



# An update on the Management Strategy Evaluation (MSE)

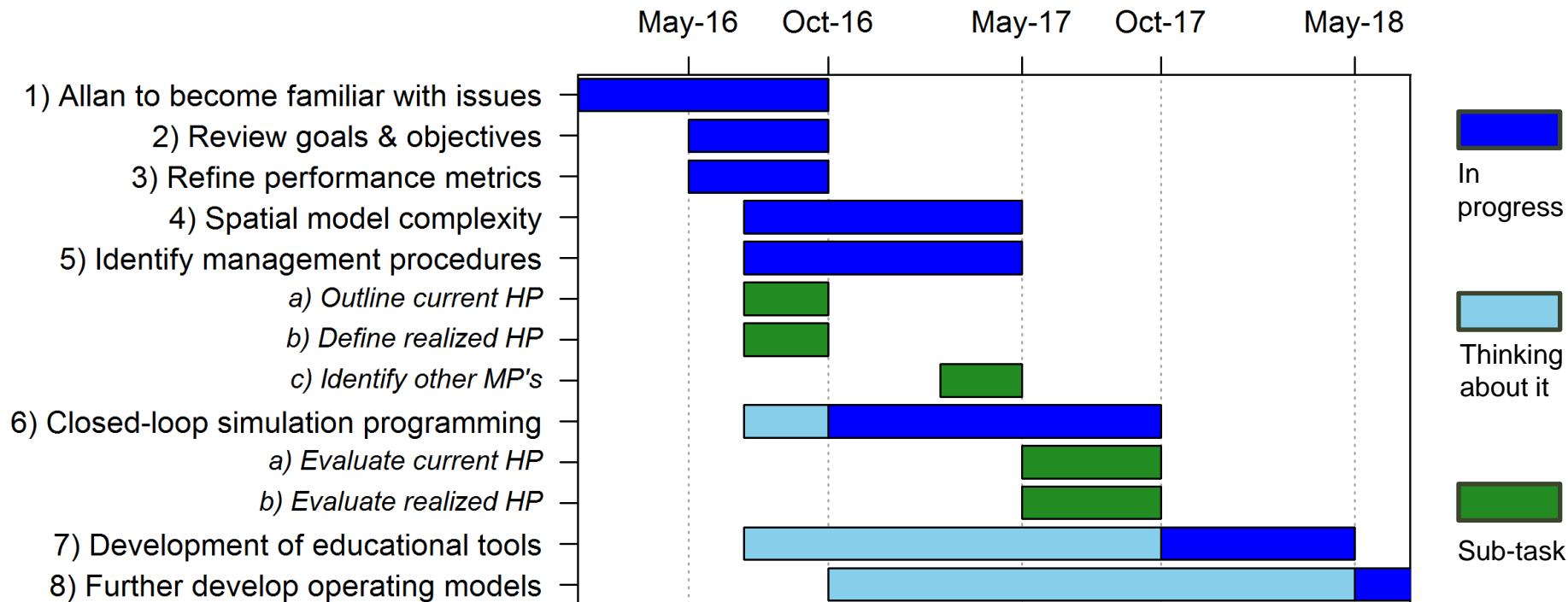
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# Workplan

- A 2-year workplan for MSE development was created



# Topics for this presentation

- An investigation of the current harvest policy
- An improved harvest policy
- MSE progress and future work

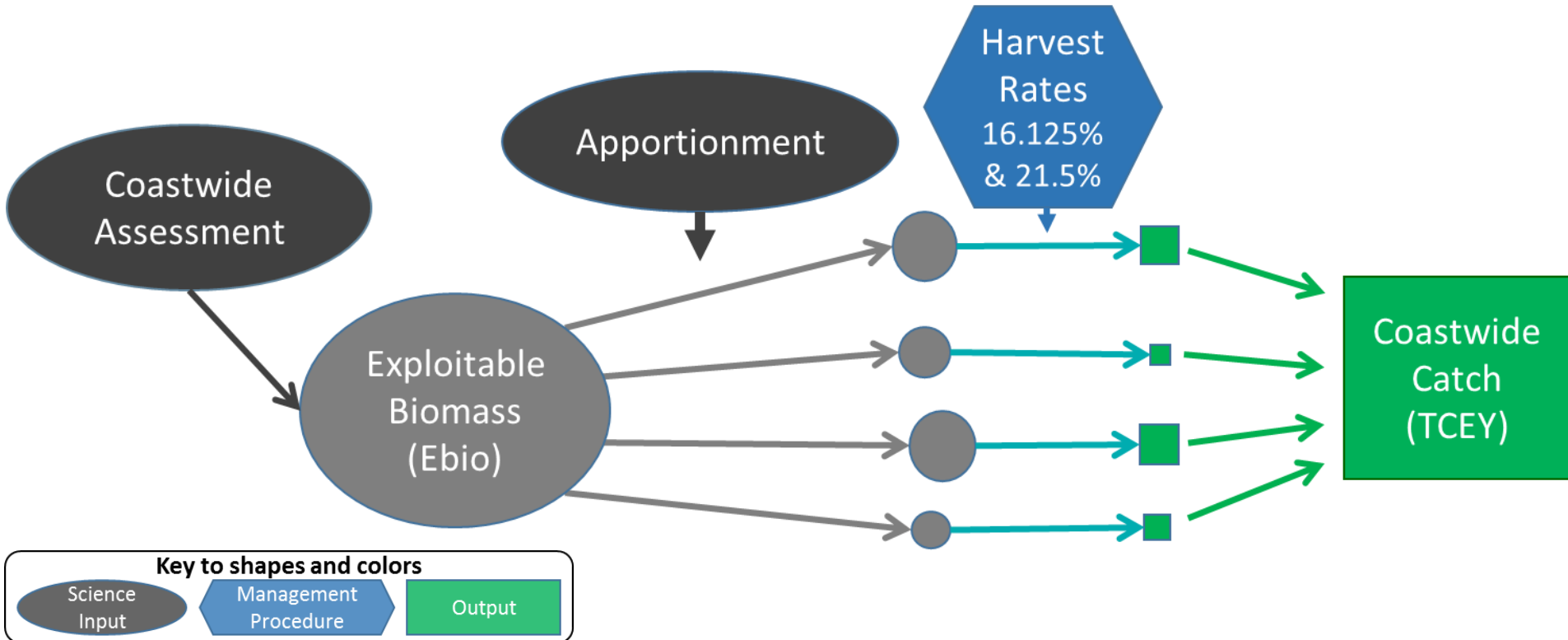


# Current harvest policy

- Defines the catch described by the Blue Line
- Designed to meet five goals
  1. avoid very low stock sizes;
  2. mostly avoid low stock sizes;
  3. achieve most of MSY;
  4. reduce variability in catch; and
  5. distribute removals in proportion to the current stock biomass (i.e. preserve biocomplexity).

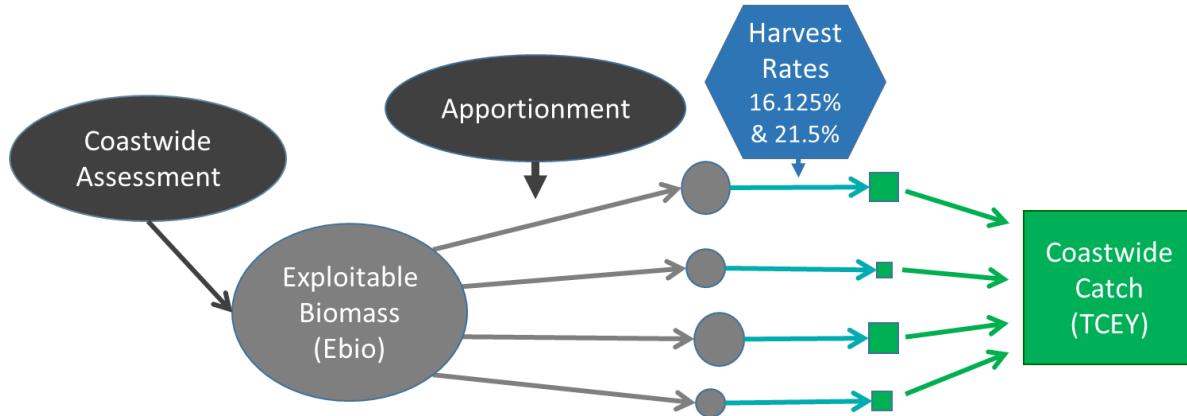


# Current harvest policy



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- **Scale:**
  - Exploitable Biomass (EBio) & harvest rates
- **Distribution:**
  - Apportionment and relative harvest rates



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What is the fishing intensity on the coastwide stock?

Scale and Distribution are not independent



# Scale of exploitation (current harvest policy)

## Exploitable Biomass

- Uses externally derived selectivity
  - Not representative of the current stock assessment

## Harvest rates (area-specific)

- 16.125%: Western areas (3B, 4A, 4B, 4CDE)
- 21.5%: Eastern areas (3A, 2C, 2B, 2A)
- Reduced by a control rule at low stock sizes ( $< 30\%$  of B0)





# **Distribution of exploitation (current harvest policy)**

## **Apportionment**

- Distribute EBio to Regulatory Areas
- O32 WPUE from setline survey

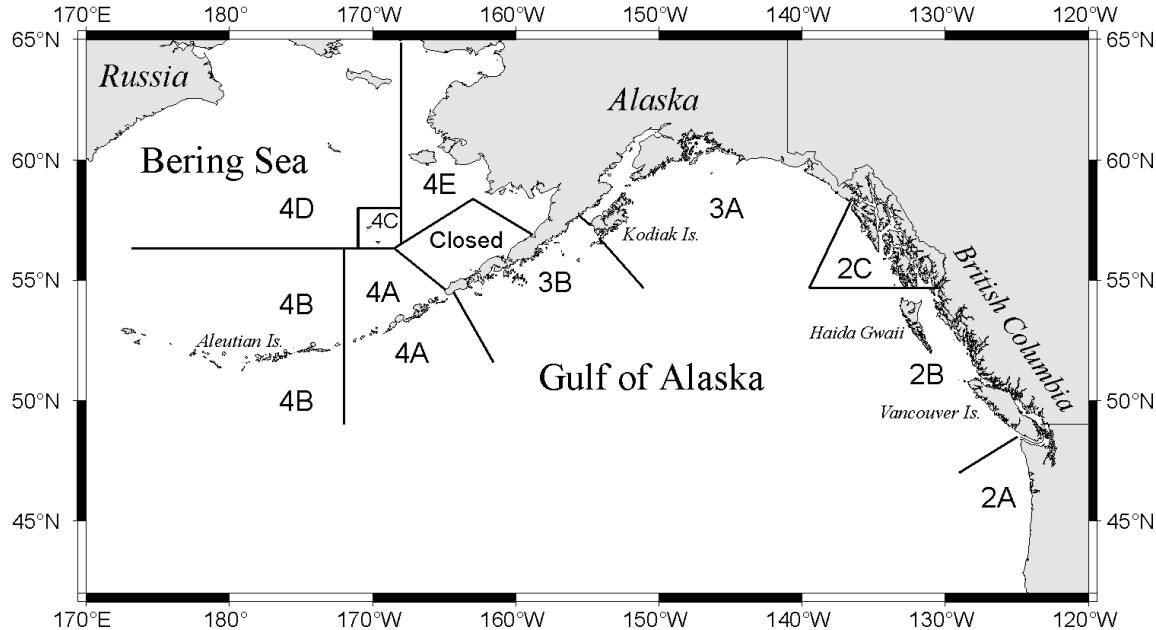
## **Relative harvest rates**

- Higher harvest rates in East



# Problems with the current harvest policy

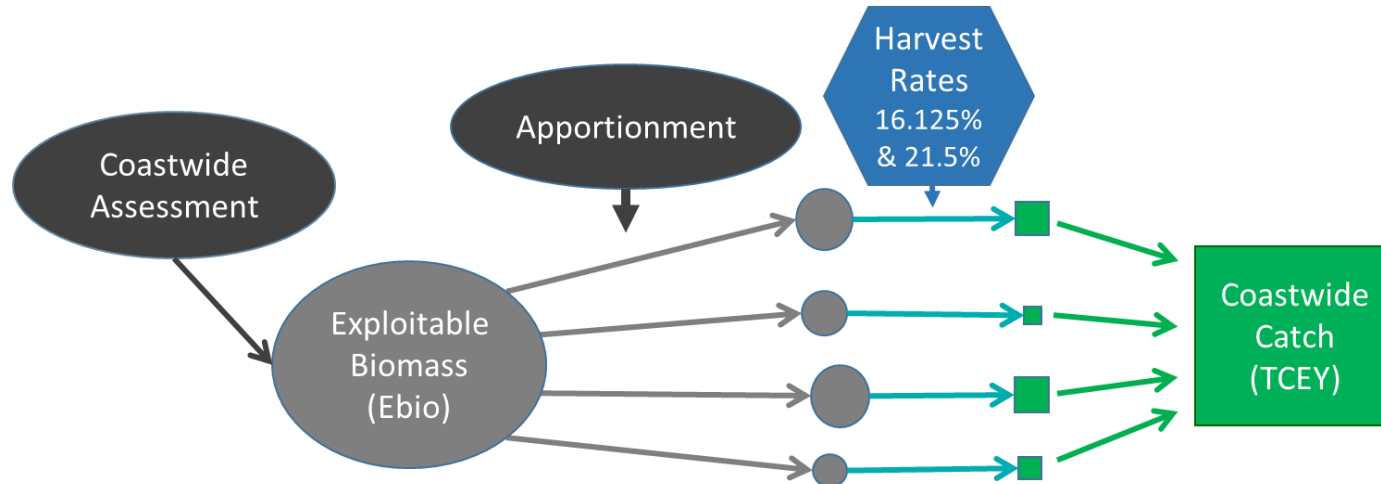
## 1. Past simulations based on core areas (2B, 2C, 3A)



# Problems with the current harvest policy

## 2. Scale (fishing intensity) and distribution (catch across areas) confounded

- Coastwide assessment, split EBio into Areas, then sum it



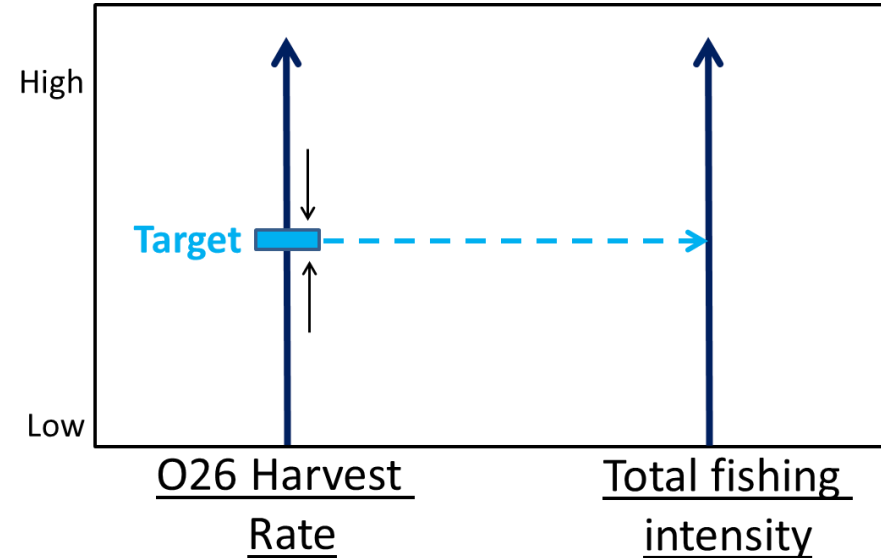
# Problems with the current harvest policy

3. EBio is inconsistent with assessment results
  - Selectivity out of sync with current assessment
  - Does not include all sources of removals
  - Does not exactly represent fishing mortality



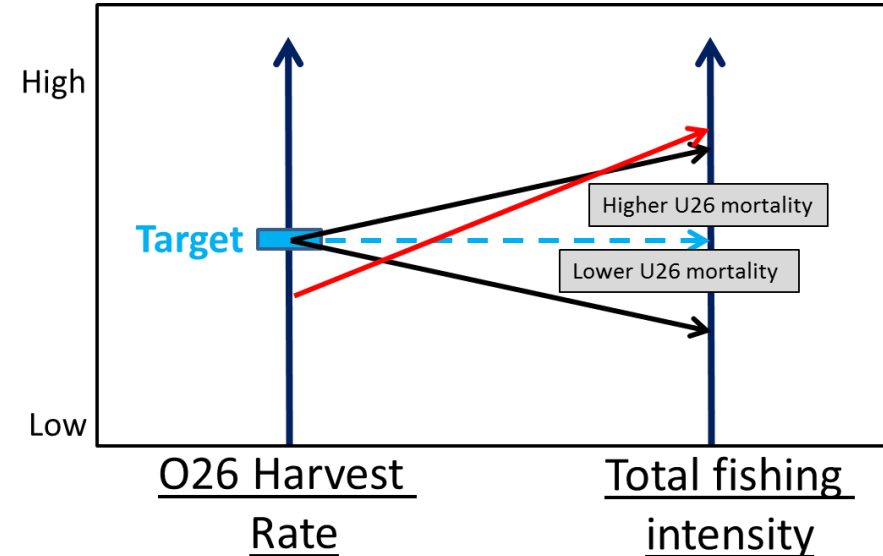
# Problems with the current harvest policy

4. Mortality of U26 fish not explicitly accounted for
  - Apportionment (O32), Harvest rates (O26), EBio (???)
  - TCEY/FCEY remains unchanged regardless of U26 mortality



# Problems with the current harvest policy

4. Mortality of U26 fish not explicitly accounted for
  - Apportionment (O32), Harvest rates (O26), EBio (???)
  - TCEY/FCEY remains unchanged regardless of U26 mortality
  - U26 mortality will be indirectly realized in later years



# Why a harvest policy?

- Long-term strategic planning to meet objectives
  - Provides a reference point to base annual decisions on
  - Short-term, tactical decisions can override the harvest policy, understanding that consistent departure will have consequences



# Why a harvest policy?

- Can be evaluated against external standards
  - For example, MSC certification
  - Provides credibility to the management of Pacific halibut
- Can include harvest agreements
  - For example, relative harvest rates across Areas





# Developing an updated harvest policy

- Management Strategy Advisory Board (MSAB)
  - Develop a Management Strategy Evaluation (MSE) process for the Pacific halibut fishery
    - Design robust harvest policies, through stakeholder consultation and simulation modelling



# Managing on total mortality

- Earlier assessments included only age 8 and older halibut
- Those were updated to include age 6 and older
- Then, management was based on O32 mortality
- In 2011, updated management for O26 mortality
- Now, why not manage on **OZero (over zero)** mortality?
  - Account for all removals across all fleets
  - Need a measure that accounts for all sizes and sources
    - Selectivity varies by fleet, thus harvest rates are not comparable



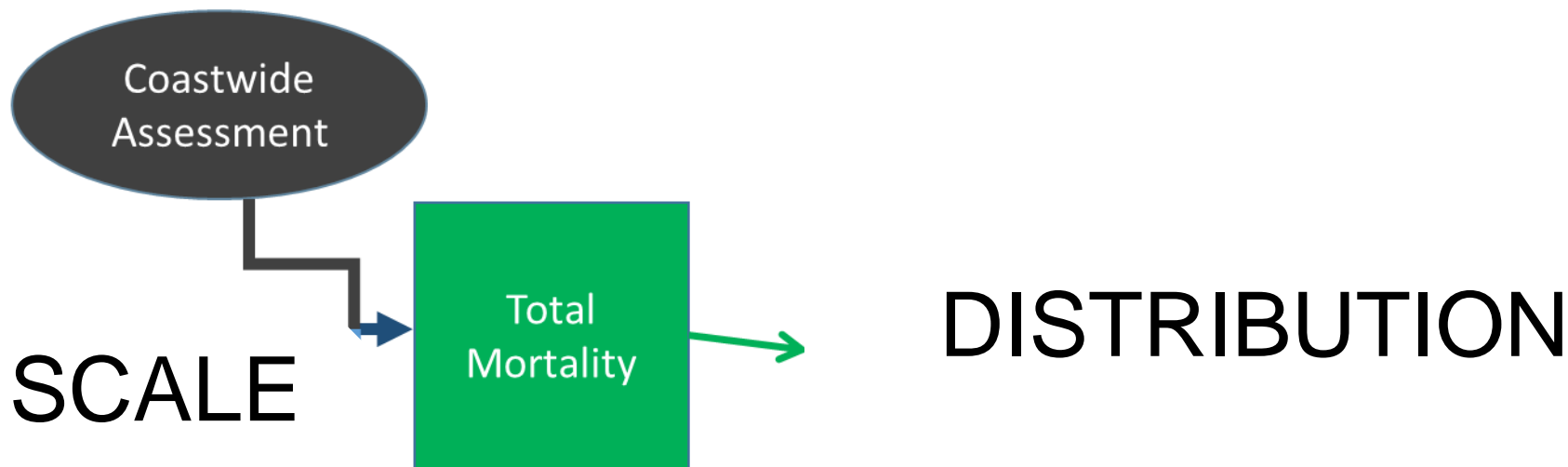
# Rearranging the current harvest policy

Key to shapes and colors

Science  
Input

Management  
Procedure

Output



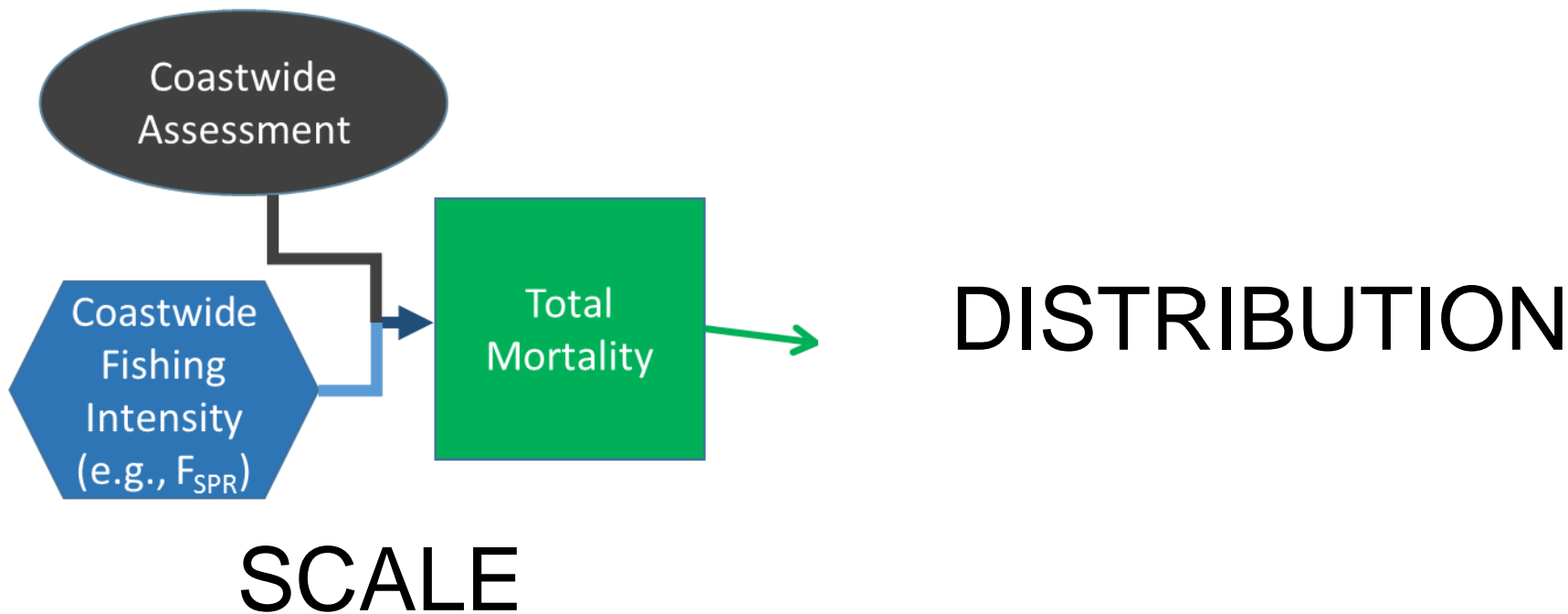
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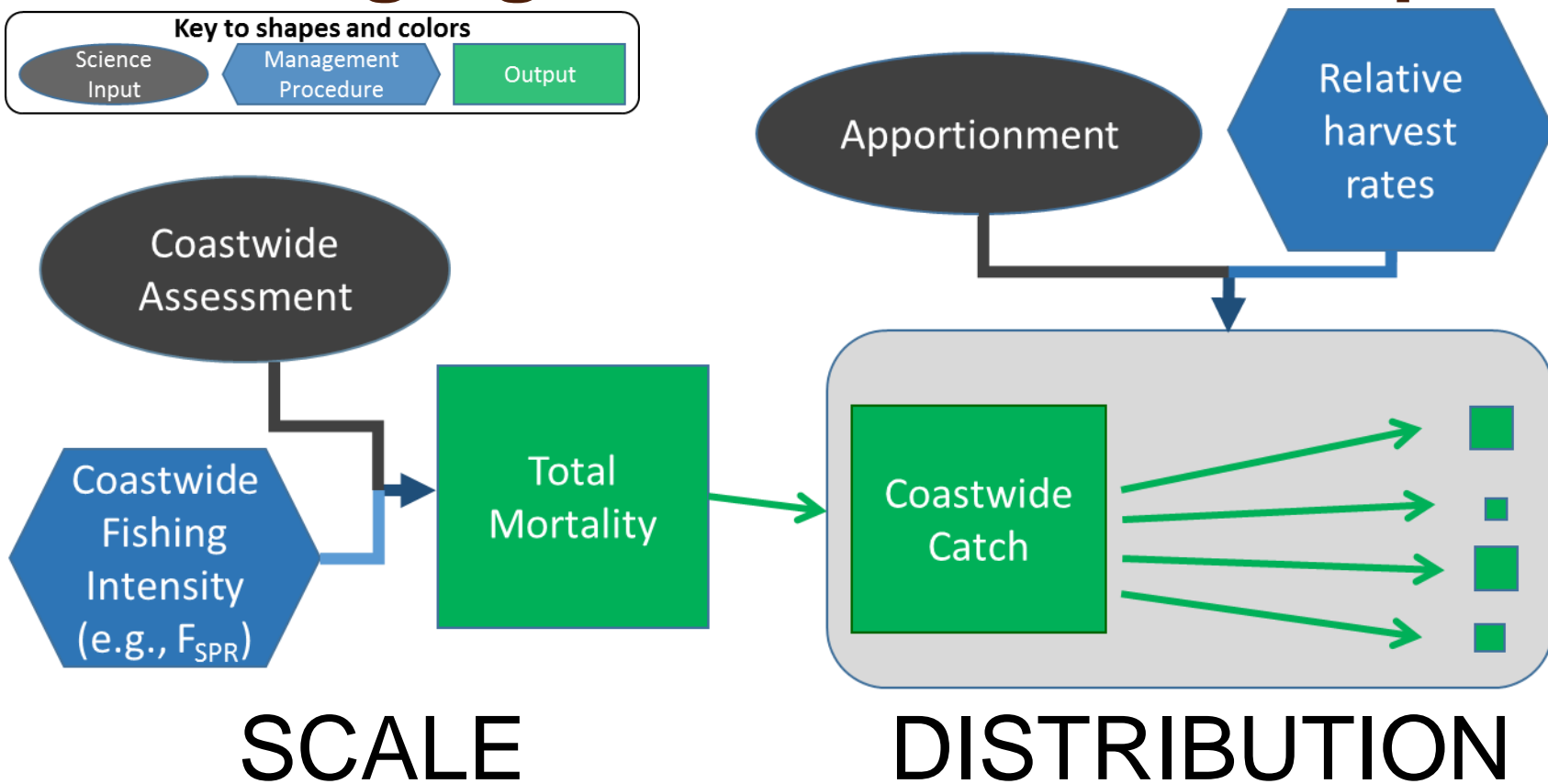
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# Spawning Potential Ratio (SPR)

Spawning Output Per Recruit with fishing *divided by*  
Spawning Output Per Recruit with no fishing

- A measure of the reduction in spawning potential due to fishing at a constant rate ( $F_{SPR}$ )
- A long-term, average concept
- SPR=100% means no fishing
- SPR=40% means a 60% reduction in spawning potential

## Coastwide Fishing Intensity



# The benefits of SPR

- Provides a single measure of fishing intensity on all sizes and over all fisheries
- Relates to spawning potential
- Is commonly used around the world
- Has been researched extensively



# Benefits of this SPR-based harvest policy

- Accounts for all mortality from all sources
- Separates scale and distribution
- Allows for a more straightforward and clear evaluation in an MSE
- First step to investigating Fisheries Footprints





# Mapping to an SPR-based approach

## 1. Introduction of $F_{SPR}$ to set the scale

- Use past adopted catch levels to define *status quo*

	Total removals (M lb)	Fishery CEY (M lb)	Fishing intensity	Stock Trend				Stock Status				
				Spawning biomass				Spawning biomass				
				in 2018		in 2020		in 2018		in 2020		
				is less than 2017	is 5% less than 2017	is less than 2017	is 5% less than 2017	is less than 30%	is less than 20%	is less than 30%	is less than 20%	
<b>2017 Alternative</b>												
<b>No removals</b>	<b>0.0</b>	<b>0.0</b>	<b>F<sub>100%</sub></b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>&lt;1</b>	<b>3</b>	<b>&lt;1</b>	<b>1</b>	<b>&lt;1</b>	
<b>Blue Line</b>	<b>37.9</b>	<b>26.1</b>	<b>F<sub>48%</sub></b> 33%-62%	<b>56</b>	<b>3</b>	<b>77</b>	<b>53</b>	<b>6</b>	<b>&lt;1</b>	<b>12</b>	<b>&lt;1</b>	
<b>status quo SPR</b>	<b>41.6</b>	<b>29.7</b>	<b>F<sub>46%</sub></b> 32%-60%	<b>68</b>	<b>6</b>	<b>87</b>	<b>64</b>	<b>6</b>	<b>&lt;1</b>	<b>15</b>	<b>&lt;1</b>	



# Looking into the future

- The *status quo* SPR
  - A stepping stone to map to a new harvest policy
  - Consistent with what we've been doing
    - The spawning biomass has recently been stable or slowly increasing at this  $F_{SPR}$  fishing intensity
  - Short-term, tactical decision making
- Various values of  $F_{SPR}$  can be evaluated with MSE
  - Long-term, strategic thinking





# Management procedures and scenarios

- A management procedure
  - Something that we control
- A scenario
  - Something that we cannot (or choose not to) control

Choose management procedures  
that are robust to scenarios



# Management procedures and scenarios

What about bycatch?



# Abundance-based Management of PSC limit

- Prohibited Species Catch limit (PSC) of Pacific halibut
  - Currently a fixed amount determined by the NPFMC
- As halibut abundance declines
  - PSC limit is a larger proportion of the total removals
- As halibut abundance increases
  - PSC limit constrains other fisheries
- ABM of a PSC limit in Bering Sea/Aleutian Islands is a priority for NPFMC
  - Working group formed to provide alternatives for consideration



# Bycatch in the MSE

- Potentially, future IPHC MSE models can help evaluate ABM of PSC limits in the BSAI
- The MSAB is focused on the directed fishery
- Current plan is to treat “bycatch” as a scenario
  - Integrate over a range of possible bycatch limits to develop a harvest policy robust to various PSC scenarios



# Summary

- The current harvest policy needs updating
- An SPR-based harvest policy is presented
  - *Status quo* SPR a row in the decision table is an interim, short-term mapping over
- MSE will be used to evaluate alternative SPR values that will meet long-term objectives
  - Robust to possible bycatch scenarios





