Updated WCPO bigeye and yellowfin TRP evaluations

WCPFC-SC17-2021/MI-WP-01

OCEANIC FISHERIES PROGRAMME, SPC

BACKGROUND

- Previous evaluations have determined <u>minimum</u> TRPs for BET and YFT ($\%SB_{F=0}$) based on the probability of exceeding the limit reference point.
  - CMM 2018-01 interim objective - maintaining ($SB/SB_{F=0}$) at or above the 2012-2015 average
- New assessments were conducted for WCPO bigeye and yellowfin and these were agreed to at SC16; both assessments contained a number of modelling changes and estimated stock status
- SC16 requested SSP undertake analyses to inform discussions related to interim TRPs for bigeye and yellowfin, as scheduled within Harvest Strategy Workplan
- These were reported at WCPFC17; no TRPs were agreed upon at the Regular Session. A request was made to update the document with multispecies considerations and to present bigeye and yellowfin results separately

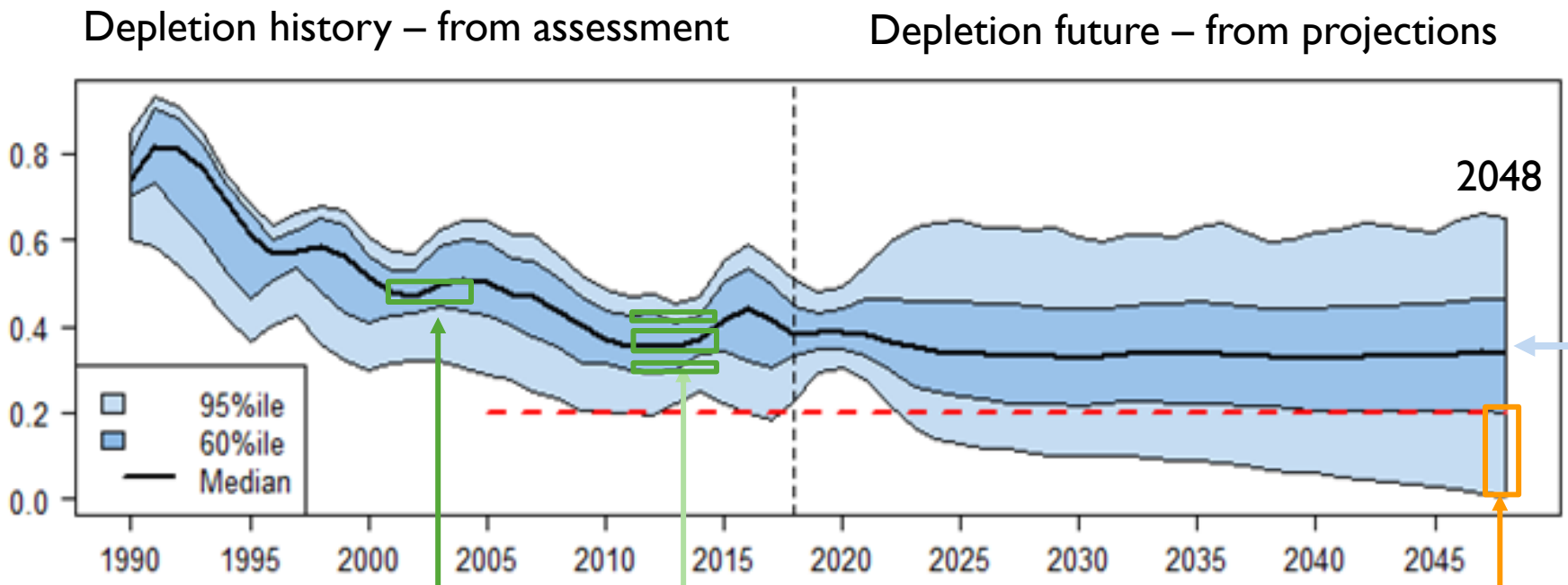
APPROACH

- Analysis based on 2020 stock assessments and the grid model runs: 24 for bigeye and 72 for yellowfin
- 100 simulations run for each model; each simulation has a different recruitment trajectory, with future recruitment drawn from variability around the stock-recruitment relationship
  - Two sets of results for bigeye: one based on ‘long term’ (1962-2016, lower avg. Rec.) recruitment and one on ‘recent’ (2007-2016’, higher avg. Rec.) recruitment; yellowfin based on ‘long term’ (1962-2016)
- No effort creep is assumed (i.e. catchability stays constant in projection years, so doesn’t account for increased fishing efficiency)

APPROACH - 2

- 2016-2018 fishing levels (effort for PS, catch for LL and “other”) used as baseline
- Scalars (change from baseline fishing level) increased/decreased in tandem for LL/PS, always maintained at baseline for “other” gears
- Results for each iTRP scenario combined across all simulations and models for bigeye (hence, 2400 total simulations) and yellowfin (7200 total)
- Measured output detailed in tables in paper:
  - Change in $SB/SB_{F=0}$ from 2012-2015 and recent (2015-2018) averages
  - Risk $SB/SB_{F=0}$ < LRP
  - Median equilibrium yield (% of MSY)
  - Relative YPR and SPR (to base fishing level)
  - Multispecies impact (Equivalent depletion for other species, i.e., SKJ + BET/YFT)

TRP (OR LRP) GOAL SEEKING



Baseline

TRP level Relative to 2000-2004

TRP levels relative to 2012-2015

TRP levels with LRP breaching risk

RESULTS: BIGEYE – 'SHORT TERM' RECRUITMENT

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Impact on BET

Impact on SKJ/YFT

Scenario (TRP goal)	% change in fishing (scalar)	BET 2048 Depl. ($SB/SB_{F=0}$)	2048 % Risk ($SB/SB_{F=0}$<LRP)	% change from 2012-2015 depletion	% change from 2015-2018 depletion	% of MSY	YFT Equiv. 2048 Depletion	SKJ Equiv. 2048 Depletion
Baseline	0%	48%	0%	+30%	+17%	95%	59%	43%
-10%	+54%	33%	10%	-10%	-20%	98%	43%	35%
2012-15 Dep.	+38%	37%	3%	0%	-10%	98%	46%	37%
+10%	+24%	41%	0%	+10%	0%	98%	48%	39%
2000-04 Dep.	-4%	49%	0%	+34%	+21%	94%	54%	44%
10% LRP risk	+55%	32%	10%	-12%	-21%	98%	43%	35%
20% LRP risk	+70%	29%	20%	-23%	-30%	98%	41%	34%

Historic Dep. levels	BET	YFT	SKJ
2015-2018 ("recent")	41%	59%	44%
2012-2015	37%	55%	49%
2000-2004	49%	54%	66%

RESULTS: BIGEYE – 'LONG TERM' RECRUITMENT

Scenario (TRP goal)	% change in fishing (scalar)	BET 2048 Depl. ($SB/SB_{F=0}$)	2048 % Risk ($SB/SB_{F=0}$<LRP)	% change from 2012-2015 depletion	% change from 2015-2018 depletion	% of MSY	YFT Equiv. 2048 Depletion	SKJ Equiv. 2048 Depletion
Baseline	0%	43%	5%	+17%	+6%	97%	59%	43%
-10%	+33%	33%	20%	-10%	-20%	98%	46%	38%
2012-15 Dep.	+22%	37%	14%	0%	-10%	97%	48%	39%
+10%	+8%	41%	8%	+10%	0%	97%	51%	42%
2000-04 Dep.	-17%	49%	1%	+34%	+21%	96%	62%	48%
10% LRP risk	+12%	40%	10%	+6%	-4%	97%	50%	41%
20% LRP risk	+33%	33%	20%	-10%	-19%	98%	46%	38%

Historic Dep. levels	BET	YFT	SKJ
2015-2018 ("recent")	41%	59%	44%
2012-2015	37%	55%	49%
2000-2004	49%	54%	66%

RESULTS SUMMARY - BIGEYE

Baseline

- 2048 BET depletion ($SB/SB_{F=0}$) better than 2012-2015 and 2015-2018
- 2048 YFT 2048 depletion ~ better than 2012-2015, same as 2015-2018
- 2048 SKJ 2048 depletion ~ lower than 2012-2015, ~ same as 2015-2018

TRP levels relative to 2012-2015

- Increased fishing, low risk to BET LRP (S-T: 0-10%, L-T 8-20%)
- 2048 YFT depletion down to 43/51%, SKJ depletion down to 35/42%

TRP level Relative to 2000-2004

- Fishing decreases slightly with no risk to BET LRP
- 2048 YFT depletion to 54/62%; SKJ to 44/48%

TRP levels with LRP breaching risk

- Potential large increase in fishing
- Potential large drop in depletion (to 29-40%)
- 2048 YFT depletion to 41/46%; SKJ to 34/38%

Historic Dep. levels	BET	YFT	SKJ
2015-2018 ("recent")	41%	59%	44%
2012-2015	37%	55%	49%
2000-2004	49%	54%	66%

RESULTS: YELLOWFIN – 'LONG TERM' RECRUITMENT

Scenario (TRP goal)	% change in fishing (scalar)	YFT 2048 Depl. ($SB/SB_{F=0}$)	2048 % Risk ($SB/SB_{F=0}$<LRP)	% change from 2012-2015 depletion	% change from 2015-2018 depletion	% of MSY	BET (S/L) Equiv. 2048 Depletion	SKJ Equiv. 2048 Depletion
Baseline	0%	59%	0%	+7%	0%	63%	48/43%	43%
-10%	+65%	49%	0%	-10%	-16%	77%	30/26%	34%
2012-15 Dep.	+29%	55%	0%	0%	-6%	70%	40/34%	38%
+10%	-5%	60%	0%	+10%	+3%	62%	50/45%	45%
2000-04 Dep.	+34%	54%	0%	-1%	-8%	71%	38/30%	38%
10% LRP risk	+200%	31%	10%	-43%	-47%	88%	8/3%	26%
20% LRP risk		NA						

Historic Dep. levels	BET	YFT	SKJ
2015-2018 ("recent")	41%	59%	44%
2012-2015	37%	55%	49%
2000-2004	49%	54%	66%

RESULTS SUMMARY - YELLOWFIN

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Baseline

- Same result as shown for BET

TRP levels relative to 2012-2015

- Greatly Increased fishing, zero risk to YFT LRP
- 2048 SKJ depletion to 34/45%, BET depletion ranges from 26/50%

TRP level Relative to 2000-2004

- Fishing increases substantially with no risk to YFT LRP
- 2048 SKJ depletion to 38%; BET decline to 30/38%

TRP levels with LRP breaching risk

- 10% risk: 3X increase in fishing required
- 2048 SKJ depletion to 38%; BET to 3/8%
- 20% risk: not achievable

Historic Dep. levels	BET	YFT	SKJ
2015-2018 (“recent”)	41%	59%	44%
2012-2015	37%	55%	49%
2000-2004	49%	54%	66%

NOTES AND CONCLUSIONS

- The recruitment assumption for bigeye is (still) influential. Projections assuming short-term recruitment imply a more resilient stock than can handle larger scalars to achieve a given TRP
- The 2020 yellowfin stock assessment, which incorporated several changes, implies a much more robust stock than previously estimated. Note that an external review of the assessment is planned for 2022, and may lead to changes in perceptions of stock status and robustness
- Multispecies implications of choosing a TRP based on YFT or one of the BET recruitment scenarios added for this paper

- <u>Bottom Line</u>
- Using 2012-2015 depletion as TRP (for any of the three analyses) generally implies a moderate increase in fishing, with low risk to breaching LRP;
- Using 2000-2004 implies a strong increase in fishing if based on YFT, but a decline if based on either BET scenario.
- Using 10% LRP risk implies large increase in fishing (and 20% incredibly large increase), large drop in Depletion levels