Review of potential mitigation measures to reduce fishing-related mortality on silky and oceanic whitetip sharks (Project 101)

Pacific Islands Fisheries Science Center

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Stock assessments for silky shark (Clarke et al. 2018) and oceanic whitetip shark (Tremblay-Boyer et al. 2019) indicated that the stocks were experiencing overfishing ($F_{current}/F_{MSY} > 1$) and oceanic whitetip shark is in an overfished state ($SB_{current}/SB_{MSY} < 1$).

As a consequence from earlier assessments, the Western and Central Pacific Fisheries Commission (WCPFC) prohibited the retention of these species (WCPFC 2011, 2013, 2014, 2019).

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Conservation and Management Measure 2019-04

For longline fisheries targeting tuna and billfish, CCMs shall ensure that their vessels comply with at least one of the following options:

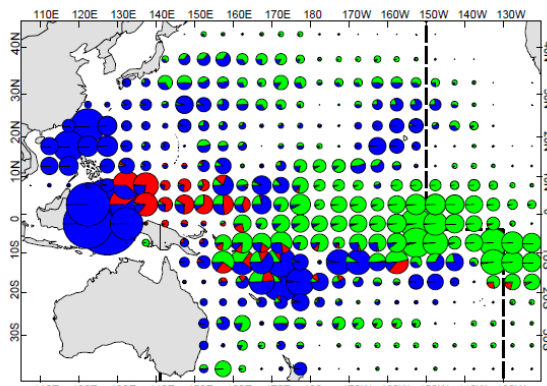(1) do not use or carry wire trace as branch lines or leaders; or

(2) do not use branch lines running directly off the longline floats or drop lines, known as shark lines.

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Harley et al. 2015. Monte Carlo simulation modelling of possible measures to reduce impacts of longlining on oceanic whitetip and silky sharks.
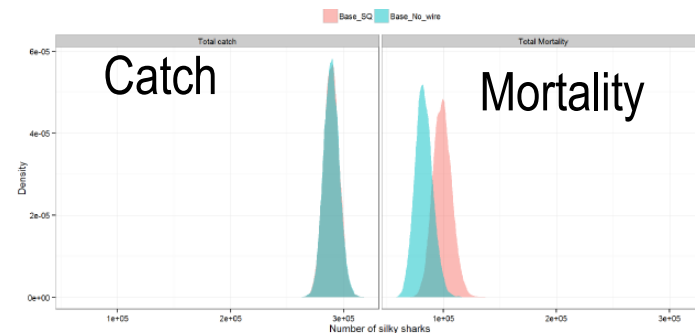
Abundance surface
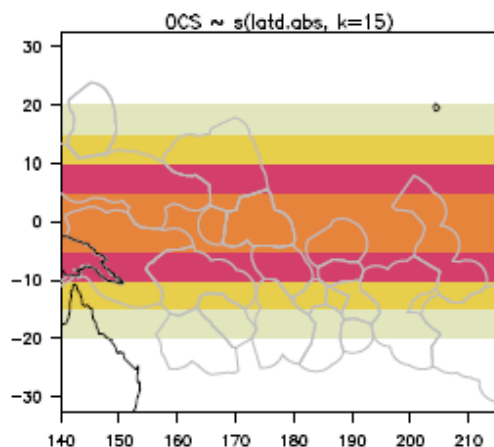
Fishing effort

GLMs developed from observer data (Marshall Islands, FSM, Fiji, A Samoa and Hawaii)

(c) No wire trace

Harley et al. 2015. - Results

Management scenario	Median mortality reduction percentage	
	Silky shark	Oceanic whitetip shark
No shark lines	14.7%	23.3%
No wire leaders	17.6%	23.3%
No shark lines and no wire leaders	29.4%	40.0%

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This analysis

1) used same assumptions and silky and oceanic whitetip shark abundance surface as Harley et al. 2015

2) used previous assumptions on results of studies on catchability (Caneco et al. 2014, Harley et al. 2015)

3) updated gear (hook type, wire/mono leader and shark lines) for 13 fleets based on observer data (ROP) from 2010 to 2018

4) updated fishing effort (20°N to 20°S) from 2015 to 2019

Proportion of longline gear use characteristics by flags

	Observed sets	Branchline leader type		Hook type			Shark line	No Shark line
		Wire	Mono	J	Tuna	Circle		
Cook Islands	487	1	0	0	0.043	0.957	0	1
China	6,277	0.922	0.078	0.013	0.449	0.539	0.124	0.876
Fiji	13,219	0.887	0.113	0.032	0.081	0.887	0.023	0.977
FSM	684	1	0	0	0.015	0.985	0	1
Japan	5,722	0.358	0.642	0	0.937	0.063	0	1
Korea	4,527	0.708	0.292	0.121	0.136	0.743	0.016	0.984
Marshall Islands	234	1	0	0.036	0.103	0.861	0	1
French Polynesia	3,477	0.834	0.166	0.066	0.416	0.518	0	1
PNG	52	0	1	0	1	0	1	0
Taiwan	32,540	0.798	0.202	0.264	0.241	0.495	0.004	0.996
USA	40,694	0.950	0.050	0	0.023	0.977	0	1
Vanuatu	2,138	0.924	0.076	0.039	0.464	0.497	0	1
Samoa	103	0.641	0.359	0	0	1	0.010	0.990
Total	110,154							

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Results

Management scenario	Median mortality reduction percentage			
	This study		Harley et al. 2015	
	Silky shark	Oceanic whitetip shark	Silky shark	Oceanic whitetip shark
No shark lines	2.6%	5.4	14.7%	23.3%
No wire leaders	28.2%	35.8	17.6%	23.3%
No shark lines and no wire leaders	30.8%	40.5	29.4%	40.0%

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Recommendations:
1) Continue Project 101, with future work:
2) Relevant members consider authorizing the release of their non-ROP longline data (facilitated through SPC) for this study, specifically to provide more complete gear configurations by flag, and allow analyses similar to Caneco et al. (2014) to estimate factors affecting shark catchability and condition on longline retrieval to be conducted using a more complete dataset.

Recommendations:

3) Conduct projections (Rice et al. 2021, WCPFC-SC17-2021/SA-IP-21) with inputs on the impact of banning shark lines and wire leaders or both and incorporating estimates of the probability of post release mortality (Hutchinson et al. 2021 - Quantitative estimates of post-release survival rates of sharks captured in Pacific tuna longline fisheries reveal handling and discard practices that improve survivorship).