Pacific Community
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Potential implications of the choice of longline mitigation approach allowed within CMM 2014-05

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SC12-EB-WP-06 REV1

Outline of presentation

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- Background
- Overview of simulation model
- Scenarios considered
- Inputs to simulation models
- Results

Background

- WCPFC-SC11-2015/EB-WP-02 analysed potential impact of several longline gear restrictions on oceanic whitetip shark and silky shark
- CMM 2014-05 states: “CCMs shall ensure that their vessels comply with **at least one** of the... options”
- Examine the implications of this allowed choice using the Monte Carlo approach of EB-WP-02

Integrate 4 components

1. A model of what we `know' about how longlines interact with sharks and influence fate
2. Spatial distribution of the two species in the Convention area
3. Current usage of longline gears
4. Species-specific information on how longline components impact catchability and survival

Catch model

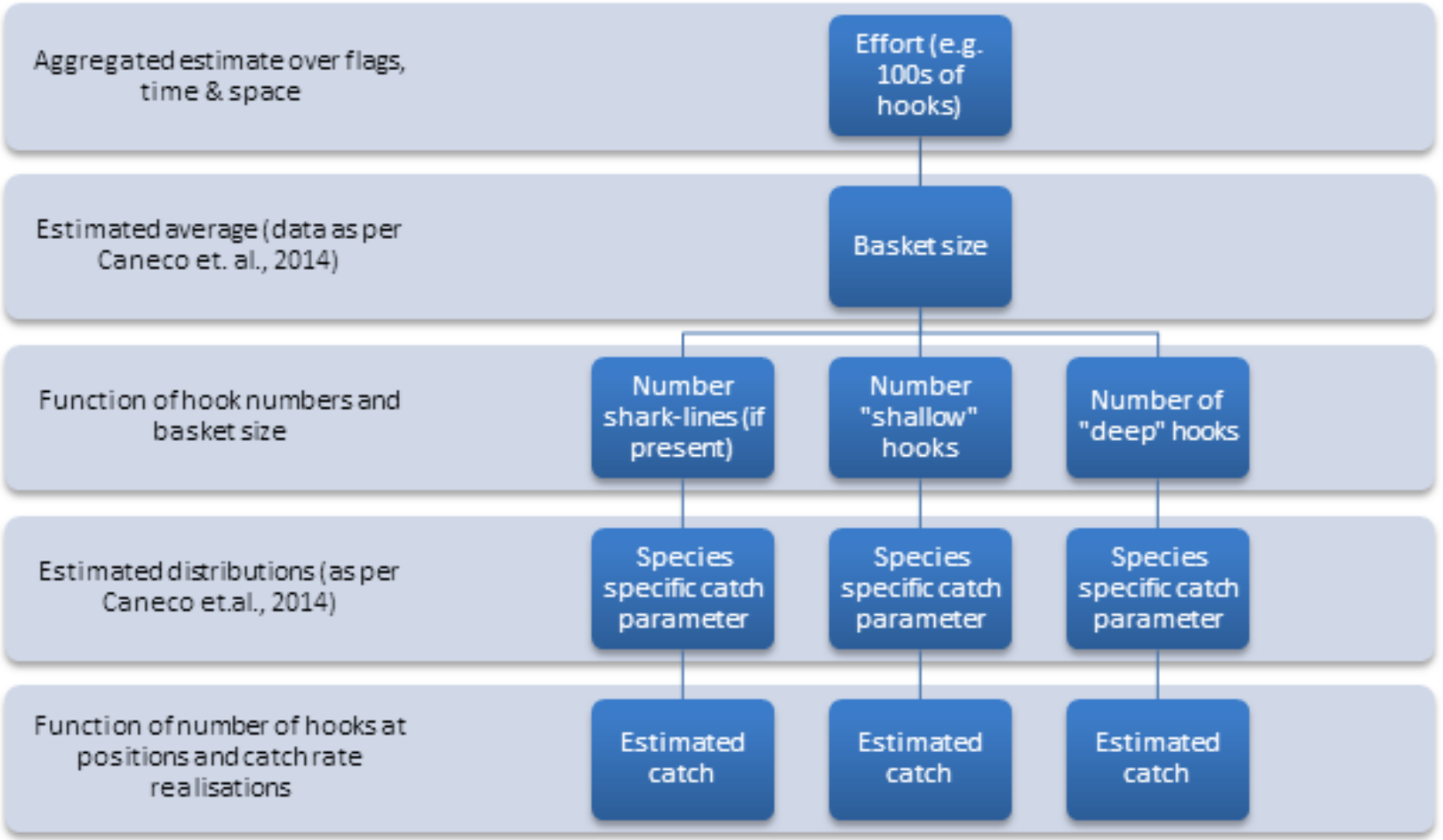


Figure 1

Fate model

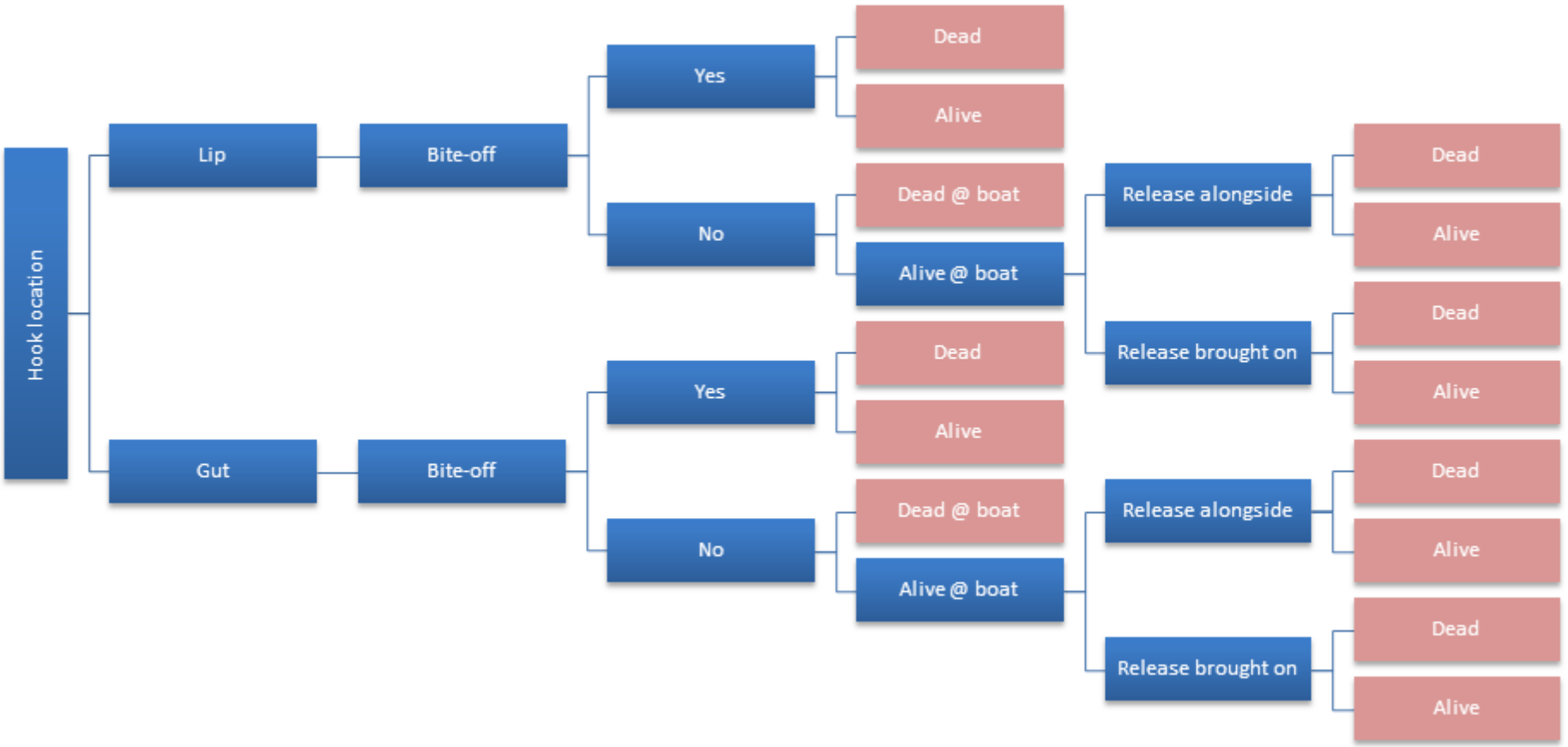
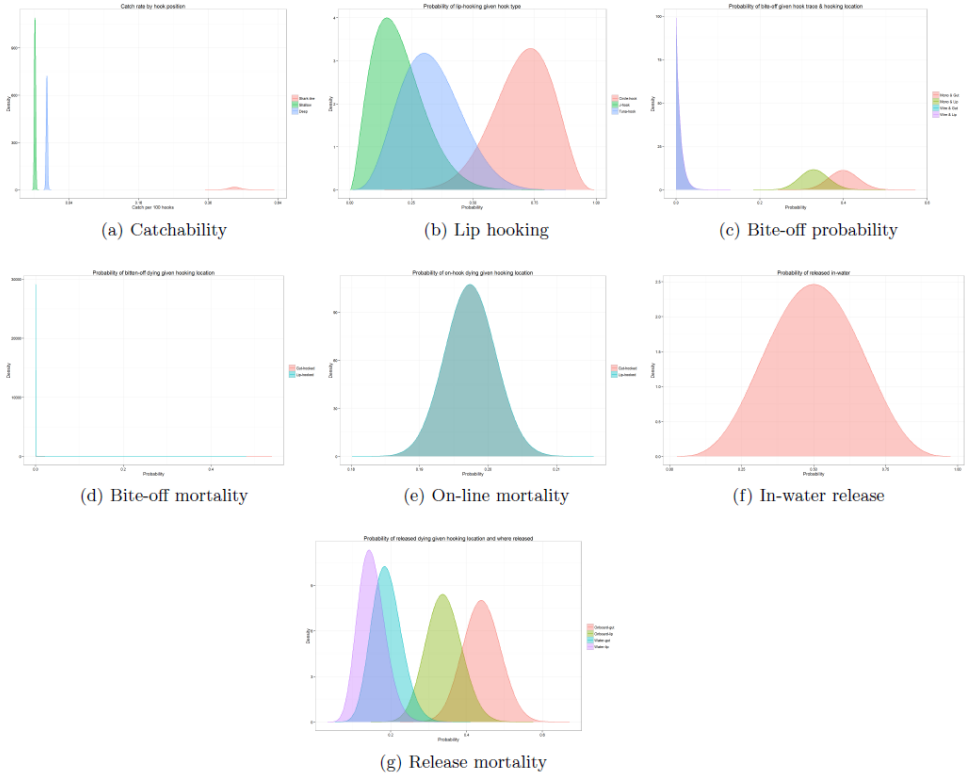


Figure 2

Model inputs – example Silky shark

Table 2: Parameters and distributions underpinning the simulations for oceanic whitetip shark. Lognormal distribution parameters are expressed on the log-scale. Beta parameters are expressed as a mean (p conceptually probability of success) and n which controls variance (conceptually the number of trials). Large n implies high-precision low-variance.

Silky shark (FAL)				
Simulation component		Distribution	Params.	Notes
Effort/Number of hooks		N/A	N/A	SPC provisioned
Basket size		N/A	30	Est SPC data (Caneco et al., 2014)
Catch rate (per 100 hooks):	Shark lines	Lognormal	$\mu = -0.78330$ $\sigma = 0.05189$	Est SPC data (Caneco et al., 2014)
	Shallow hooks	Lognormal	$\mu = -4.56537$ $\sigma = 0.03520$	Est SPC data (Caneco et al., 2014)
	Deep hooks	Lognormal	$\mu = -3.98790$ $\sigma = 0.02983$	Est SPC data (Caneco et al., 2014)
Prob. lip-hook (else gut) given:	J-hook	Beta	$p = 0.2$ $n = 14$	Afonso et al. (2011) est. from plot
	T-hook	Beta	$p = 0.33$ $n = 14$	Little information SPC prelim est.
	C-hook	Beta	$p = 0.7$ $n = 14$	Afonso et al. (2011) est. from plot
Prob. bite-off given:	Mono leader and lip-hooked	Beta	$p = 0.33$ $n = 190$	Afonso et al. (2012) [5]
	Mono leader and gut-hooked	Beta	$p = 0.40$ $n = 32$	Ward et al. (2008)
	Wire leader	N/A		Assume negligible
Prob. mort. given bite-off:	Lip-hooked	Beta	$p = 0.0323$ $n = 20$	Little information SPC prelim est.
	Gut-hooked	Beta	$p = 0.0625$ $n = 20$	Little information SPC prelim est.
Prob. mort. at landing:	Lip-hooked	Beta	$p = 0.1974$ $n = 11,470$	Est. SPC data (Caneco et al., 2014) [6]
	Gut-hooked	Beta	$p = 0.1974$ $n = 11,470$	Est. SPC data (Caneco et al., 2014)
Prob. release in water (vs. brought-on, then released)		Beta	$p = 0.5$ $n = 10$	Little information speculative & broad
Prob. mort. given:	Water release and lip-hooked	Beta	$p = 0.15$ $n = 100$	Musyl et al. (2011)
	Water release and gut-hooked	Beta	$p = 0.19$ $n = 100$	Campana et al. (2009)
	Landed release and lip-hooked	Beta	$p = 0.34$ $n = 100$	Clarke et al. (2011)
	Landed release and gut-hooked	Beta	$p = 0.44$ $n = 100$	Clarke et al. (2011)



(a) Catchability (b) Lip hooking (c) Bite-off probability

(d) Bite-off mortality (e) On-line mortality (f) In-water release

(g) Release mortality

Figure 4: Sample distributions from which Monte Carlo draws were made for the silky shark analysis.

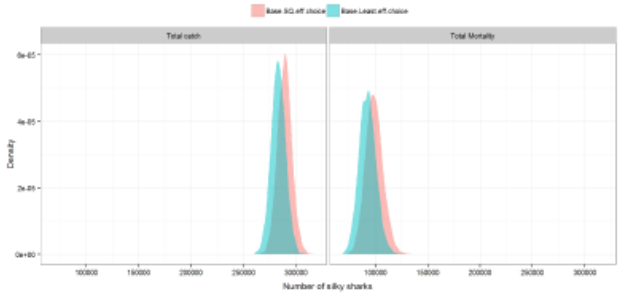
SC11 EB-WP-02 Table 2 and Figure 4

Scenarios

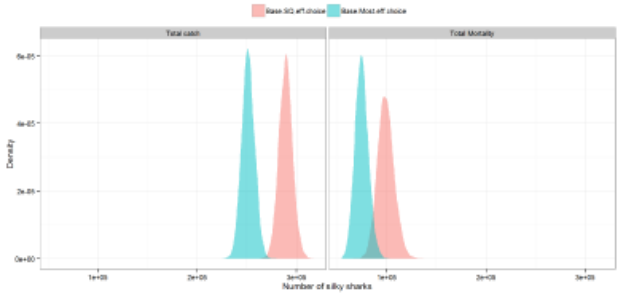
- Status quo
- Least-used
- Most-used
- No shark lines
- No wire trace
- No shark lines OR wire trace

Flag	Trace		Shark line	
	Wire	Mono	ShkLn	NoShkLn
CK	0.005	0.995	0	1
CN	0.140	0.860	0.142	0.858
FJ	0.269	0.731	0.264	0.736
FM	0.129	0.871	0.289	0.711
JP	0.834	0.166	0.018	0.982
KR	0.834	0.166	0.018	0.982
MH	0.608	0.392	1	0
PF	0.418	0.582	0.002	0.998
PG	1	0	0.943	0.057
TW	0.150	0.850	0.080	0.920
US	0.900	0.100	0	1
VU	0.350	0.650	0.868	0.132
WS	0	1	1	0

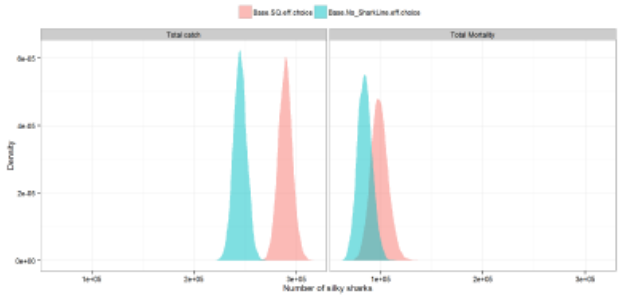
Results – silky shark



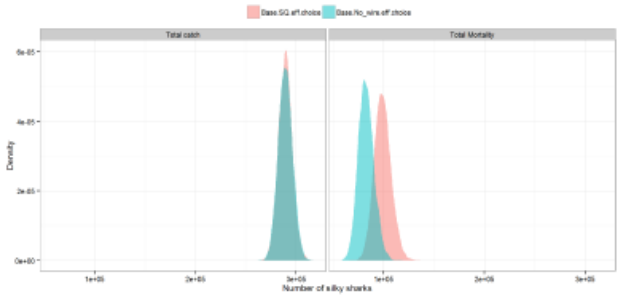
(a) Ban least-used method



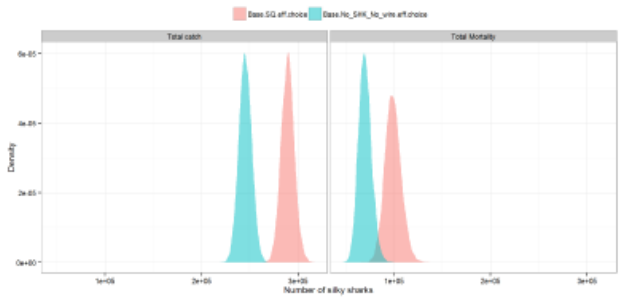
(b) Ban most-used method



(c) Ban shark lines



(d) Ban wire trace



(e) Ban both

Status quo = pink
Scenario = blue

Figure 3: One-off comparisons for silky shark between the status quo (Base.SQ) and each scenario in terms of the Monte Carlo distributions of catch (left side of the individual panels) and mortality (right side of the individual panels).

Silky shark % reduction from S. quo

	10th percentile	median	90th percentile
Least used	6	6	5
Most used	23	21	18
No Shark lines	10	9	8
No wire trace	19	18	13
No Shark lines or wire trace	26	24	24

Table 4

OWT shark % reduction from S. quo

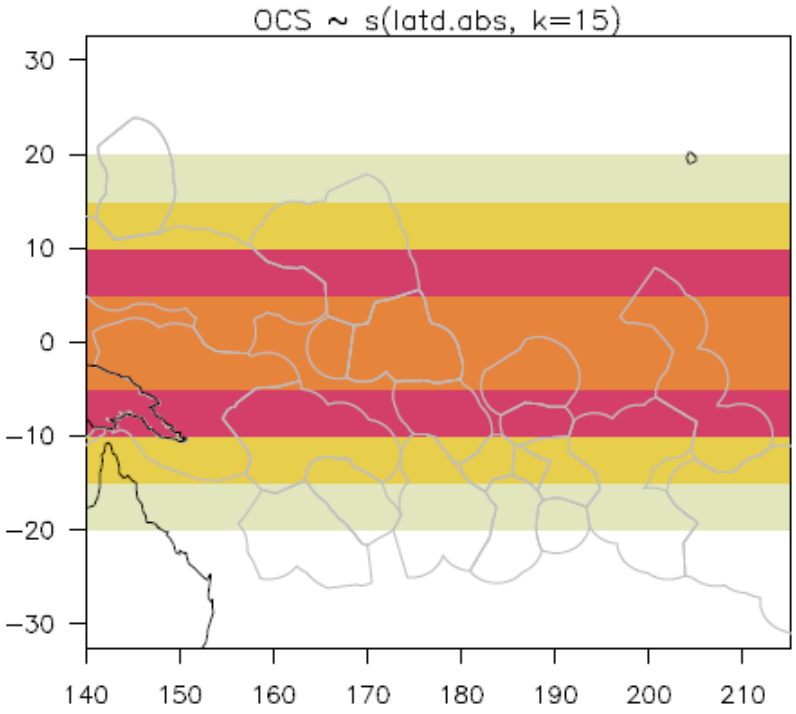
	10th percentile	median	90th percentile
Least used	11	10	9
Most used	33	30	27
No Shark lines	19	17	15
No wire trace	30	23	21
No Shark lines or wire trace	41	37	33

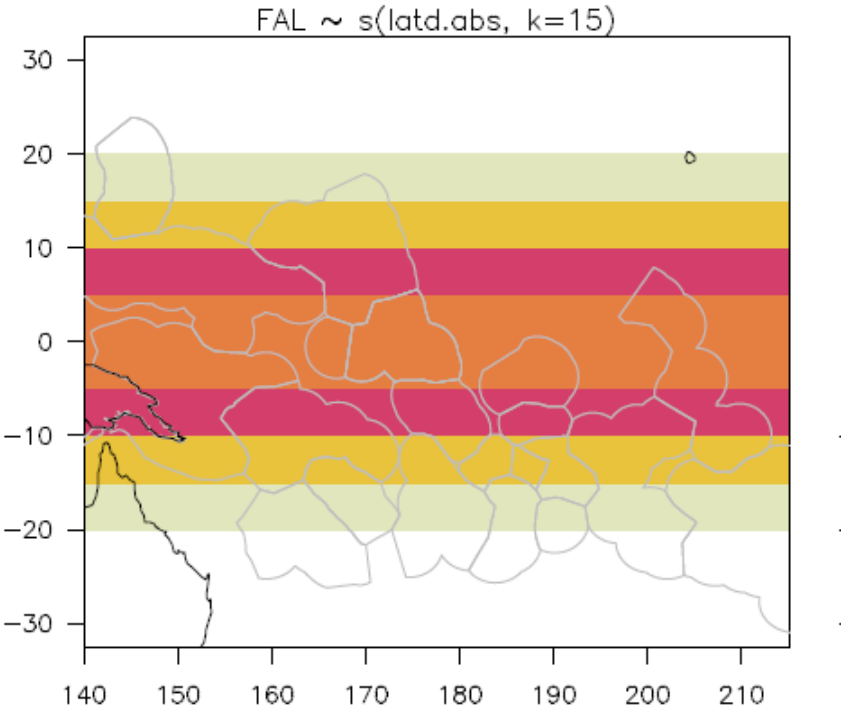
Table 5

Key conclusions

- Flag state choice has the potential to greatly reduce the benefits of the CMM for silky and oceanic whitetip shark
- If flag states exclude the least used technique, median predicted reductions in fishing-related mortality are 6% (silky) and 10% (OWT) rather than 24% and 37% respectively
- CMM text potentially allows vessel-level choice – will reduce CMM effectiveness further
- Recommendations on data improvements (incl. increased observer data)

Spatial distribution





Modified from SC11-EB-WP-02 Figure 3