MONTE CARLO SIMULATION MODELLING OF PURSE SEINE CATCHES OF SILKY AND OCEANIC WHITETIP SHARKS

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SC12-EB-WP-03

Outline of presentation

Pacific Community
Communauté du Pacifique

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

Background

- Performance of mitigation measure options in longline fisheries have been explored using Monte Carlo simulation models
- In 2015, WCPFC requested that simulation models be used to examine effects of redistributing FAD effort to free school
- EB-WP-03 presents this for silky and oceanic whitetip shark (> 80 % of elasmobranch bycatch)

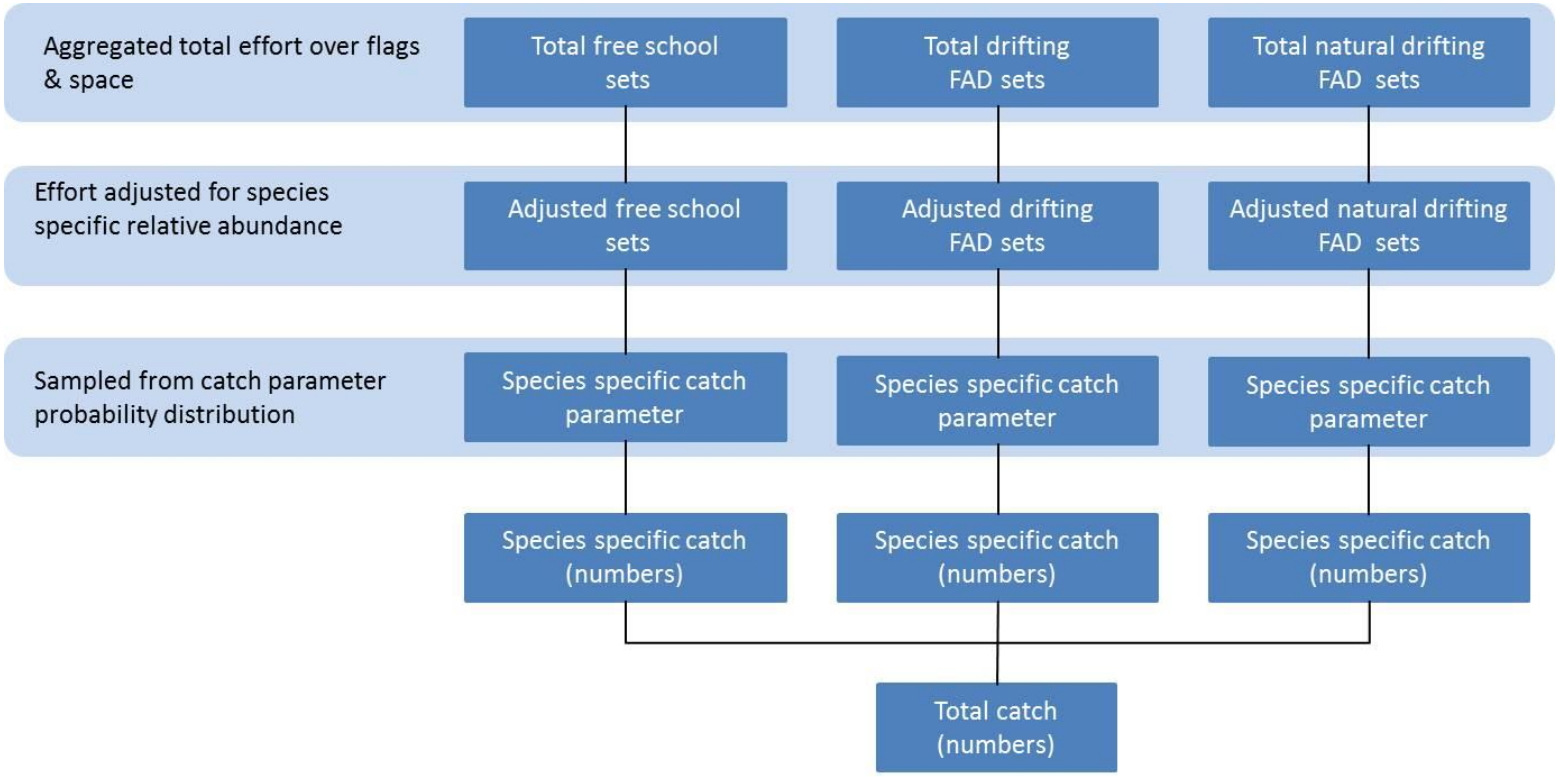
Output of Project 54

General approach

- General analysis of available purse seine observer data;
- Process model of how silky and oceanic whitetip sharks interact with purse seine gear (simplify: >95% dead);
- Scenarios to reflect the redistribution of purse seine effort between association types;
- Spatial surfaces of purse seine effort by school association type;
- Adjust total effort to take account of the relative species abundance;
- Estimate silky shark and oceanic whitetip shark catch rates by school association;
- Estimation of probability distributions for process model parameters (p(catch), level of +ive catches);
- Comparison of outputs of Monte Carlo simulations for the scenarios considered (100,000 draws)

Simulation model

- Modelling framework from SC11-EP-WP-02



Scenarios considered

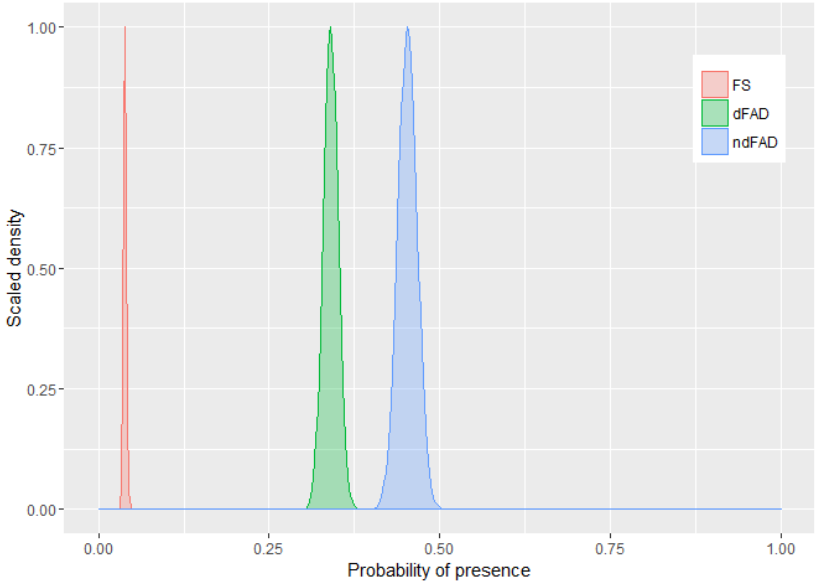
- *Status quo*
  - Average sets per year, by association type and 5 x 5 ° cell
- *No FAD*
  - Status quo, but with drifting FAD and natural drifting FAD sets redistributed to free school
- *No Free School*
  - Status quo, but with free school sets redistributed to drifting FAD and natural drifting FAD sets (proportionally) within each 5 x 5 ° cell
- *No Free School* included as the natural counterpoint to the *No FAD* scenario
- Sets with other association classifications excluded (5 % of total sets)

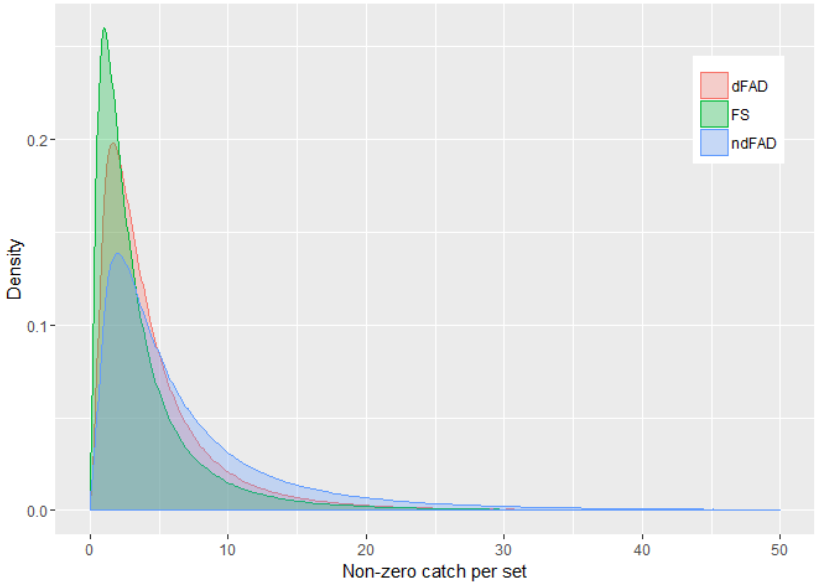
Shark interaction rates

- Probabilities of catching silky and oceanic white tip shark estimated using models of presence/absence of shark catch (fitted to observer data)
- Numbers of shark caught when present based on observed distributions (using observer data)
- These used to generate probability distributions for shark interactions
  - Species and association type specific

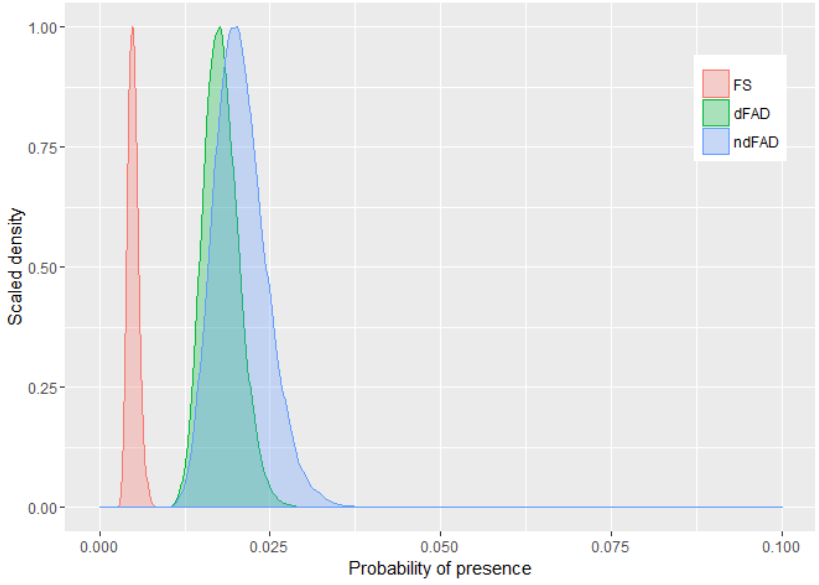
Shark interaction rates

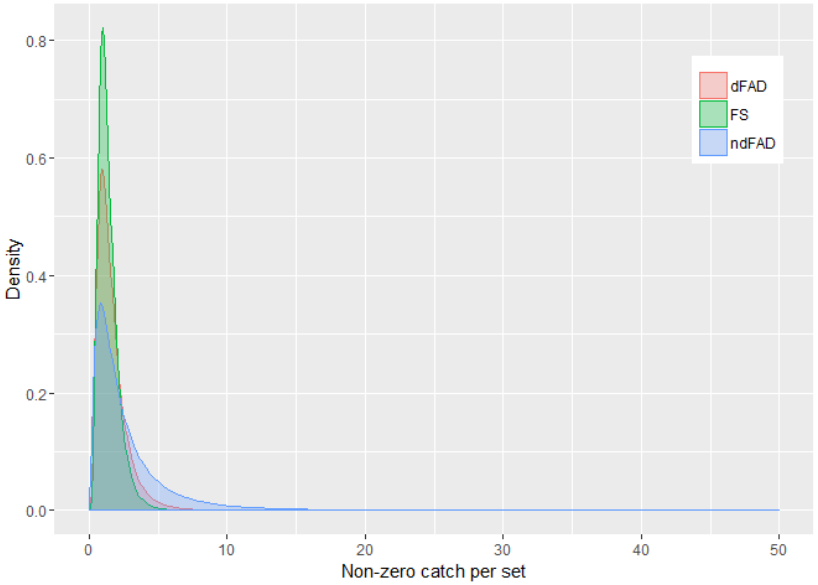
Silky shark





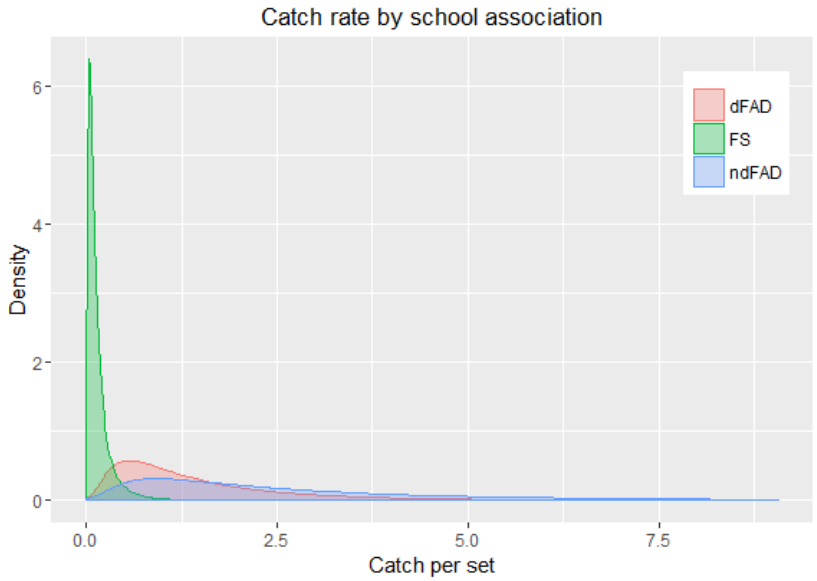
Oceanic whitetip



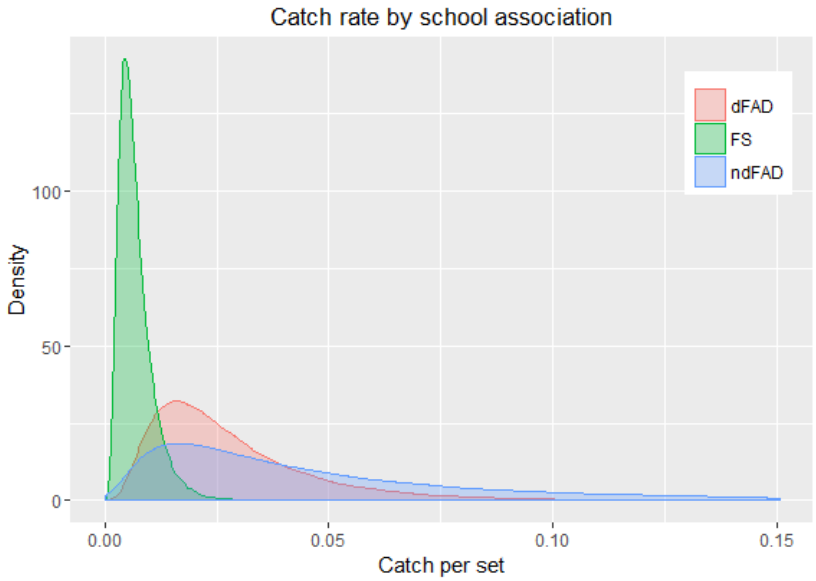


Simulation Model Inputs

Silky shark



Oceanic whitetip



- Interaction rates lowest for free school sets compared to drifting FAD and non drifting FAD sets for both species

Simulation Model Outputs

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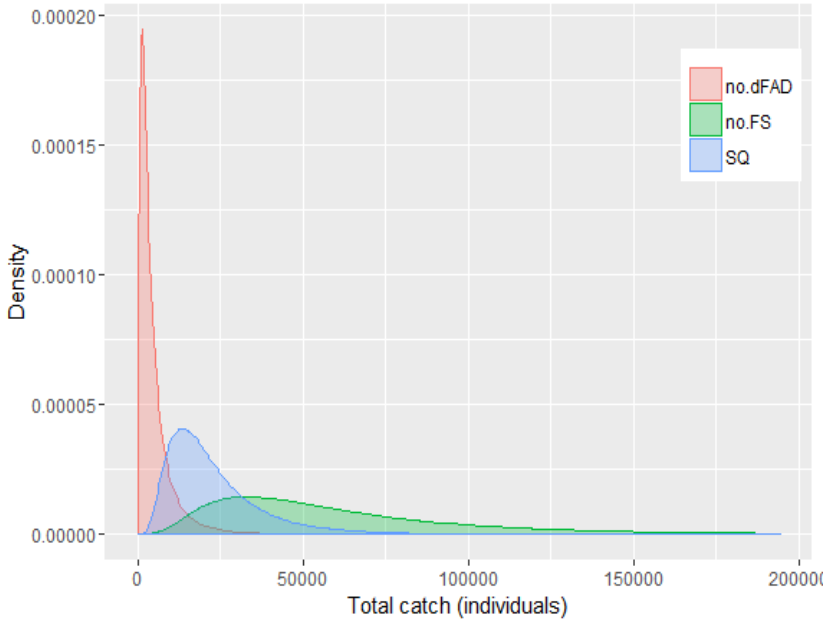
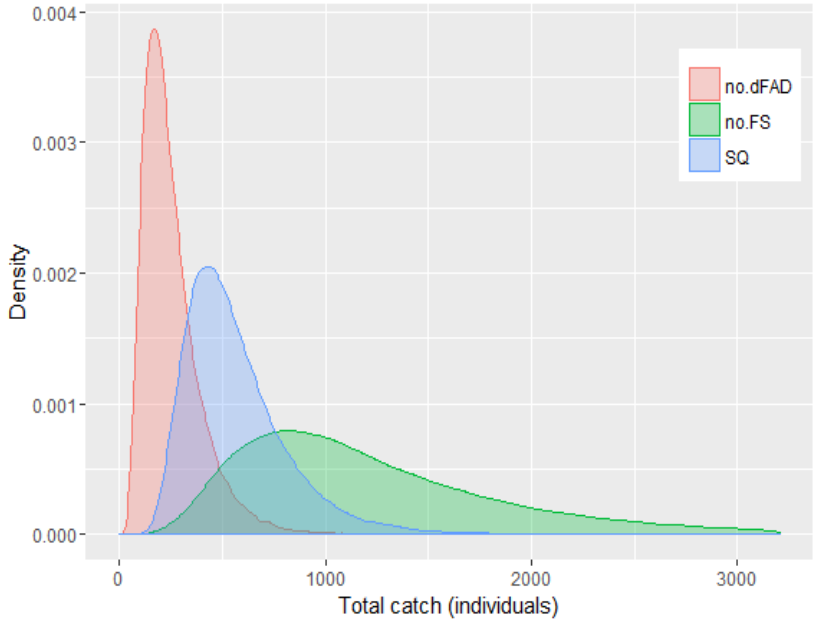
Silky shark



Oceanic whitetip



- Redistributing (drifting and natural drifting) FAD effort to free school substantially reduces catches of silky (by 83 %) and oceanic whitetip shark (by 57 %)
- Redistributing free school effort to (drifting and natural drifting) FADs increases catches of silky (by 168%) and oceanic whitetip (113%) shark

Discussion

- Redistributing FAD effort to free school substantially reduces catches of silky and oceanic whitetip shark
- Overlap in estimated catches for the different scenarios
  - Mainly due to uncertainty in catch numbers when present
- > 95 % of individuals were dead at point of capture
  - Changes in catches also indicative of changes in mortalities
- CMMs 2013-08 and 2011-04 ban retention, and require release so as to cause minimal harm
  - Would require sharks to be released pre-brailing to reduce mortalities resulting from interaction