Stock assessment of blue shark in the southwestern Pacifc

(SA-WP-08)

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Oceanic Fisheries Programme
Pacific Community

Caution

- **This assessment remains a work in progress and that we do not recommend that the derived stock status estimates be used as the basis for management advice at this time.**

Overview

- Main model structure and model settings
- of the 2016 assessment
- Key model inputs
- Structural uncertainty (grid) and results of selected runs
- Stock status and conclusions

Supporting documents

- SA-IP-10 [MFCL developments]
- SA-WP-09 [Catch reconstruction and CPUE]

Main model structure

- Used MULTIFAN-CL
- Assume blue shark in the southwestern Pacific ocean as a closed population
- Single region
- Single sex and 20 age classes
- Assessment period : 1994-2014
- No tag release/recapture data

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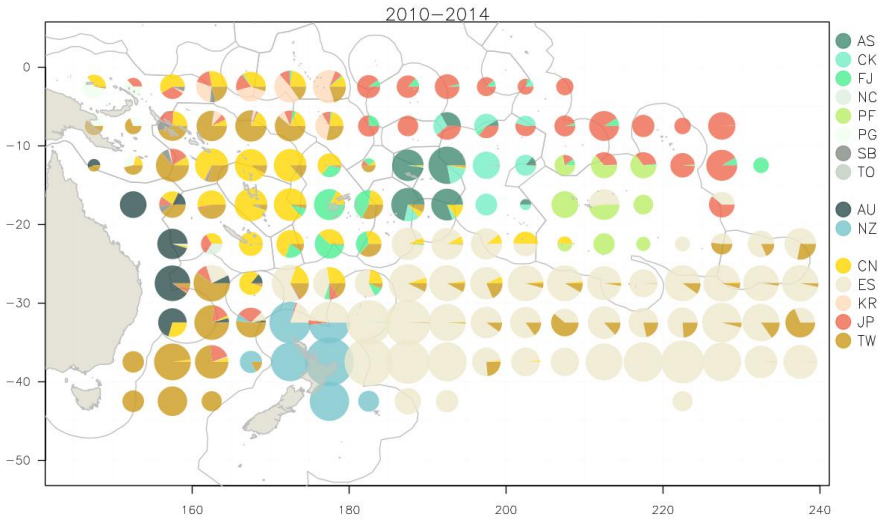
Key model inputs

Reported BSH catch and fishery-regions



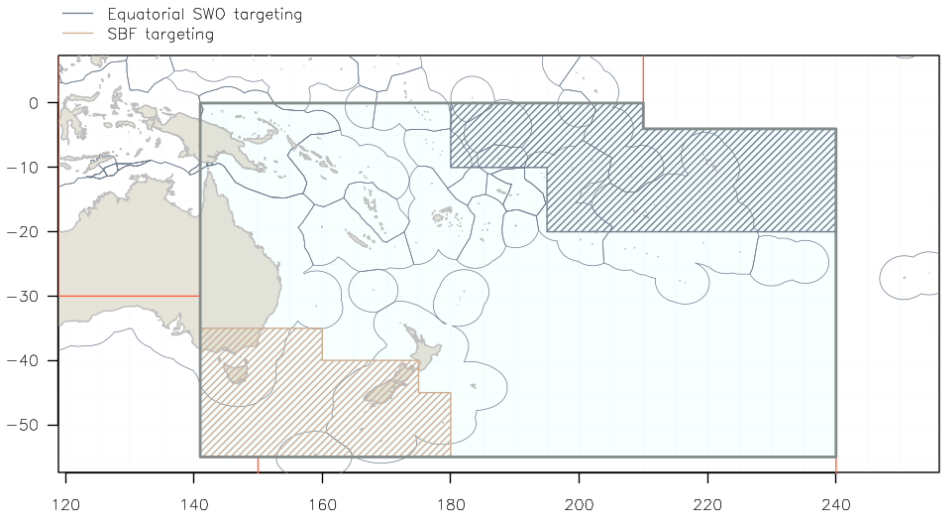


Figure 1

Fishery definitions

Table 1: Definition of fisheries and selectivity groupings

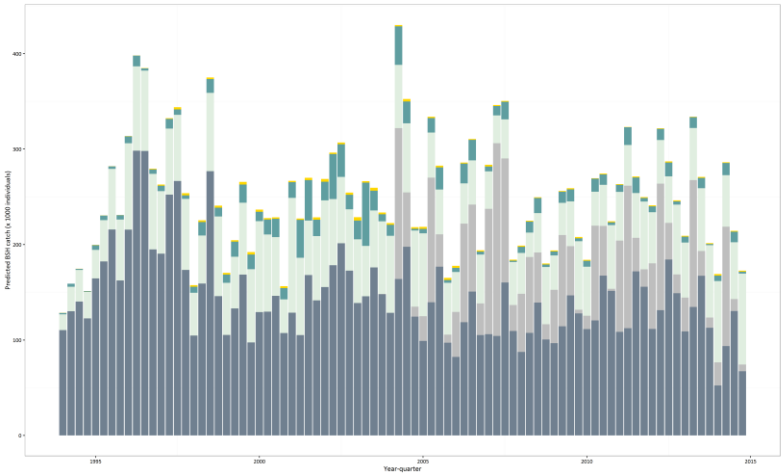
	Fishery name	Grouping	Shape of selectivity	CPUE
FL1	American Samoa	1	Asymptotic	
FL2	Australia	2	Asymptotic	
FL3	Australia SBT	3	Dome shape	
FL4	Cook Islands	1	Asymptotic	
FL5	China	1	Asymptotic	
FL6	China SWO	4	Asymptotic	
FL7	EU Spain	3	Dome shape	
FL8	Fiji	1	Asymptotic	
FL9	Japan	1	Asymptotic	PW
FL10	Japan SBT	1	Asymptotic	
FL11	Korea	1	Asymptotic	
FL12	Korea SWO	4	Asymptotic	
FL13	New Caledonia	1	Asymptotic	
FL14	New Zealand	5	Asymptotic	NZ
FL15	New Zealand SBT	3	Asymptotic	
FL16	French Polynesia	1	Asymptotic	
FL17	PNG	1	Asymptotic	
FL18	Solomon Islands	1	Asymptotic	
FL19	Tonga	1	Asymptotic	
FL20	Chinese Taipei	1	Asymptotic	TW
FL21	Chinese Taipei SWO	4	Asymptotic	
FL22	Australia after 2012	3	Dome shape	

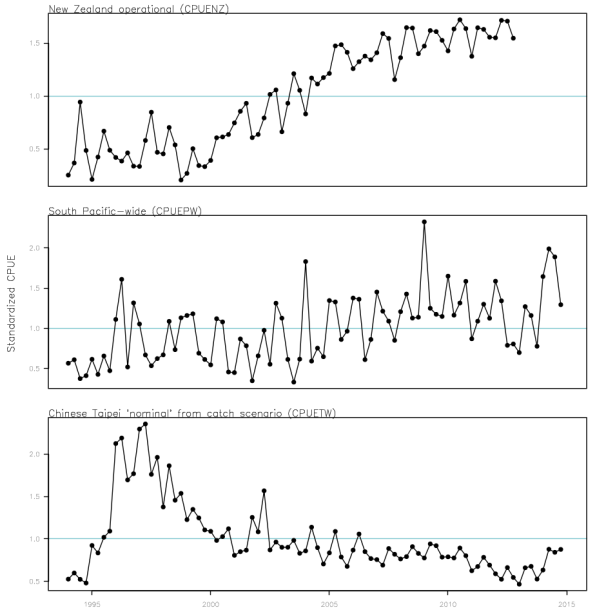
1. DW and Islds fleets
2. Australia before 2012
3. SBT fisheries, Spain, AUS after 2012
4. SWO fisheries
5. NZ

Table 1

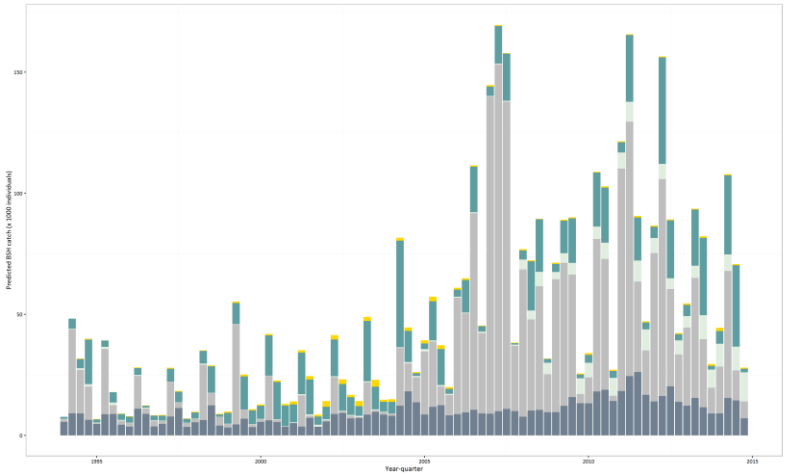
Catch, CPUE and length comps

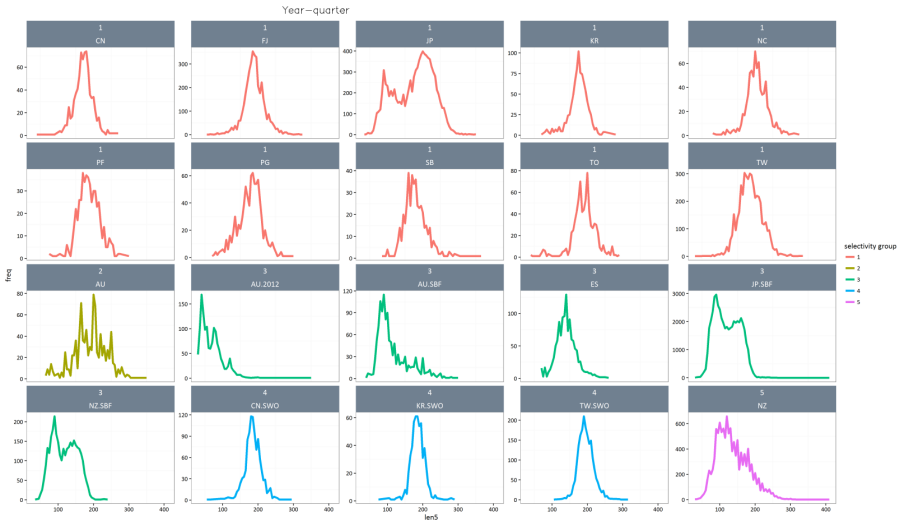
Pacific wide CPUE based





observer catch vs general shark catch in observer





Figures 4, 8 and 9

Data availability

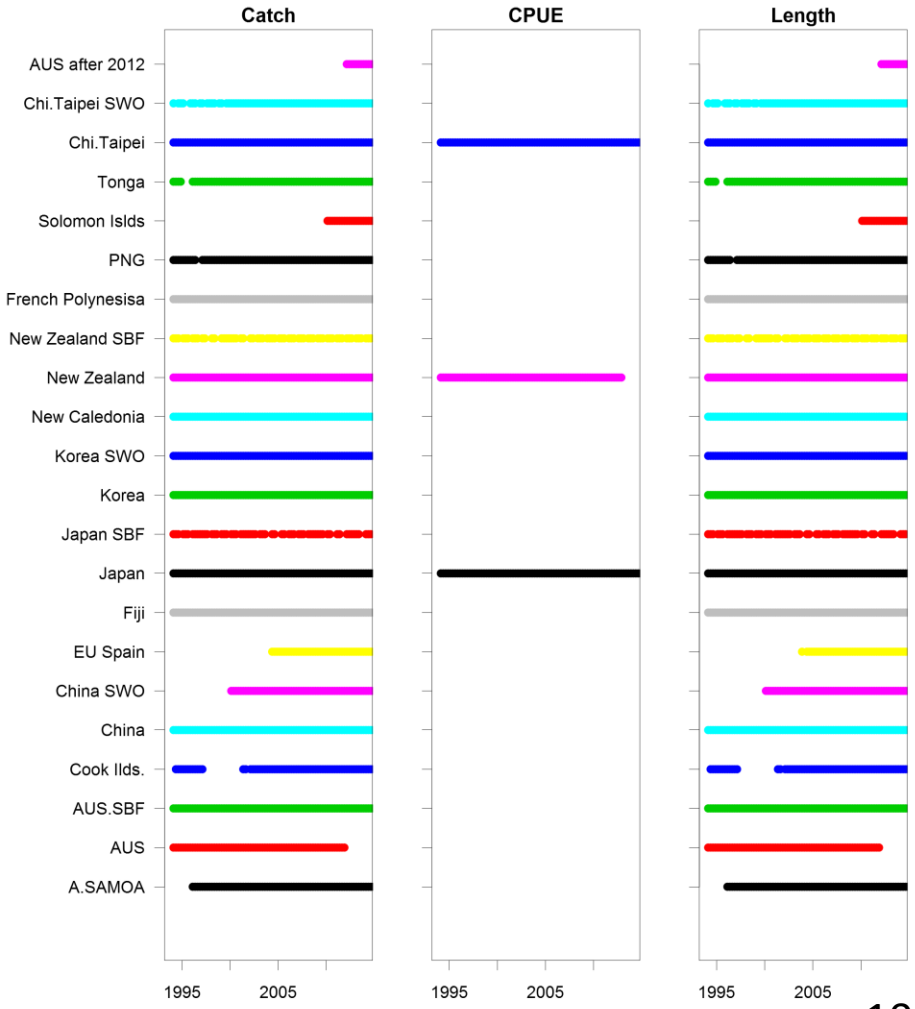
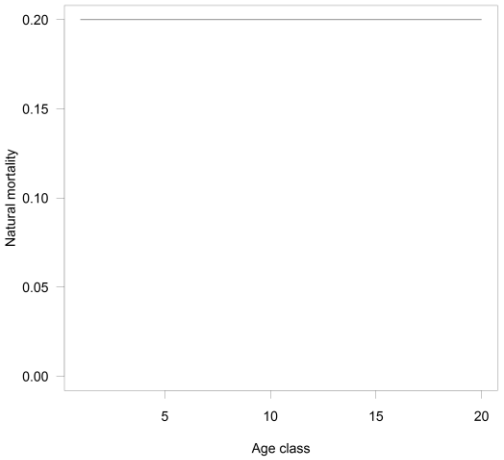
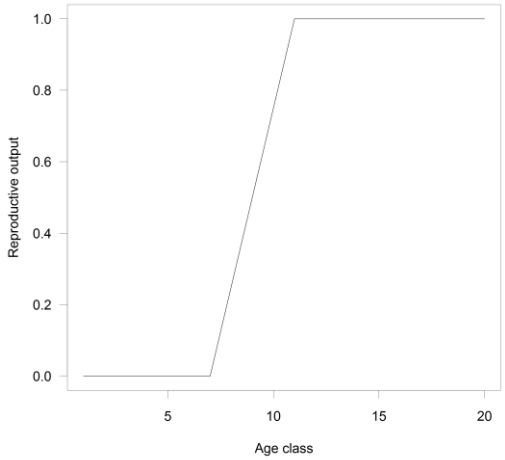
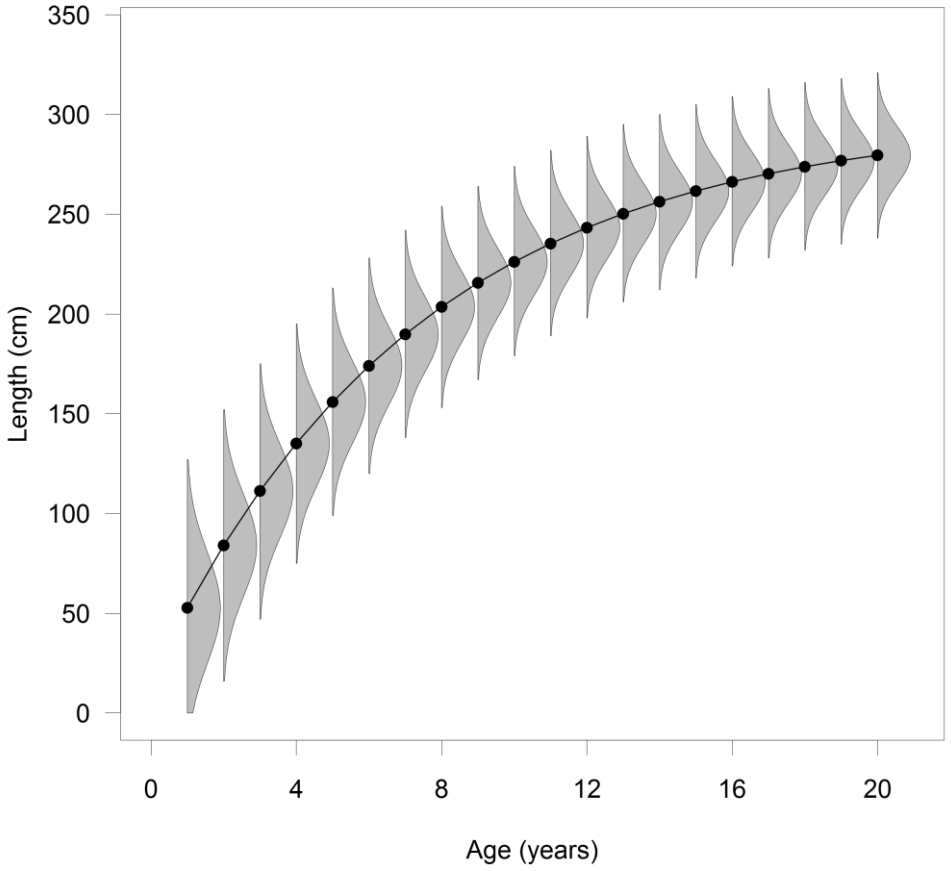


Figure 13

Biological parameters







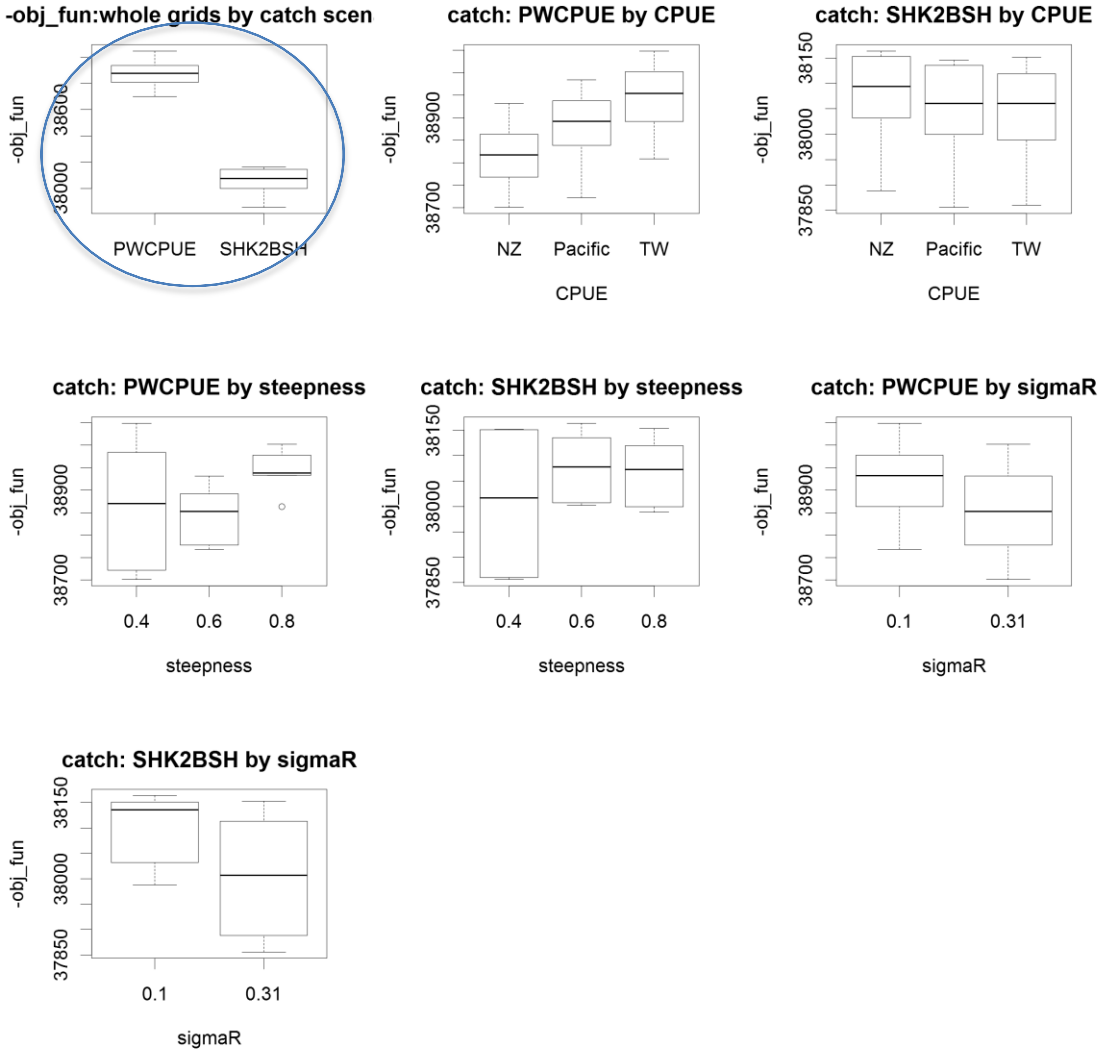
Figures 11, 12 and 14

Structural uncertainties (grid)

Axis	Levels	Options	Description
Catch scenario	2	Pacific-wide CPUE based, observer-based blue shark/general shark ratio	Catch scenario
CPUE	3	CPUEPW, CPUENZ, CPUETW	CPUE scenarios
steepness	3	0.4, 0.6, 0.8	Steepness of Beverton-Holt stock recruit relationship
σR	2	0.1, 0.31	Standard deviation of log Rdev

Table 3

Objective functions



big contrast between two catch estimates, Compared with

Figure 16

Six selected runs

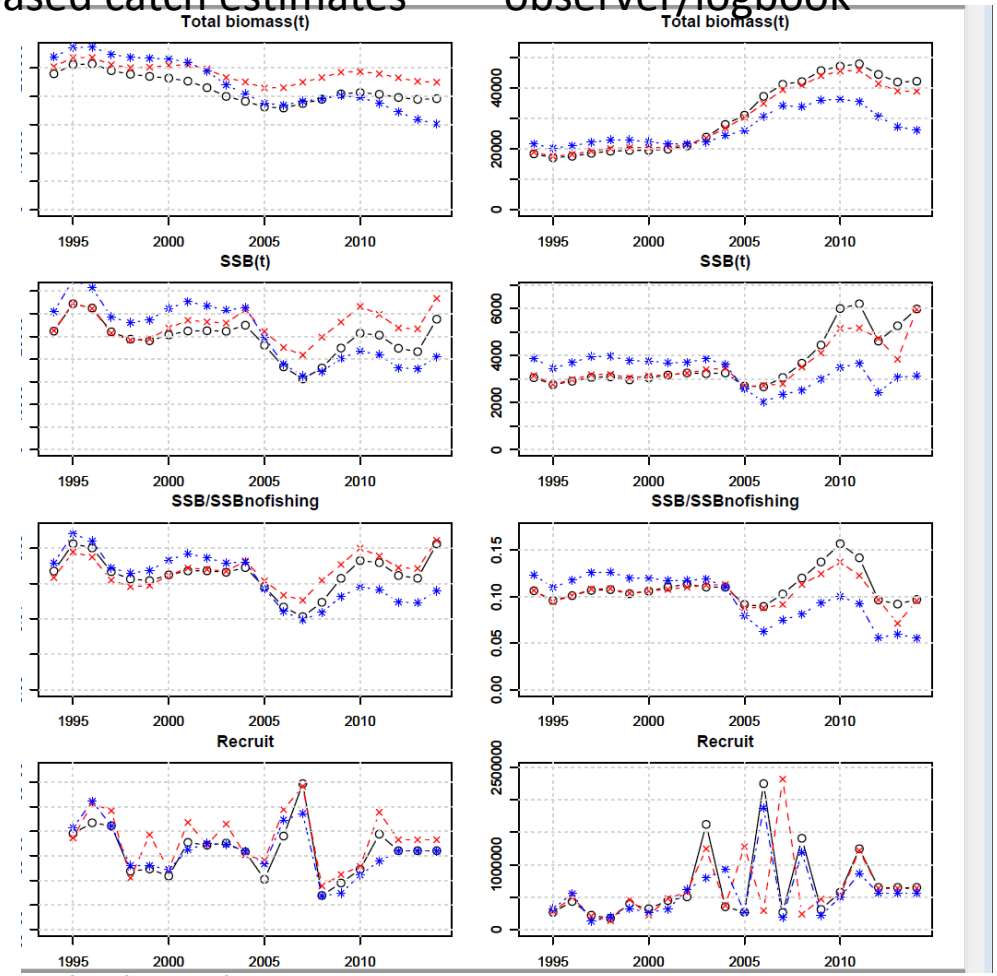
Catch Scenario	CPUE	Steepness	Sigma-R
Pacific-wide CPUE based	NZ	0.6	0.31
Pacific-wide CPUE based	PW	0.6	0.31
Pacific-wide CPUE based	CT	0.6	0.31
observer-based blue shark/general shark ratio	NZ	0.6	0.31
observer-based blue shark/general shark ratio	PW	0.6	0.31
observer-based blue shark/general shark ratio	CT	0.6	0.31

Table 4

Summary

the Pacific-wide CPUE-based catch estimates

the ratio of observer/logbook



Black circle : NZ CPUE

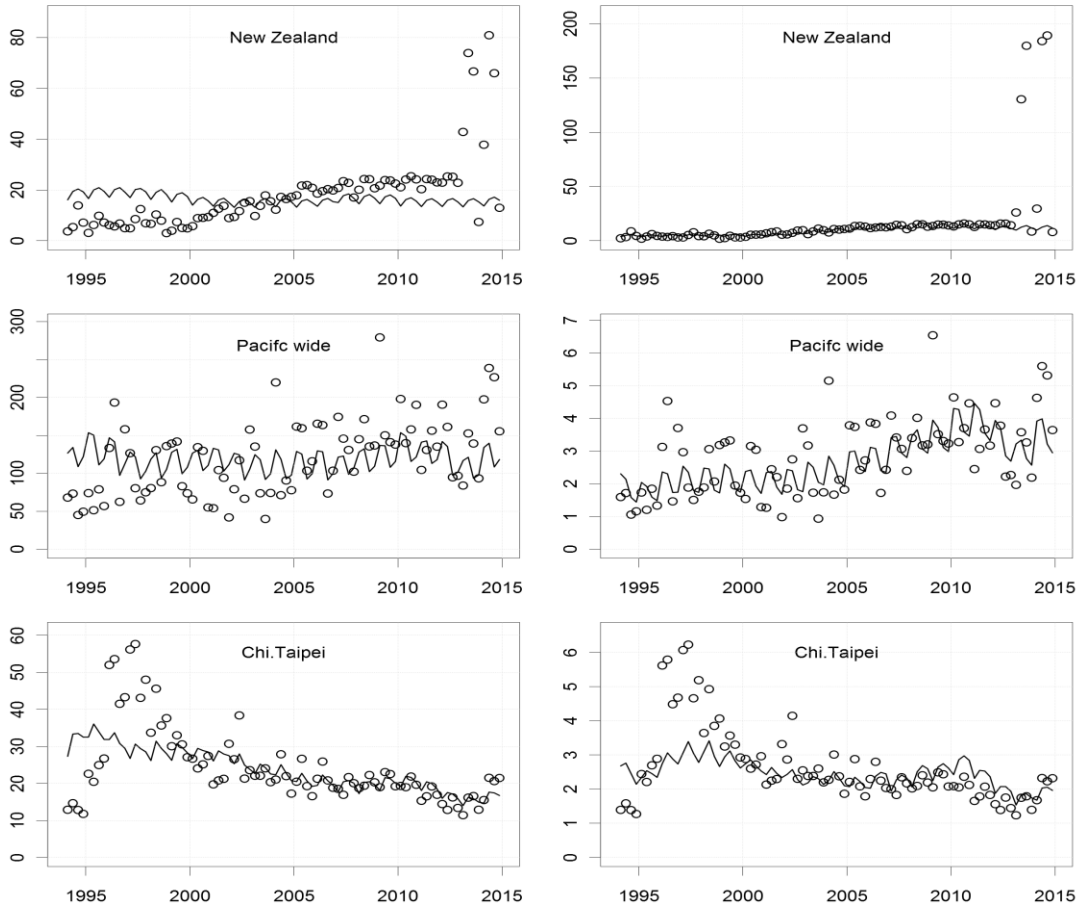
Red X : Pacific wide CPUE

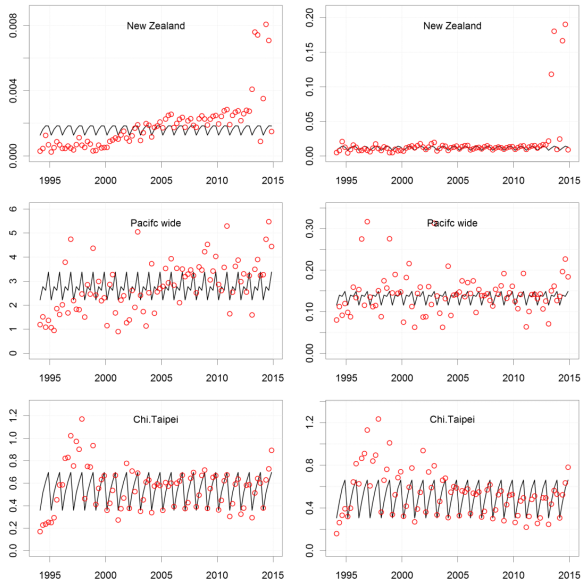
Blue * : CT CPUE

- Different total biomass, spawning biomass and recruits by different catch estimates.
- Spawning biomass depletion is estimated to be 0.08 to 0.10 against those without fishing.

Figure 20

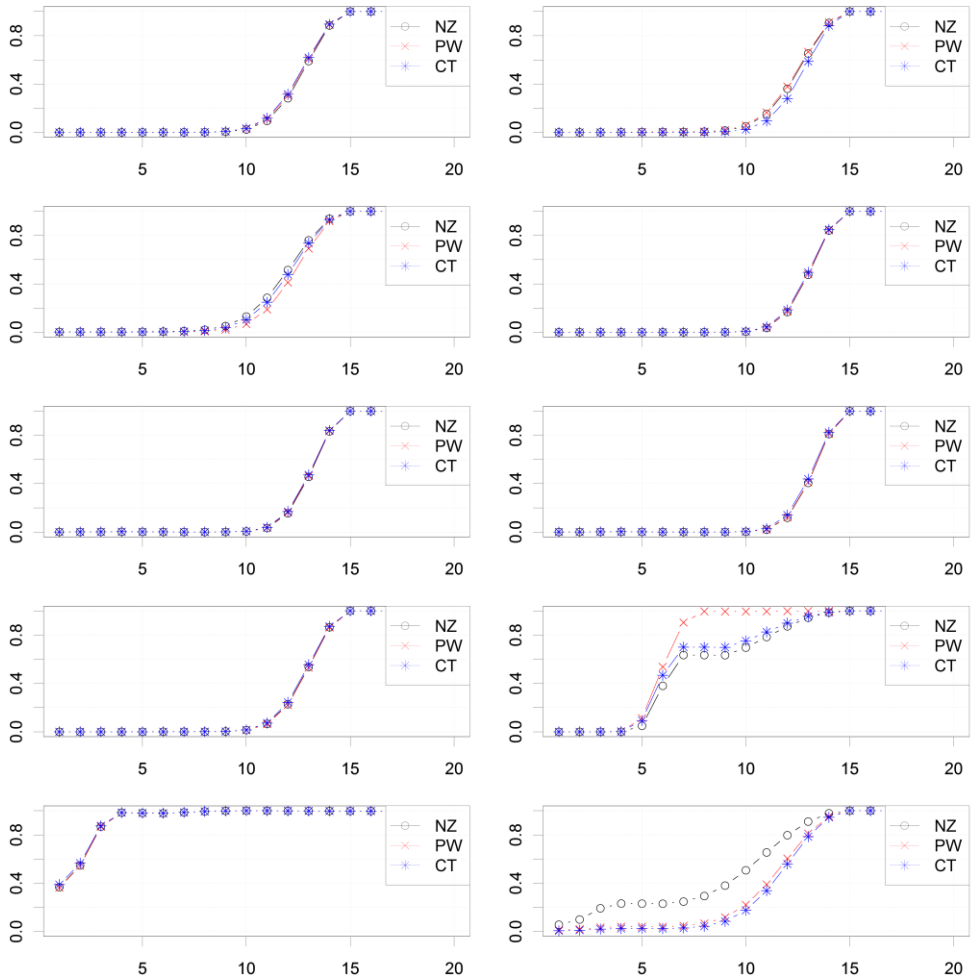
Observed and predicted CPUE





Figures 16 and 17

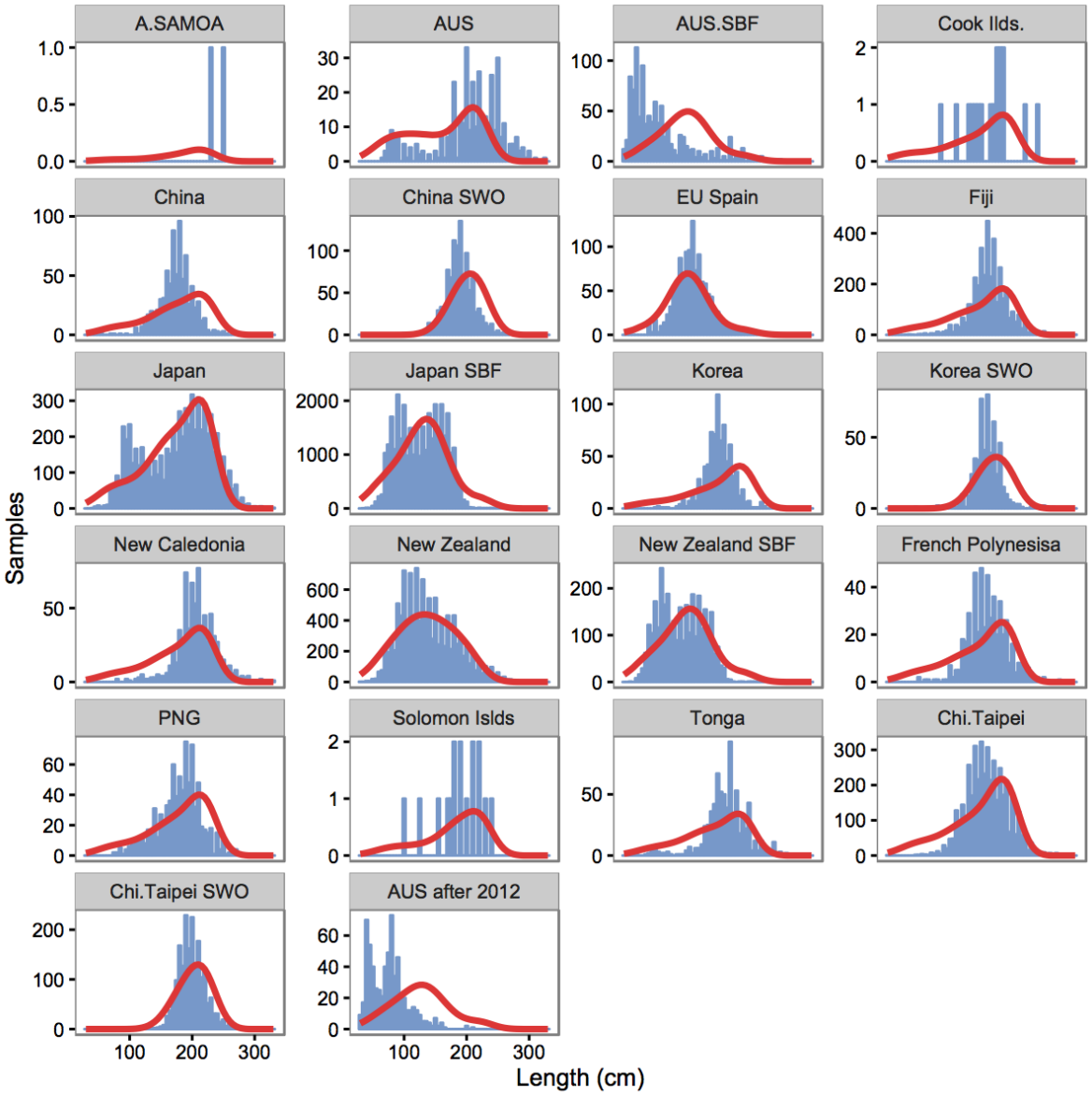
Age-specific selectivity



Selectivity group 5 (AUS LL after 2012)

Figure 18

Overall size data fit



- Size sample divided by 20
- i.e., down weighted to 5% of original sample size)
- Obviously MFCL could not fit fake small BSH caught by AUS (FL22)

Figure 19

Biological reference points

- To date for shark species WCPFC has not yet determined biological reference points. Stock status for shark assessments previously presented to the Scientific Committee was assessed relative to MSY-based quantities and reference points. As noted earlier, in this assessment, it was not possible to obtain realistic estimates of equilibrium unexploited recruitment and spawning biomass using the SRR; therefore, estimates of MSY-based quantities could not be obtained.
- (7.3 Stock status and biological reference points)

Subset of research recommendations

- utilise data sources additional to observer data, such as trade data for catch reconstructions
- Evaluation of existing observer data and improvement of observer data as a source of the assessment input data
- Reference points for elasmobranchs
- further work focused on growth, mortality, reproduction and movement and on stock structure
- a careful consideration of the availability and quality of data existing east of the WCPFC-CA before future stock assessments
- active collaborations between interested CCMs

Data and observer related recommendations

- The continuation of ongoing efforts to expand observer coverage for longline fleets operating in the WCPO;
- An analysis of the statistical power of WCPO observer coverage configurations to detect changes in spatio-temporal abundance of bycatch species;
- Noting the significant catch of blue sharks and other species of interest associated with the Southern bluefin tuna fishery within the WCPFC-CA, increased collaboration for the purpose of assessing WCPO stocks should be pursued;
- Future catch reconstruction should prioritize the inclusion of discard mortality scenarios.
- the use of Electronic Monitoring approaches to supplement observer coverage;

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7.3 Stock status and biological reference points

- In this assessment, it was not possible to obtain realistic estimates of equilibrium unexploited recruitment and spawning biomass using the SRR; therefore, estimates of MSY-based quantities could not be obtained.
- Estimates of total biomass, spawning biomass, spawning biomass depletion and recruitment are shown for the six representative runs in Figure 20. For runs conditioned on the Pacific-wide CPUE-based catch estimates, biomass declines moderately over the period of the assessment; however, for the runs conditioned on the observer-based blue shark/general shark ratio catch estimates, biomass is stable in the first half of the time series and tends to increase thereafter. For all of the runs, spawning biomass depletion is estimated to be 0.08 to 0.10, inferring very strong impacts of fishing from unexploited conditions. However, these impacts have been fairly stable over the period of the assessment. Recruitment is variable from year to year for the Pacific-wide CPUE runs, but is higher in the second half of the time series for the observer-based ratio catch estimation runs.

Subset of research recommendations

- utilise data sources additional to observer data, such as trade data for catch reconstructions
- Evaluation of existing observer data and improvement of observer data as a source of the assessment input data
- Reference points for elasmobranchs
- further work focused on growth, mortality, reproduction and movement and on stock structure
- a careful consideration of the availability and quality of data existing east of the WCPFC-CA before future stock assessments
- active collaborations between interested CCMs
  - (E.g. Expert WS)

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- Noting the significant catch of blue sharks with the Southern bluefin tuna fishery within the WCPFC-CA, increased collaboration for the purpose of assessing WCPO stocks should be pursued;
- Noting the increase prevalence of regulations aimed at managing shark mortality across WCPO, future catch reconstruction should prioritize the inclusion of discard mortality scenarios.
- the use of Electronic Monitoring approaches be pursued to supplement observer coverage;

- Questions

Stock status conclusions

- 20 years are too short to obtain reliable results.
- “One way trip” abundance indices may have made it difficult to determine stock size
- MFCL may not have constraints to initial recruitment scaling in contrast to SS which has constraint to initial recruitment against virgin recruitment.

Why not surplus production model?

- aa

Catchability

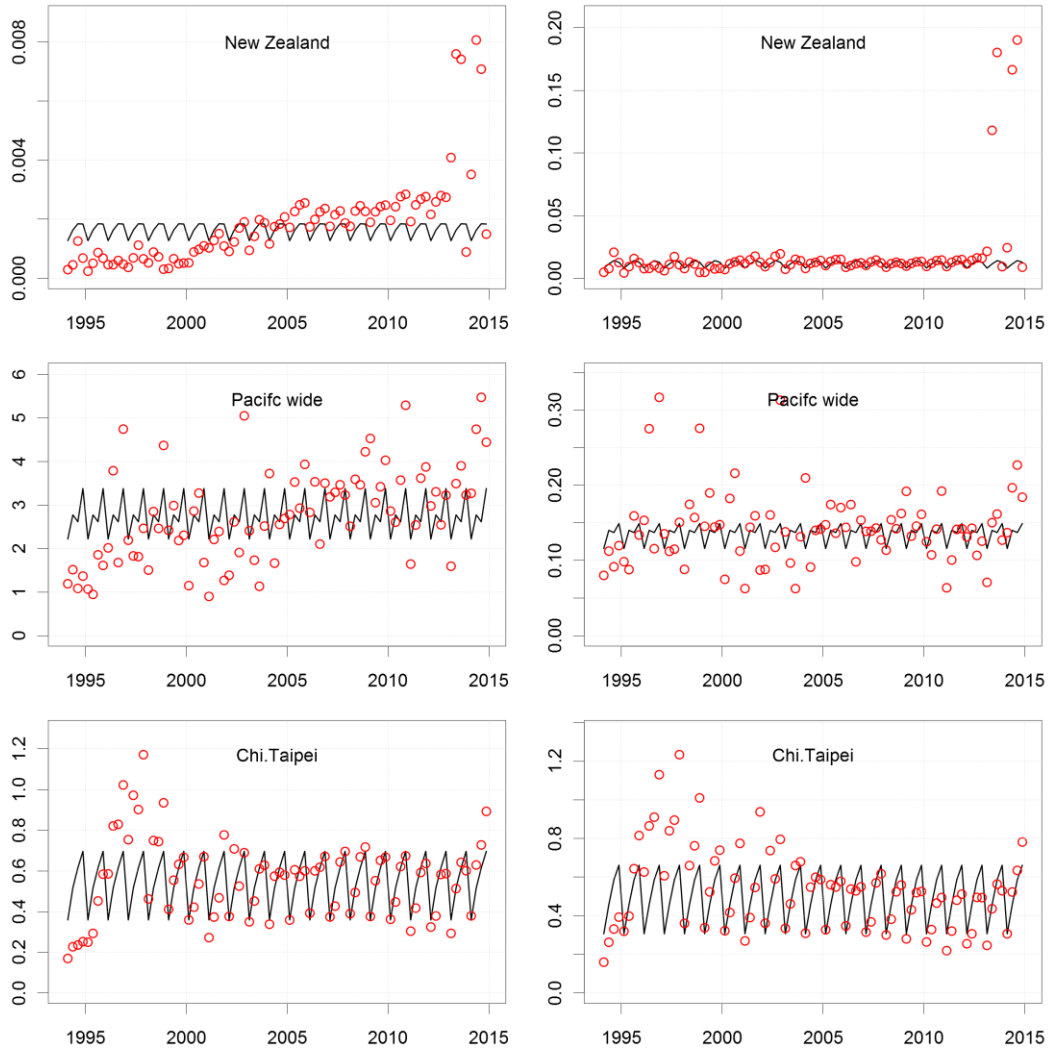


Figure 16

Growth curve

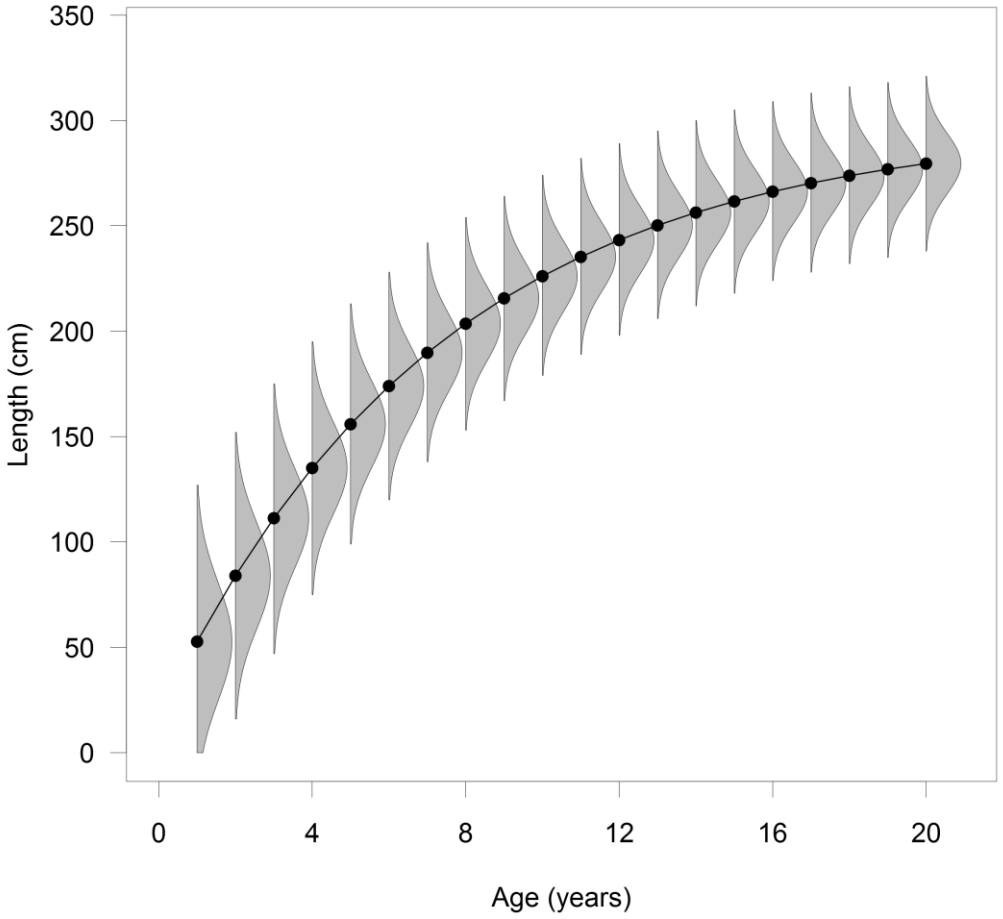


Figure 14

Selex

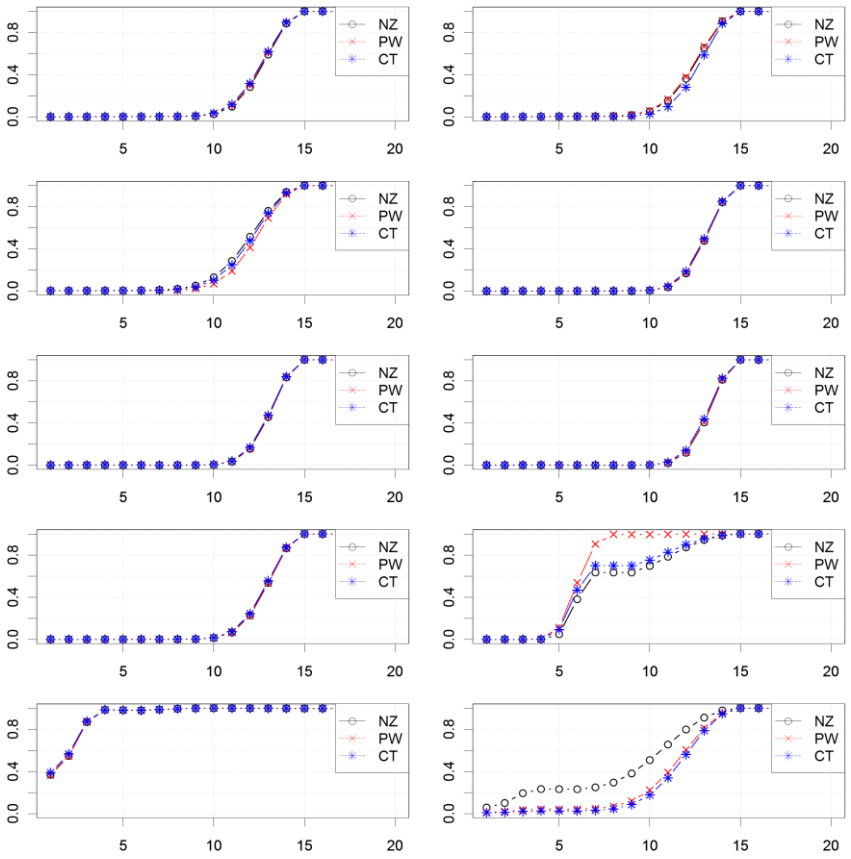
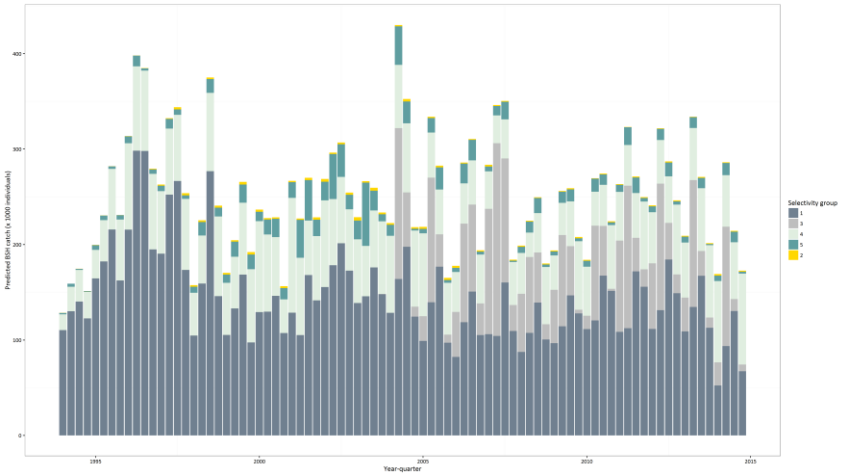


Figure 18

Catch scenarios

Pacific wide CPUE based



observer catch vs general shark catch in observer

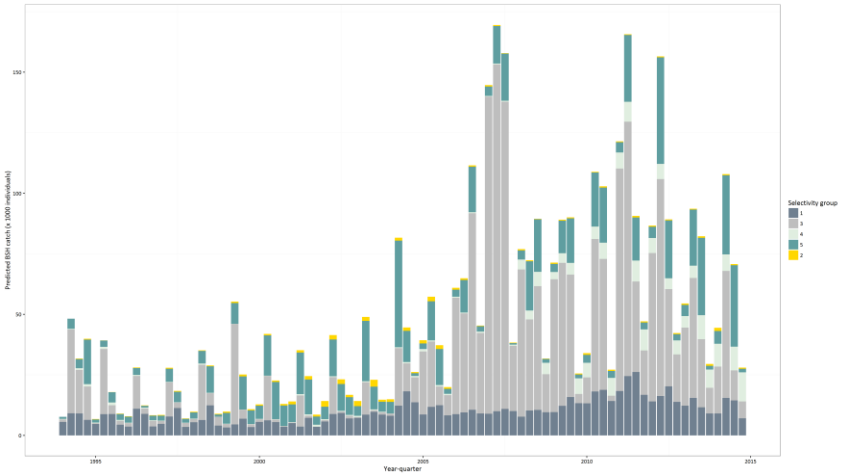


Figure 4

CPUEs

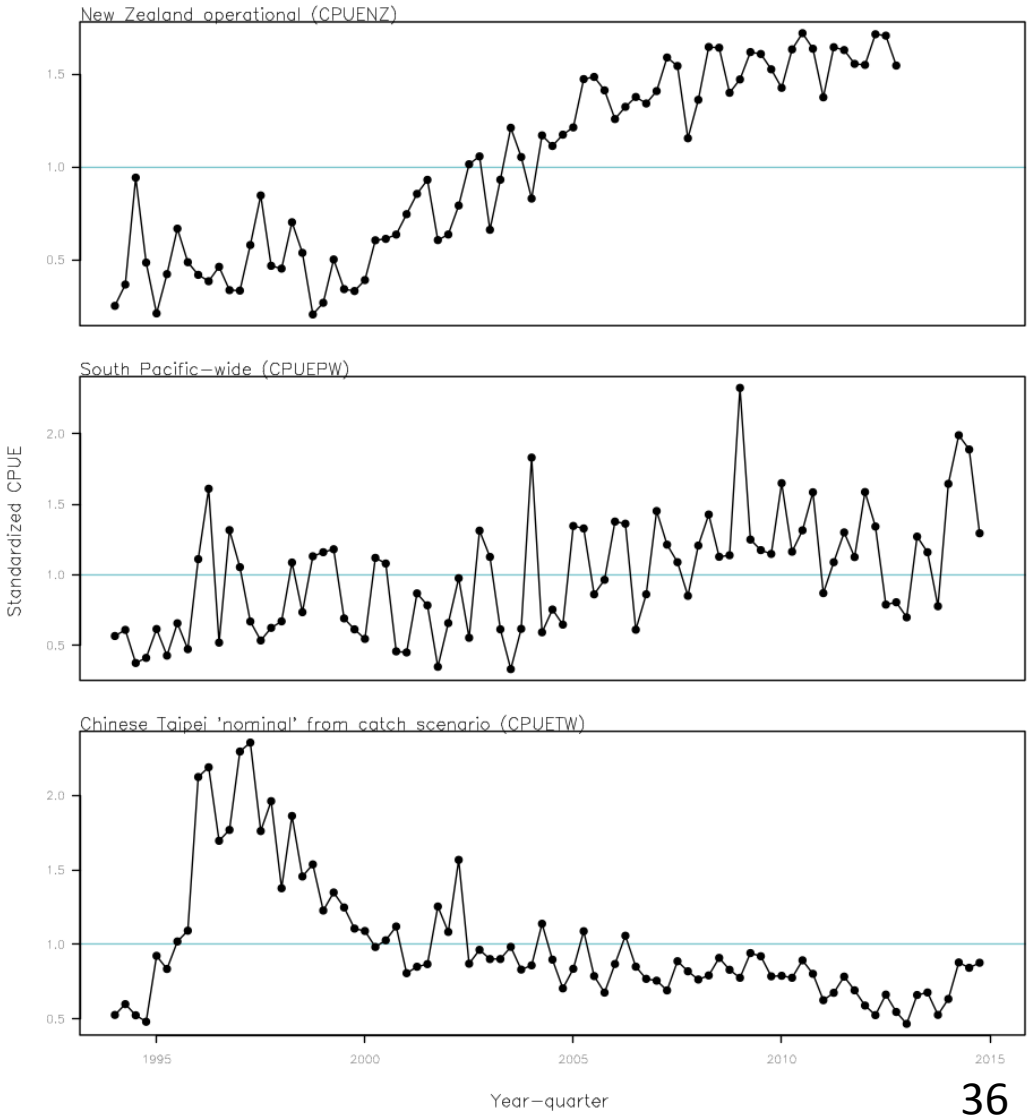


Figure 9

CPUEs

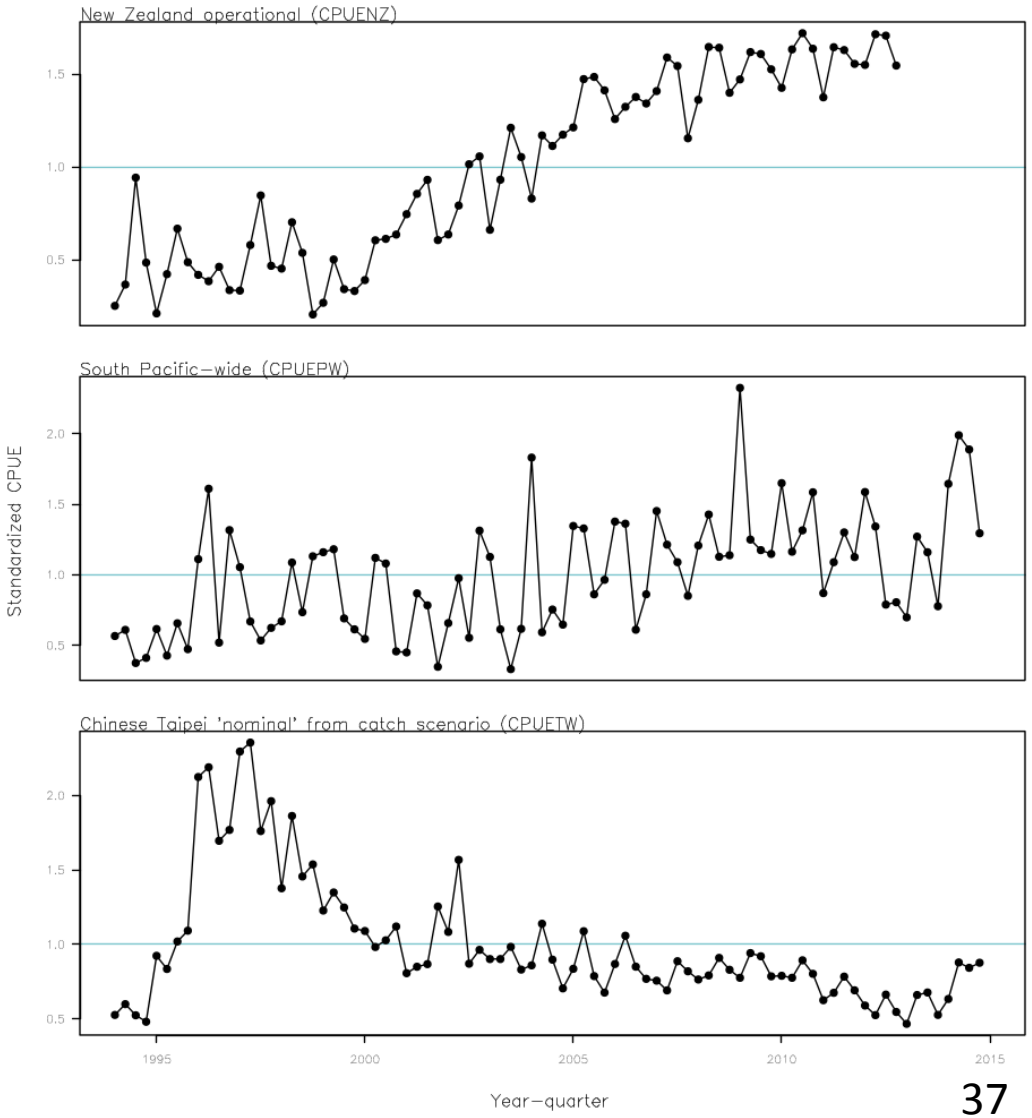


Figure 9

Size sample availability

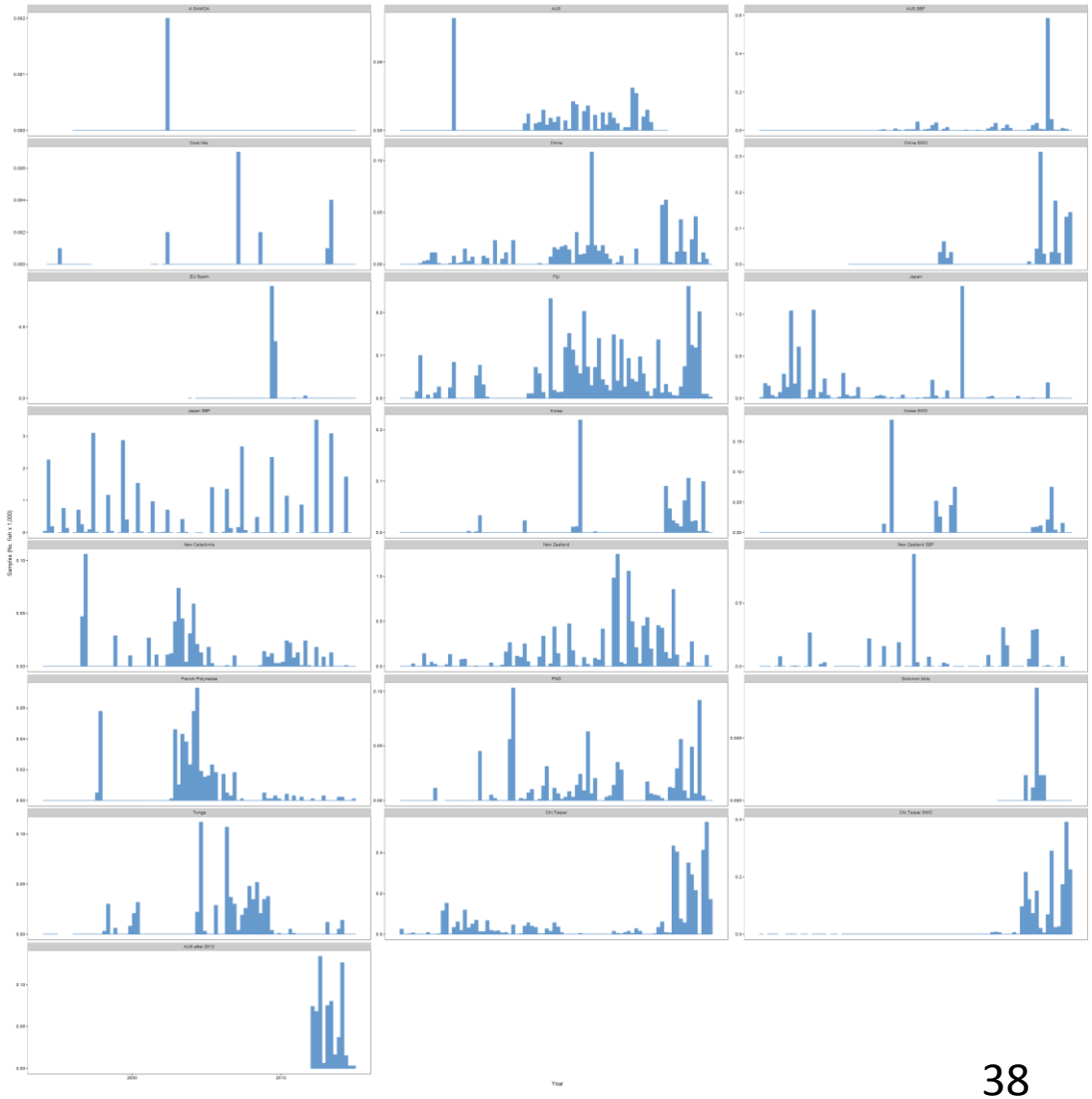


Figure 10

Length comps by fishery and grouping

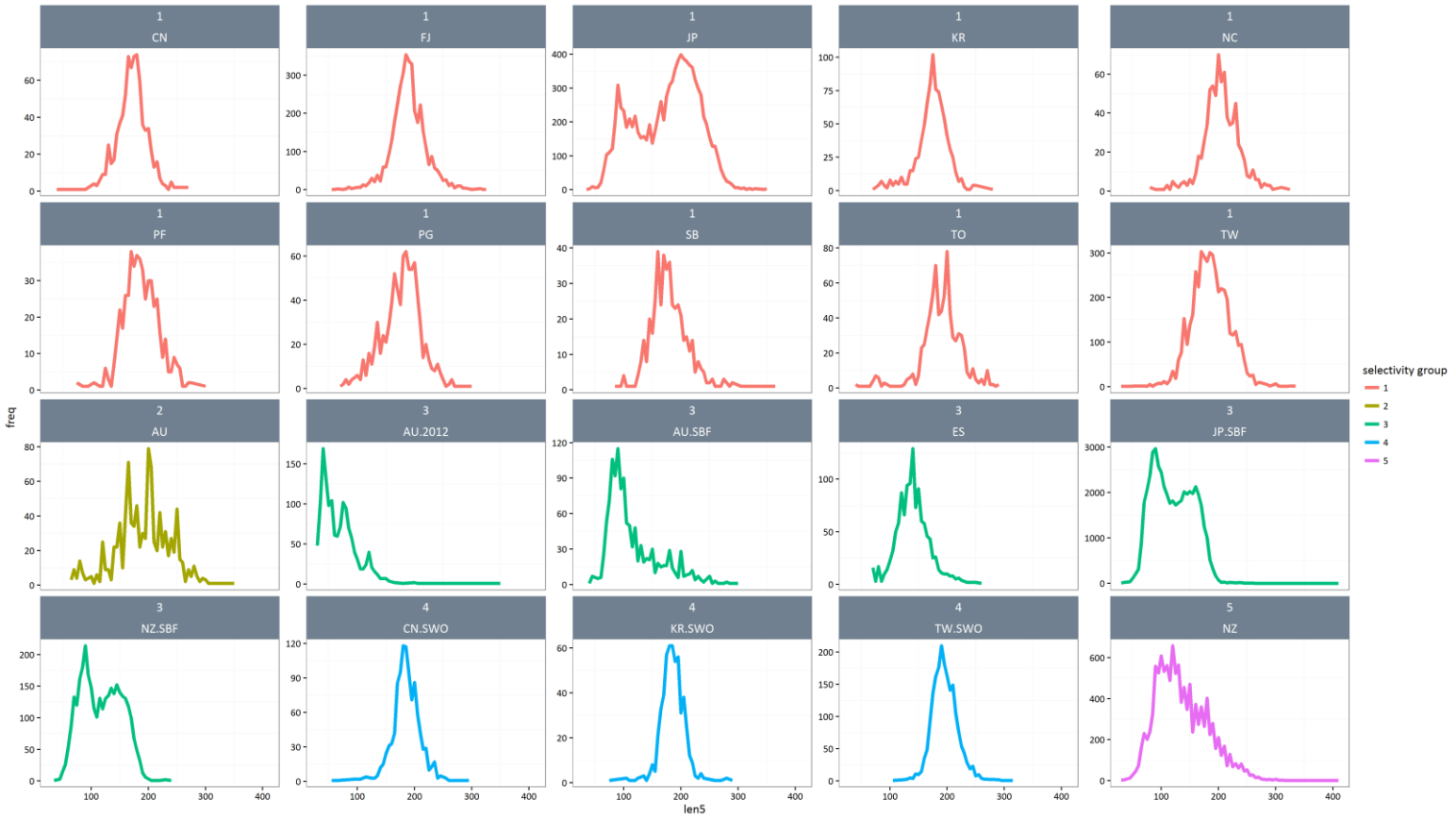


Figure 9

Catch time series by fishery

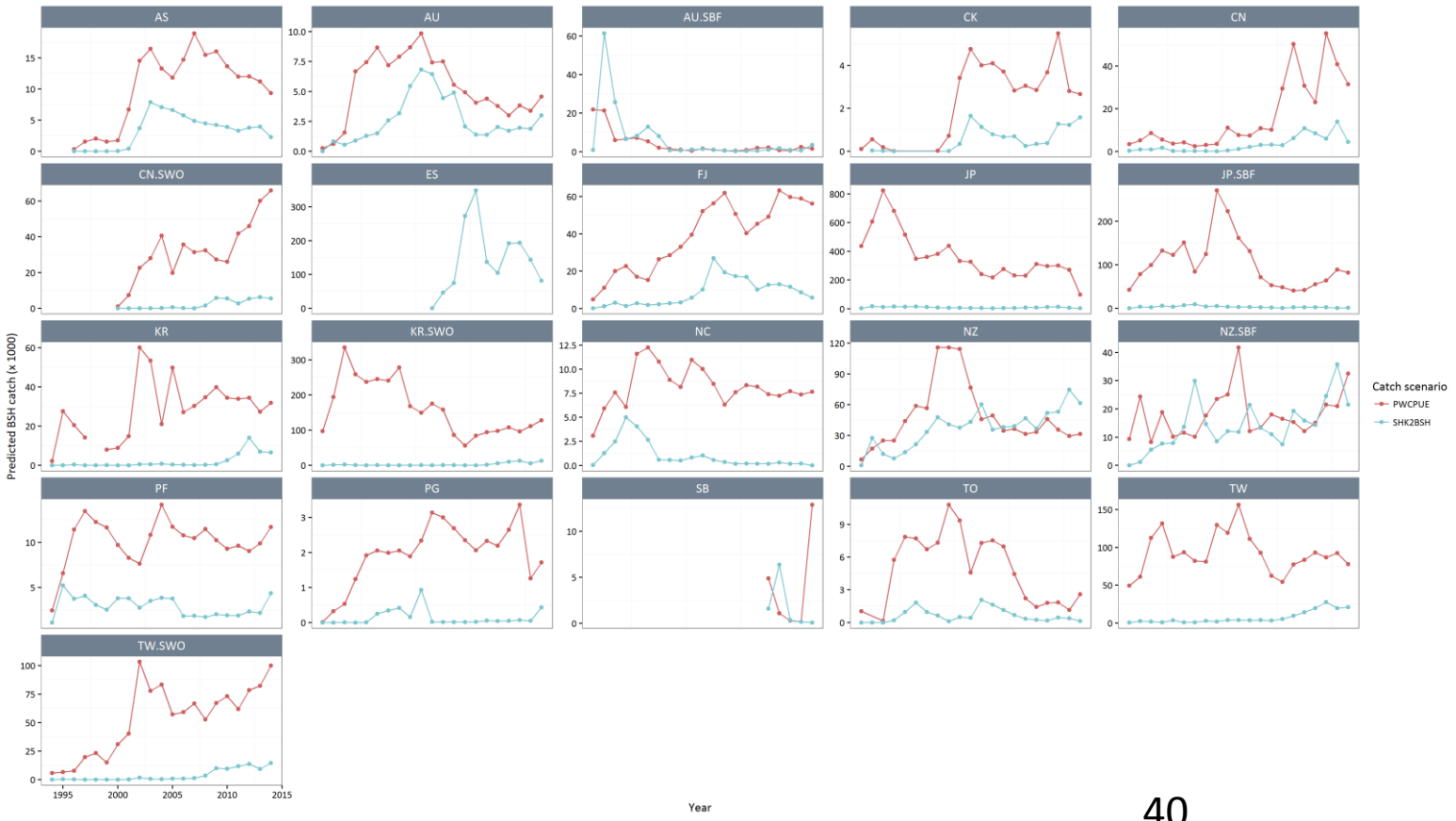


Figure 3

Regional structure

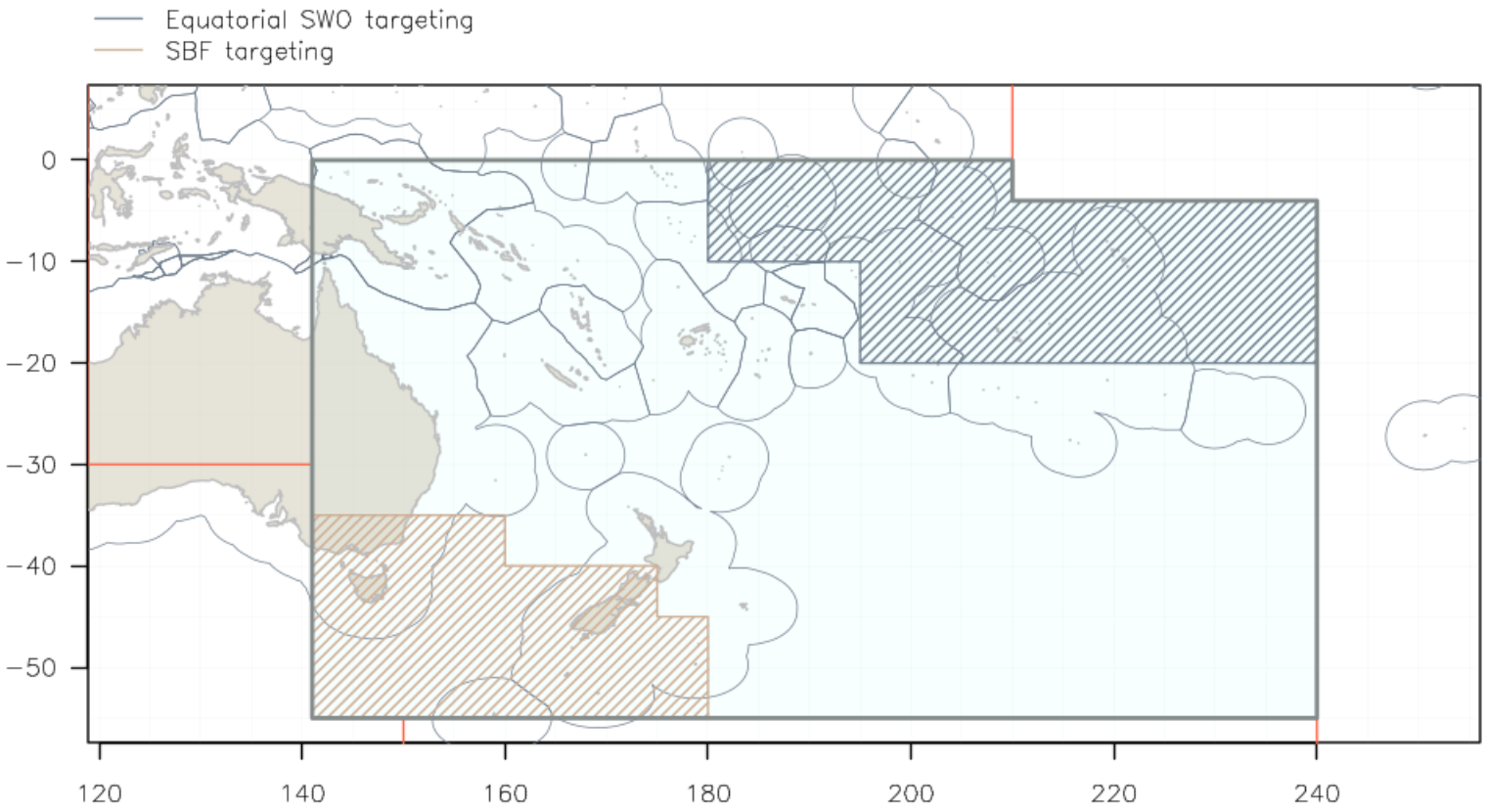


Figure 2

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Communauté du Pacifique

Structural uncertainties

Slide title

- Text