

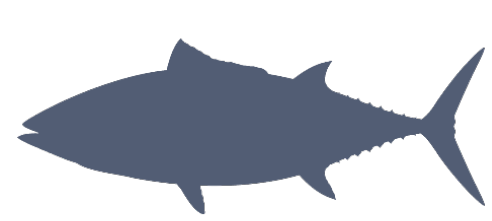
# ALBACORE MANAGEMENT STRATEGY EVALUATION INTERACTIVE WEB TOOL

Agenda Item I.2.a  
Supplemental HMSMT Presentation 1  
March 2022

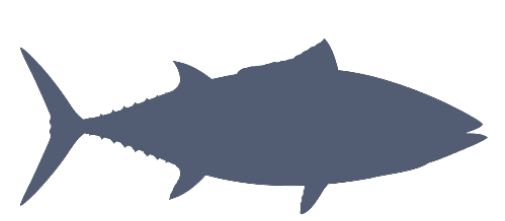
March PFMC Council Meeting  
Agenda Item I.2.a  
HMSMT Supplemental Report 1  
March 13, 2022

Presented by:

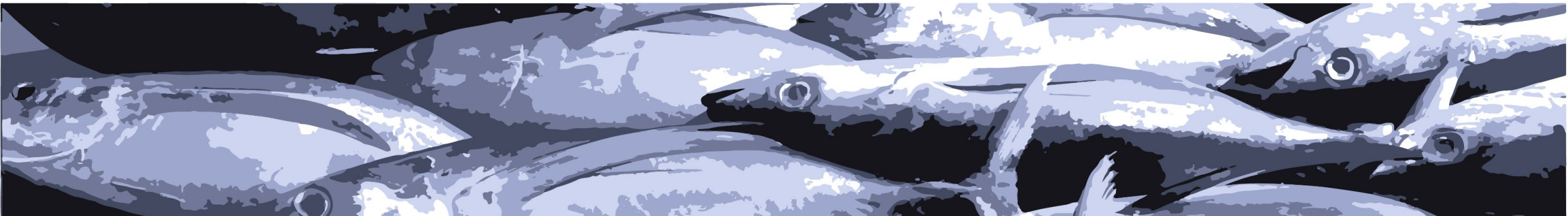
Jessica Watson (HMSMT) and Dr. Desiree Tommasi (NOAA SWFSC and Institute of Marine Sciences at UCSC)



# ALBACORE MANAGEMENT STRATEGY EVALUATION INTERACTIVE WEB TOOL



**[https://pfmc.shinyapps.io/Albacore\\_MSE/](https://pfmc.shinyapps.io/Albacore_MSE/)**



North Pacific Albacore Management


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Pacific Fishery Man... Sign in to Concur |... Workday oregon ~... Alaska Airlines Oregon Coastal Oc... NVS : Tuna Fishers MSC | Western Fish... Western Fishboat O... Highly Migratory S... Federal Register :: l... Fish Ticket - SQL Se... » | Other bookmarks Reading list

North Pacific Albacore Management Strategy Evaluation

☰

📄 Background

🗨 What is a Management Strategy?

👤 What is an MSE?

📄 Limitations of MSE

👤 Who Conducted the MSE?

📄 The Management Objectives

📄 The Harvest Strategies

☰ How to Use the Tool

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📄 Where to Go From Here?

⚙ Glossary

⚙ How Does the Tool Work?

## Background

The app is intended to help managers and stakeholders understand fishery management concepts, learn about the North Pacific albacore management strategy evaluation (MSE), and evaluate the results of the MSE in relation to their particular concerns about the fishery.

The five tabs following this one (accessed from the pane on the left) help the user understand what we mean by a management – or harvest – strategy, and how they are evaluated through computer simulation (the MSE). Users are encouraged to read through those tabs before moving on to the *Evaluation Tool* in the sixth tab. (For reference, there is a glossary of terms on the last tab.)


The *Evaluation Tool* lets the user interact with the MSE results. The results, the evaluation part of MSE, have been reported with respect to management objectives that were identified at the start of the MSE process. These objectives represent the concerns of various stakeholders, such as minimizing the risk of depleting the albacore stock and maintaining consistent catch levels. Using the *Evaluation Tool*, stakeholders can selectively weight the objective-related performance indicators according to their preferences. The *Evaluation Tool* then displays the relative performance of each harvest strategy based on those preferences. This should give the user a better understanding of which management strategies they would like to see get put in place by managers.

Inspired by the presentations and discussions at the Fifth Stakeholder Workshop, Kit Dahl (Pacific Fishery Management Council staff) and Jessica Watson (Oregon Department of Fish and Wildlife and on the PFMC's Highly Migratory Species Management Team) began working on this app after in March 2021. They sought advice from Desiree Tommasi from the National Marine Fisheries Service Southwest Science Center and the University of California Santa Cruz Institute of Marine Sciences, who was the lead modeler for the MSE. The Evaluation Tool uses the results reported in Tables A5 and A6 of the [Report of the North Pacific Albacore Tuna Management Strategy Evaluation](#). These tables present the results in terms of the likelihood of an objective being met. The tool applies user-provided weights to scaled versions of these values and produces a summed value to relative value of harvest strategies based on the user's preferences.

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North Pacific Albacore Management

pmc.shinyapps.io/Albacore\_MSE/

North Pacific Albacore Management Strategy Evaluation

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## Harvest Strategy Evaluation Tool

The Evaluation Tool uses a simple scoring system to rank harvest control rules based on user input. Results of the MSE underlie it in the form of probabilities that each evaluated performance indicator would be achieved under each HCR. These are reported in Table A5 (for the mixed control management procedure) and Table A6 (for the TAC management procedure) found in the Appendix to the North Pacific Albacore MSE Final Report. In the MSE, these probabilities were calculated by simulating, for each candidate HCR, the albacore population and fleets over a 30-year future time period under different “what if” scenarios for stock productivity, recruitment variability, availability to the Eastern Pacific Ocean (EPO) fishery, observation error, assessment error, and management implementation error. These “what if” scenarios were based on the ALBWG’s best estimate of the uncertainty or were specified by the managers and stakeholders.

Probabilities are reported for the four productivity scenarios incorporated into the MSE. These productivity scenarios represent different operating models representing “true” stock dynamics based on parametrization of biological factors such as growth or natural mortality.

## Evaluation Tool

To use this tool, set the slider bars below to indicate how important you think it is to achieve each objective relative to the other objectives. Dropdown menus below the description of each objective allow you to choose which performance metric to use for that objective (in cases where there is more than one metric for that objective). The slider bars allow you to indicate your importance rating on a five point scale (from left to right): **1 - not important, 2 - slightly important, 3 - moderately important, 4 - important, 5 - very important**. Note that you will get the same ranking if you choose the same importance level for all the objectives, no matter the value chosen.

Below the slider bars is another dropdown menu allowing you to choose the stock productivity scenario you want to use when ranking the HCRs. These are:

- Scenario 1: moderately high productivity, high plausibility
- Scenario 3: highest productivity, medium plausibility
- Scenario 4: moderately low productivity, medium plausibility
- Scenario 6: lowest productivity, low plausibility

Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

Probability that SSB in any future year of the MSE simulation is above the LRP



Maintain Historical Total Biomass (maintain depletion of total biomass around historical average depletion):

Probability that the depletion of total biomass in any future year of the MSE simulation is above minimum historical (2006-2015) depletion



Plot Option 1

Plot Option 2

Plot Option 3

Results

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Maintain Catches Above Average Historical Catch (maintain catches above historical average):

Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch.



Change in Total Allowable Catch Between Years Should be Relatively Gradual (minimize changes in management over time):

Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

🐟 Analyze Data!

Plot Option 1

Plot Option 2

Plot Option 3

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Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

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Ftarget/F



Scenario:

1: moderately high productivity, high plausibility

Analyze Data!

Plot Option 1

Plot Option 2

Plot Option 3

Results

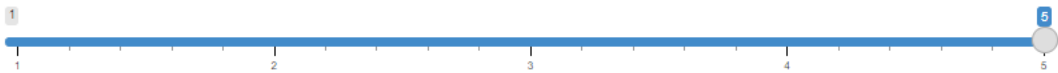
Table

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Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

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Maintain Historical Total Biomass (maintain depletion of total biomass around historical average depletion):

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Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

Analyze Data!

Plot Option 1

Plot Option 2

Plot Option 3

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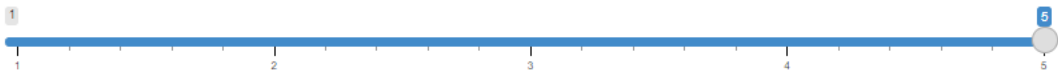
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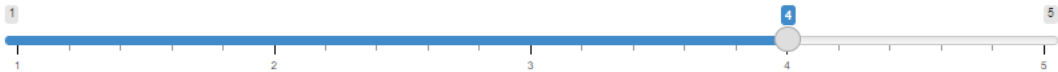
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Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

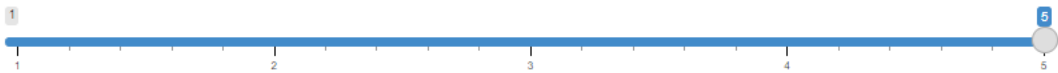
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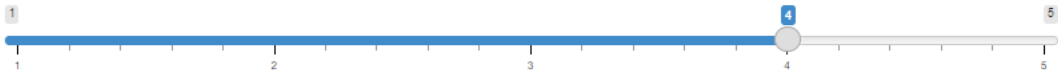
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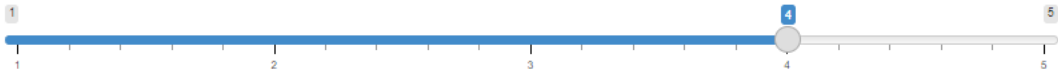
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Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

🐟 Analyze Data!

Plot Option 1

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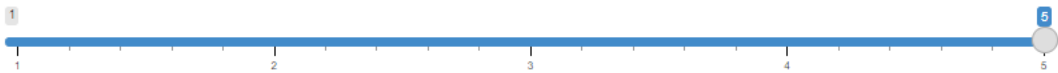
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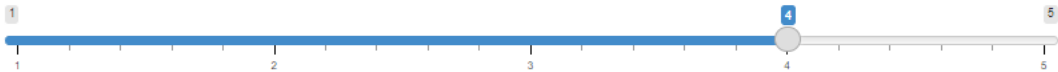
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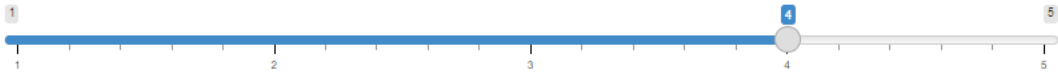
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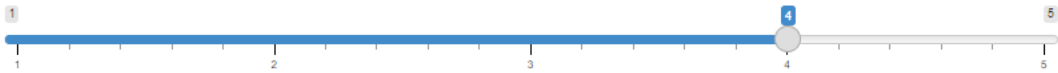
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Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

🐟 Analyze Data!

Plot Option 1

Plot Option 2

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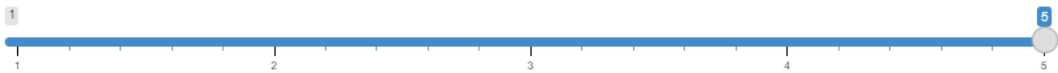
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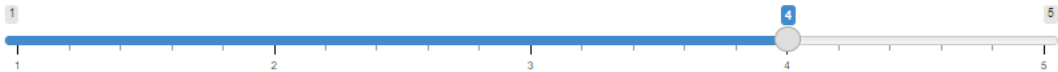
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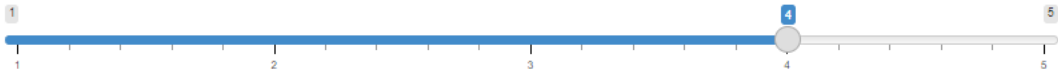
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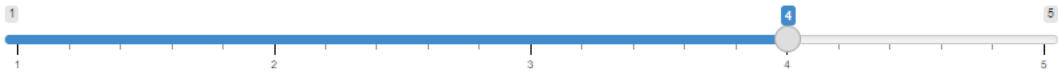
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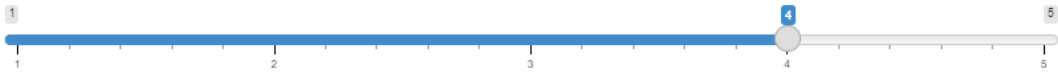
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Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

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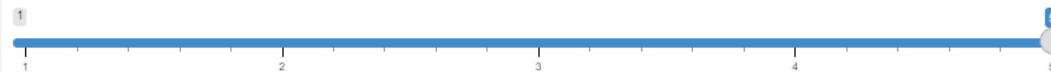
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Plot Option 1 Plot Option 2 Plot Option 3 Results

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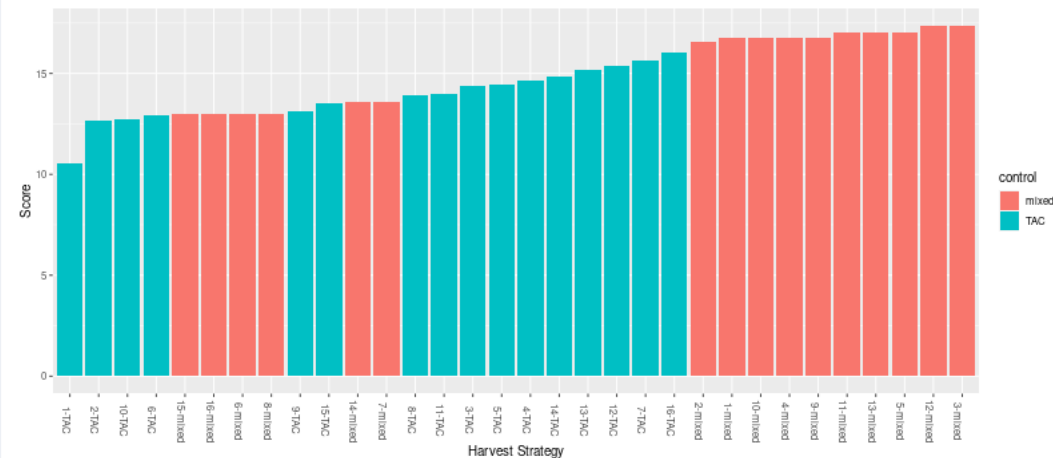
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Harvest strategy scores based on your management objective preferences

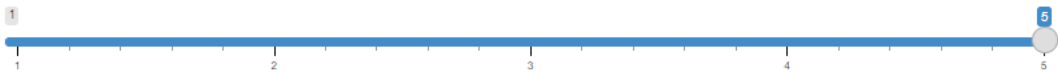
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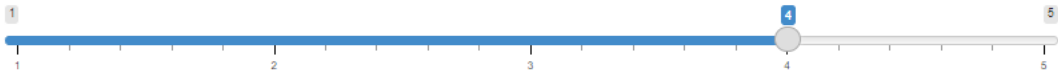
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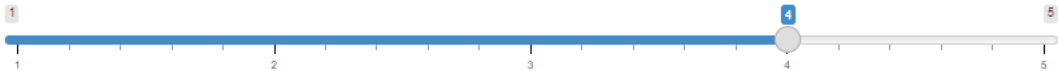
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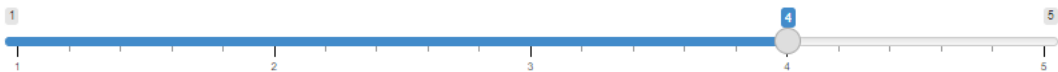
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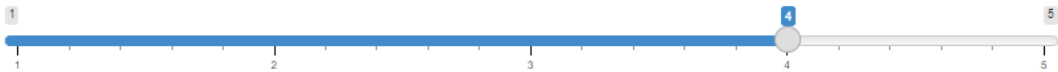
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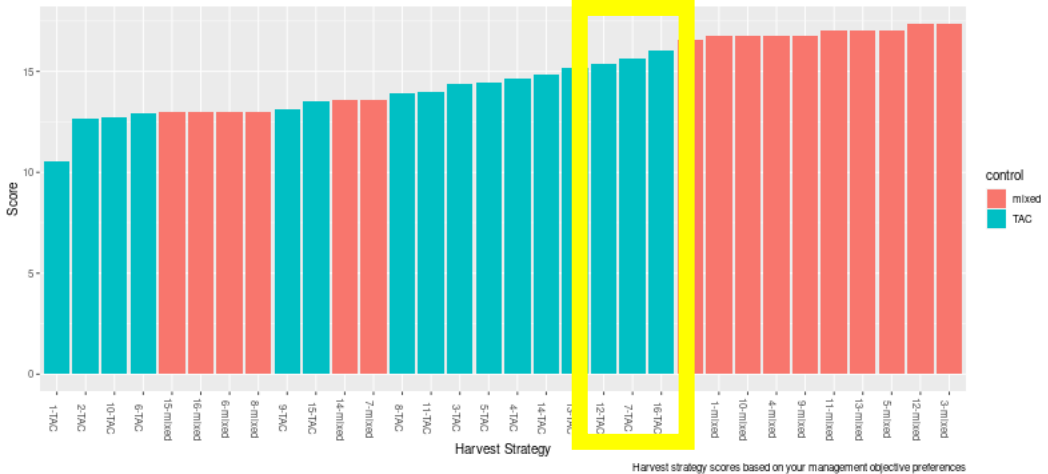
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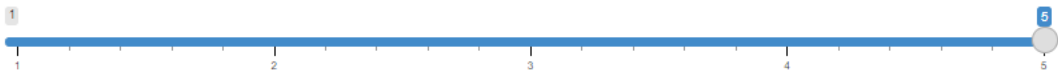
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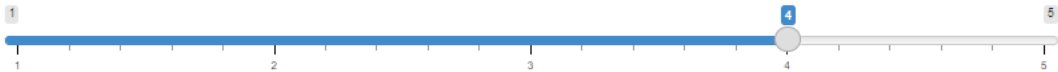
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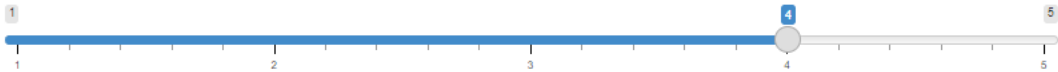
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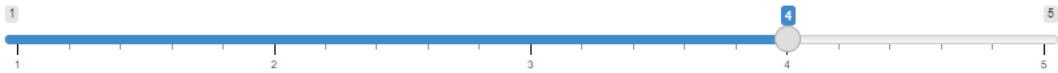
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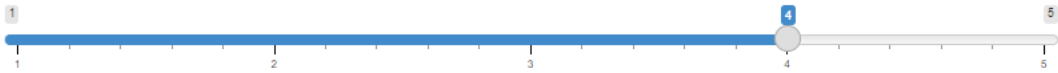
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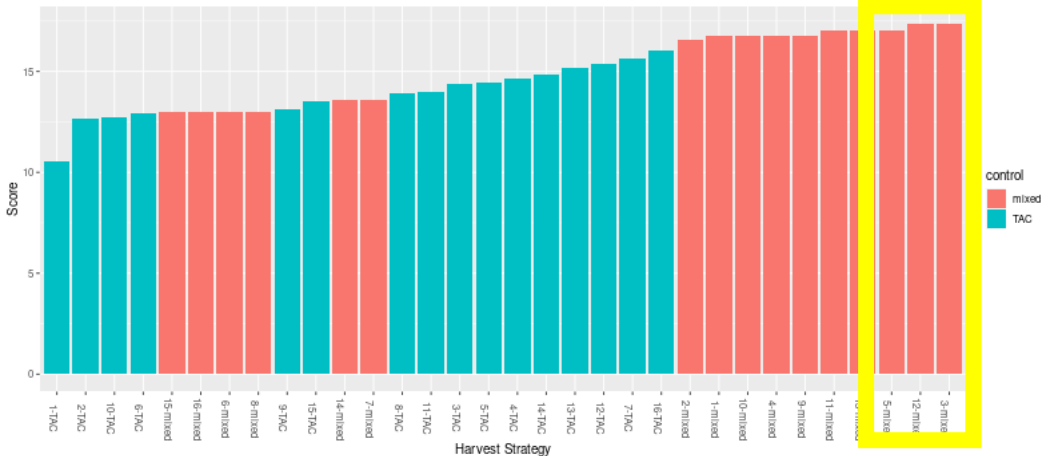
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Harvest strategy scores based on your management objective preferences

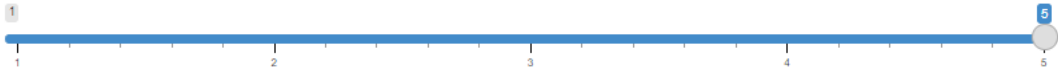
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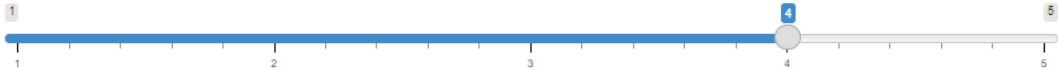
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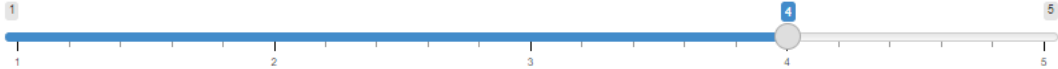
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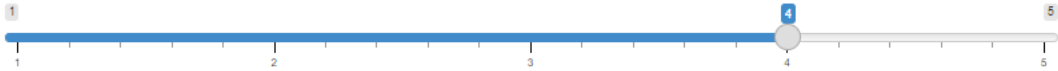
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Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch.



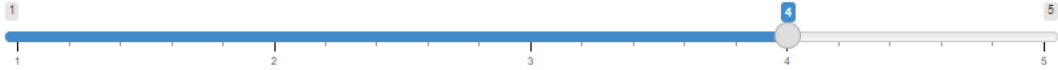
Change in Total Allowable Catch Between Years Should be Relatively Gradual (minimize changes in management over time):

Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

Ftarget/F



Scenario:

1: moderately high productivity, high plausibility

Analyze Data!

Plot Option 1 | Plot Option 2 | Plot Option 3 | Results

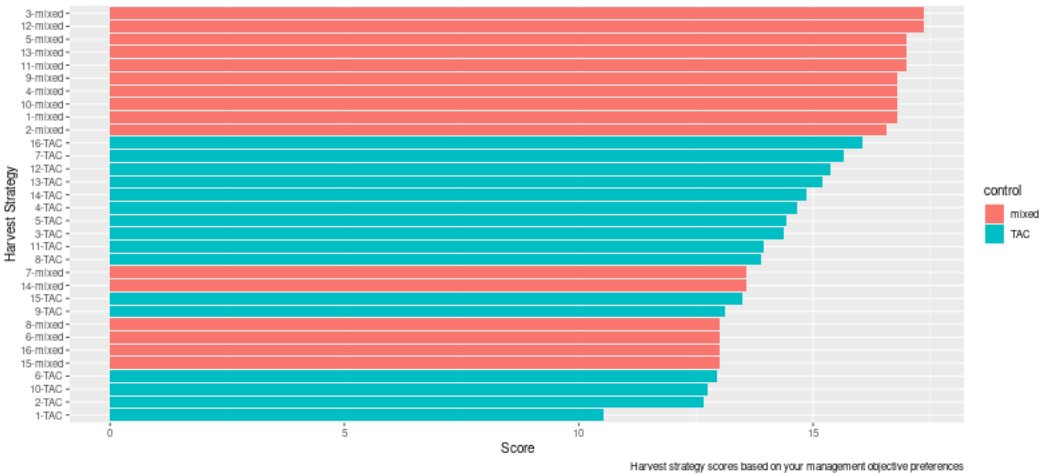
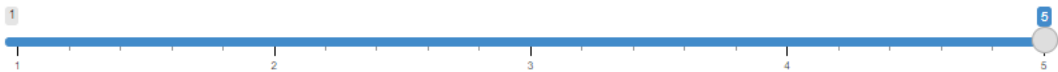


Table | Summary | Results

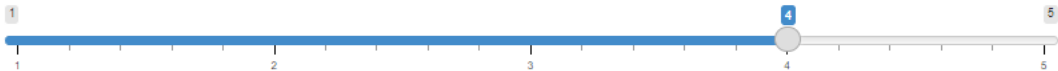
Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

Probability that SSB in any future year of the MSE simulation is above 20% of the dynamic unfished SSB



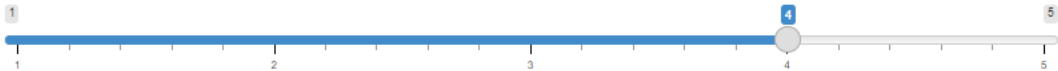
Maintain Historical Total Biomass (maintain depletion of total biomass around historical average depletion):

Probability that the depletion of total biomass in any future year of the MSE simulation is above minimum historical (2006-2015) depletion



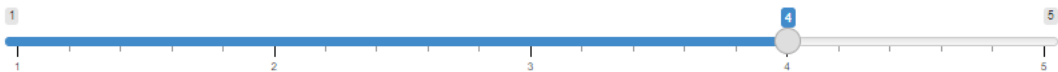
Maintain Catches Above Average Historical Catch (maintain catches above historical average):

Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch.



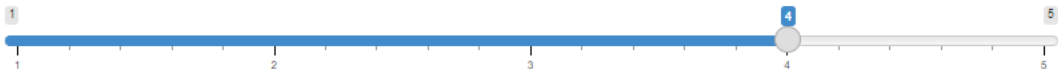
Change in Total Allowable Catch Between Years Should be Relatively Gradual (minimize changes in management over time):

Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

Analyze Data!

Plot Option 1 Plot Option 2 Plot Option 3 Results

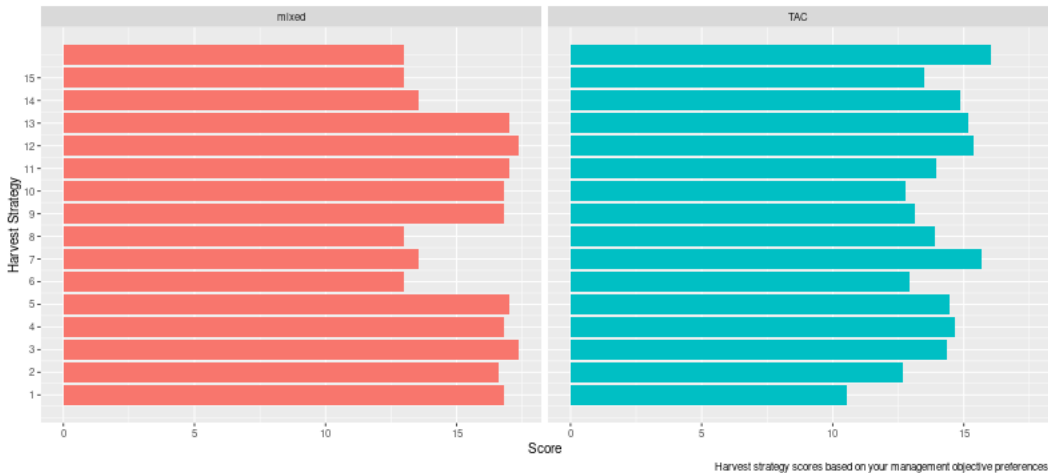
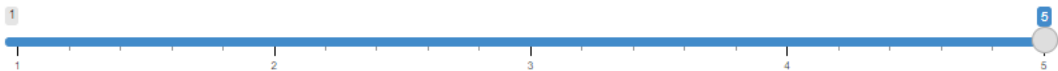


Table Summary Results

Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

Probability that SSB in any future year of the MSE simulation is above 20% of the dynamic unfished SSB



Maintain Historical Total Biomass (maintain depletion of total biomass around historical average depletion):

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Maintain Catches Above Average Historical Catch (maintain catches above historical average):

Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch.



Change in Total Allowable Catch Between Years Should be Relatively Gradual (minimize changes in management over time):

Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

F<sub>target</sub>/F



Scenario:

1: moderately high productivity, high plausibility

🔍 Analyze Data!

Plot Option 1 Plot Option 2 Plot Option 3 Results

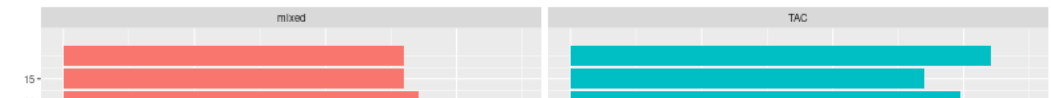
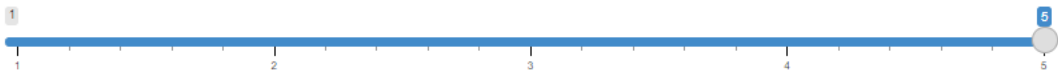


Table Summary Results

Management Procedure		Management Procedure	
HCR	mixed	HCR	TAC
3	17.36	16	16.04
12	17.36	7	15.66
5	17.00	12	15.38
11	17.00	13	15.19
13	17.00	14	14.87
1	16.79	4	14.67
4	16.79	5	14.44
9	16.79	3	14.37
10	16.79	11	13.96
2	16.58	8	13.90
7	13.57	15	13.50
14	13.57	9	13.12
16	13.00	6	12.95
8	13.00	10	12.76
15	13.00	2	12.67
6	13.00	1	10.52

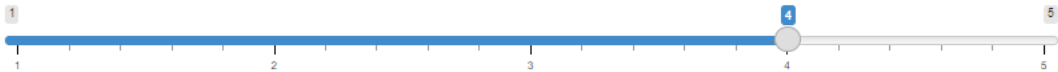
Maintain Historical Spawning Biomass (maintain SSB above the limit reference point):

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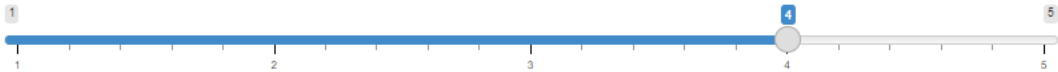
Maintain Historical Total Biomass (maintain depletion of total biomass around historical average depletion):

Probability that the depletion of total biomass in any future year of the MSE simulation is above minimum historical (2006-2015) depletion



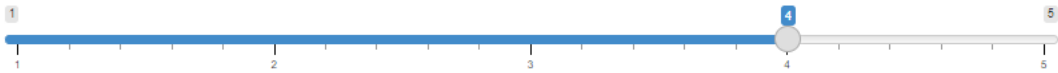
Maintain Catches Above Average Historical Catch (maintain catches above historical average):

Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch.



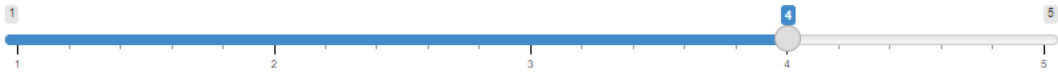
Change in Total Allowable Catch Between Years Should be Relatively Gradual (minimize changes in management over time):

Catch stability



Maintain Fishing Intensity (F) at the Target Reference Point with Reasonable Variability (maintain fishing impact around the target value):

Ftarget/F



Scenario:

1: moderately high productivity, high plausibility

Analyze Data!

Plot Option 1 Plot Option 2 Plot Option 3 Results



Table Summary Results

Run	Objective 1: Rating	Objective 2: Rating	Objective 4: Rating	Objective 5: Rating	Objective 6: Rating	Scenario	Strategy1	Strategy2
1	Probability that SSB in any future year of the MSE simulation is above 20% of the dynamic unfished SSB : 5	Probability that the depletion of total biomass in any future year of the MSE simulation is above minimum historical (2006-2015) depletion : 4	Probability that catch in any future year of the MSE simulation is above average historical (1981-2010) catch : 4	Catch stability : 4	Ftarget/F : 4	1	3-mixed	16-TAC



## North Pacific Albacore Management Strategy Evaluation

- Background
- What is a Management Strategy?
- What is an MSE?
- Limitations of MSE
- Who Conducted the MSE?
- The Management Objectives
- The Harvest Strategies
- How to Use the Tool
- Evaluation Tool
- Where to Go From Here?**
- Glossary
- How Does the Tool Work?

### Where To Go From Here?

This evaluation tool allows users to view how each of the harvest control rules (HCRs) tested in the albacore MSE ranks in performance based on his/her most valued management objectives. It does not, however, allow users to visualize tradeoffs between objectives. Users are encouraged to consult the full [ISC North Pacific Albacore MSE Final Report](#), and in particular the cobweb plots and output tables therein to assess tradeoffs between the objectives for each HCR.

Adoption of any management strategy for this highly migratory species is the purview of its international management bodies, the WCPFC and IATTC. MSE results might inform selection of specific harvest strategies and/or reference points, and each member country may draw on the MSE results to develop proposals for new harvest strategies. We hope this tool will help familiarize users with the reference points and HCRs tested in the MSE in preparation for domestic consultation meetings between managers and stakeholders to seek input on development of proposals on a potential harvest strategy to present to WCPFC and IATTC.

#### Evaluation Tool Results

Run	Strategy1	Strategy2
1	3-mixed	16-TAC

#### HCR Comparison Tables

#### HCR Comparison Spider Plots

#### Odds



Mixed Control Across Reference Scenarios															
				Management Objective 1				Management Objective 2	Management Objective 4			Management Objective 5		Management Objective 6	
hcr	TRP	LRP	SSB threshold	Odds SSB > LRP	Odds SSB > 20% SSB0	Odds SSB > Equilibrium 7.7% SSB0	Odds SSB > 7.7% SSB0	Odds Depletion > Minimum Historical	Odds Mean Annual Catch > Historical	Odds Mean Medium Term Catch > Historical	Odds Mean Long Term Catch > Historical	Catch Stability	Odds No Management Change	Ftarget/F	
1	F50	0.20	0.30	0.98	0.98	0.96	1.00	0.75	0.59	0.59	0.67	0.99	0.88	0.92	
2	F50	0.14	0.30	0.99	0.97	0.96	1.00	0.74	0.60	0.59	0.68	1.00	0.87	0.92	
3	F50	0.08	0.30	1.00	0.98	0.96	1.00	0.74	0.59	0.58	0.68	1.00	0.88	0.92	
4	F50	0.14	0.20	0.99	0.98	0.96	1.00	0.74	0.60	0.59	0.68	1.00	0.98	0.92	
5	F50	0.08	0.20	1.00	0.98	0.96	1.00	0.75	0.60	0.59	0.68	1.00	0.98	0.92	
6	F40	0.14	0.20	0.97	0.93	0.93	0.99	0.72	0.69	0.68	0.77	1.00	0.93	1.04	





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#### Evaluation Tool Results

Run	Strategy1	Strategy2
1	3-mixed	16-TAC

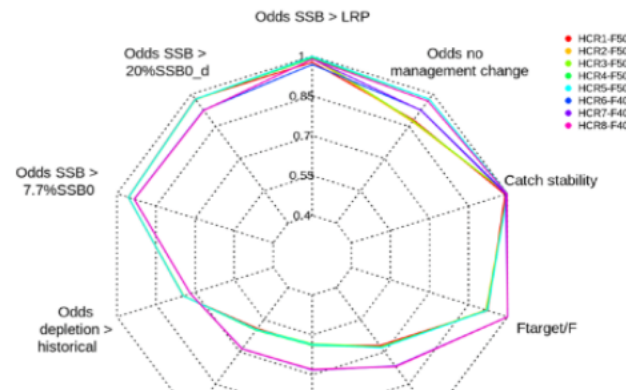
#### HCR Comparison Tables

#### HCR Comparison Spider Plots

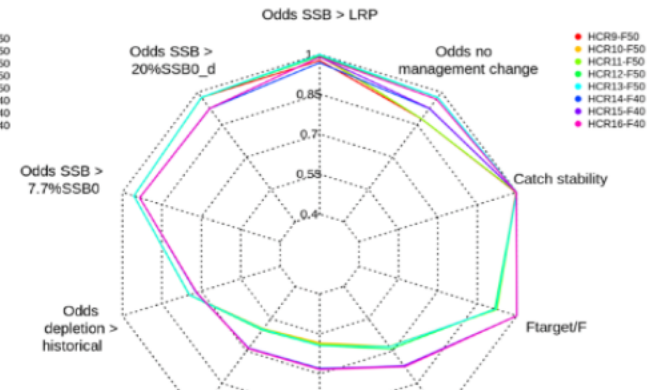
HCR	TRP	SSB <sub>threshold</sub>	LRP	Prob SSB > LRP	TAC <sub>min</sub> or TAE <sub>min</sub> Fraction
1	F50	30%	20%	0.8	0.25
2	F50	30%	14%	0.9	0.25
3	F50	30%	7.7%	0.9	0
4	F50	20%	14%	0.9	0.25
5	F50	20%	7.7%	0.9	0
6	F40	20%	14%	0.9	0.25
7	F40	20%	7.7%	0.9	0
8	F40	14%	7.7%	0.9	0

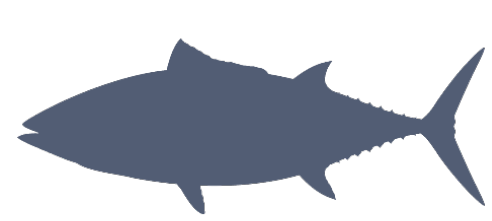
HCR	TRP	SSB <sub>threshold</sub>	LRP	Prob SSB > LRP	TAC <sub>min</sub> or TAE <sub>min</sub> Fraction
9	F50	30%	20%	0.8	0.5
10	F50	30%	14%	0.9	0.5
11	F50	30%	7.7%	0.9	0.25
12	F50	20%	14%	0.9	0.5
13	F50	20%	7.7%	0.9	0.25
14	F40	20%	14%	0.9	0.5
15	F40	20%	7.7%	0.9	0.25
16	F40	14%	7.7%	0.9	0.25

#### Mixed Control Reference Set



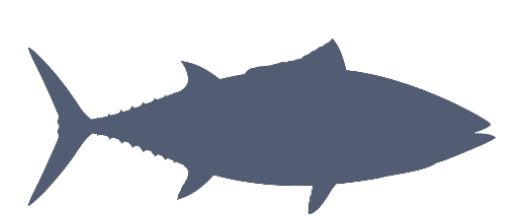
#### Mixed Control Reference Set



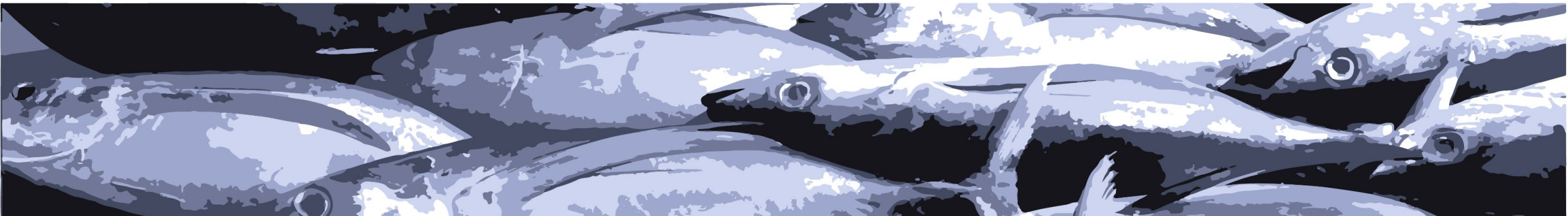


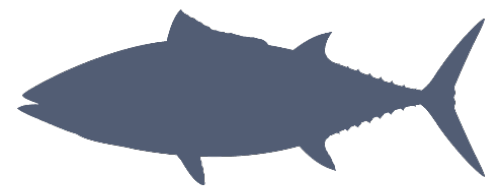
# ALBACORE MANAGEMENT STRATEGY EVALUATION INTERACTIVE WEB TOOL

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The Council and other stakeholders are encouraged to use this application and provide input on further refinements that would be useful.





# QUESTIONS?

