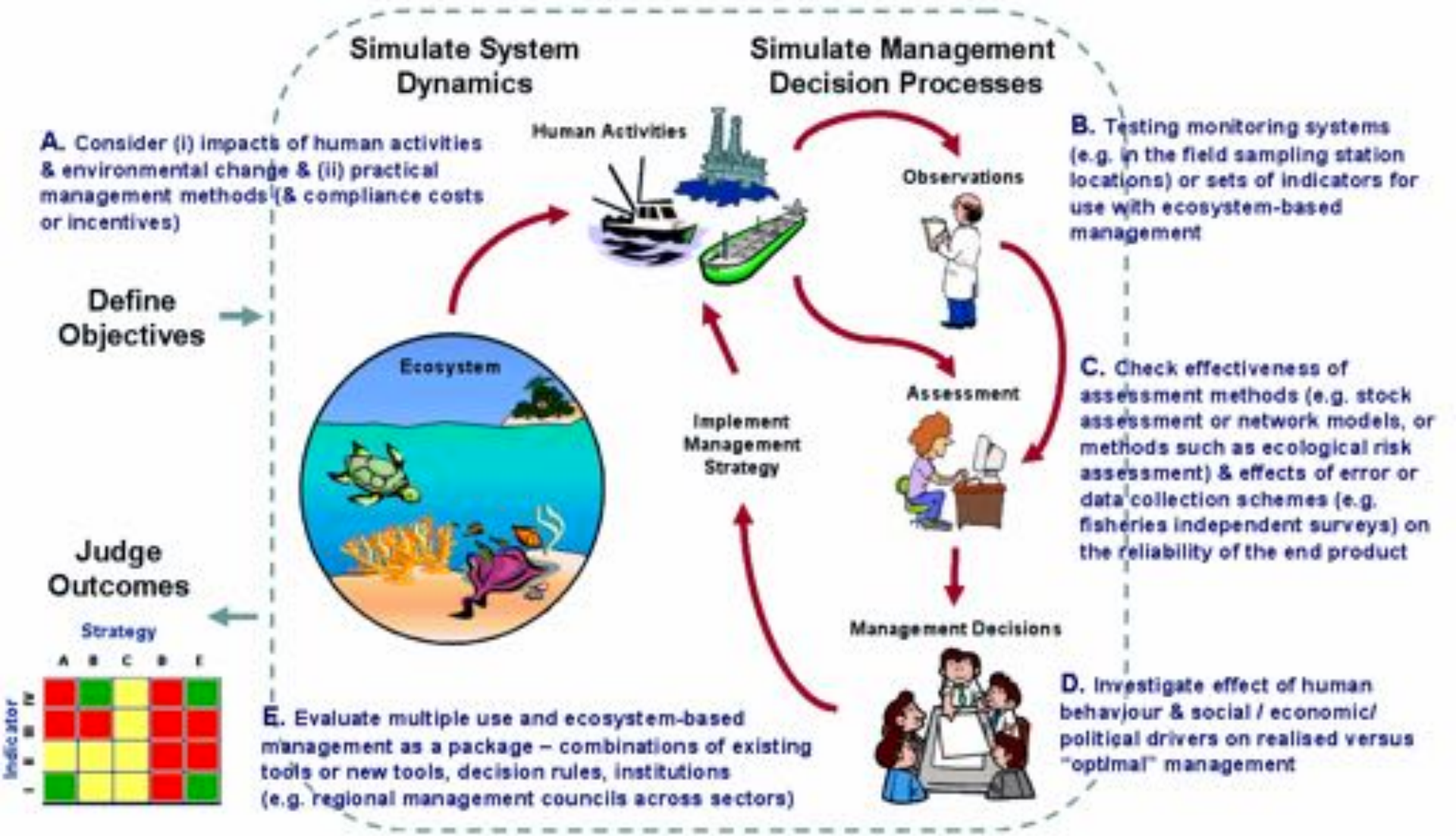
What are the side effects?

Management strategy evaluation

Forces declaration of
strategic goals



Finds tactical,
transparent methods



Source: CSIRO, Australia

An MSE framework

- Key elements (Smith 1994)

1. Multiple objectives
2. Uncertainty characterized
3. Stakeholders involved
4. Trade-offs evaluated

Multiple objectives

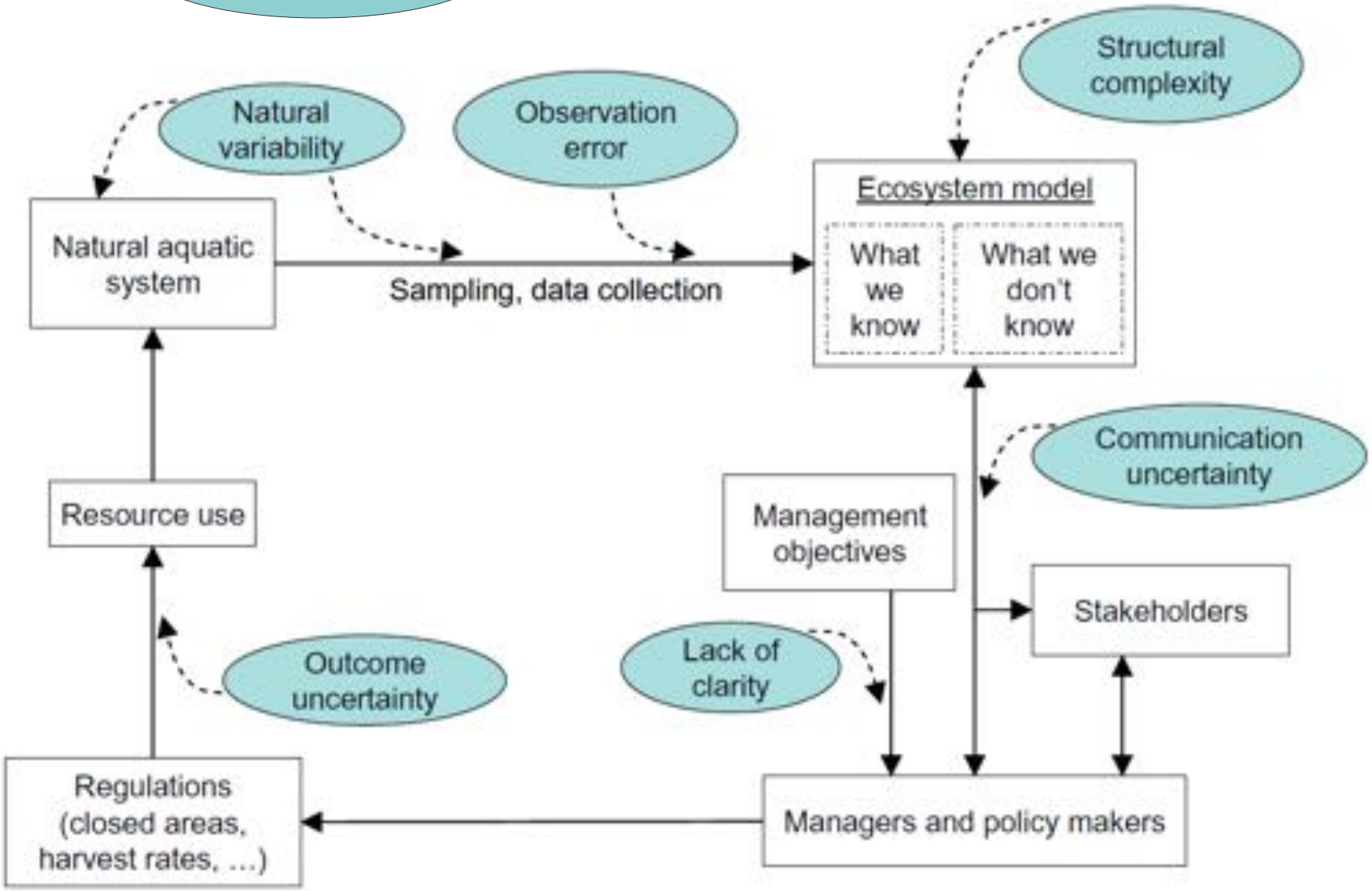
- For the US, any and all of the National Standard guidelines…

1. Multiple objectives
2. U
3. S
4. T

Explicit characterization of uncertainty

1. M
2. Uncertainty characterized
3. S
4. T

Uncertainty in resource management



J.S. Link et al./Progress in Oceanography 102 (2012) 102–114

Involving stakeholders

- Iteration required to refine scientific questions

1. M
2. U
3. Stakeholders involved
4. T

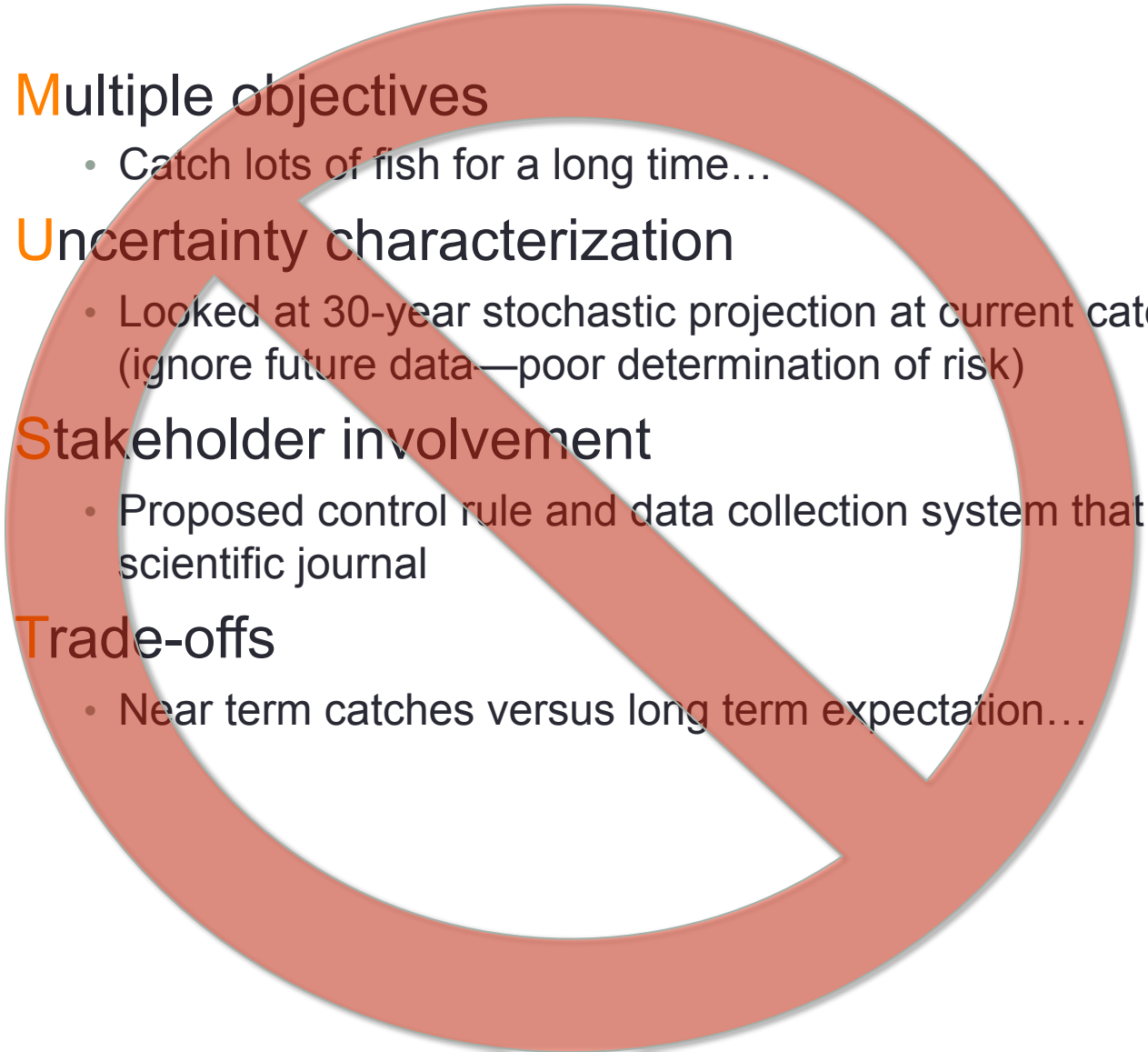
Evaluating trade-offs

- Refined performance indicators
- Not about optimality (in any single factor)

1. M
2. U
3. S
4. Trade-offs evaluated

Key MSE elements

- Multiple objectives
  - Catch lots of fish for a long time…
- Uncertainty characterization
  - Looked at 30-year stochastic projection at current catches (ignore future data—poor determination of risk)
- Stakeholder involvement
  - Proposed control rule and data collection system that only appears in a scientific journal
- Trade-offs
  - Near term catches versus long term expectation…



Basic MSE Layout

From:
Punt et al. 2014. Management strategy evaluation: best practices. Fish and Fisheries. DOI:10.1111/faf.12104

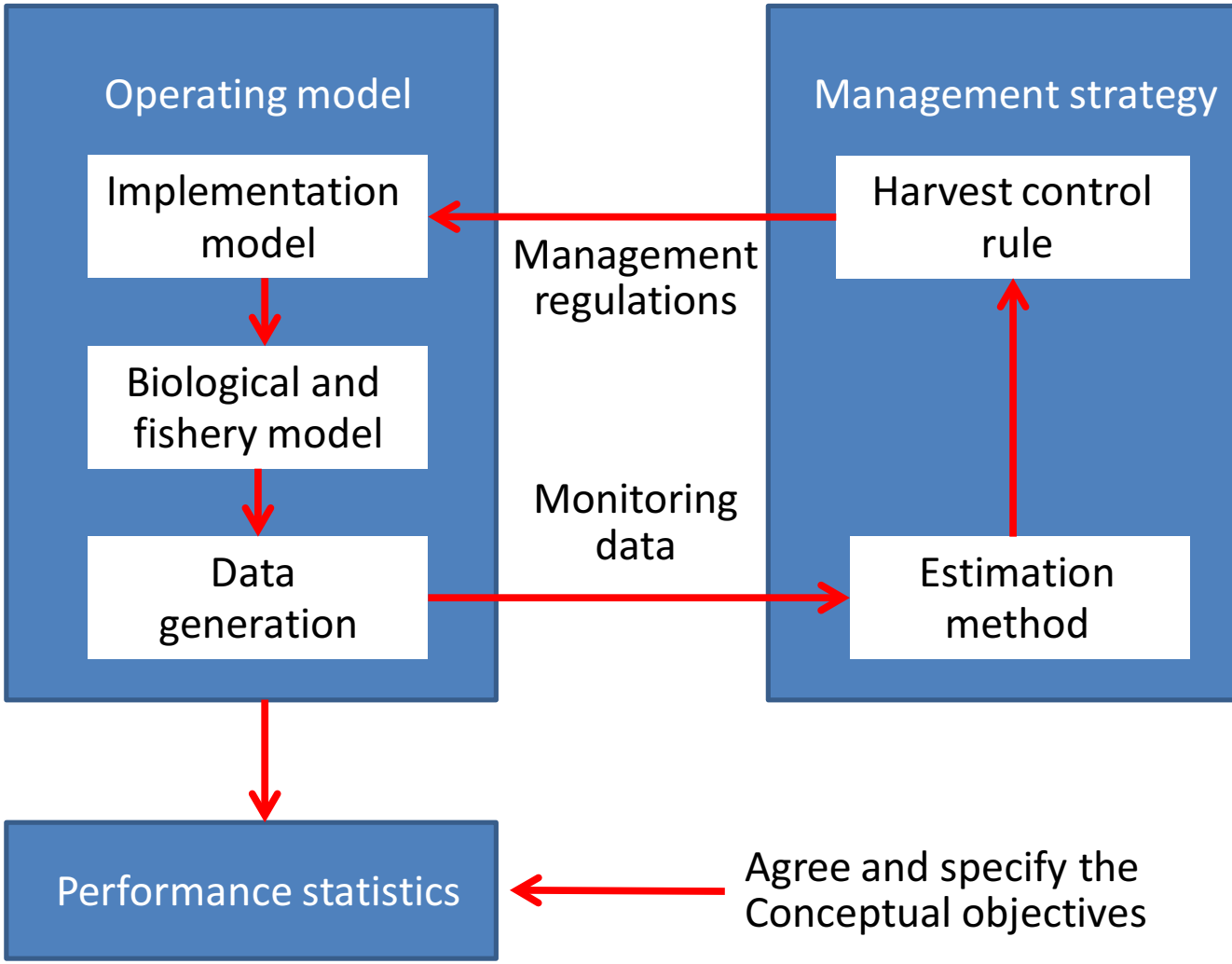
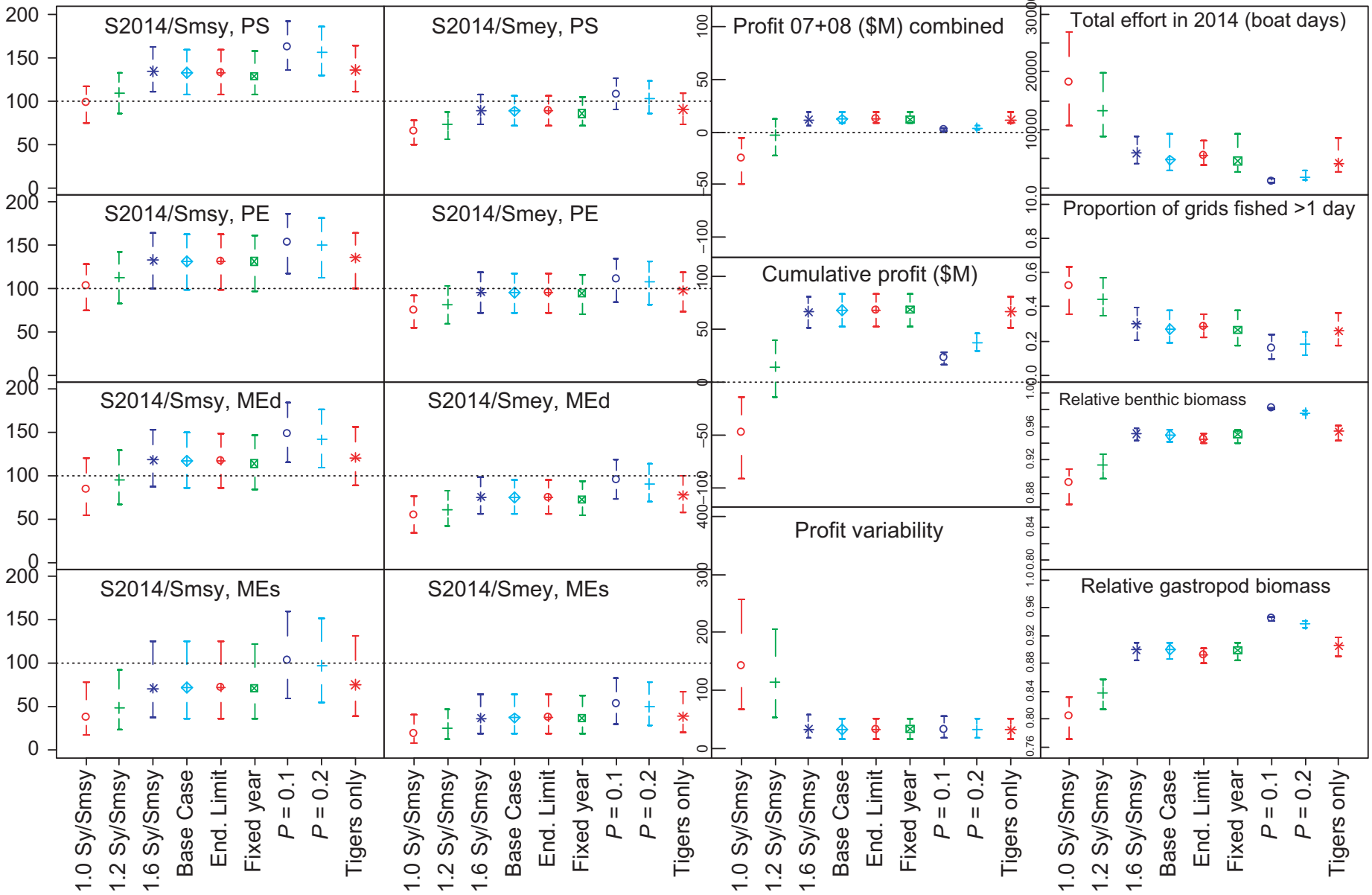


Figure 1 Conceptual overview of the management strategy evaluation modelling process.

MSE Challenges

Fulton, E.A., Smith, A.D.M., Smith, D.C. and van Putten, I.E. (2011a) Human behavior: the key source of uncertainty in fisheries management. Fish and Fisheries 12, 2–17.

What do performance indicators look like?

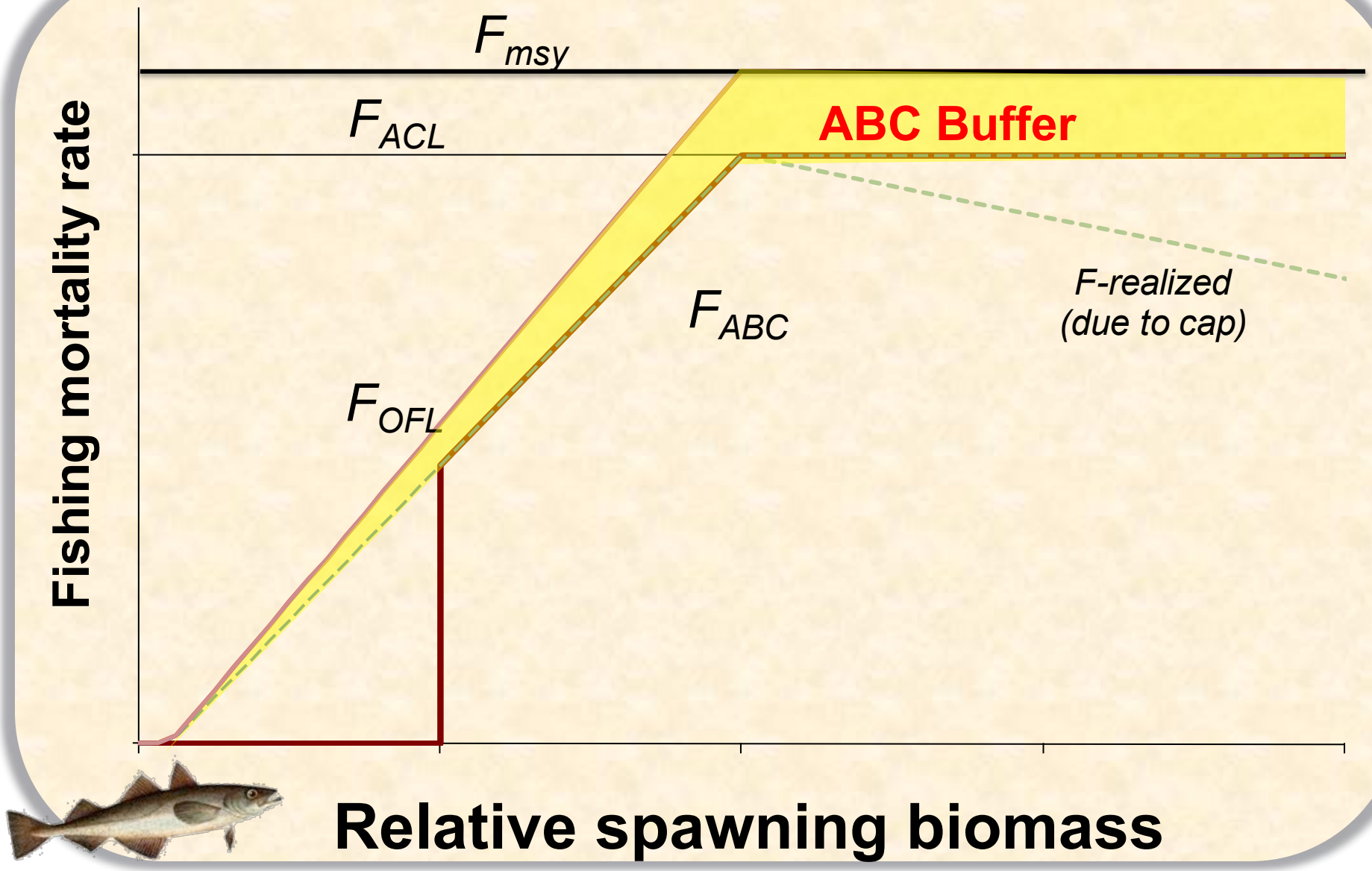


Scoring over alternatives

Evaluating harvest strategy … under climate change


Bering
Sea
Basin
Aleutian Islands
Eastern
Bering
Sea
(EBS)
Shelf
Alaska
Gulf of

Setting catch limits…

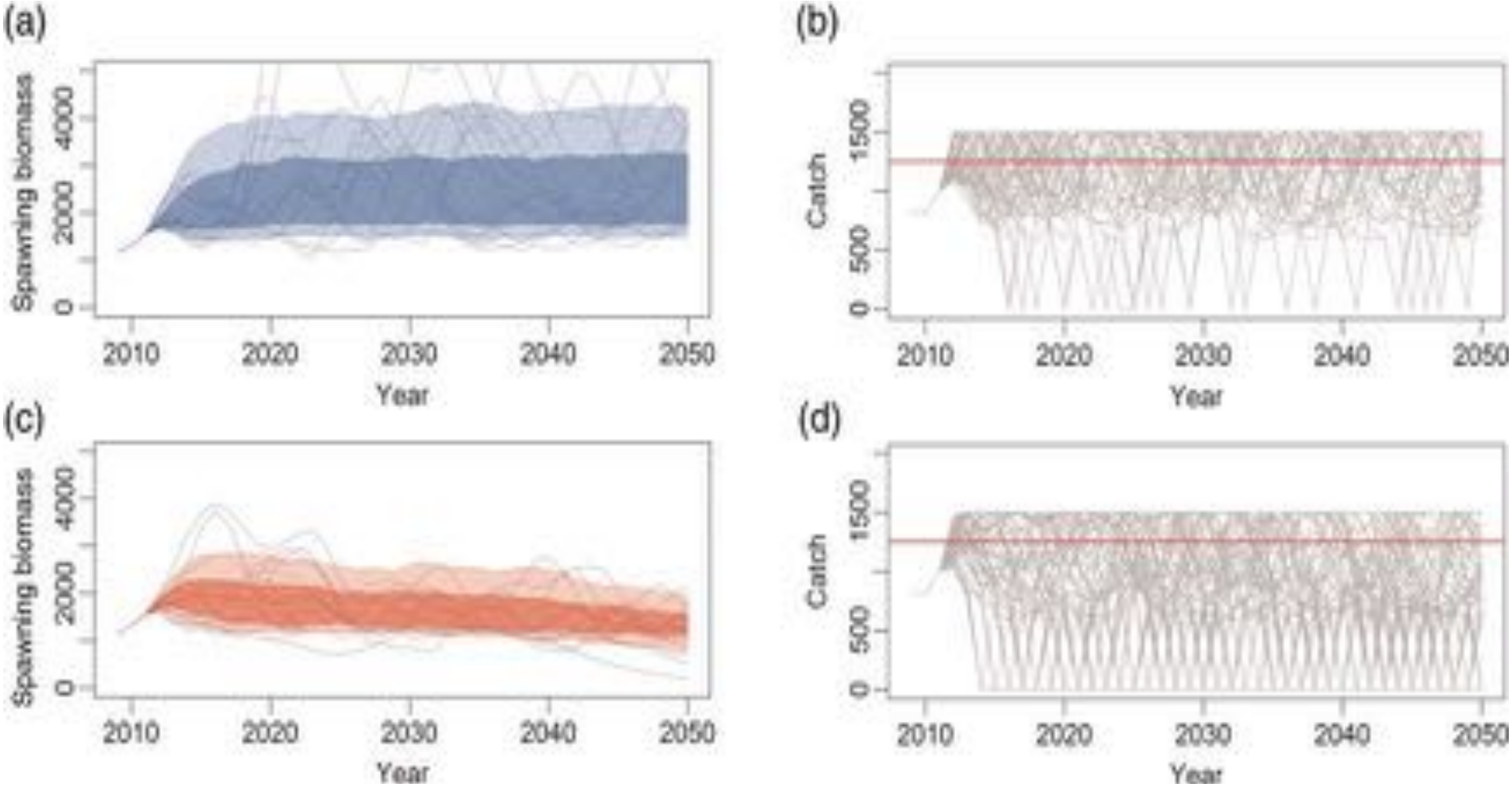


Catch management

Catch $\leq$ TAC $\leq$ ABC < OFL

OFL ~ Catch at F_{MSY}

Policy testing under climate change



Ianelli et al. (2011). Evaluating management strategies for eastern Bering Sea walleye pollock (*Theragra chalcogramma*) in a changing environment. ICES Journal of Marine Science, 68(6), 1297–1304.

Policy testing under climate change

Weaknesses:

- Narrow focus on pollock
  - But control rules based on implicit ecosystem issues (e.g., Steller sea lion measures)
- Ignores future data collections and assessments (affects uncertainty characterization)
- Little traction at the Council level (stakeholder involvement low)

Strengths

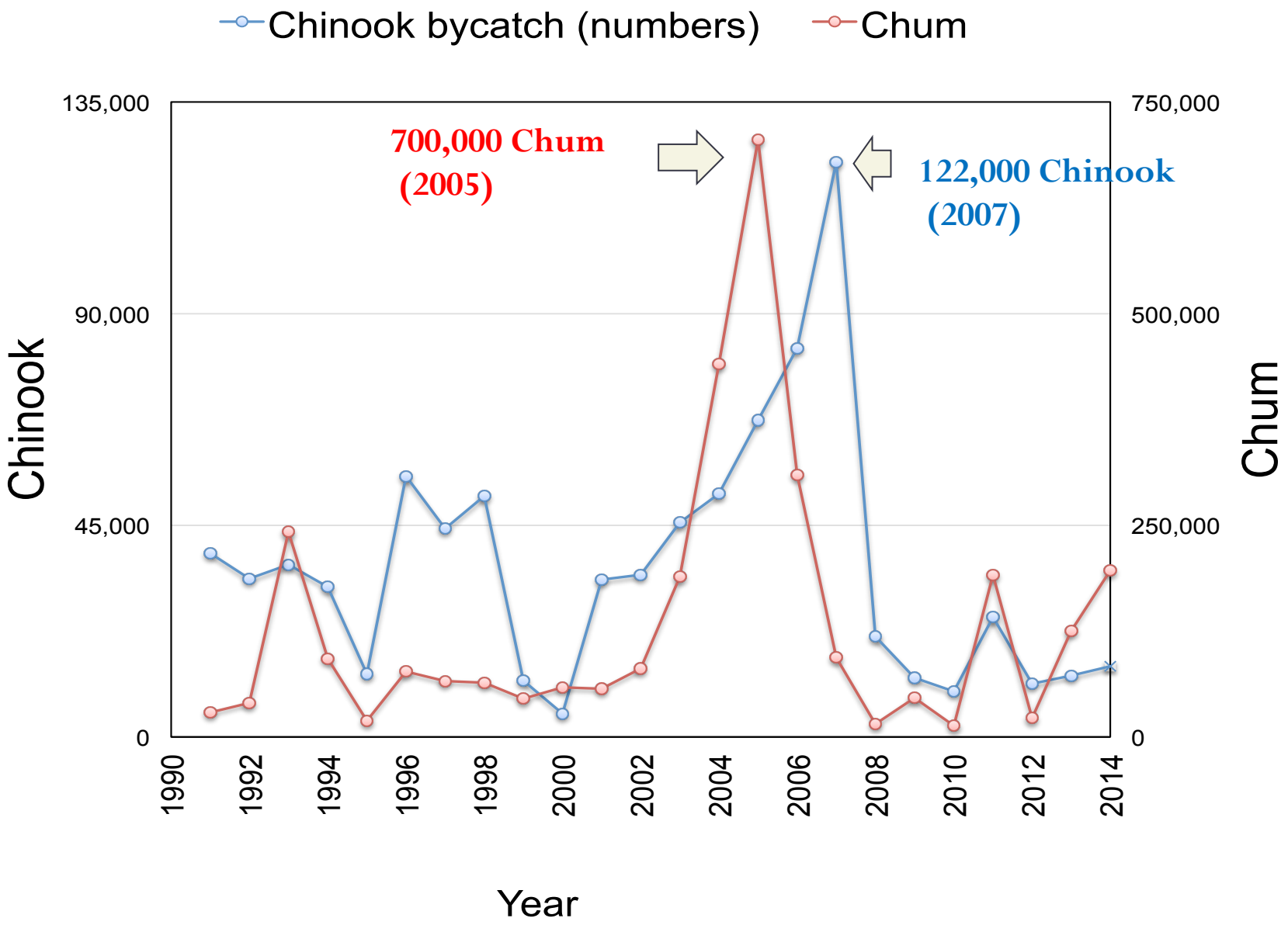
- Illustrates trade-offs at a strategic level that current HCR components may require adjusting

Ianelli et al. (2011). Evaluating management strategies for eastern Bering Sea walleye pollock (*Theragra chalcogramma*) in a changing environment. ICES Journal of Marine Science, 68(6), 1297–1304.

Chinook salmon bycatch in the pollock fishery…

Is an EA/RIR an MSE???

The issue—bycatch in the pollock fishery



Risk assessment and management is hard…

Alternatives under consideration in 2015

Three broad measures:

1. Combined chum and Chinook program
2. Changes to incentive plan requirements
3. Lower bycatch caps in years of low Chinook abundance

Chinook salmon EA/RIR (FMP Amend. 110)

Weaknesses

- Characterization of uncertainty
  - Extensive data employed, but behavioral aspect far too complex to model reasonably (Used an empirical approach—i.e., “what if” alternative management measures had been in place…

Strengths

- Many objectives considered
- Stakeholders very involved (outreach, long process of many meetings)
- Trade offs explicit in NEPA

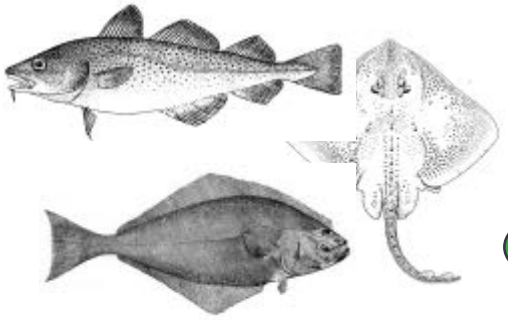
A spectrum of tools, a spectrum of uses

Stock/Single Species

SS models

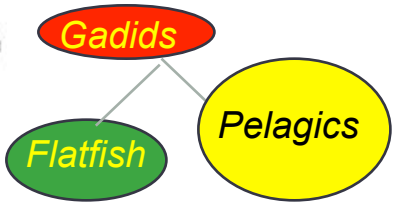
SS assessments with add-ons: explicit M2 or habitat or climate considerations

Multi-species



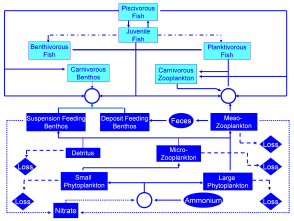
Multi-species assessments

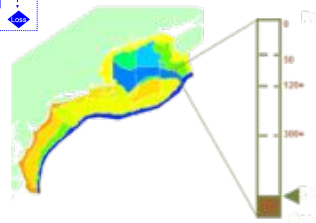
Aggregate Biomass



Functional group models

Ecosystem





Whole system models

Integrated ecosystem assessments

Courtesy Sarah Gaichas et al. NEFSC

MSE developments within NOAA/NMFS

- One New FTE specializing in MSEs at each center
  - Ecosystem-based management (EBM) and social science experience in fisheries management context desired