Review and Discuss Management Strategy Evaluation Results

Meeting #6 December 19, 2019

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Outline:

Two-zone management strategy

- Review four management strategy options (A, B, C, D)
- Discuss alternative management strategies

Summary of modeling assumptions

Three-zone sampling design

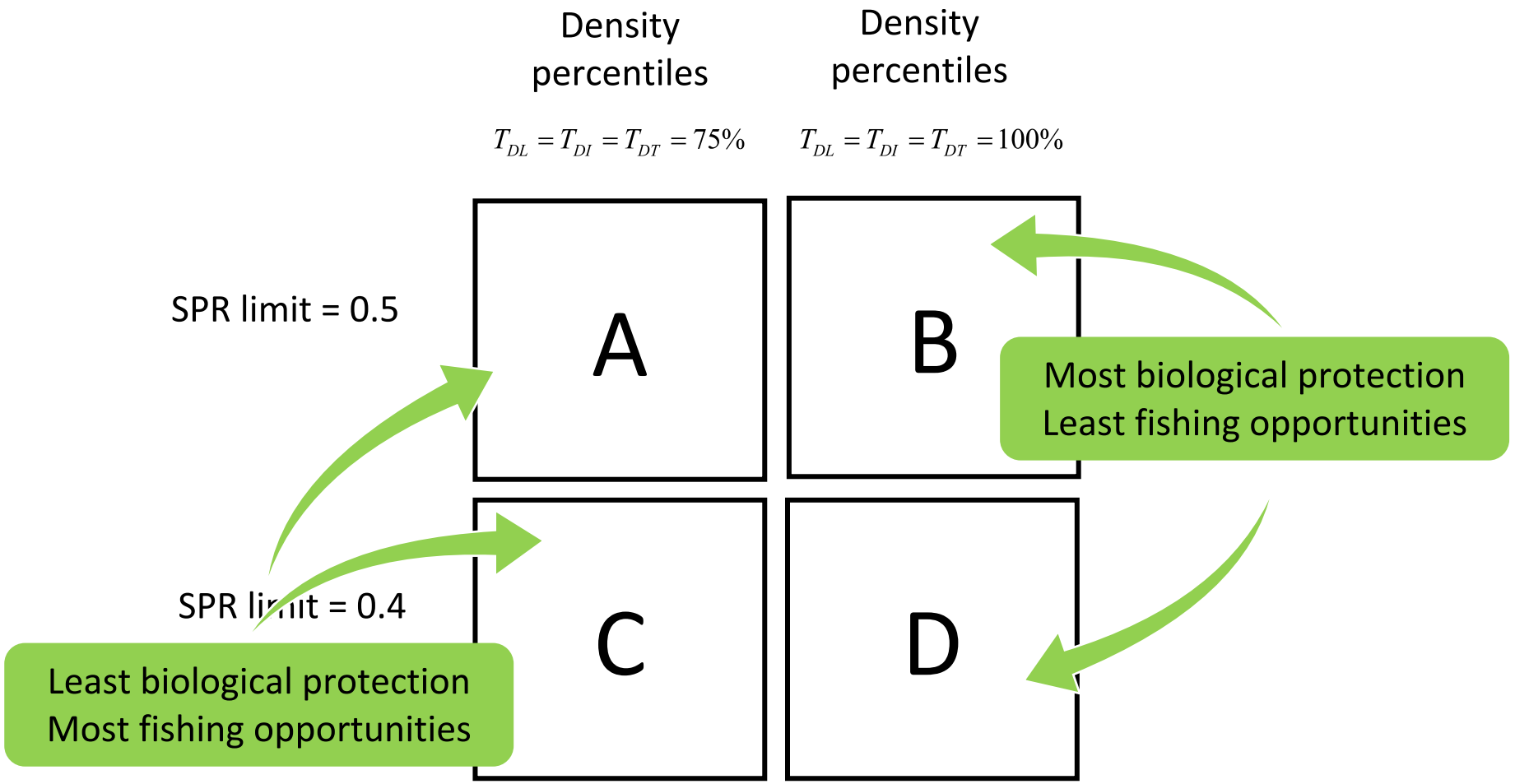
- Review considerations revealed through modeling

Two-zone management strategy

Two-zone management strategy

- Four base options evaluated (A, B, C, D)
- Consisted of integrating indicator-based approaches from two initial proposals
- Management strategies differed in choices of reference points and other decision-making criteria

What are the base options?



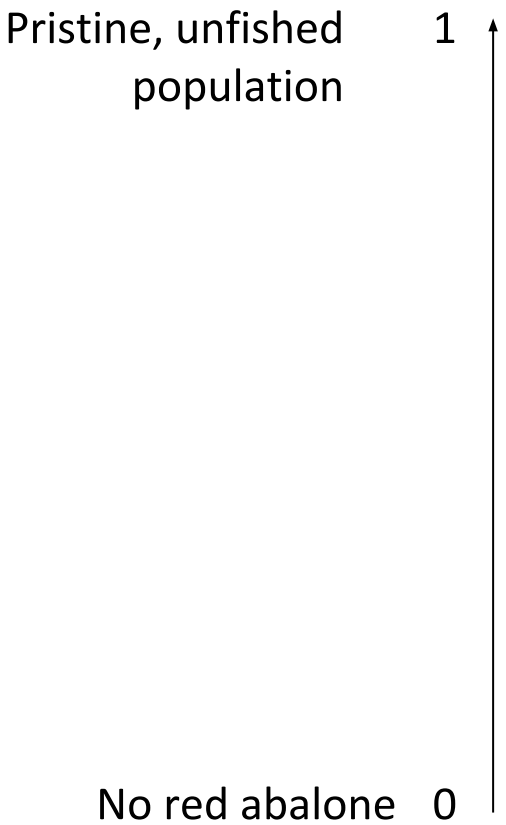
Alternative management strategies

- Explore properties of management strategy design
- Changes made to management strategy A
- De minimis TAC specified at 5,000
- Results are shown for biological model 1 (operating model 1)
- Mendocino/Humboldt/Del Norte zone shown, similar trends for Sonoma/Marin zone

Alternative management strategies

- A.1: Strategy A, except changing minimum harvest size to 8 inches (203 mm)
- A.2: Strategy A, except changing minimum harvest size to 9 inches (229 mm)
- A.3: Strategy A, except changing density reference points to: limit 0.2 m^{-2}, 0.25 m^{-2}, 0.3 m^{-2}
- A.4: Strategy A, except changing percentiles of density to T_{DI} T_{DL} T_{DT} = 90%
- A.5: Strategy A, except changing density CI to 25%
- A.6: Strategy A, except changing density CI to 10%

What is depletion?



What additional cautions should be taken, if any?

What depletion level is a suitable target for long-term sustainability?

What depletion level is acceptable for a reduced fishery, like a de minimis fishery?

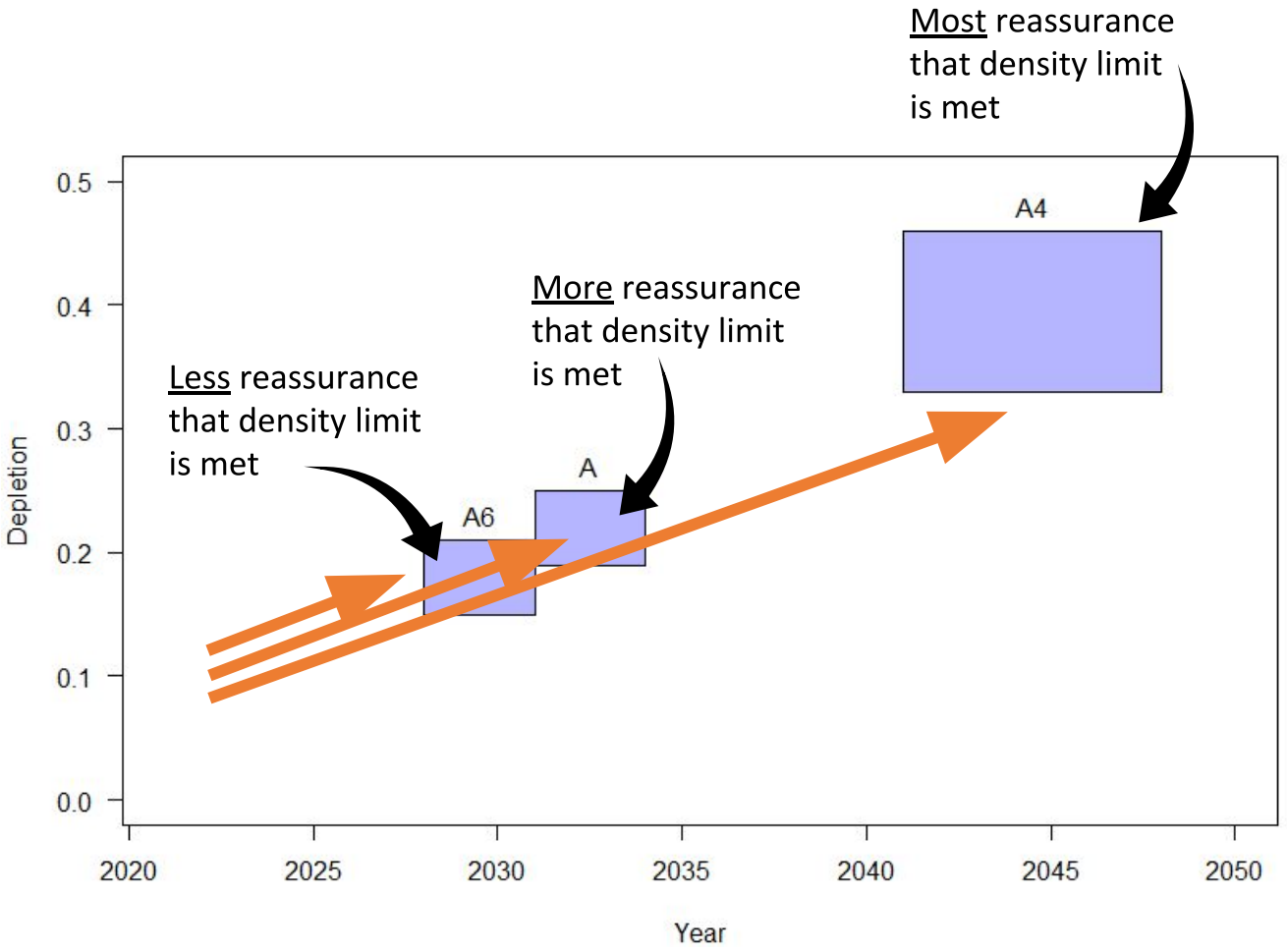
Is any depletion level too low to allow some fishing?

Alternative management strategies

Strategy	Depletion	Time to de minimis	When to return to fishing?
A	0.19 – 0.25 (0.22 median)	10 - 13 years (11 median)	Moderate caution
A1	0.18 – 0.25	10 - 13 years	
A2	0.18 – 0.25	10 - 13 years	
A3	0.19 – 0.26	10 - 13 years	
A4	0.33 – 0.46	20 – 27 years	Most caution
A5	0.17 – 0.22	8 – 11 years	
A6	0.15 – 0.21	7 – 10 years	Least caution before returning

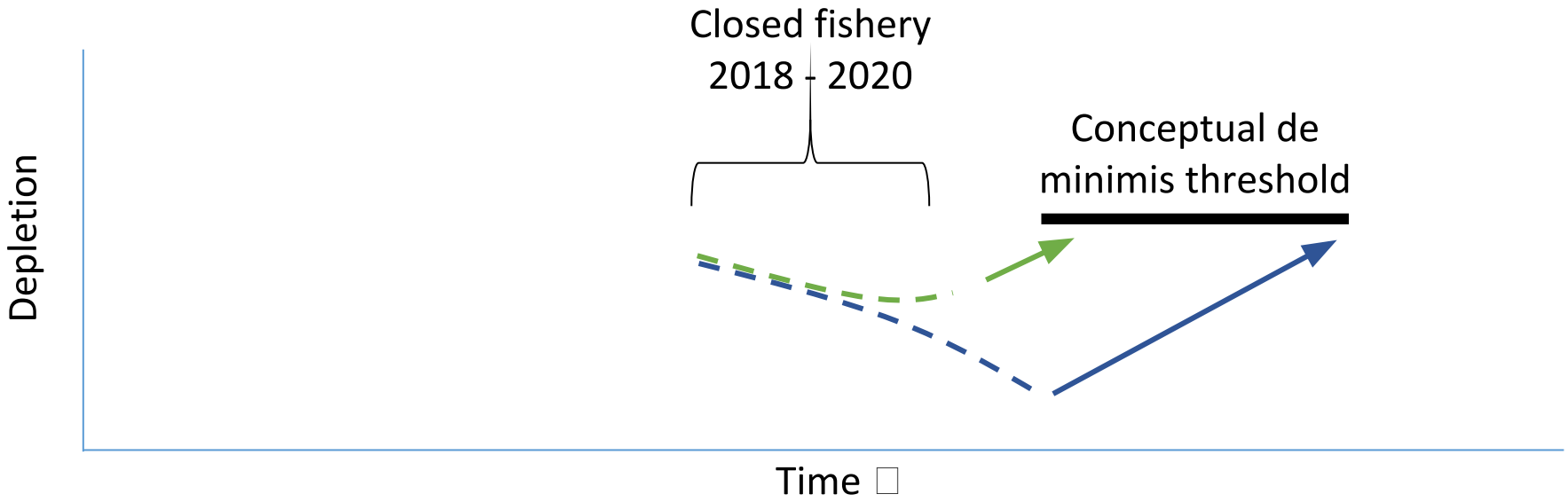
- MS design affects some performance metrics
- Biological recovery time also plays an important role

Alternative management strategies



What are the factors delaying triggering of a de minimis fishery?

1. Magnitude and duration of reduced abalone survival because of unfavorable environment
2. Percentile of density estimates meeting 0.2 per m^2 (100% or 75% of estimates clearing threshold)
3. Limit density reference point (0.2 per m^2) and SPR reference point (0.4 or 0.5)
4. Natural recovery rate of red abalone – slow growing, long lived life history

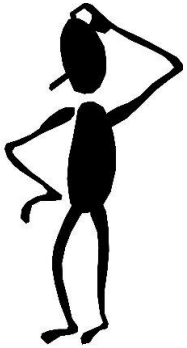


Summary of modeling assumptions

Population scaling

Mendocino/Humboldt/Del Norte:
10,000 to 20,000

Sonoma/Marin: < 10,000



But would knowing how many to harvest not also require knowing how many are in the water?

DB-SRA
Technical method that provides some context for this task

Population scaling

- DB-SRA is a data-limited method, it is not as thorough as conducting a stock assessment (i.e., data-rich)

- The scientific literature advises us that uncertainty is usually larger in data-limited situations, than data rich situations.

- More uncertainty usually means higher risk

- Often, data-limited TACs are set lower than those that would be set in data-rich situations

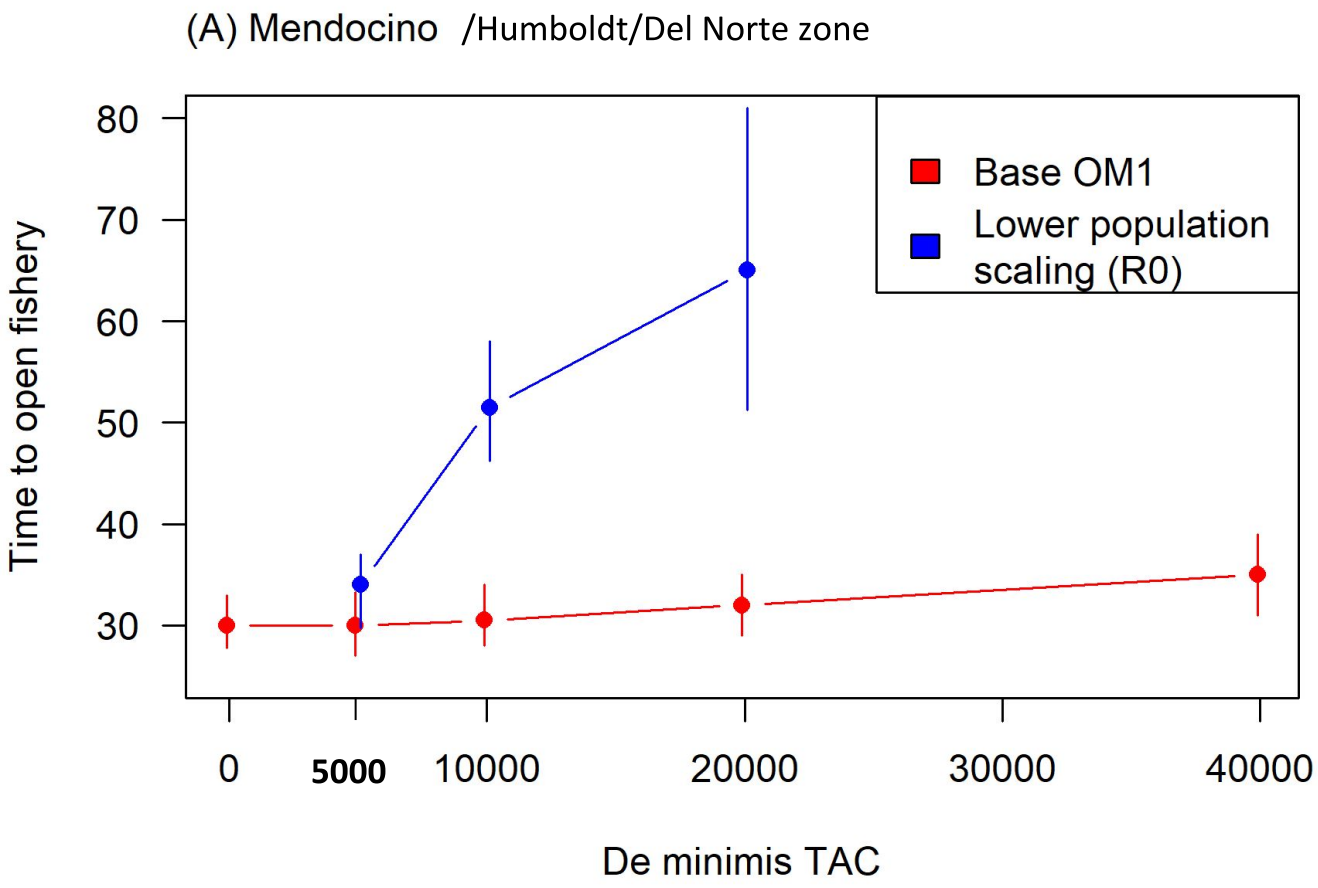
Population scaling

DB-SRA provides a scale "point estimate", which is a value most consistent with empirical data

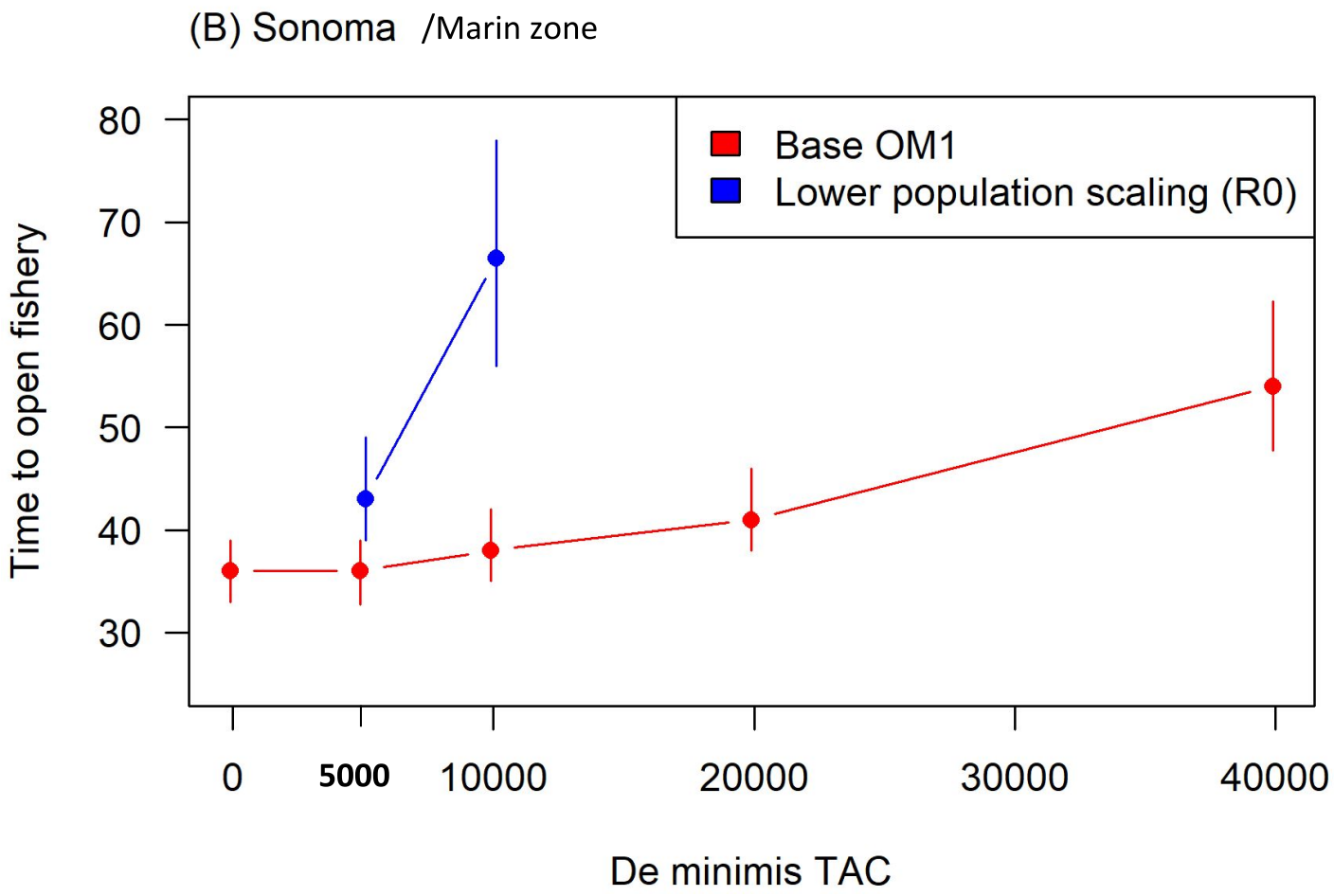
…. But DB-SRA notes that there is some support in the data for lower scaling values

…. But DB-SRA notes that there is some support in the data for higher scaling values

Population scaling



Population scaling



What other modeling assumptions will affect MSE outcomes?

- Life history parameters:
  - Best available parameter estimates obtained from the scientific literature
  - Alternative parameters will affect recovery time (slowing or increasing abalone productivity, based on direction of parameter error)
  - Onset of Allee effects will negatively affect recovery time

What other modeling assumptions will affect MSE outcomes?

- Initial depletion/abundance in 2002:
  - Model tuned to SPR from length-frequency data
  - Where initial depletion/abundance may be lower, would require additional precaution in setting a de minimis TAC
  - This is because productivity declines at lower abundance

What other modeling assumptions will affect MSE outcomes?

- Environmental effects on red abalone survival:
  - Best available parameter estimates obtained from experimental studies and from recent downward trends in density
  - Errors in effect size will affect recovery time (can increase or decrease recovery time, based on direction of error)
  - This is why 2 operating models were examined, to highlight this issue

What other modeling assumptions will affect MSE outcomes?

- Field observation of length-frequency data:
  - MSE assumes field sampling will continue at existing intensity. Changes may affect the reliability of the management strategy
  - Life history parameters needed to estimate SPR are assumed to be reliably obtained (+/- small observation error). An inability to do so may lead to erroneous SPR estimates

What other modeling assumptions will affect MSE outcomes?

- Field observation of density data:
  - MSE assumes field sampling will continue at existing intensity. Changes may affect reliability of the management strategy
  - Density is assumed to be proportional to abundance. If this assumption does not hold true, reliability of the management strategy may be affected

What can be done to better understand the accuracy of these assumptions?

- Conduct life history studies to validate existing estimates
- Continue to monitor density, understand whether declines continue, stabilize, and eventually increase.
- Encourage citizen science programs to maintain largest possible field sampling efforts

Pause for questions

Three-zone sampling design

- The goal is to provide preliminary guidance on design of sampling in Humboldt / Del Norte (HDN)

- Given that work has been done on density and length frequency, it was intuitive to begin by thinking about length frequency sampling

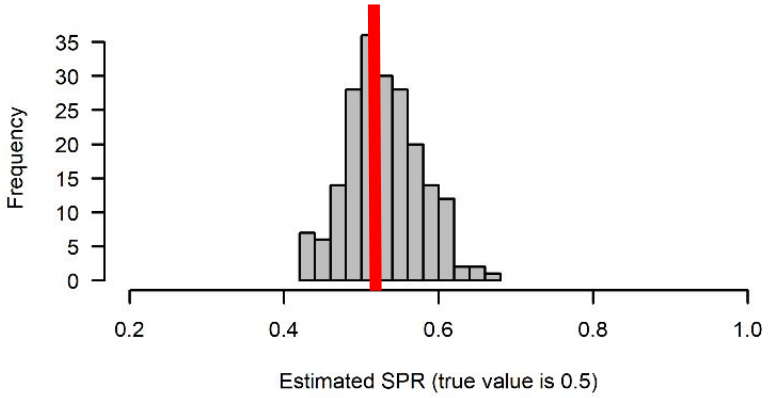
- But please don’t constrain broader discussions to length only - consider other or multiple indicators

Three-zone sampling design

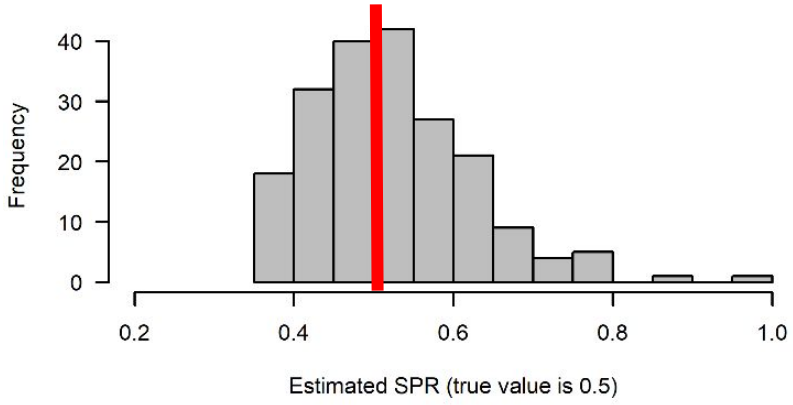
- What is the effect of length measurement sample size on SPR estimation?

Three-zone sampling design

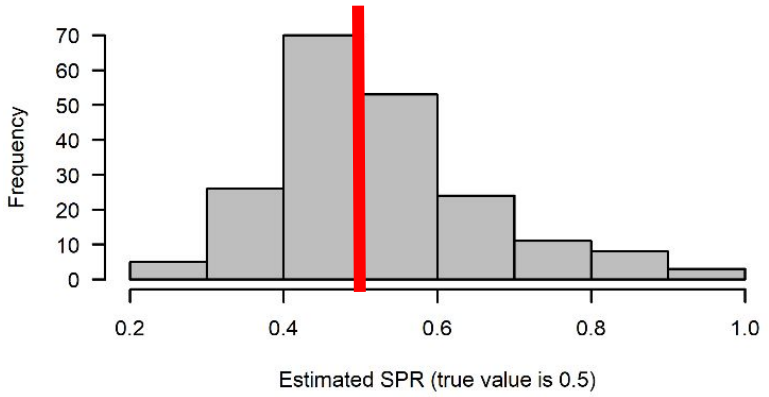
300 length measurements



60 - 100 length measurements



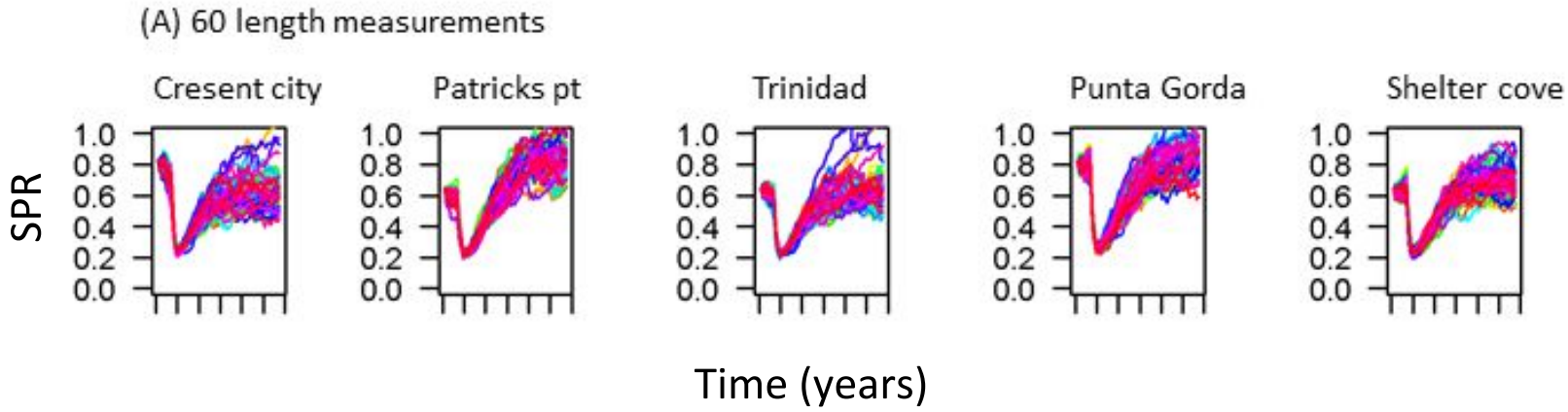
30 length measurements

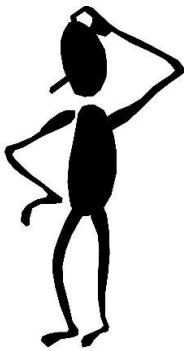


Three-zone sampling design

- Can a simple management strategy be designed?
- Assumed:
  - 60 – 100 length measurements across all of HDN could be made over 3 yrs of data collection
  - Make a TAC decision every third year
  - This strategy is not intended to be responsive to near-term abundance fluctuations, only aimed at guiding HDN towards long-term SPR reference point
  - HDN assumed to be initially in a depleted state (an assumption that was made for modeling purposes)

Three-zone sampling design





- But! This strategy is not implementation ready.
- The analyst had to make many assumptions.
- These assumptions led to a checklist of items and guidance for developing HDN strategy

Three-zone sampling design

Checklist:

- Define your management objectives first. Define what type of fishery you prefer in HDN

- It remains unclear whether 60 to 100 length measurements every 3 years are feasible in reality. Perhaps a pilot study is needed.

Three-zone sampling design

Checklist:

- Growth parameters in HDN may be needed, consider examining the feasibility of obtaining this information.

- Creativity is likely needed in developing HDN indicators, don’t be constrained to length measurements. This is a non-trivial task, it requires considerable effort.

Concluding thoughts

De minimis TAC

- Determining a de minimis TAC is the most uncertain part of this MSE process
- Getting the de minimis TAC right, is dependent on 'population scaling' or 'total abundance'.
- But total abundance is likely to be least reliably estimated quantity in data-limited approaches

Concluding thoughts

De minimis TAC

- This MSE provides a starting point for de minimis TAC discussions, but cannot provide complete guidance
- Additional research and alternative analyses are recommended to support selection of a de minimis TAC
- Often, data-limited TACs are set lower than those that would be set in data-rich situations

Concluding thoughts

De minimis TAC

Mendocino/Humboldt/Del Norte:

- Model-based 10,000
- Sensitivity run, precautionary upper limit 5,000

Sonoma/Marin:

- Model-based < 10,000
- Sensitivity run, precautionary upper limit <5,000

Concluding thoughts

Strengths of our MSE

- Provides criteria and technical details to support the functioning of a multi-indicator approach

- Provides guiding information about how these strategies likely behave relative to one another

Weaknesses of our MSE

- At best, MSE provides a starting point for thinking about a de minimis TAC, but guidance is incomplete

- MSE highlighted the need for very cautious TACs during rebuilding, relative to historical catches

Concluding thoughts

How did we get here?

Initially…

- TNC-led proposal focused on length-based SPR and cMSY
- CDFW proposal focused on density, while also recognizing the utility of a wider variety of ecological and health indicators
- Focused on diverse objectives related to long-term sustainability and to rebuilding (if necessary)

Concluding thoughts

How did we get here?

Peer review…

- Urged integration of indicators, examination of a multi-indicator approach
- Additional emphasis on rebuilding

Concluding thoughts

How did we get here?

Integration process …

- Emphasis on indicator integration
- Largely focused on rebuilding because of apparent duration of rebuilding time frames
- So, over the last 2 to 3 years this has been a somewhat evolving process.
- Many of the challenges we are facing today are a result of the severely unfavorable condition of the kelp forest, sea urchins, etc.

Final tasks?

- Minor edits to modeling report