

OMP-18 development: alternative constraints relating to the sardine Critical Biomass metarule

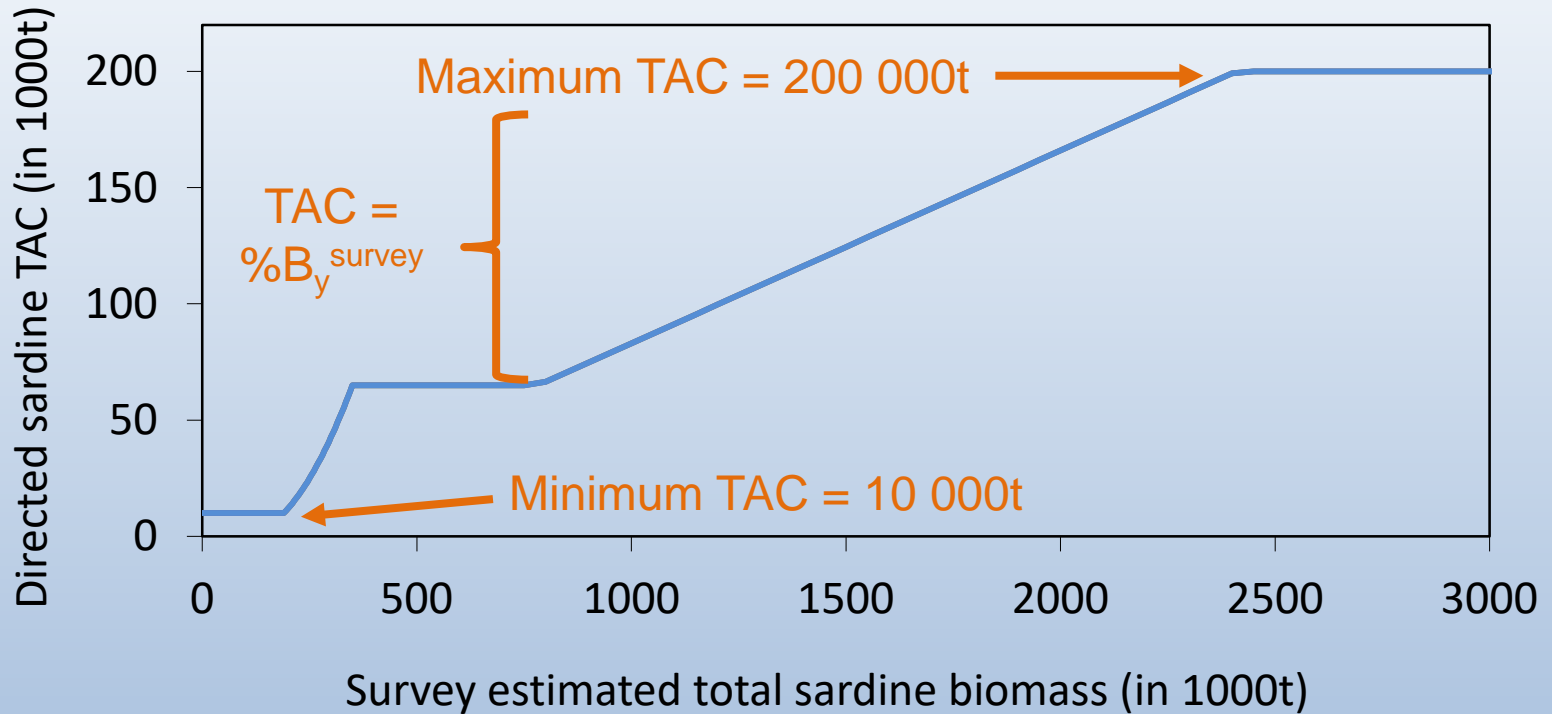
SWG-PEL Meeting
31st May 2018

Carryn de Moor



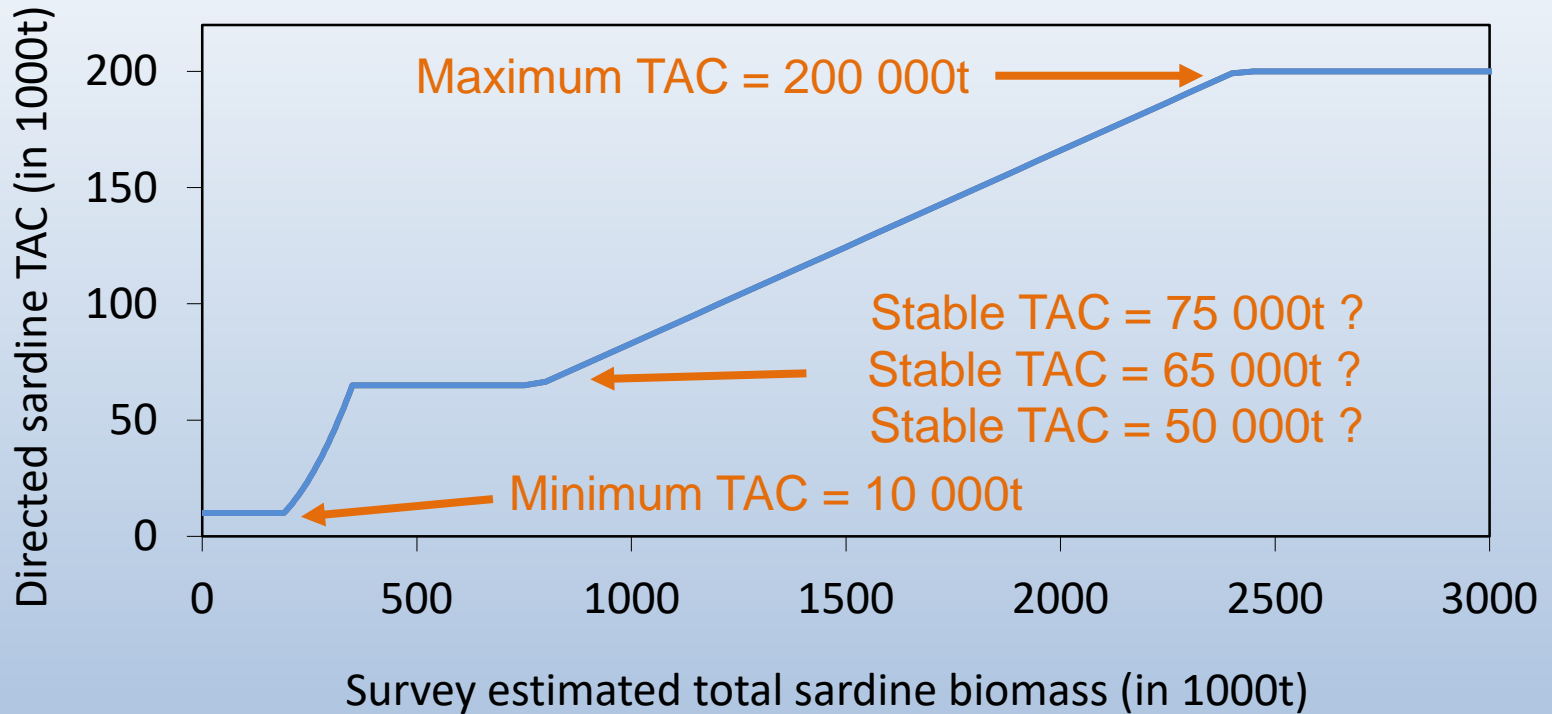
Marine Resource Assessment and Management Group (MARAM)
Department of Mathematics and Applied Mathematics
University of Cape Town

Directed Sardine HCR



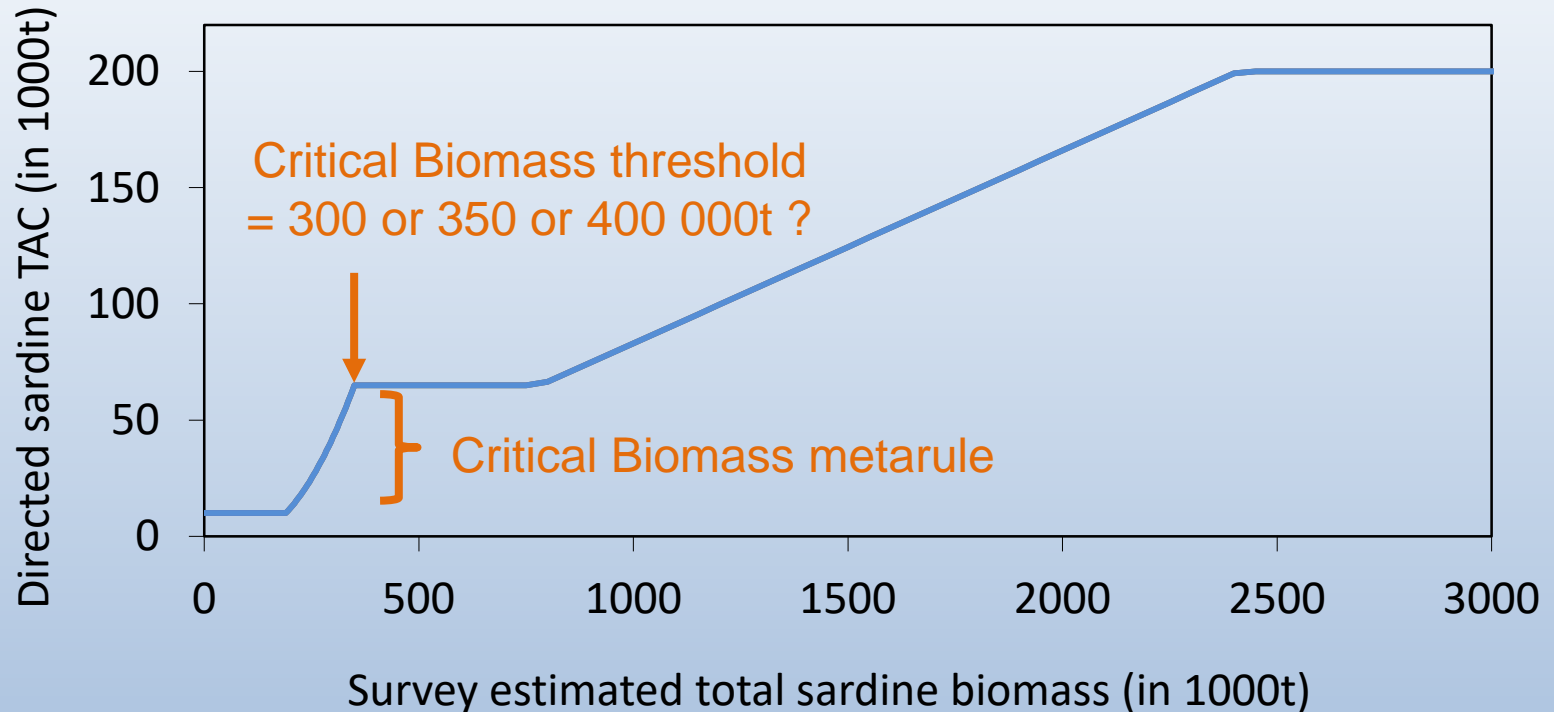
Plotted assuming a low TAC_{y-1}

Directed Sardine HCR



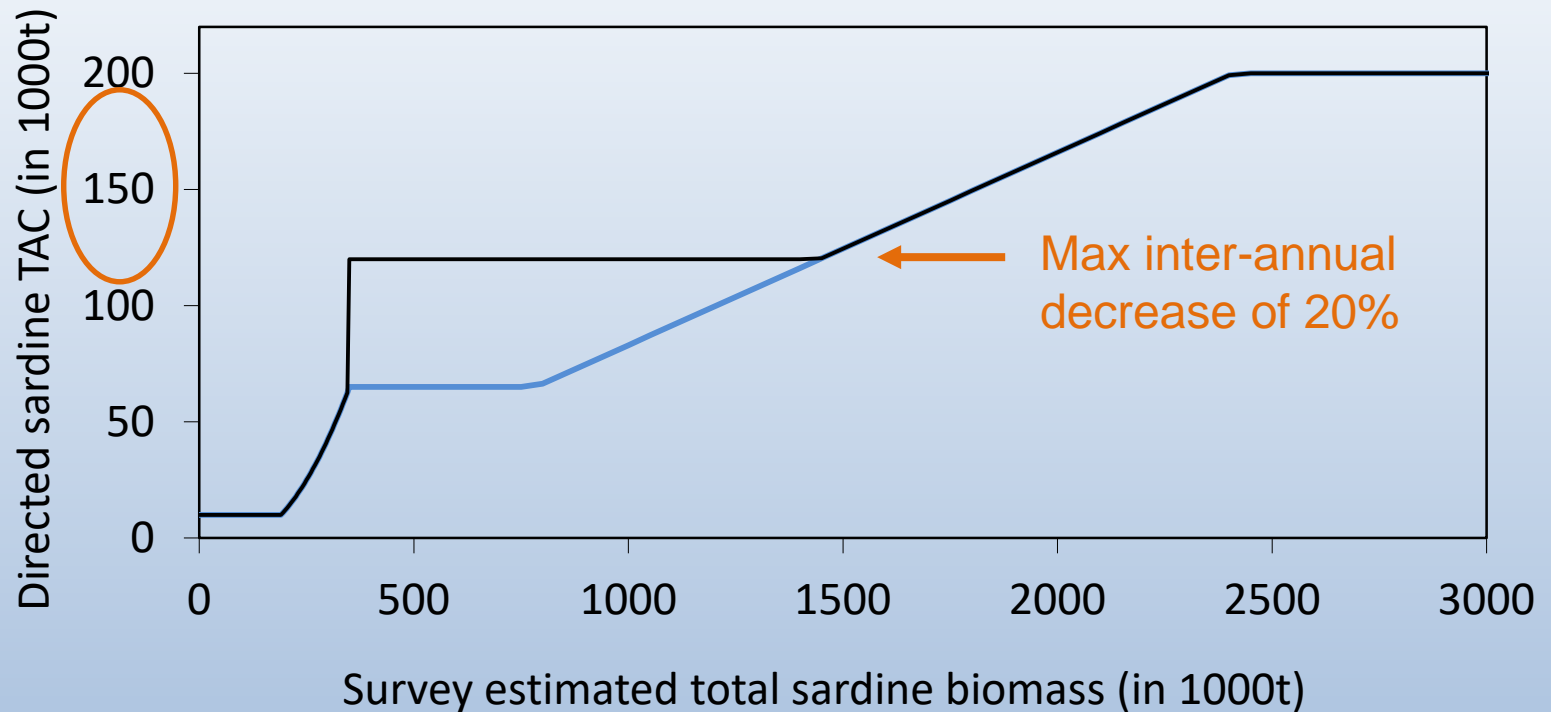
Plotted assuming a low TAC_{y-1}

Directed Sardine HCR



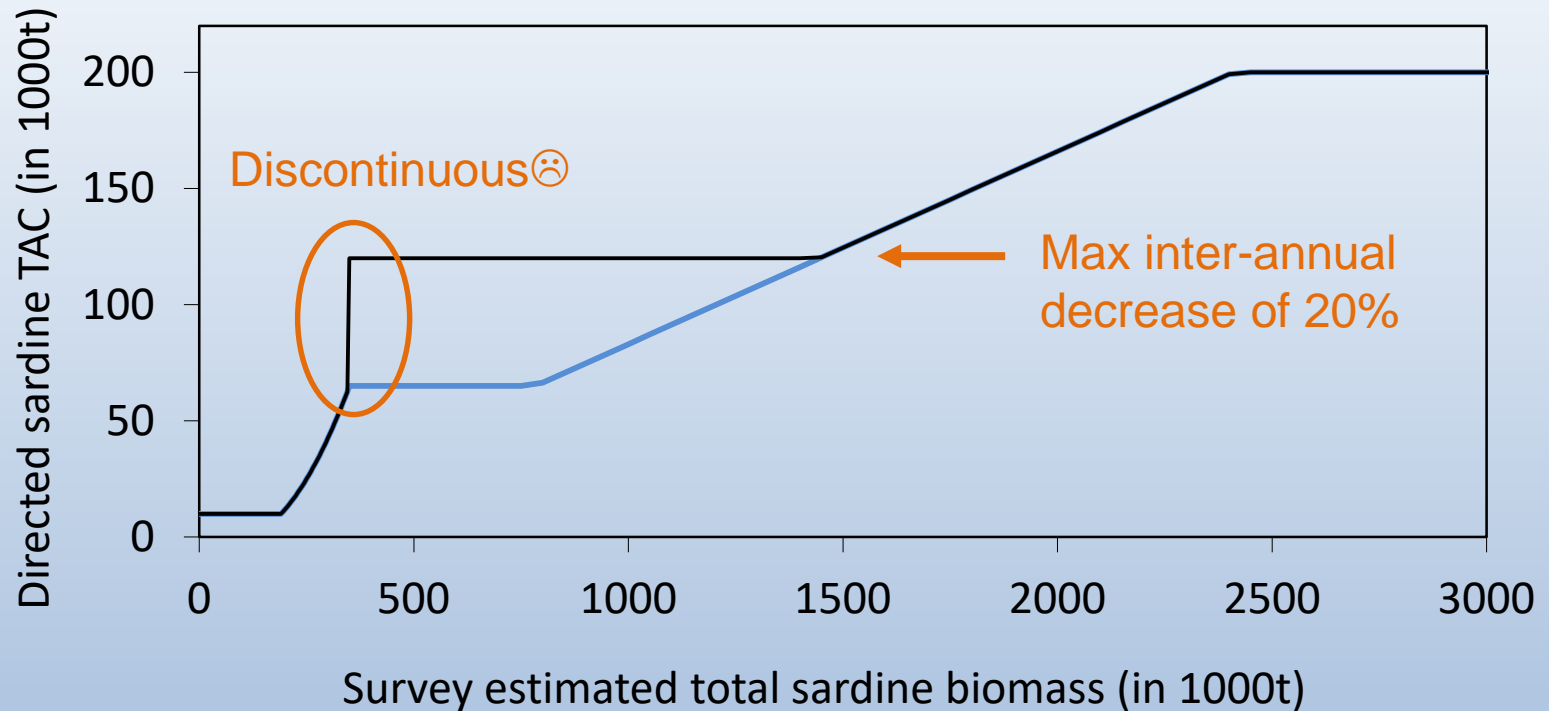
Plotted assuming a low TAC_{y-1}

Directed Sardine HCR



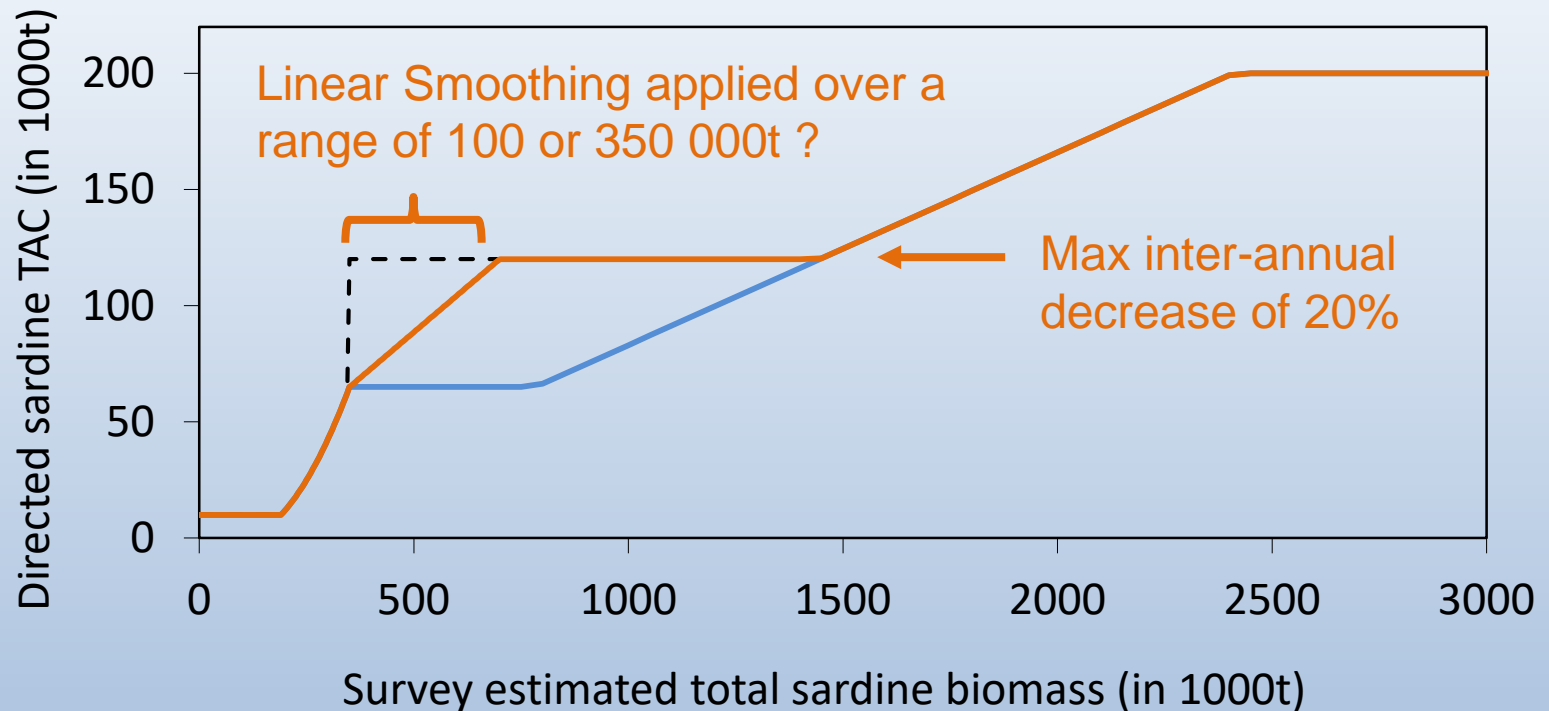
If $TAC_{y-1} = 150\ 000t$, 20% constraint on inter-annual decrease applies:
 $0.8 \times 150\ 000t = 120\ 000t$

Directed Sardine HCR



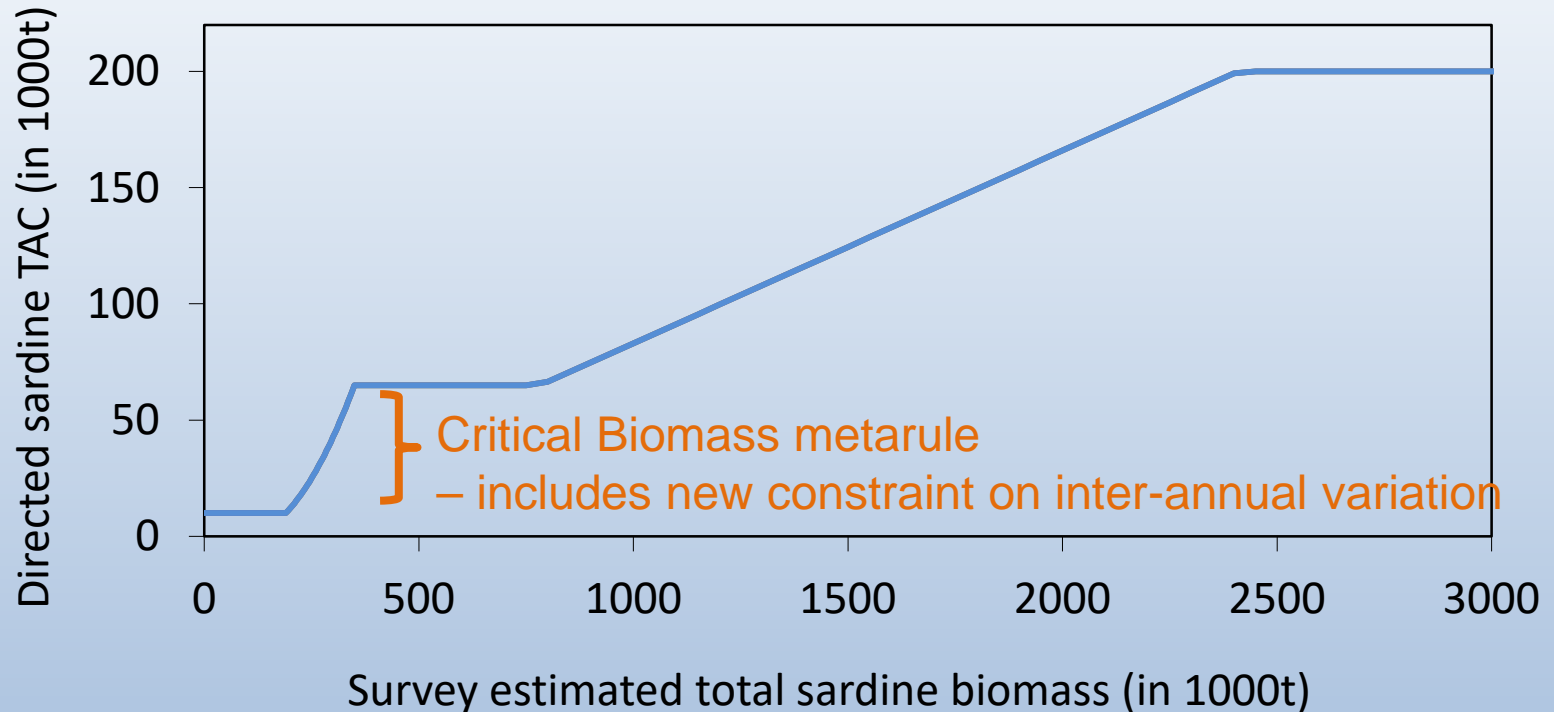
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Directed Sardine HCR



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 $0.8 \times 150\ 000t = 120\ 000t$

Directed Sardine HCR



Plotted assuming a low TAC_{y-1}

Constraints on inter-annual increase/decrease when $B_{y-1} < B_{crit}$

- When Critical Biomass metarule employed ($B_{y-1} < B_{crit}$), TAC_y calculated from quadratic curve without any constraint on inter-annual variability

(i) TAC_y constrained to increase* /decrease by at most x% from TAC_{y-1} if $B_{y-1} < B_{crit}$

(ii) TAC_y constrained to increase* /decrease by at most x% from $\min(TAC_{y-1}; c_{stbl}^S / (1 - p_{crit}^S))$ if $B_{y-1} < B_{crit}$

e.g. $c_{stbl}^S = 50$ & $p_{crit}^S = 0.3$: 71 429t
 $c_{stbl}^S = 50$ & $p_{crit}^S = 0.5$: 100 000t

$c_{stbl}^S = 65$ & $p_{crit}^S = 0.3$: 92 857t
 $c_{stbl}^S = 65$ & $p_{crit}^S = 0.5$: 130 000t

* Constraint is $\max\{0.2TAC_{y-1}, 10\ 000t\}$

Stable TAC and metarule % change

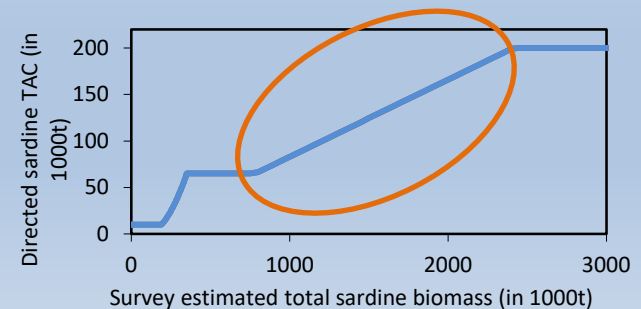
	Reference	Option i)			Option ii)		
	Case	$p_{crit}^S = 0.3$	$p_{crit}^S = 0.4$	$p_{crit}^S = 0.5$	$p_{crit}^S = 0.3$	$p_{crit}^S = 0.4$	$p_{crit}^S = 0.5$
$c_{stbl}^S = 50$	0.170	0.074	0.091	0.106	0.088	0.103	0.112
$c_{stbl}^S = 65$	0.145	(0.15095)	0.060	0.083	(0.15095)	0.065	0.084
$c_{stbl}^S = 75$	0.108	(0.15095)	(0.15095)	(0.15095)	(0.15095)	(0.15095)	(0.15095)

- 75 000t stable TAC only possible under the Reference Case

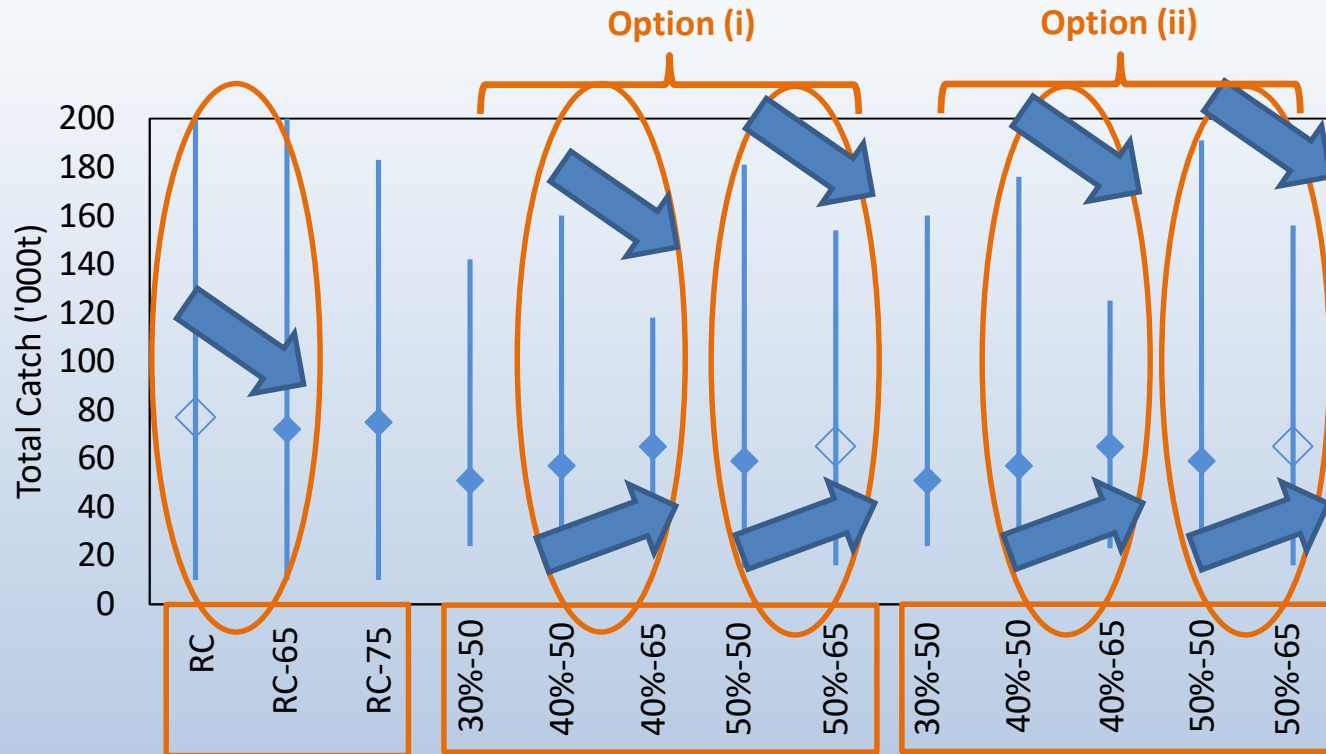
Stable TAC and metarule % change

	Reference	Option i)			Option ii)		
	Case	$p_{crit}^S = 0.3$	$p_{crit}^S = 0.4$	$p_{crit}^S = 0.5$	$p_{crit}^S = 0.3$	$p_{crit}^S = 0.4$	$p_{crit}^S = 0.5$
$c_{stbl}^S = 50$	0.170	0.074	0.091	0.106	0.088	0.103	0.112
$c_{stbl}^S = 65$	0.145	(0.1589)	0.060	0.083	(0.1589)	0.065	0.084
$c_{stbl}^S = 75$	0.108	(0.1589)	(0.15475)	(0.15155)	(0.1589)	(0.15475)	(0.15155)

- 65 000t stable TAC not possible with $p_{crit}^S = 0.3$
- β decreases as c_{stbl}^S increases
- β decreases as p_{crit}^S decreases (tighter constraints)

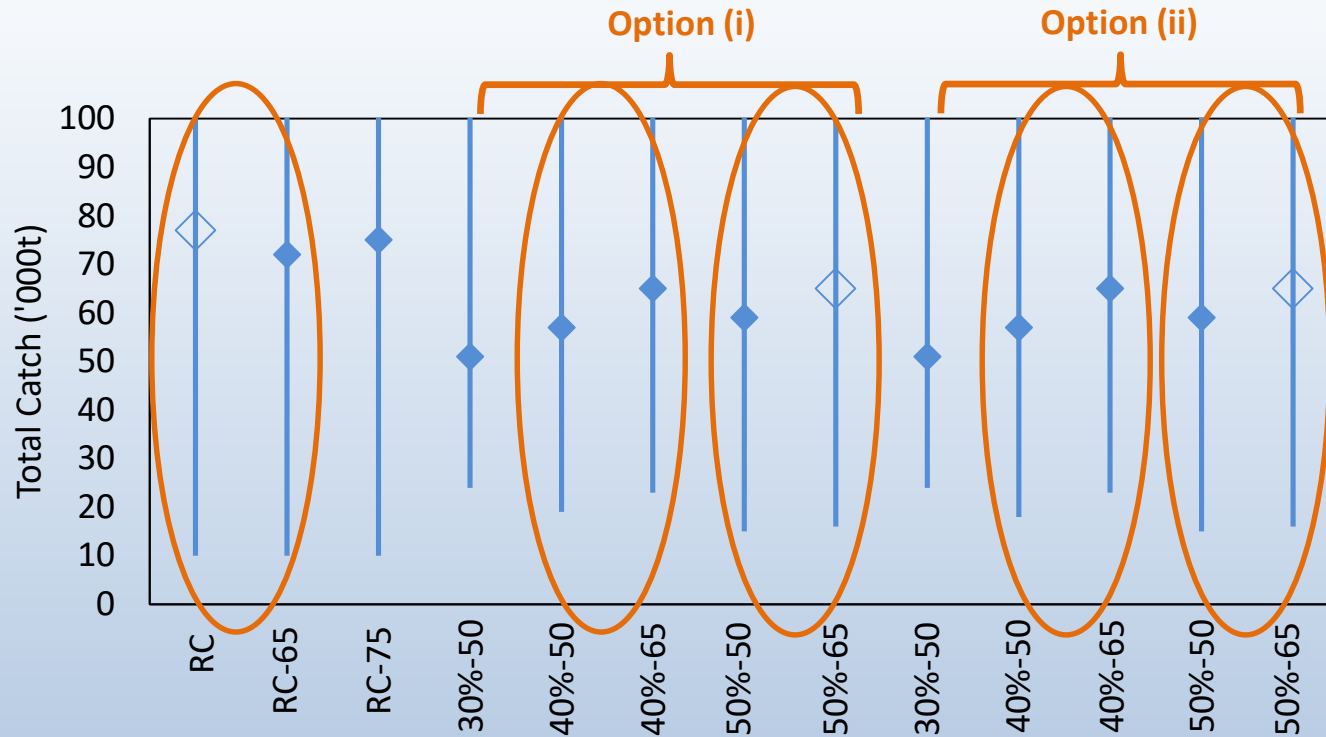


Stable TAC and metarule % change



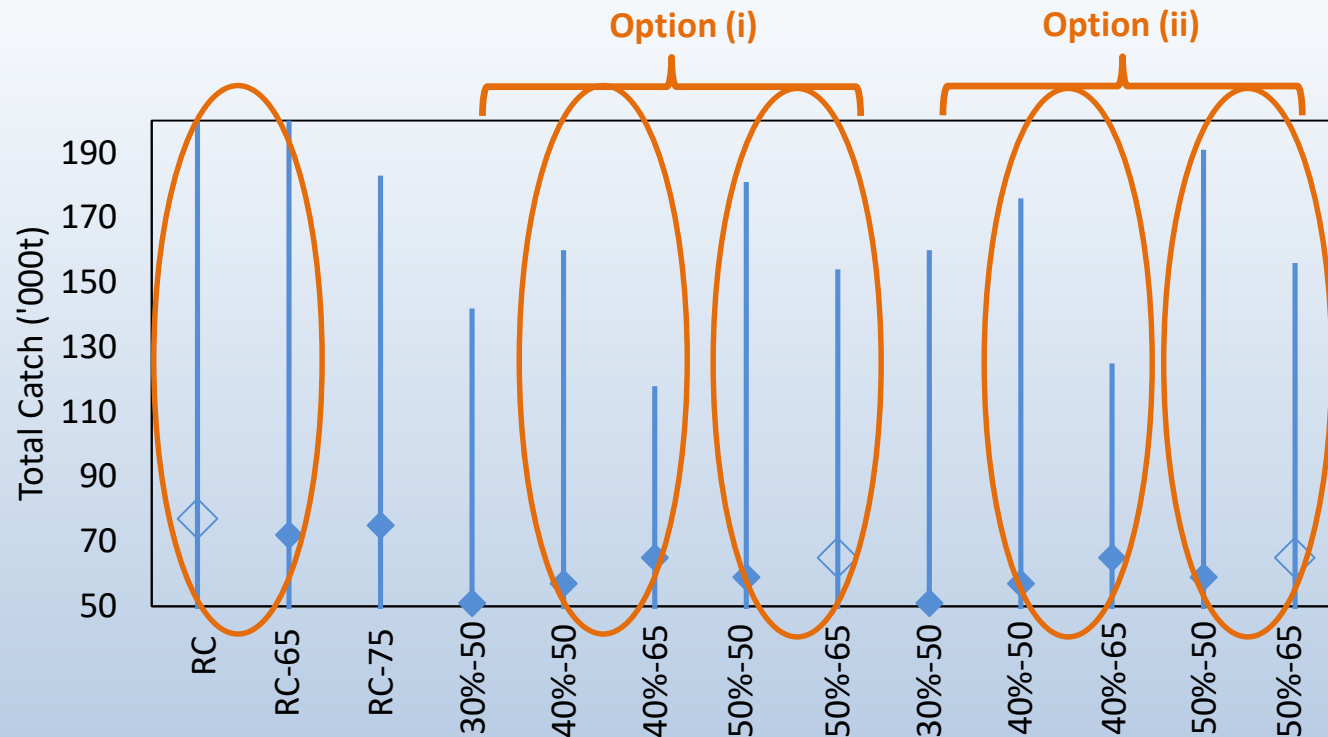
- c_{stbl}^S from 50 000t to 65 000t (β decreases)

Stable TAC and metarule % change



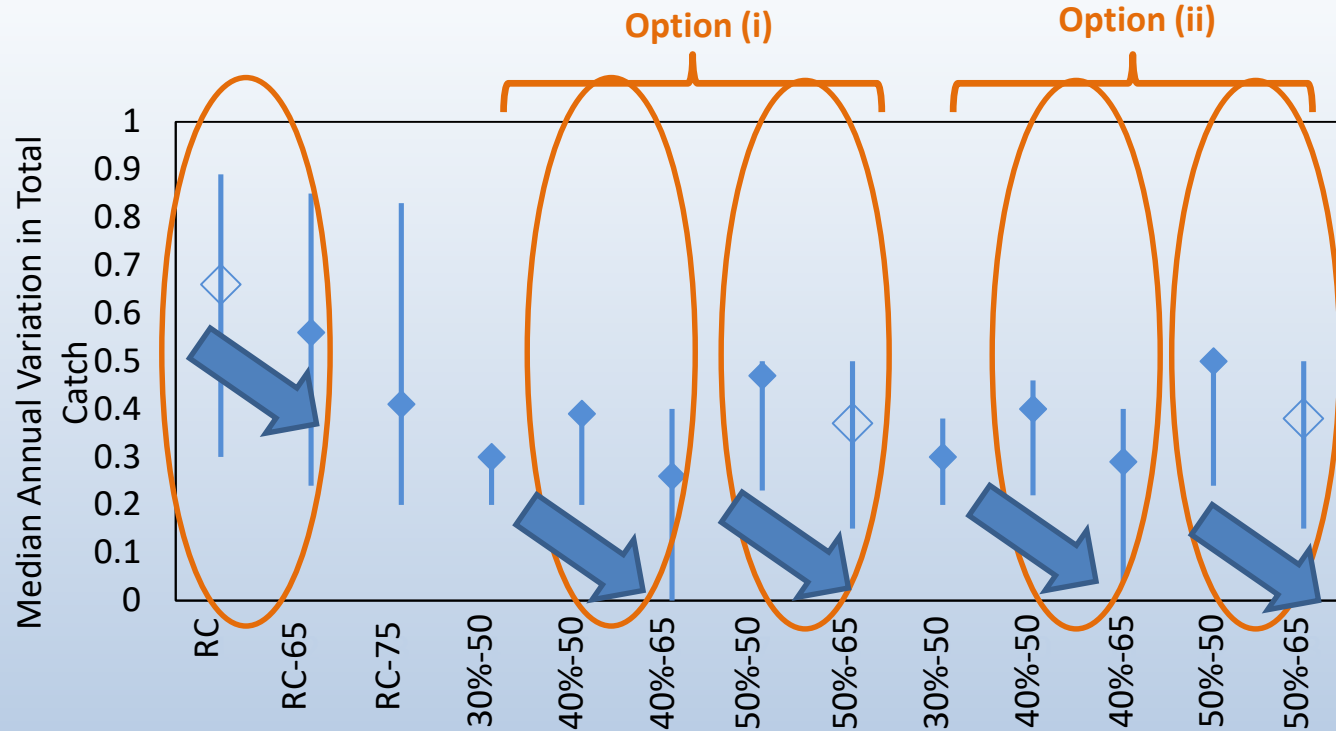
- c_{stbl}^S from 50 000t to 65 000t (β decreases)

Stable TAC and metarule % change



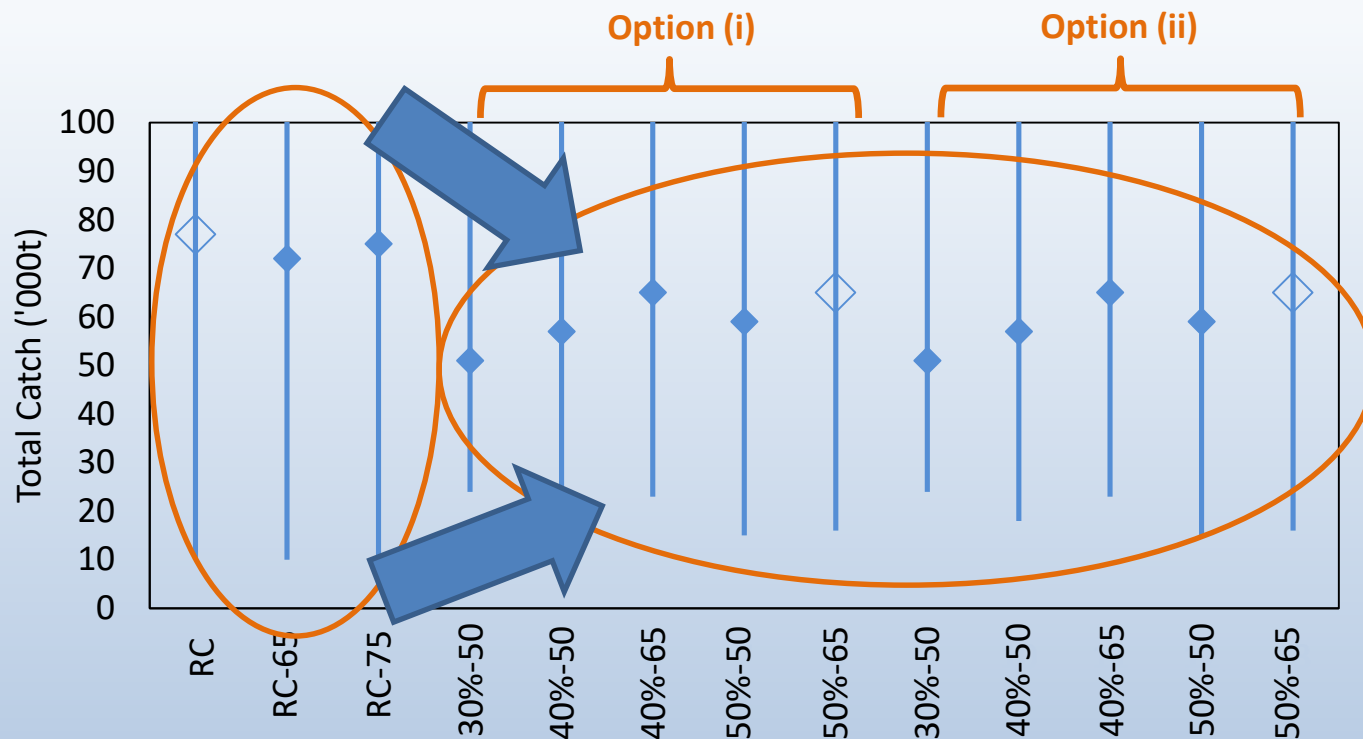
- c_{stbl}^S from 50 000t to 65 000t (β decreases)

Stable TAC and metarule % change



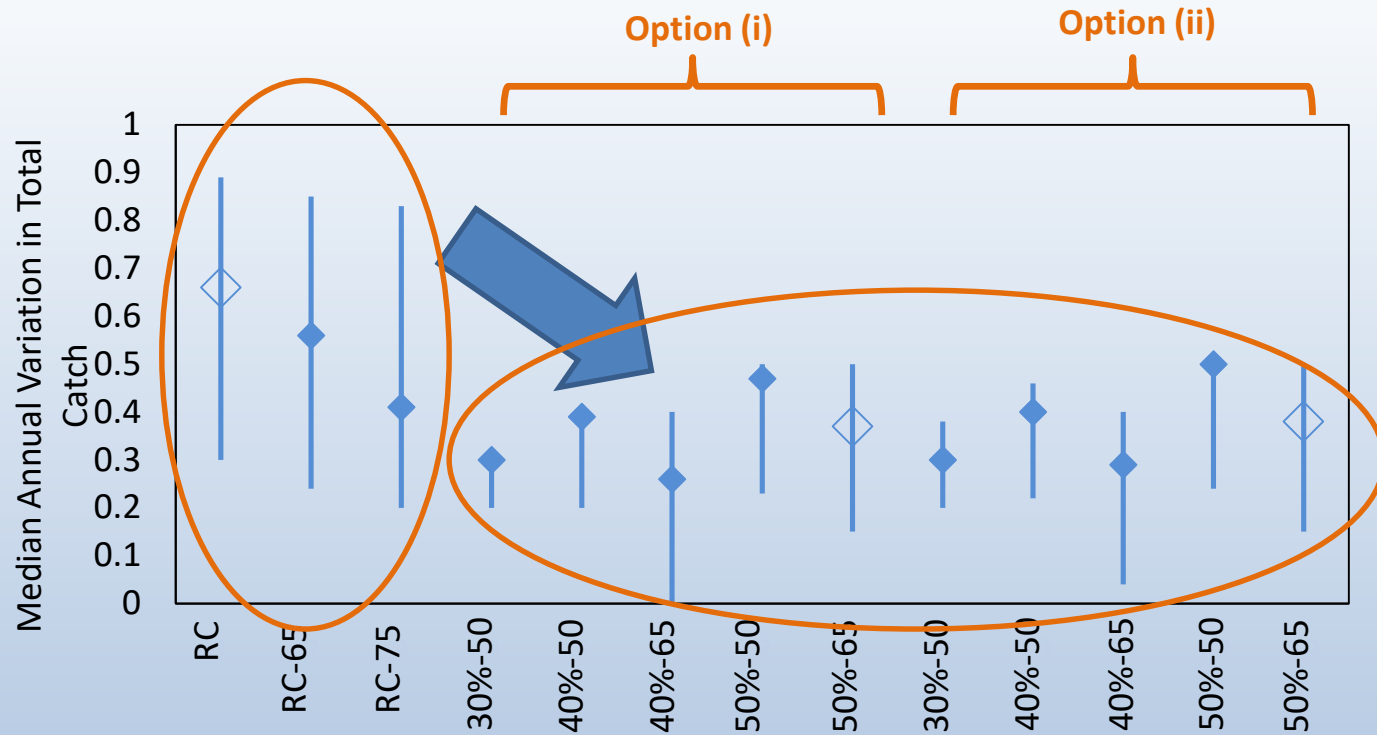
- c_{stbl}^S from 50 000t to 65 000t (β decreases)

Stable TAC and metarule % change



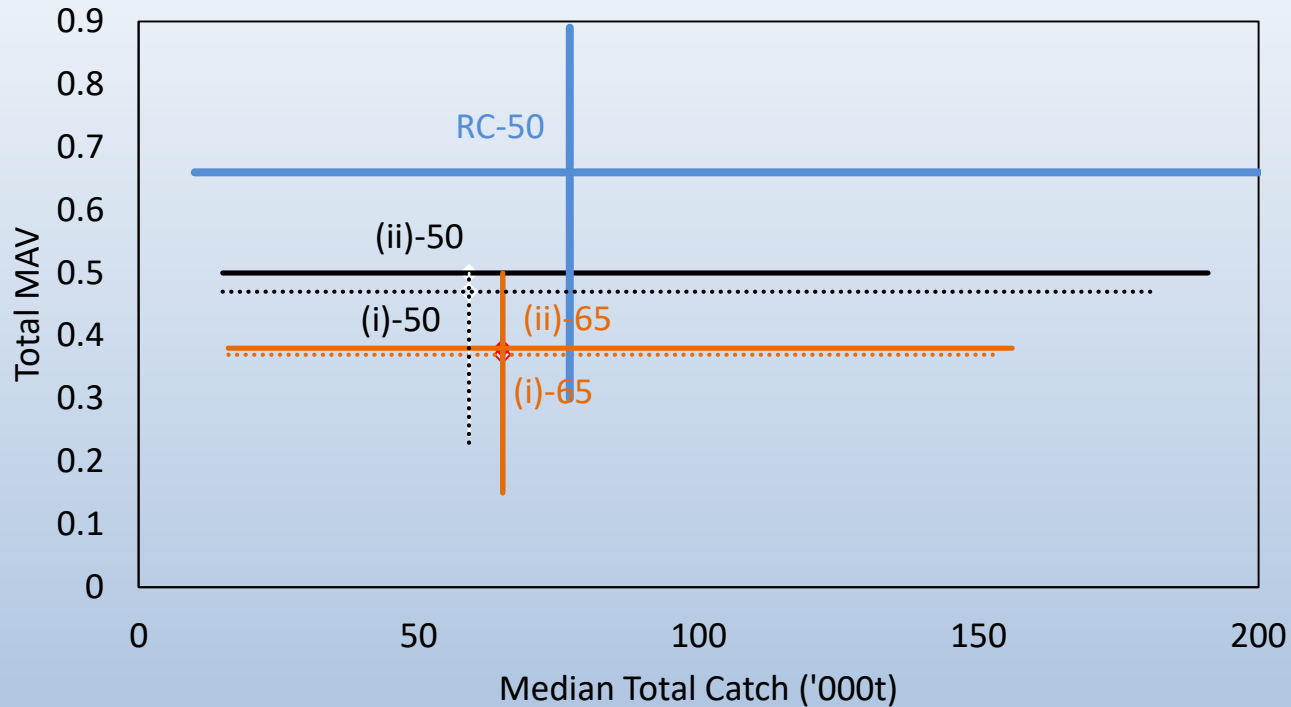
- Moving from RC to metarule constraint

Stable TAC and metarule % change

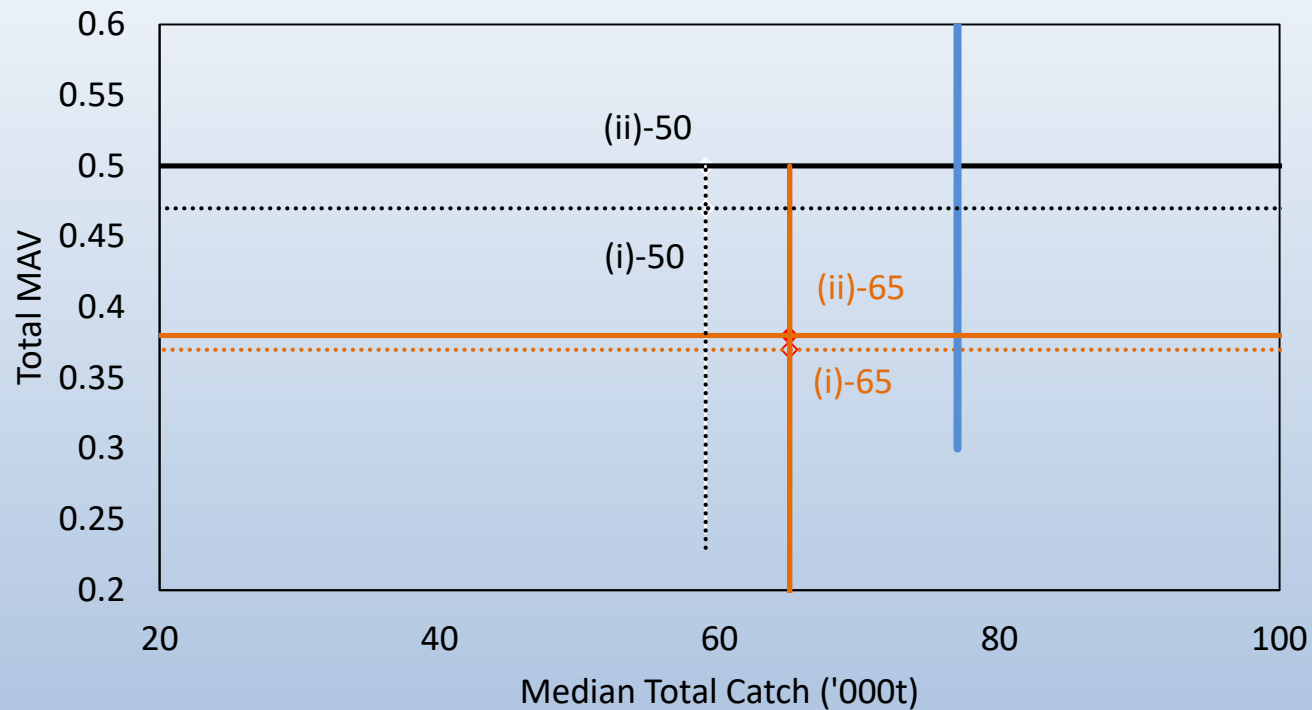


- Moving from RC to metarule constraint

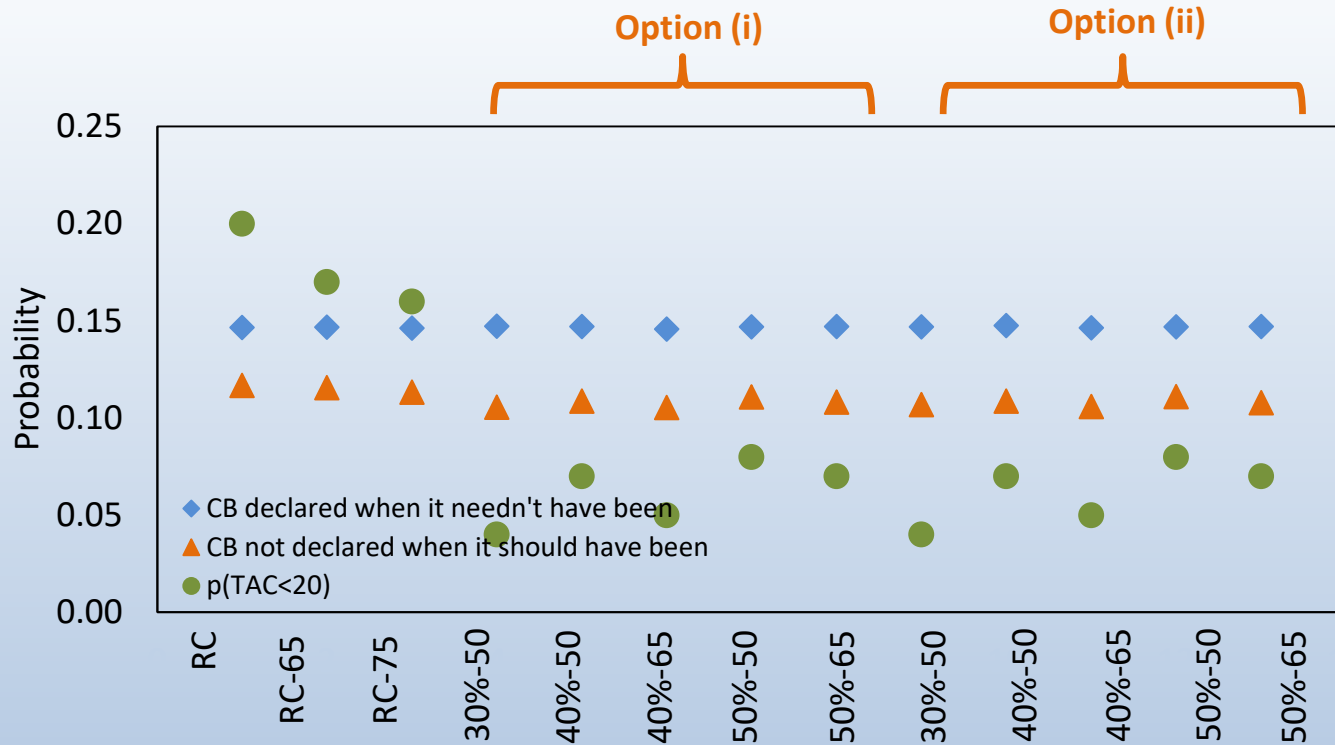
Stable TAC and metarule % change



Stable TAC and metarule % change

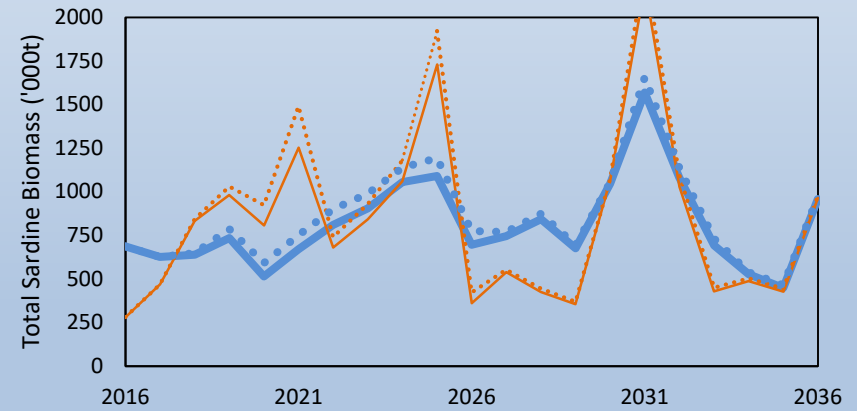
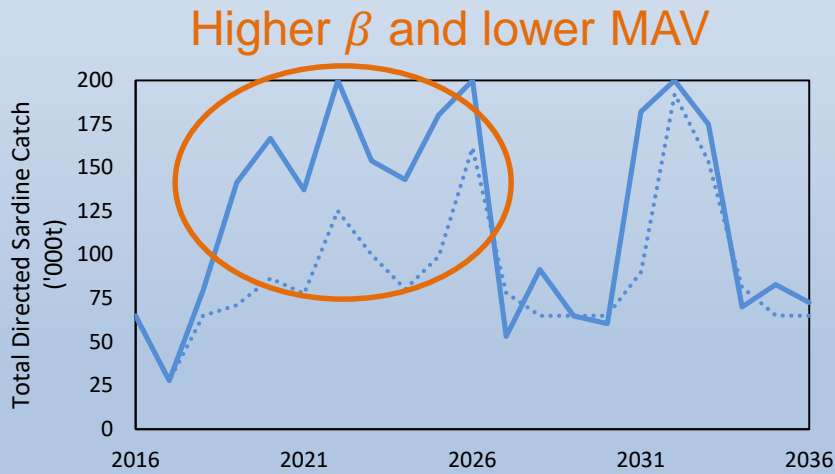
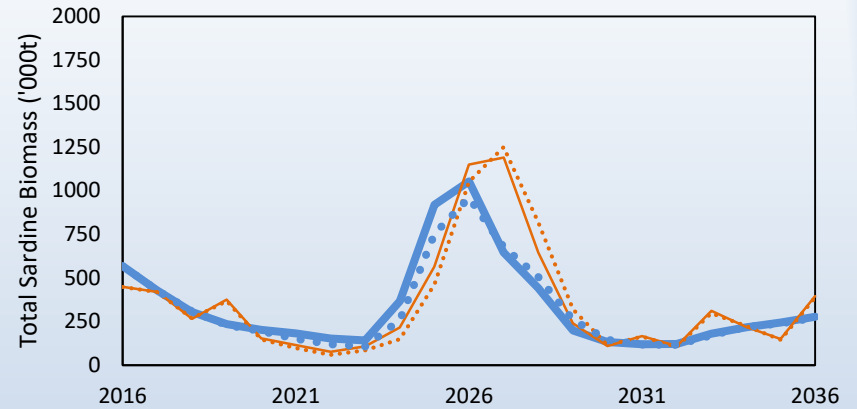
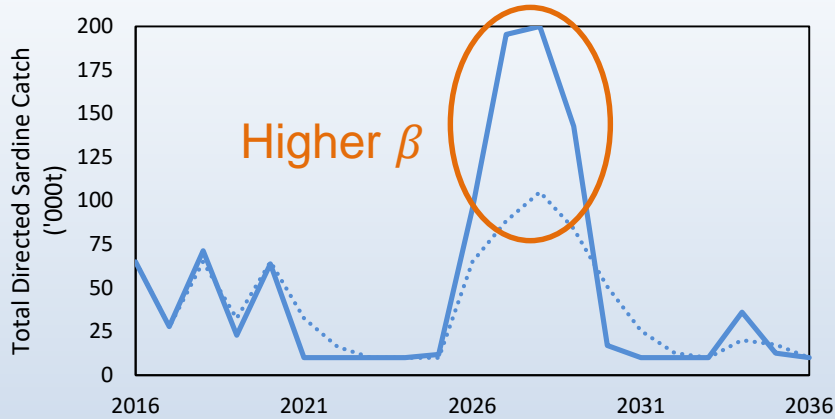


Stable TAC and metarule % change



- $p(\text{TAC} < 20)$ lower under options (i) and (ii)
- CB declared 'unnecessarily' 15%
- CB not declared when necessary 11-12%

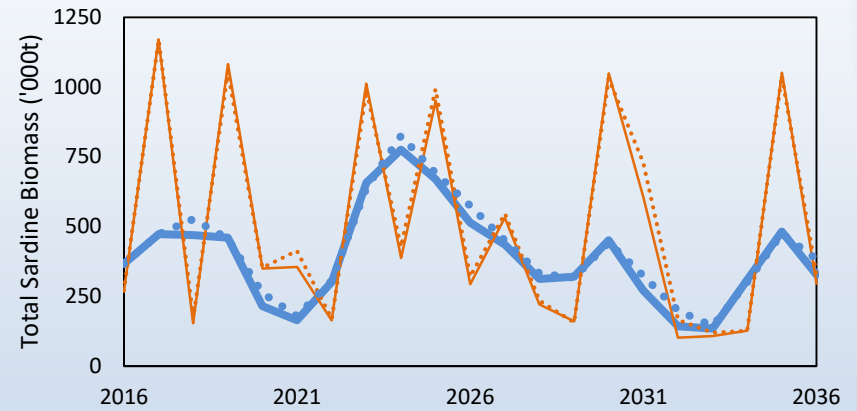
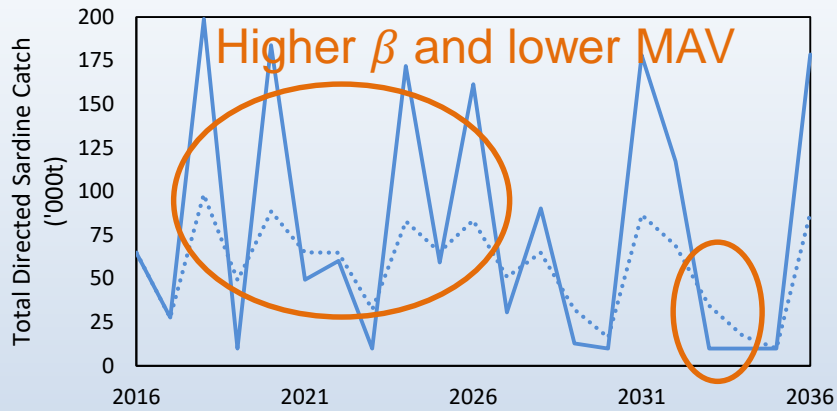
Example Trajectories



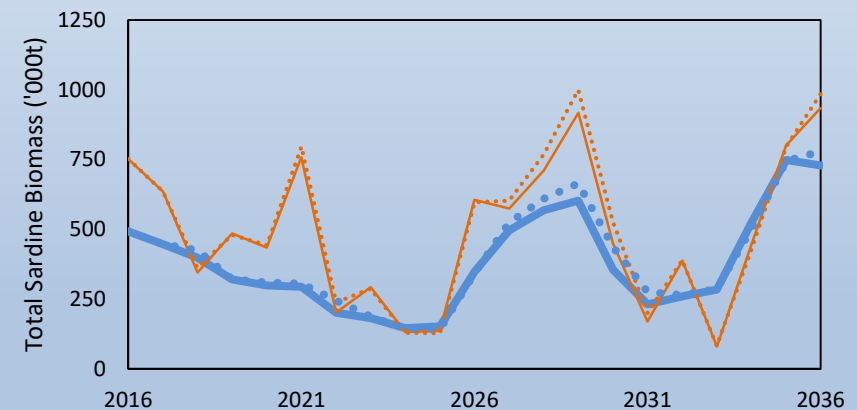
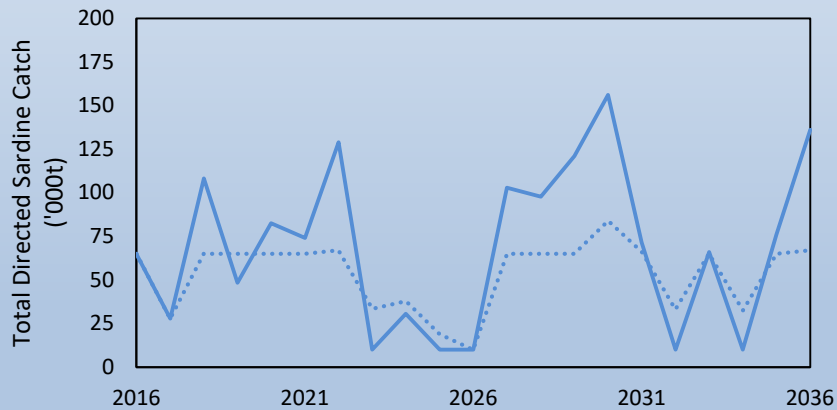
- Reference Case: $\beta = 0.17$ & $c_{stbl}^S = 50$
- Opt (ii): $\beta = 0.084$ & $c_{stbl}^S = 65$

True Biomass
Survey estimate of biomass

Example Trajectories



Slower decrease under metarule



- Reference Case: $\beta = 0.17$ & $c_{stbl}^S = 50$
- Opt (ii): $\beta = 0.084$ & $c_{stbl}^S = 65$

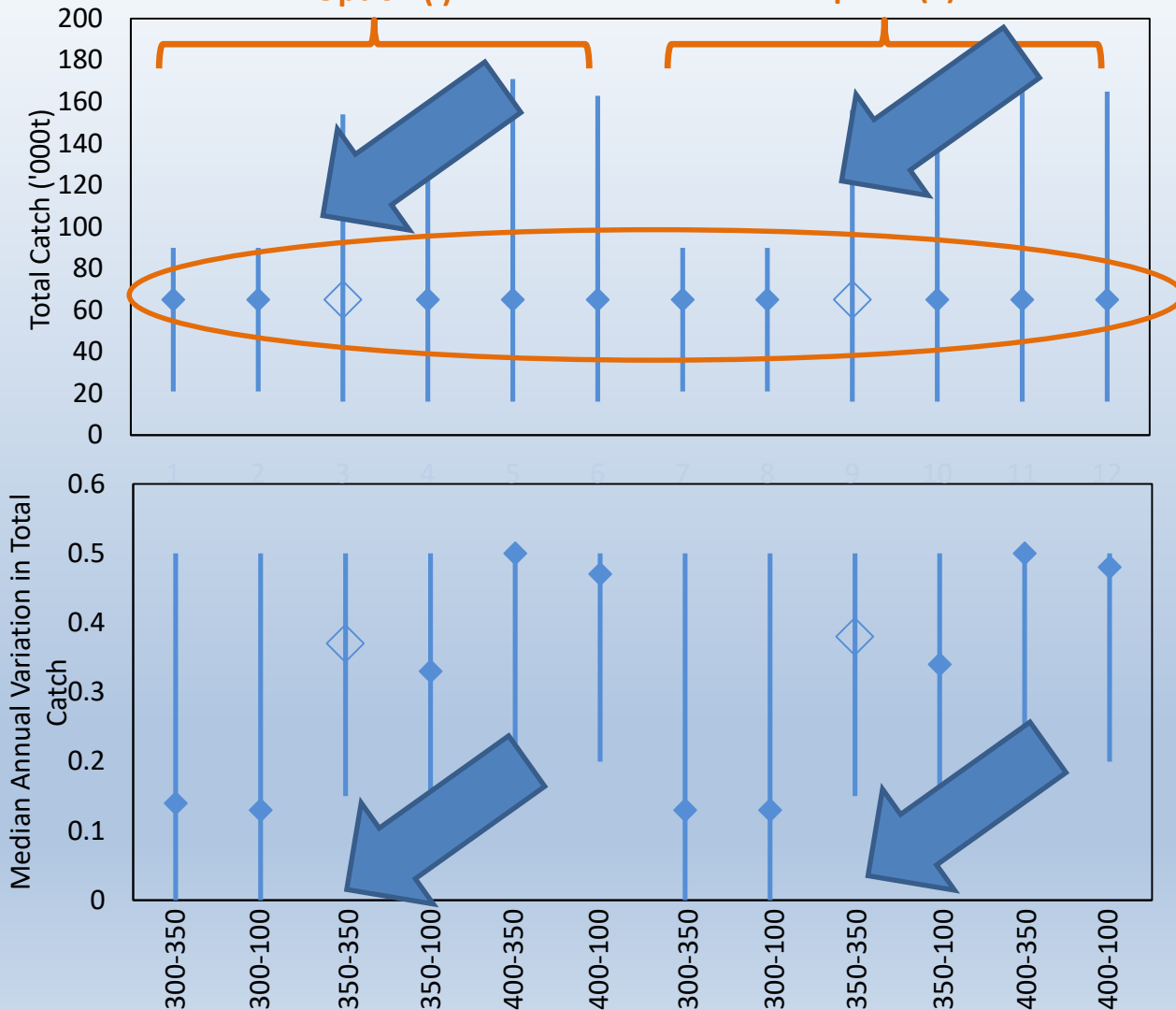
True Biomass
Survey estimate of biomass

Alternative B_{thresh} and Linear Smoothing range

Option (i)

Option (ii)

$c_{stbl}^S = 65$
frequently applied



Only ~12% in
350 – 450 000t