Evaluation of management options from the Hawaii TT CMM meeting

WCPFC-2017-10 REV1

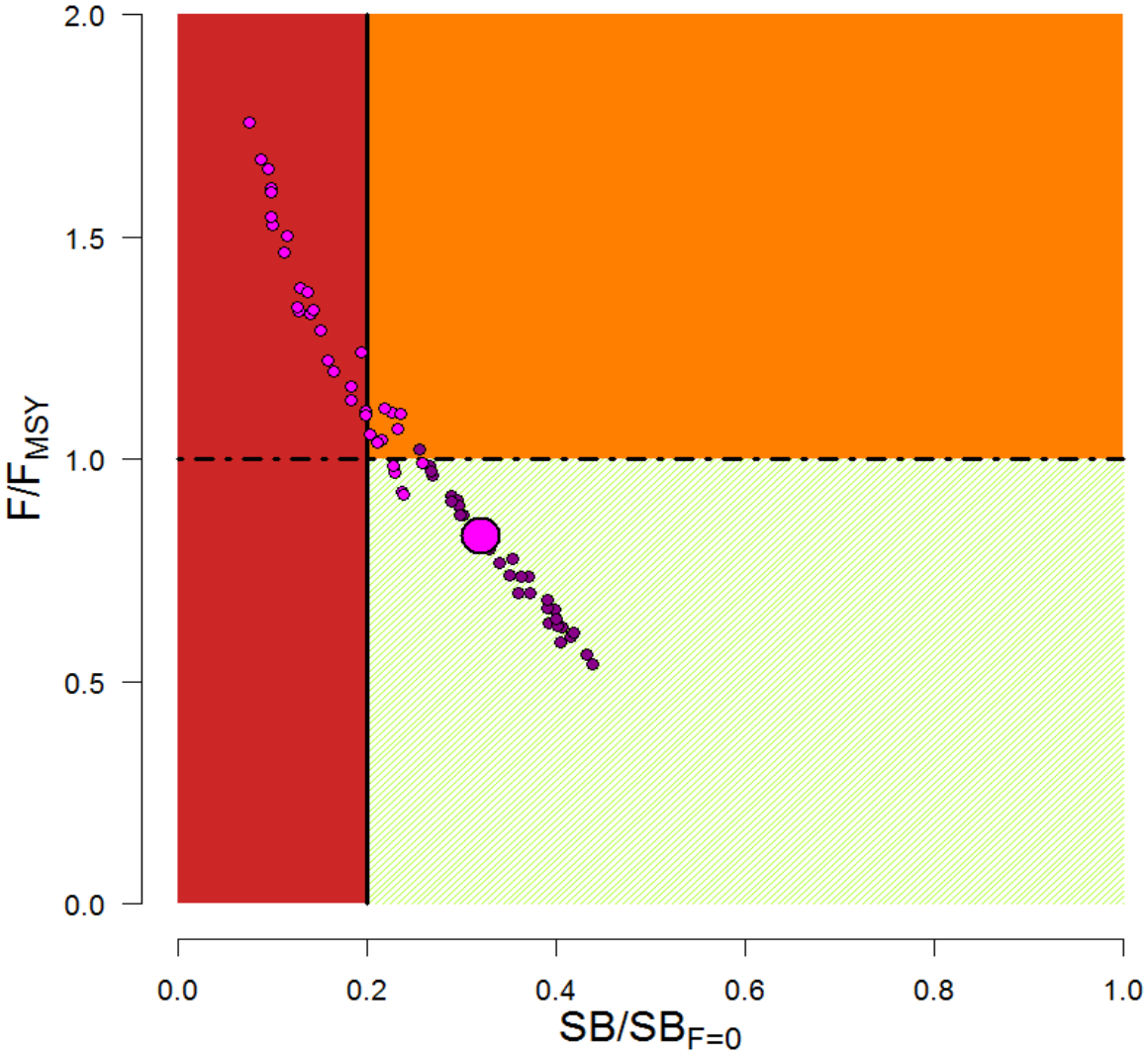
Oceanic Fisheries Programme, SPC

Second Intersessional Meeting to Progress the Draft Bridging Measure for Tropical Tunas, WCPFC14, December 2017

Overview

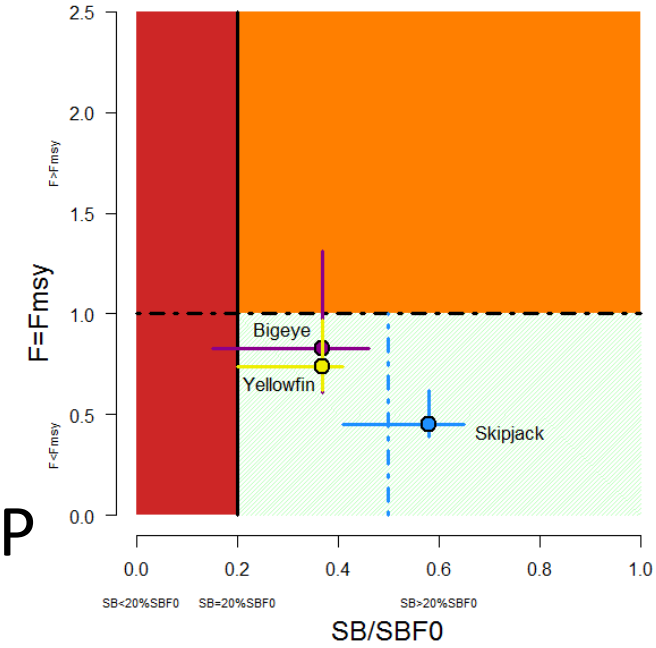
- New BET assessment and SC advice
- What was the tasking of SPC?
- Our approach
  - Quantifying options
  - Running projections
  - Key outcomes

2017 assessment



SC advice (paraphrased)

- Bigeye and yellowfin (SC13)
  - Stocks not experiencing overfishing and stocks not overfished (noting some risk of both cases)
  - Fishing mortality should not be increased from current level to maintain current or increased spawning biomass
- Skipjack
  - spawning biomass is now around the adopted TRP
  - Take action to keep the spawning biomass near the TRP



SPC Tasking – management options

Option	Sub-option	Description for purse seine	Description for longline
1	**a**	CCM 2016-01 (2017 FAD closure limits) - 4 month FAD closure/flag state options for 4th month + high seas FAD closure (KI exemption and footnote 3 (5?))	Assumed TT CMM specified catch levels for 2017 for constrained flags, non-constrained flags assumed to take their average catch over 2013-2015.
	b	2015-16 measures – 4 month FAD closure/ flag state options for 4th month	Assumed TT CMM specified catch levels for 2015/2016 for constrained flags, non-constrained flags assumed to take their average catch over 2013-2015.
	c	2012-15 measures – 3.5 month FAD closure	Baseline longline catch from CMM 2008-01 minus 31.25%
2		3 months FAD closure + (3/4/5/6/9/12 month) high seas FAD closure (KI exempt); + total effort equals 3/4/5000 days on the high seas.	Not specified

SPC Tasking

Option	Sub-option	Description for purse seine	Description for longline
3	**a**	No FAD closure, hard FAD set limits option (USA provided hard limits: the average FAD set numbers from 2011-2014, 90% of that number, 95% of that number, 105% of that number and 110% of that number)	Catch limits of 77,400, 81,700, 86,000, 90,300 and 94,600 mt
	b	SPC calculate limits necessary to meet objectives	SPC calculate limits necessary to meet objectives
4	-	4 month closure/flag state option for 4th month + high seas FAD closure, 5th month FAD closure for non-SIDS fleets averaging >500mt of bigeye per purse seiner (average 2010-2013).	Not specified
5	-	3 month FAD closure, zero effort (PS) for 3 months in the high seas	Not specified

SPC Tasking – evaluation criteria

- **Bigeye and Yellowfin**
  - Spawning biomass depletion ratio ($SB/SB_{F=0}$) maintained at or above average $SB/SB_{F=0}$ for 2012-2015
  - fishing mortality maintained at or below average F in 2011-2014
  - the fishing mortality at F_{MSY}
  - risk of breaching the adopted LRP (20% of estimated recent average spawning biomass in the absence of fishing: $20\%SB_{F=0}$)
  - Vulnerable biomass
  - [relative impact on spawning biomass by fishery sector/gear]
- **Skipjack**
  - Most of the above
  - $SB/SB_{F=0}$ maintained on average at the target reference point (50%)
  - PLUS catches (purse seine)

Projection approach

- Deterministic projections for each stock (BET/YFT/SKJ)
  - Computationally feasible
  - Run across assessment grid – summarised as (weighted) median
- Future recruitments = those from the SRR
- 30 year projection
  - Long-term impacts, not the trajectory
- Baseline 2013-2015 – ACTUAL fishing levels
  - Note 2015 an 'unusual' optimistic year
- 2013-15 baseline outcomes expected to be slightly more pessimistic than post SC13 runs
- Risk metric likely underestimated (confirmed, but approximated risk is indicative)

Translating Options into scalars

- General approach similar to that for recent TT CMM evaluations
- 'Flag' level impact of Options
  - Due to flag exemptions, flag-based choices
- Example of approach – 3 month FAD closure
  - 2013-2015 = 4 months (i.e. FAD sets from 8mths fishing)
  - 3 month FAD closure allows 1/8 more FAD sets
  - Applied by flag and summed, then compared 2013-15 avg
- PS projected on effort, LL on catch
  - Others, avg 2013-15

Translating Options into scalars

- PS overall effort maintained (2013-15 avg)
  - Combined PS ASS and UNA constant
  - Exception – where overall effort limited
  - AW effort unaffected
- Used LL catch limits/levels where specified, otherwise assumed 2013-2015 avg
  - But - 2013-15 avg also applied to those fleets theoretically limited to 2000mt BET catch
  - Scalars applied to BET catch assumed to apply to YFT catches

- Additionally - ran a 'grid' of PS and LL scalars
  - 0.5 to 1.5 x 2013-2015 avg for PS AND LL
  - Grid of 121 options, across models
  - Results provided in spreadsheet

Translating options into scalars

Option	Sub-option	Purse Seine		Longline
		Associated	Unassociated	
1	a	1.06	-	1.04
	b	1.10	-	1.11
	c	1.06	-	1.11
2	a-e	1.08, 1.08, 1.08, 1.08, 1.05	0.92	Not specified
	f-j	1.10, 1.10, 1.09, 1.09, 1.05	0.94	Not specified
	k-o	1.11, 1.10, 1.09, 1.09, 1.05	0.97	Not specified
3	a	1.16, 1.04, 1.10, 1.22, 1.27	-	1.17, 1.24, 1.31, 1.37, 1.44
	b	['SPC to define levels that meet evaluation criteria']		
4		0.96	-	Not specified
5		1.04	0.96	Not specified

- Only 1 scenario where PS or LL scalar < 1

BET example results

Option	Sub-option	Resulting scalars		$SB/SB_{F=0}$	$SB/SB_{F=0}$ relative to $SB_{2012-2015}/SB_{F=0}$	F/F_{MSY}	F/F_{MSY} relative to $F_{2011-2014}/F_{MSY}$	Vulnerable biomass		Risk of		Relative impact on $SB/SB_{F=0}$	
		PS ASS	LL					PS	LL	SB <LRP	$F > F_{MSY}$	PS	LL
2013-15		1.00	1.00	0.31	0.99	0.93	1.12	1.00	1.00			-	-

Other combinations (Option 3B) where SB ~ $SB_{recent}/SB_{F=0}$

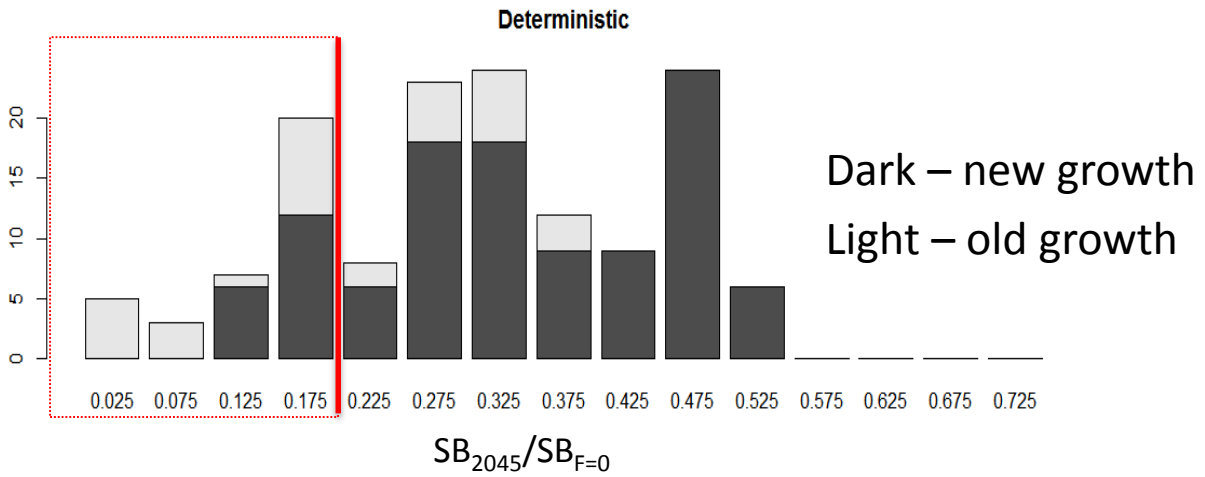
Scalars		$SB/SB_{F=0}$	$SB/SB_{F=0}$ relative to $SB_{2012-2015}/SB_{F=0}$	F/F_{MSY}	F/F_{MSY} relative to $F_{2011-2014}/F_{MSY}$	Approximated risk of		Approx equivalent	
PS ASS	LL					SB <LRP	F > F_{MSY}	FAD closure	LL catch (mt)
0.5	1.3	0.32	1.00	0.91	1.10			8	85,700
0.6	1.2	0.32	1.02	0.91	1.09			7.2	79,100
0.8	1.1	0.32	1.00	0.92	1.11			5.6	72,500
1	1	0.31	0.99	0.93	1.12			4	65,900
1.1	0.9	0.32	1.01	0.91	1.10			3.2	59,300
1.3	0.8	0.32	1.00	0.92	1.10			1.6	52,700

Other combinations (Option 3B) where F~ F_{recent}/F_{MSY}

Scalars		$SB/SB_{F=0}$	$SB/SB_{F=0}$ relative to $SB_{2012-2015}/SB_{F=0}$	F/F_{MSY}	F/F_{MSY} relative to $F_{2011-2014}/F_{MSY}$	Approximated risk of		Approx equivalent	
PS ASS	LL					SB <LRP	F > F_{MSY}	FAD closure	LL catch (mt)
0.5	1	0.37	1.17	0.82	0.99			8	65,900
0.7	0.9	0.37	1.15	0.83	1.00			6.4	59,300
0.8	0.8	0.37	1.16	0.82	0.99			5.6	52,700
0.9	0.8	0.36	1.13	0.84	1.01			4.8	52,700
1	0.7	0.36	1.14	0.82	0.99			1	46,100
1.1	0.7	0.35	1.11	0.84	1.01			3.2	46,100
1.2	0.6	0.36	1.12	0.82	0.99			2.4	39,500
1.3	0.6	0.35	1.09	0.84	1.01			1.6	39,500
1.5	0.5	0.35	1.09	0.83	0.99			0	32,900

Additional notes

- BET projections are run off the full 72 model runs selected by SC13 [up-weighted ‘new growth’]
- These include more pessimistic ‘old growth’ runs
  - SC13 called for further research into BET growth
  - Results to be discussed at SC14 (2018)
  - This may affect weight of ‘old growth’ results in the grid in future



Assumptions, assumptions…

Option	PS Associated	Longline	Comments
2013-15 avg	1.0	1.0	2013-15 avg
Option 1 a	1.06	1.04	Limits (e.g. LL catch, FAD set limit) taken
Option 1b	1.10	1.11	Limits (e.g. LL catch, FAD set limit) taken

- Where fishing limits are specified (Option 1 CMM values, specifically), those limits are assumed to be taken
- Recent fishing levels may be below those 2017 limits
  - LL catch limits (~ -5,760mt, offset by others)
  - PS FAD set limits (~ -1,300 sets)

Summary - BET

- 2013-15 avg actual conditions maintain $SB/SB_{F=0}$ (very slight declines)
- To achieve F/F_{MSY} stability, further fishing reductions required
- Options 2, 4 and 5 can achieve $SB/SB_{F=0}$ evaluation criterion – with (Options 2 and 5) additional LL catch reductions required (by ~ 10-30%)
- Alternative options investigated
- Impact of change in LL > change in PS ASS

Summary – YFT/SKJ

- Achieve evaluation criteria under 2013-15 conditions
  - Actions to address BET should be positive for these stocks
  - SKJ remains around TRP
- Robust to PS ASS/UNA combinations
  - Assumption that total effort constant
  - No effort creep/change in catchability
- YFT affected by LL fishing changes
  - Lower overall impact than seen for BET
  - Note assumption – change in BET = change in YFT catch
    - No change in targeting
  - No change in 'other gear' fishing levels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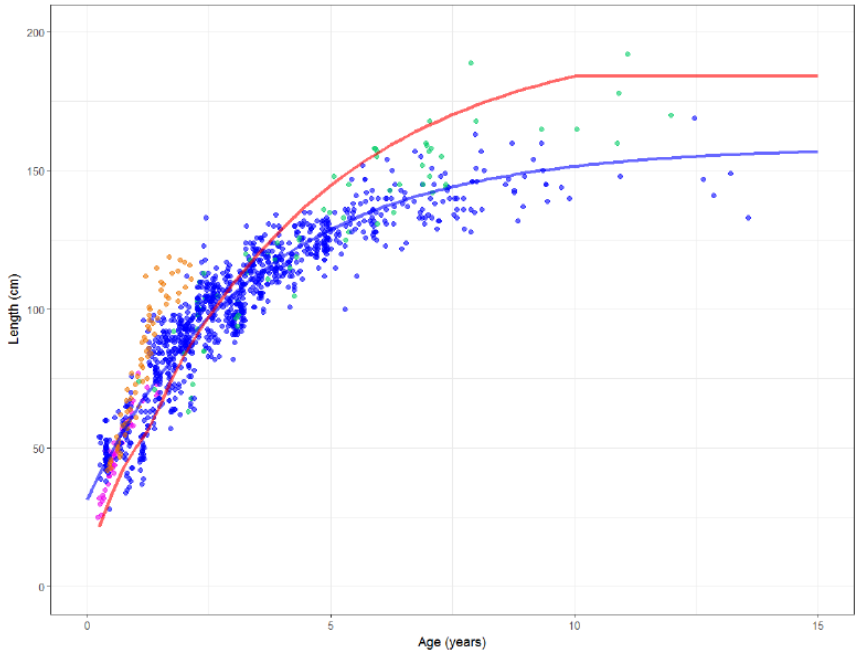
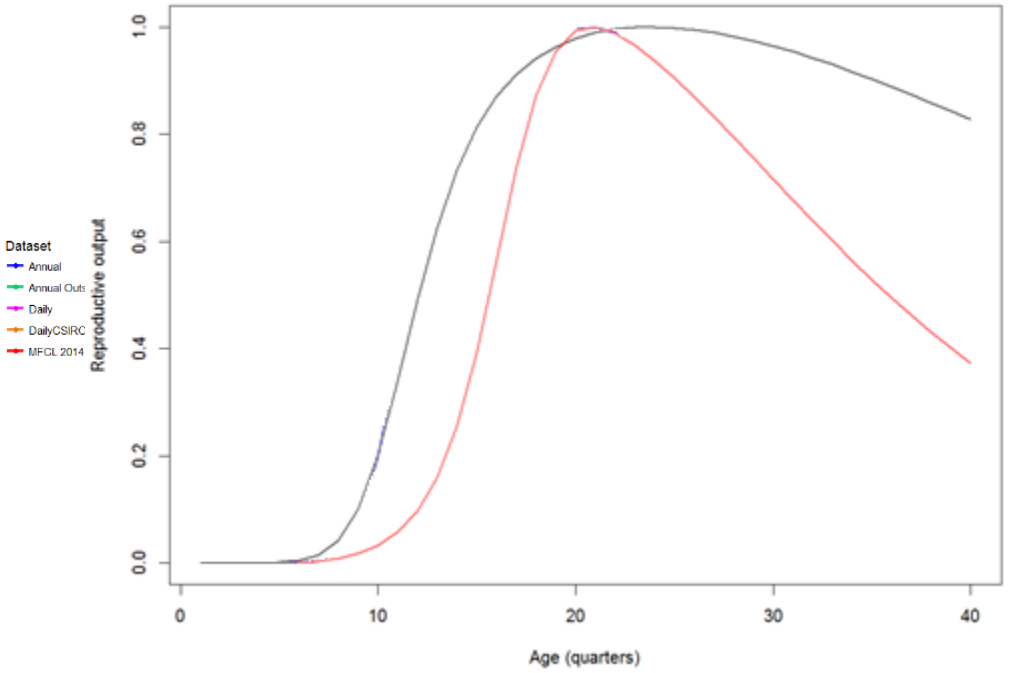
Bigeye biology



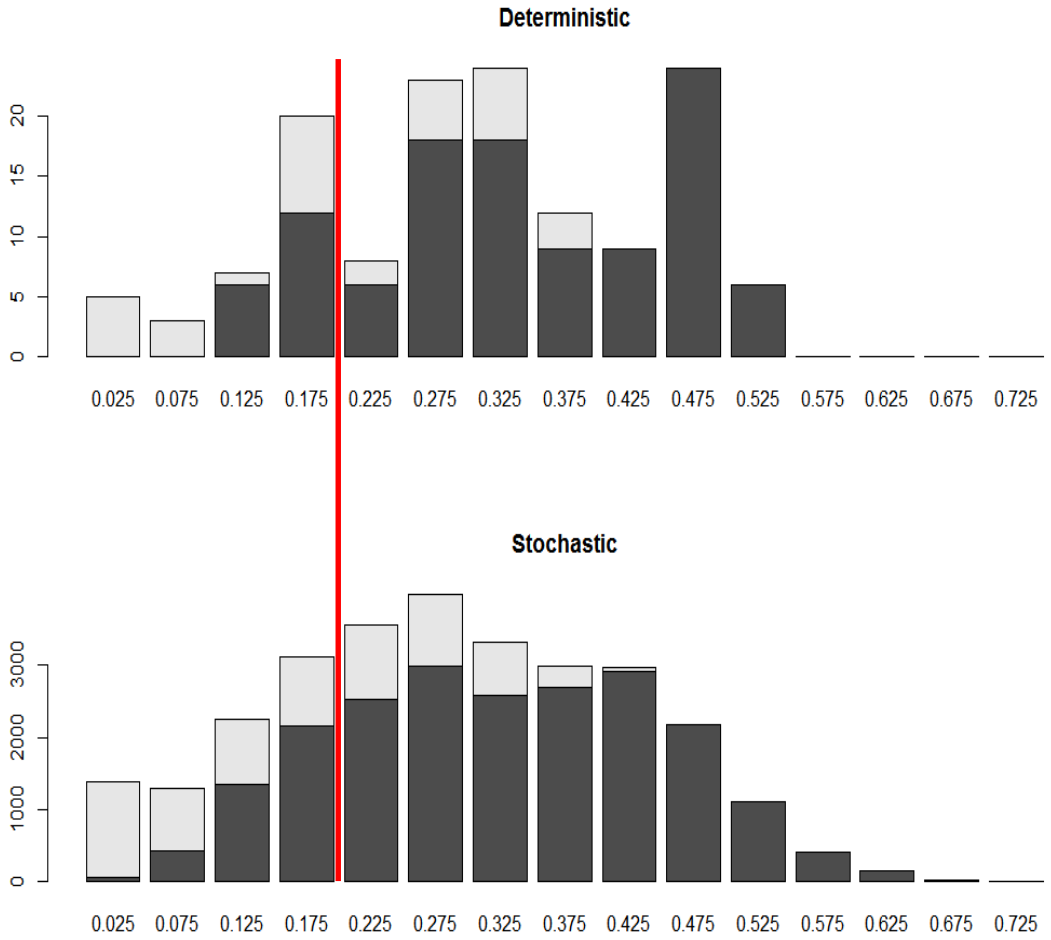


Red: 2014 ‘old growth’
Blue: 2017 ‘new growth’

Red: 2014
Black 2017 growth + new maturity

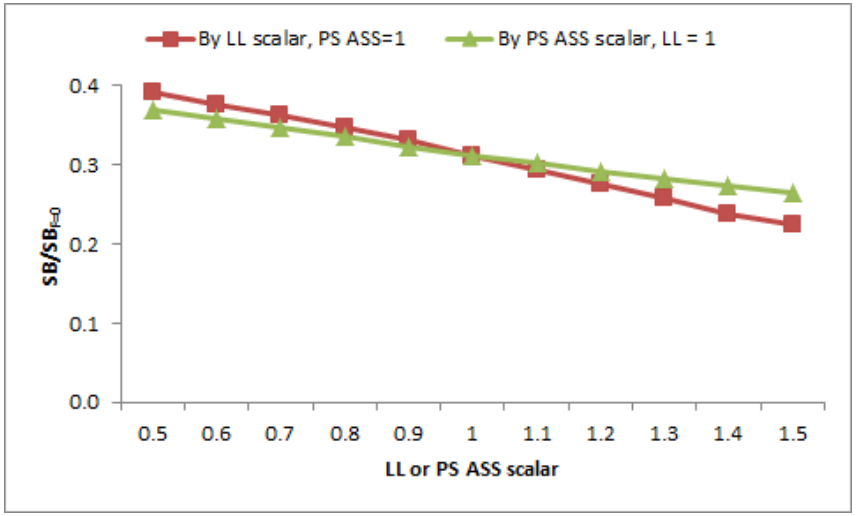
Risk calculations

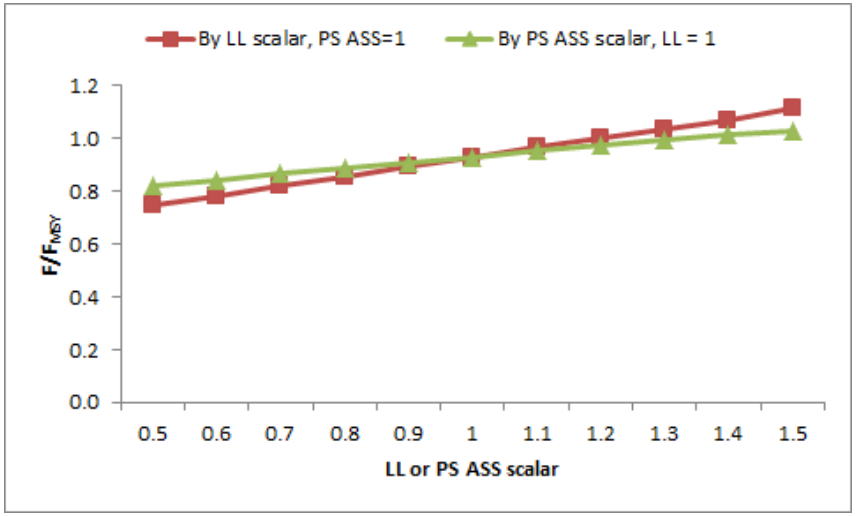
- Compare risk under deterministic v stochastic assumptions for 2013-15 conditions
- Det. risk = 24%
- Stoch. risk = 28%



- Dark – new growth
- Light – old growth

Relative gear impact





- 'Impact plot'-style analysis for 2013-15 conditions – LL fishery = 53% v PS fishery = 47%

Some general figures

Management option component	Unit of change	Resulting fishery component scalar relative to 2013-2015 average
PS FAD closure	3 month closure (one month less)	1.13
	5 month closure (one month more)	0.88
PS High seas FAD closure	Total closure, no exemptions	0.91
	Total closure with exemptions	0.96
Longline catch	5000 mt total reduction	0.92
	5000 mt total increase	1.08