

Developing an estimation method for South Pacific albacore

MI-WP-05

Scientific Committee Meeting
Manila, Philippines
14-21 August 2024

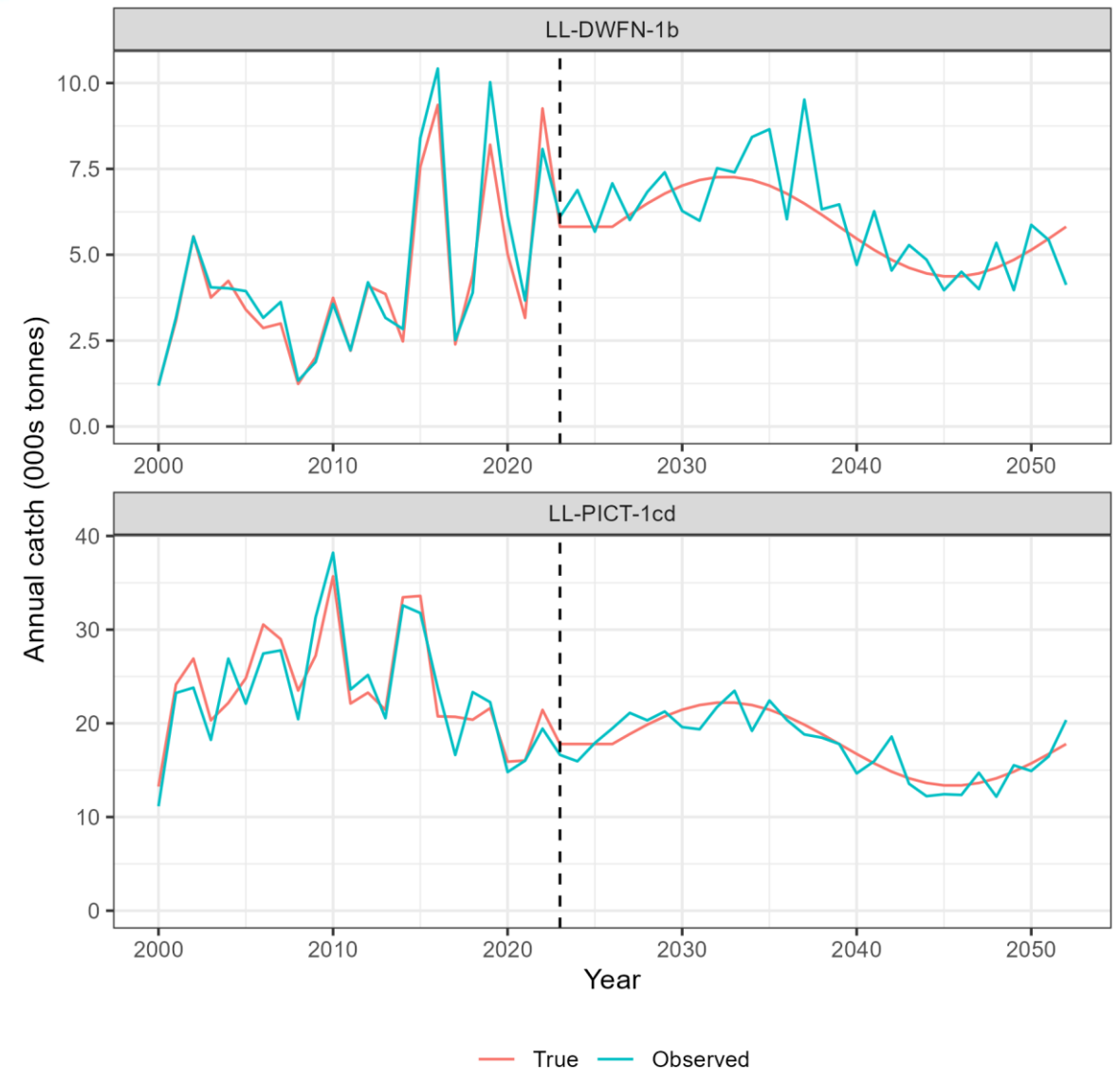
SPC/OFP

Introduction

- SC19 – presented results from testing estimation method for SPA (MI-IP-02)
- Age-structured production model, implemented using Multifan-CL, (ASPM) performed better than other models
- SC19 ASPM based on 2021 stock assessment for SPA
 - Concerns with the 2021 assessment
- Updated for SC20 following 2024 stock assessment
 - Move to a catch-conditioned approach
- Tested against a wide range of simulated data to evaluate performance

Generation of test data

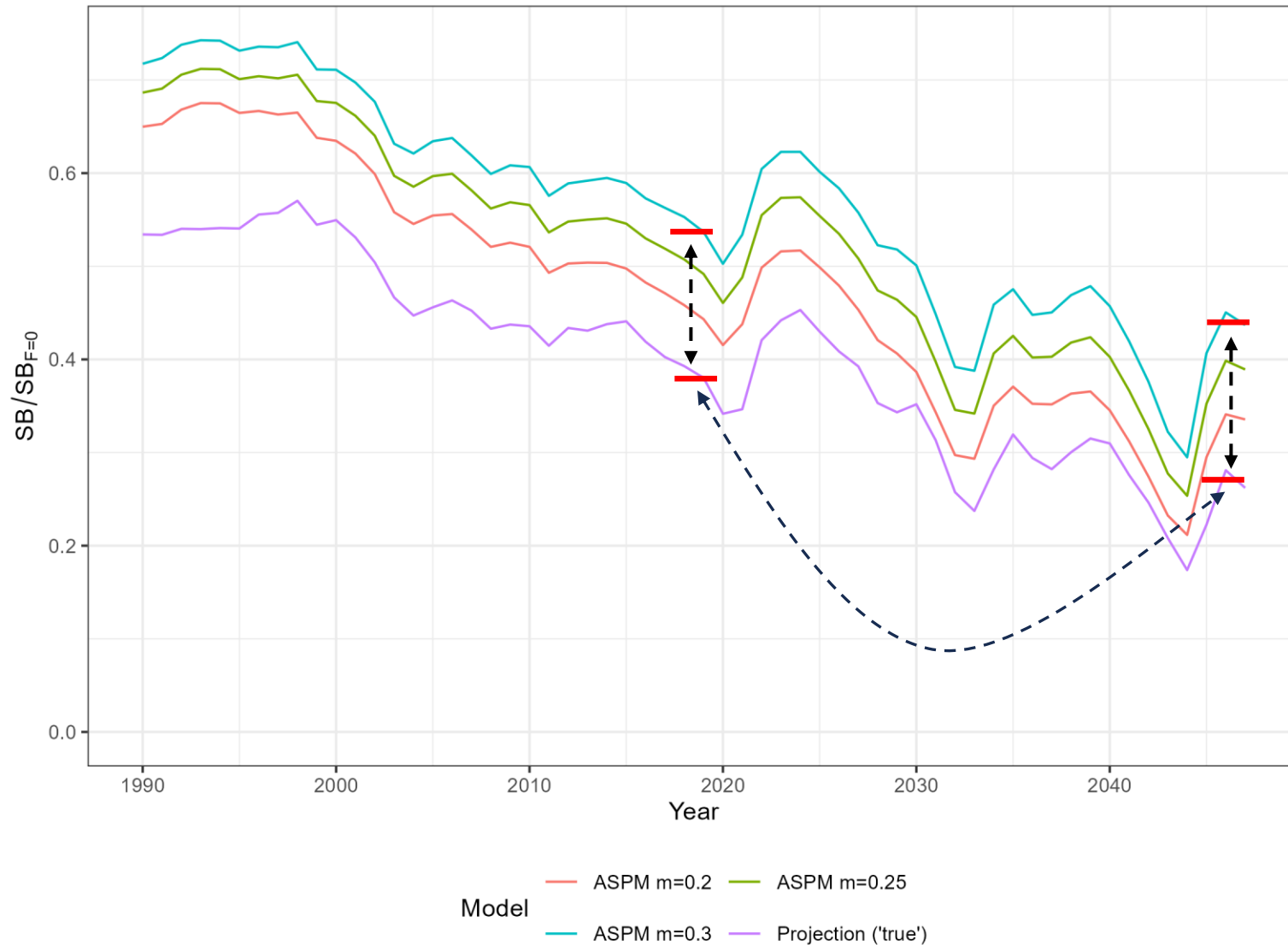
- 30 year stochastic projections based on proposed OM grid (MI-WP-04).
- Future catches set as sine wave (mean 2020-2020 catches +/- 25%)
- Include observation error on catch (extraction fisheries) and CPUE (index fisheries)
- 800 projections across the grid (60 failed due to overfishing)
- Truncated time series to different final years in five year periods (up to 2007, 2012, 2017 ... 2052)
- Gave 7400 data sets on which to fit the ASPM



ASPM

- Same model structure as 2024 stock assessment
 - Two model regions
 - 17 extraction fisheries
 - 3 index fisheries
- No size data
- Fix parameters to the 'diagnostic' case: selectivity, stock-recruitment relationship, movement, natural mortality, growth
- Out of the 7400 ASPM fits, 480 models failed (failure rate of 6%).
 - Unstable population structure
 - Those that did fit converged well (max. grad. $< 1e7$)

Impact of natural mortality



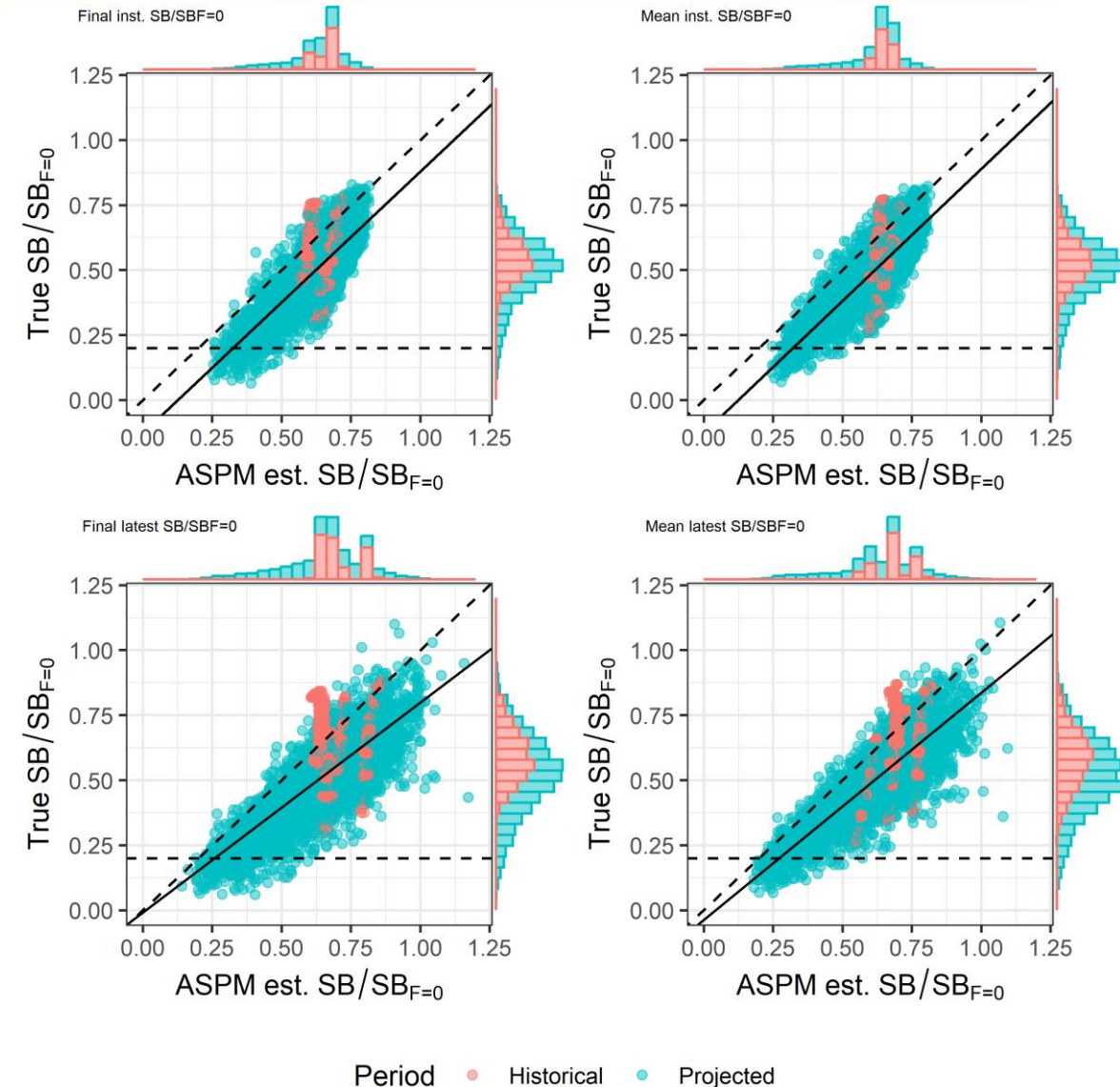
- Natural mortality assumptions influence population scaling
- ASPM – single model, single value of M
- Expressing estimated stock status as relative to 2017-2019 reduces impact of choice of M in ASPM

ASPM performance

- Compare 'true' value of stock status from projection to ASPM estimated value
- Only interested in generating an input to the HCR, not on how well the whole time series is estimated
- Different metrics calculated:
 - Terminal year $SB/SB_{F=0}$
 - Mean $SB/SB_{F=0}$ of last three years
 - Mean $SB/SB_{F=0}$ of last three years relative to 2000-2002
 - Mean $SB/SB_{F=0}$ of last three years relative to 2017-2019
- For two calculation of $SB/SB_{F=0}$
 - Instantaneous ($SB_y/SB_{F=0,y}$)
 - Latest ($SB_{latest} / SB_{F=0}$)
- Relative metrics designed to overcome impact of uncertainty in natural mortality

Absolute results

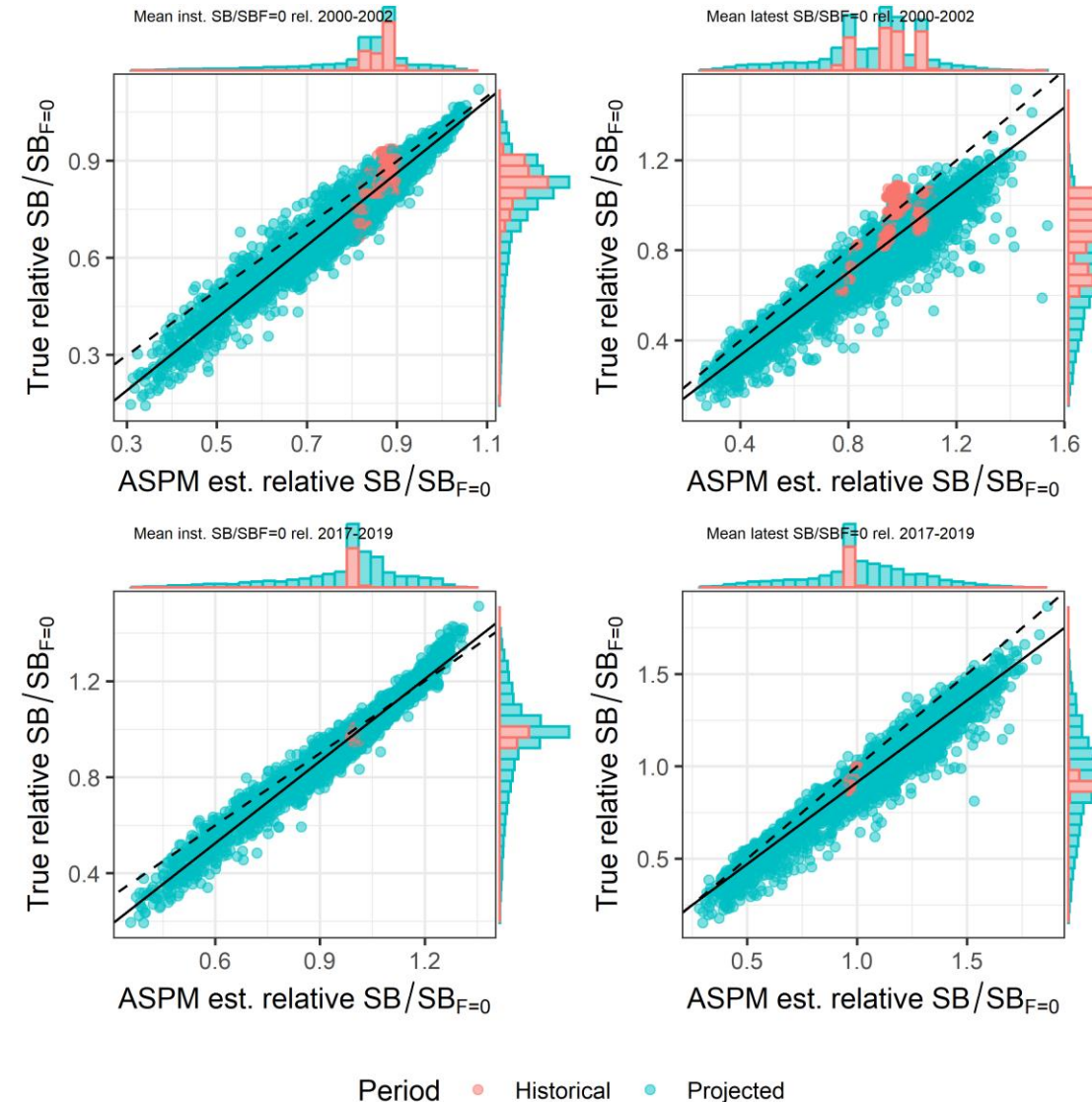
- Comparing 'true' terminal $SB/SB_{F=0}$ (from projections) to ASPM estimated terminal $SB/SB_{F=0}$
- Solid line is from linear regression, dashed line is 1-1
- Fairly noisy and tendency to overestimate stock status
- Possible to correct for known bias through HCR



Metric	R-squared	Intercept	Slope
Final inst. $SB/SB_{F=0}$	0.59	-0.13	1.01
Mean inst. $SB/SB_{F=0}$	0.63	-0.13	1.02
Final latest $SB/SB_{F=0}$	0.55	-0.01	0.81
Mean latest $SB/SB_{F=0}$	0.67	-0.04	0.87

Relative results

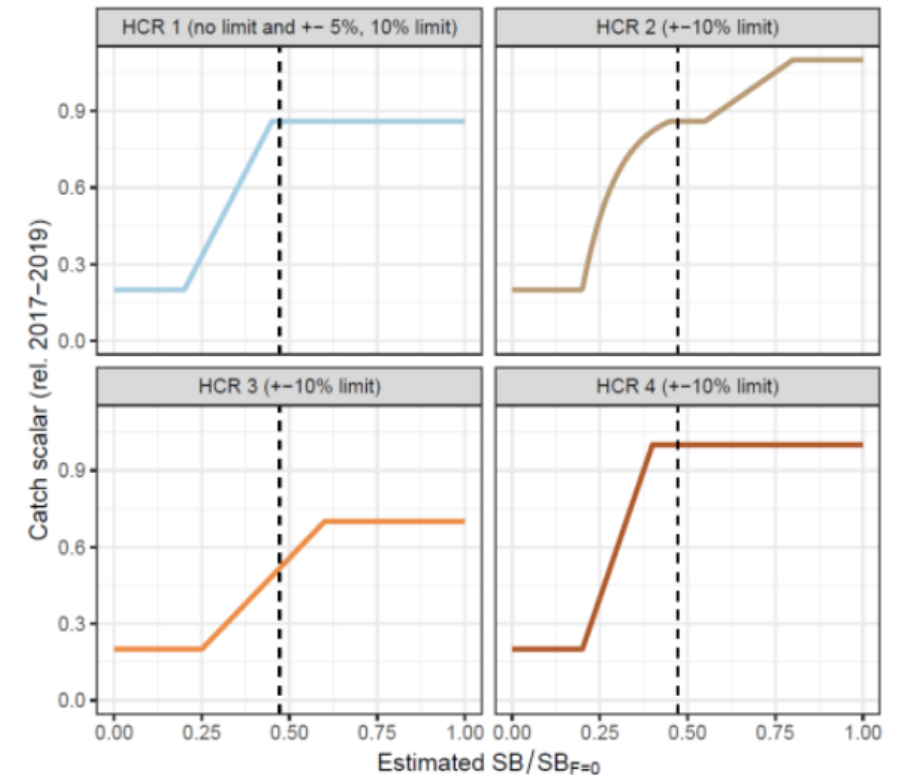
- True and ASPM estimated $SB/SB_{F=0}$ relative to 2000-2002 or 2017-2019
- 2017-2019 has less historical data
- Solid line is from linear regression, dashed line is 1-1
- Reduced scatter and better agreement.



Metric	R-squared	Intercept	Slope
Mean inst. $SB/SB_{F=0}$ relative to 2000-2002	0.92	-0.15	1.12
Mean inst. $SB/SB_{F=0}$ relative to 2017-2019	0.97	-0.16	1.14
Latest inst. $SB/SB_{F=0}$ relative to 2000-2002	0.83	-0.03	0.92
Latest inst. $SB/SB_{F=0}$ relative to 2017-2019	0.93	0.03	0.89

Next steps

- Develop candidate MPs using estimation methods based on both absolute and relative measures of stock status.
- The shapes of the harvest control rules in the candidate MPs can be adapted from those considered at WCPFC20.
- Test the candidate MPs using an updated MSE framework, using the updated operating model grid.
- Calculate and present performance indicators so that members may evaluate the relative performance of the candidate MPs and provide feedback.

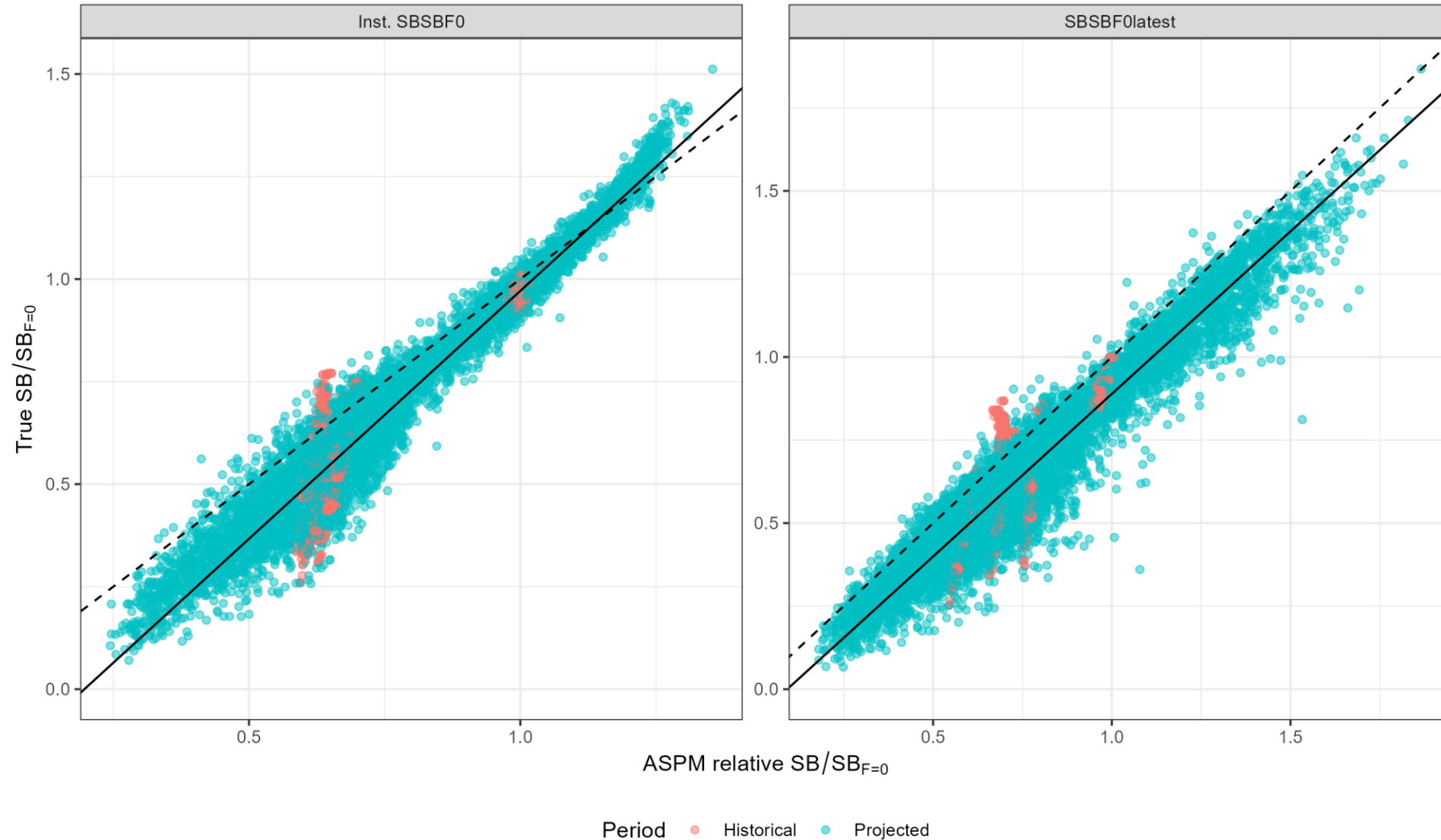


Recommendations

- Consider the results of the estimation method trials for the South Pacific albacore management procedure.
- Endorse the use of the proposed ASPM as the estimation method for candidate management procedures.
- Endorse the use of relative and absolute depletion metrics for input into candidate South Pacific albacore harvest control rules.

Bonus

Absolute true $SB/SB_{F=0}$
against ASPM estimated
relative $SB/SB_{F=0}$ (2017-
2019)



Bonus

Observed and predicted CPUE for the three index fisheries in the ASPM

