

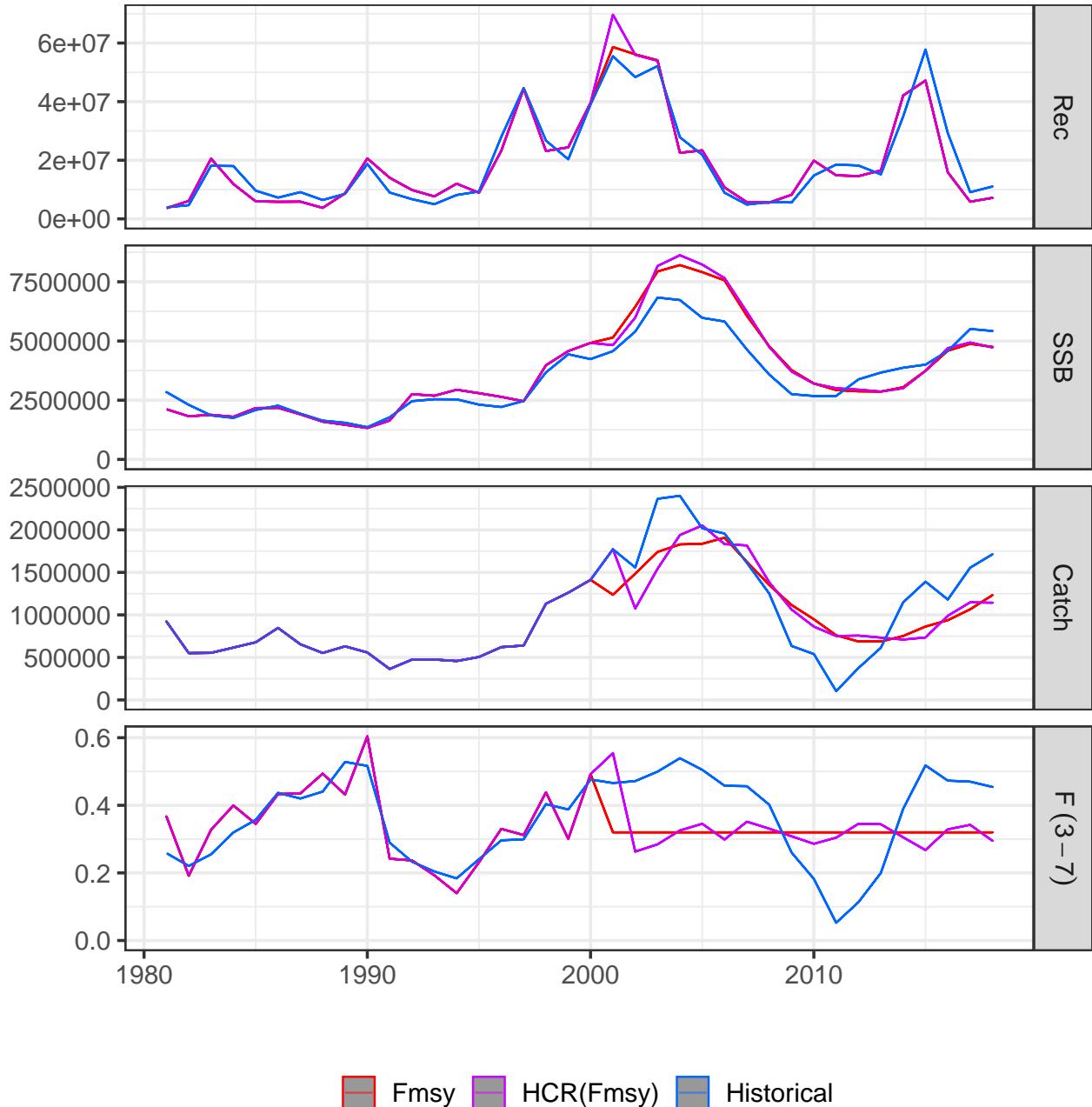
# Blue whiting Operating Model

Beverton and Holt SRR with steepess fixed at 0.9

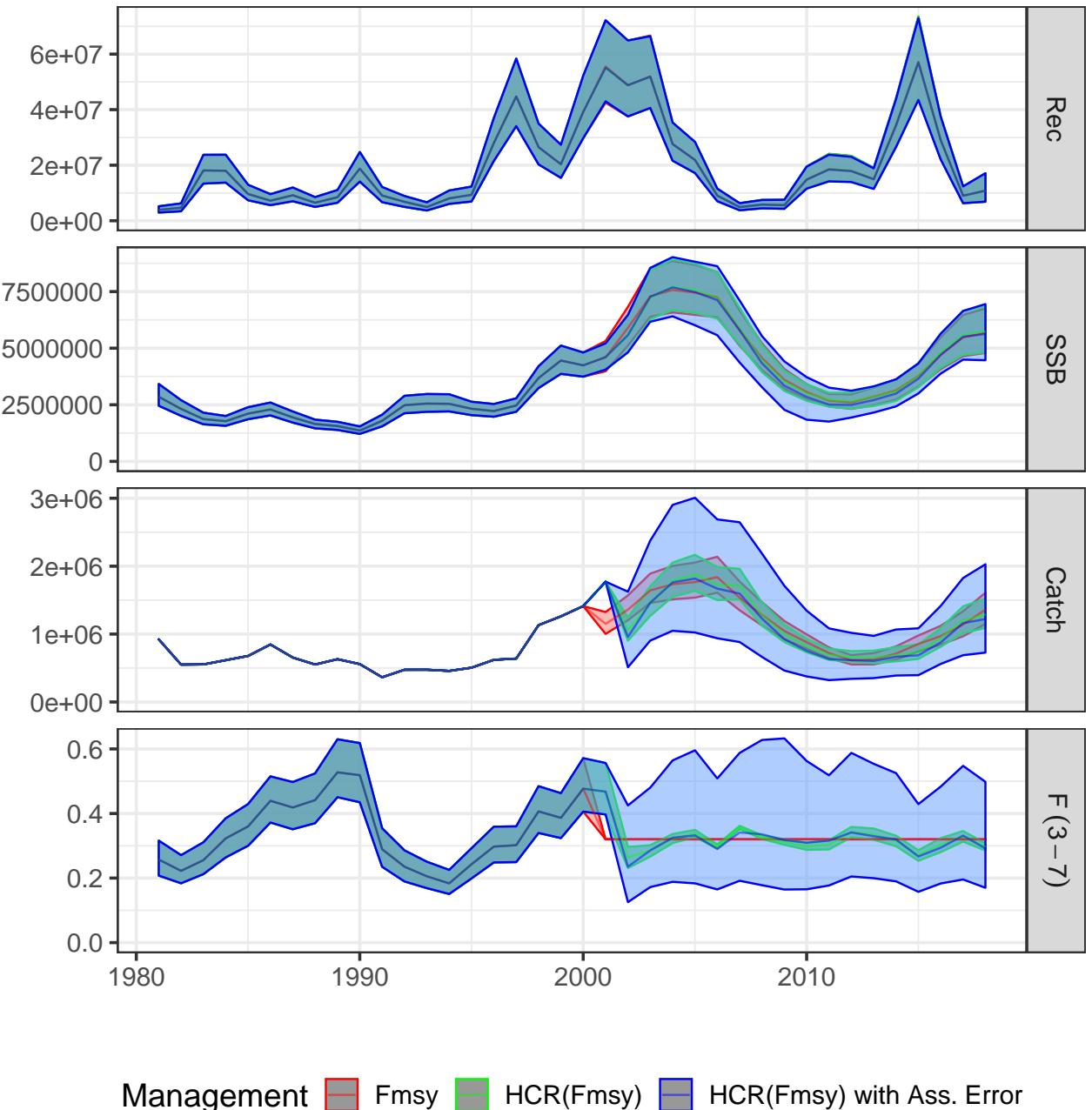
Laurence Kell

12 August, 2019

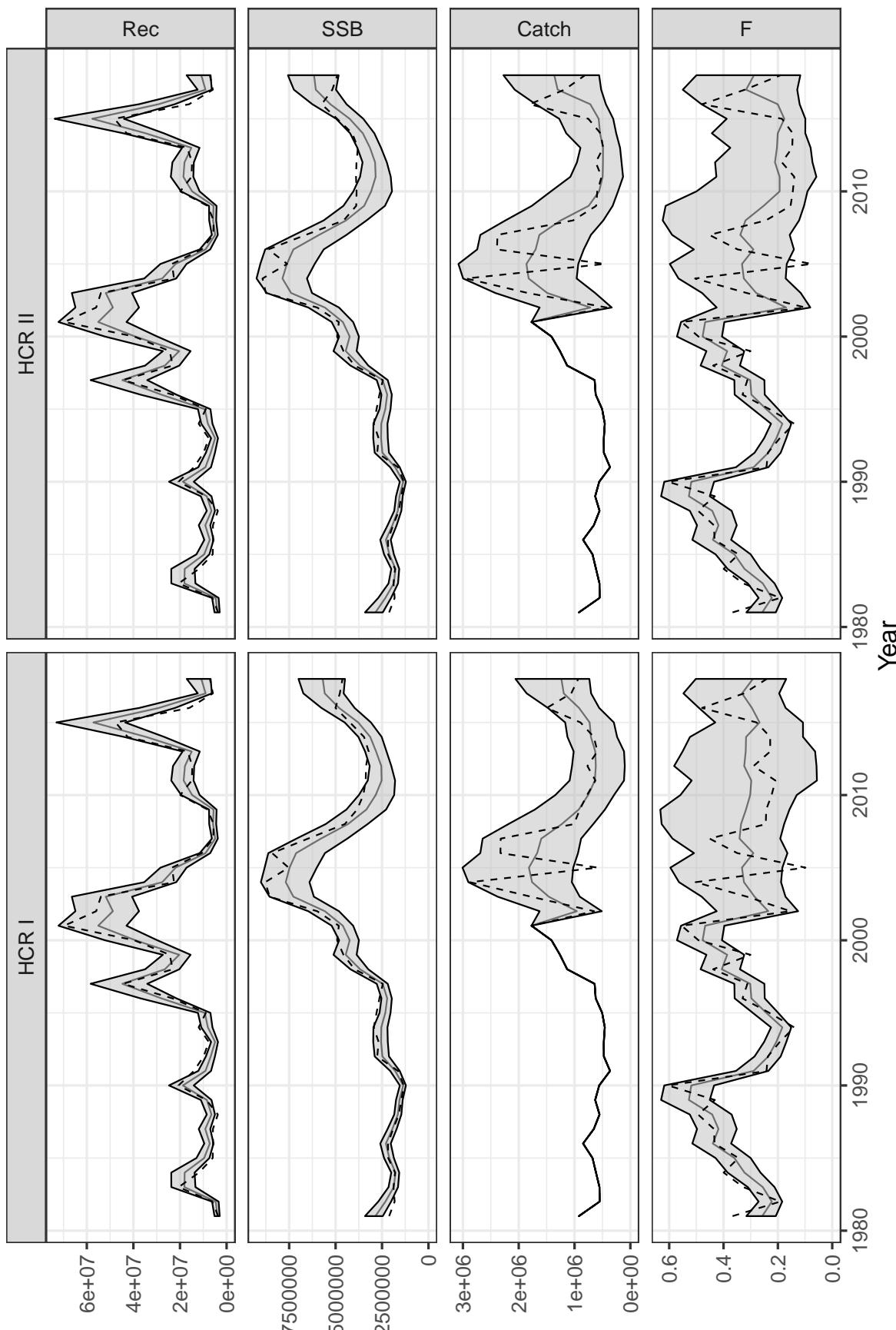
## Notes



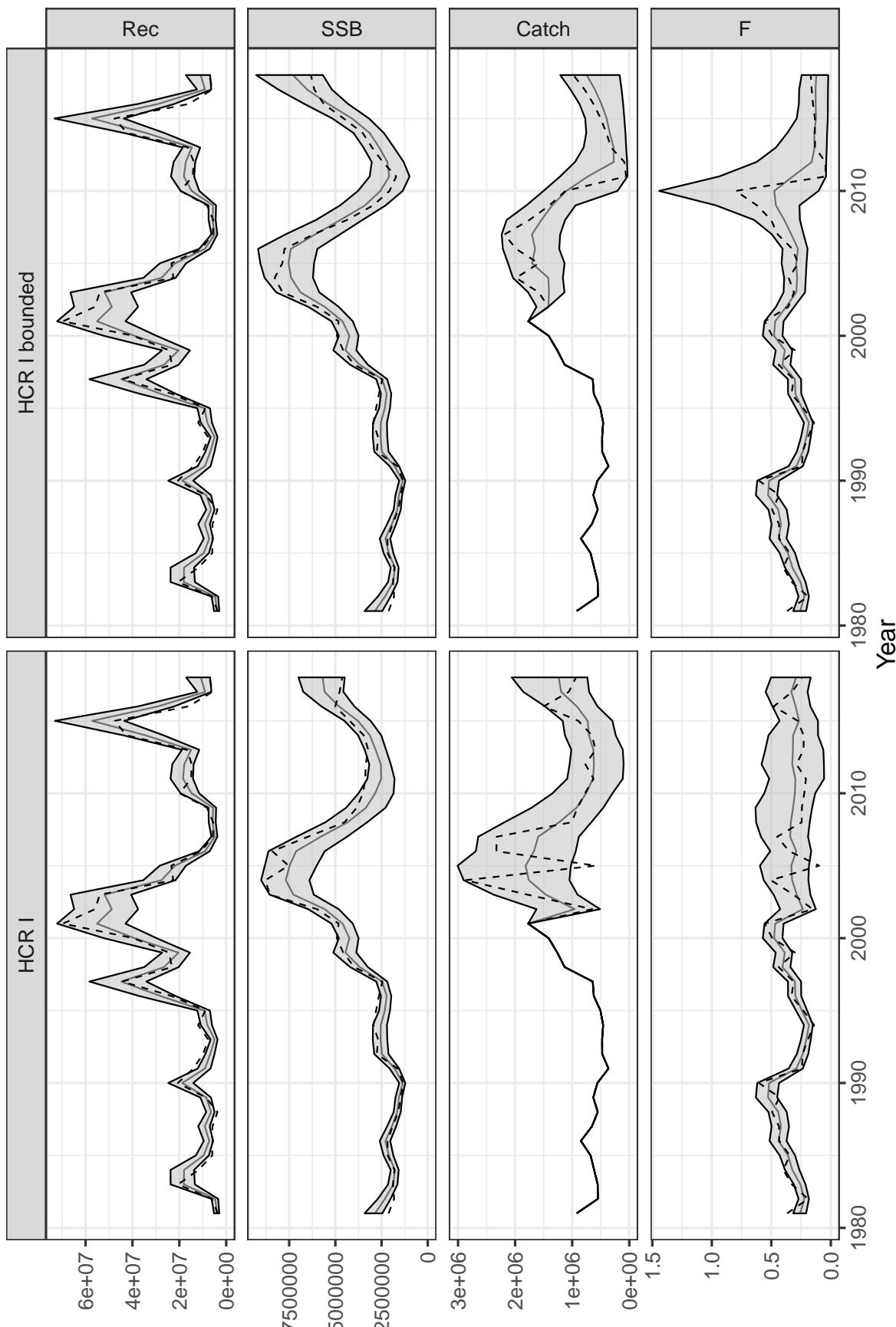
**Figure 26** Comparison between historical assessment estimates, and a single Monte Carlo realisation for a projection at Fmsy, and HCR1 without assessment error.



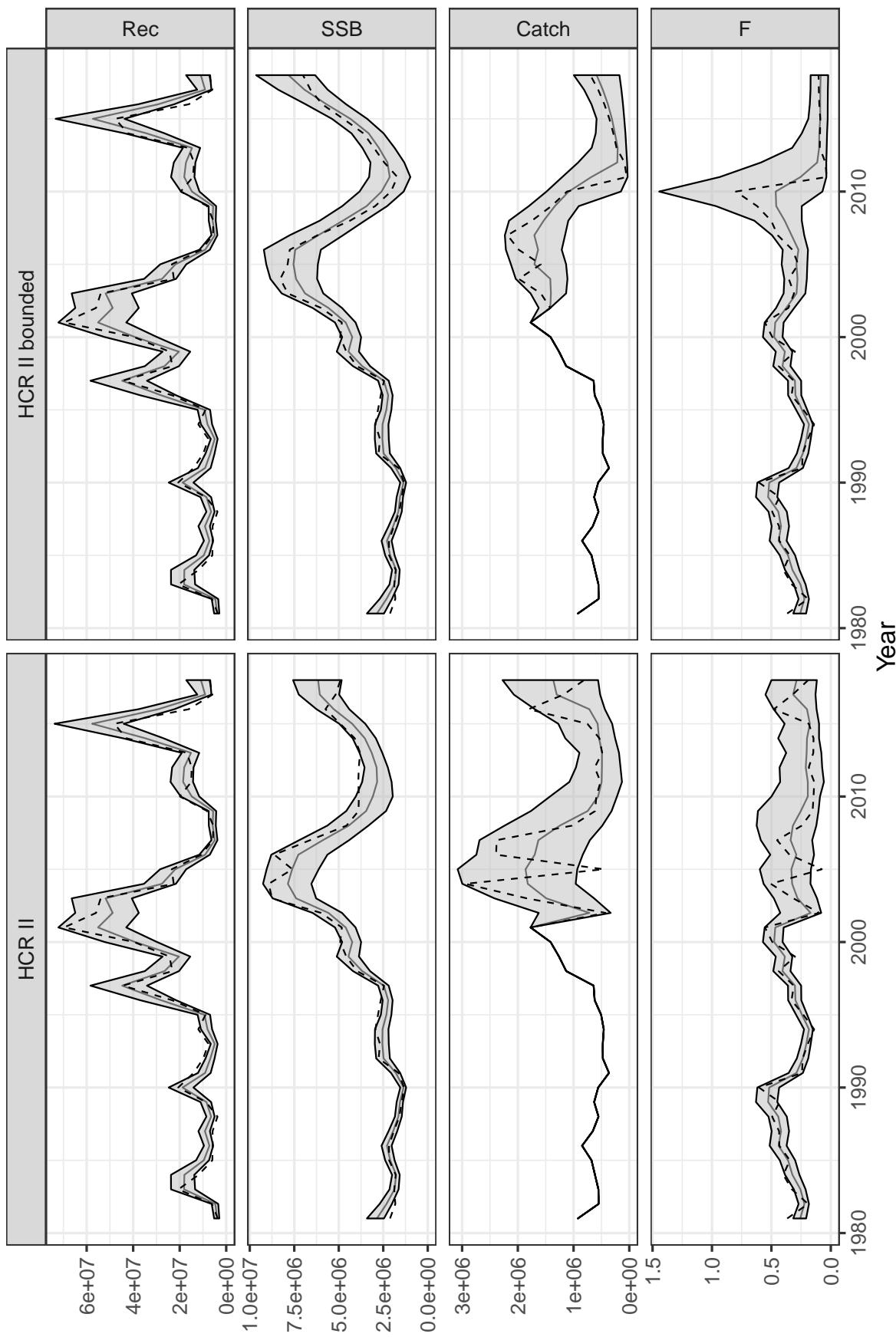
**Figure 27** HCR with and without assessment error compared to historical estimates; with median and 10 and 90 percentiles, the hatched line is a single Monte Carlo realisation.



**Figure 28** Comparison between HCR I & II with assessment error; shown with median and 10 and 90 percentiles, the hatched line is a single Monte Carlo realisation.



**Figure 29** Comparison between HCR I without and with bounds; shown with median and 10 and 90 percentiles, the hatched line is a single Monte Carlo realisation.



**Figure 30** Comparison between HCR II without and with bounds; shown with median and 10 and 90 percentiles, the hatched line is a single Monte Carlo realisation.

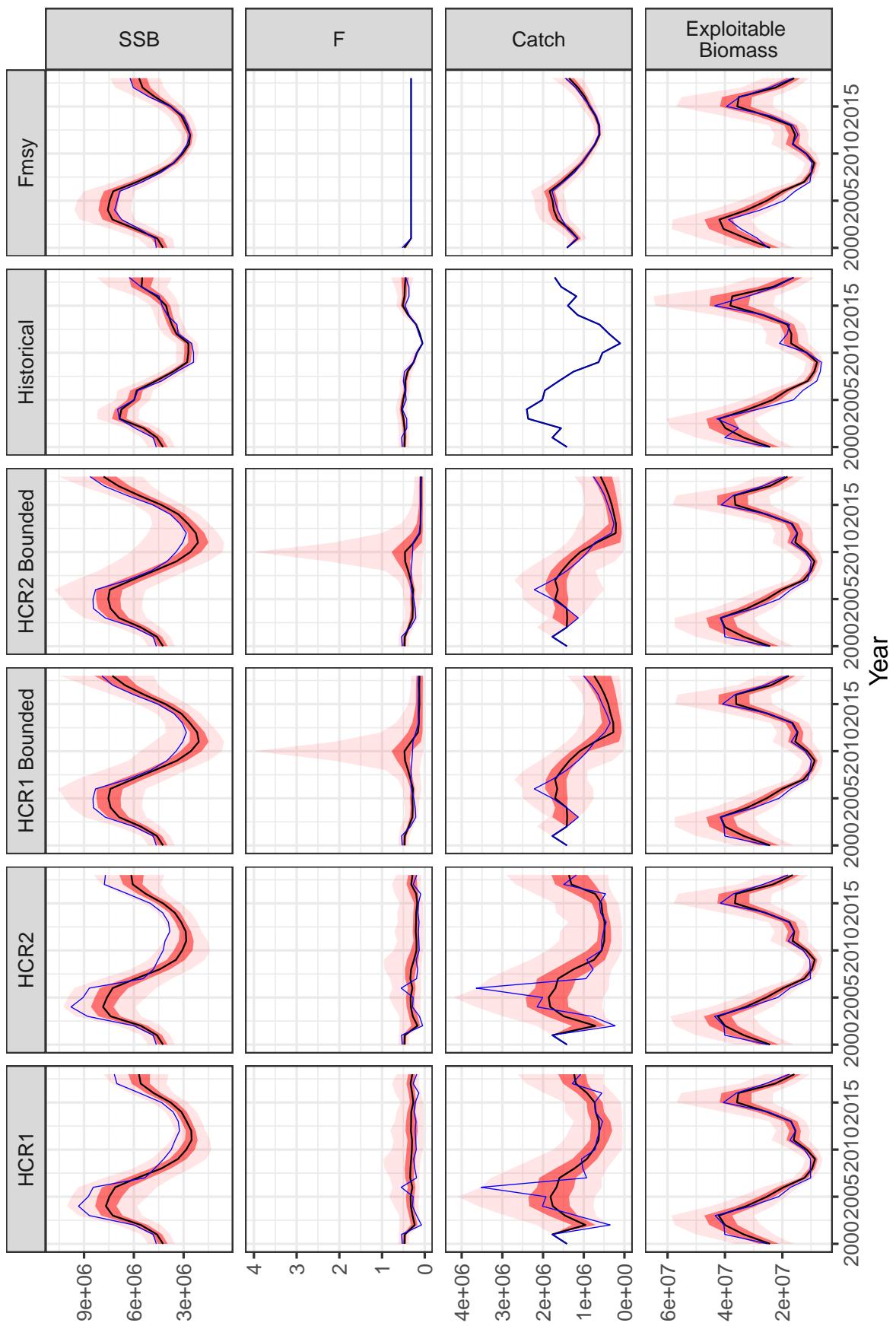


Figure 31 Summary of HCR performance.

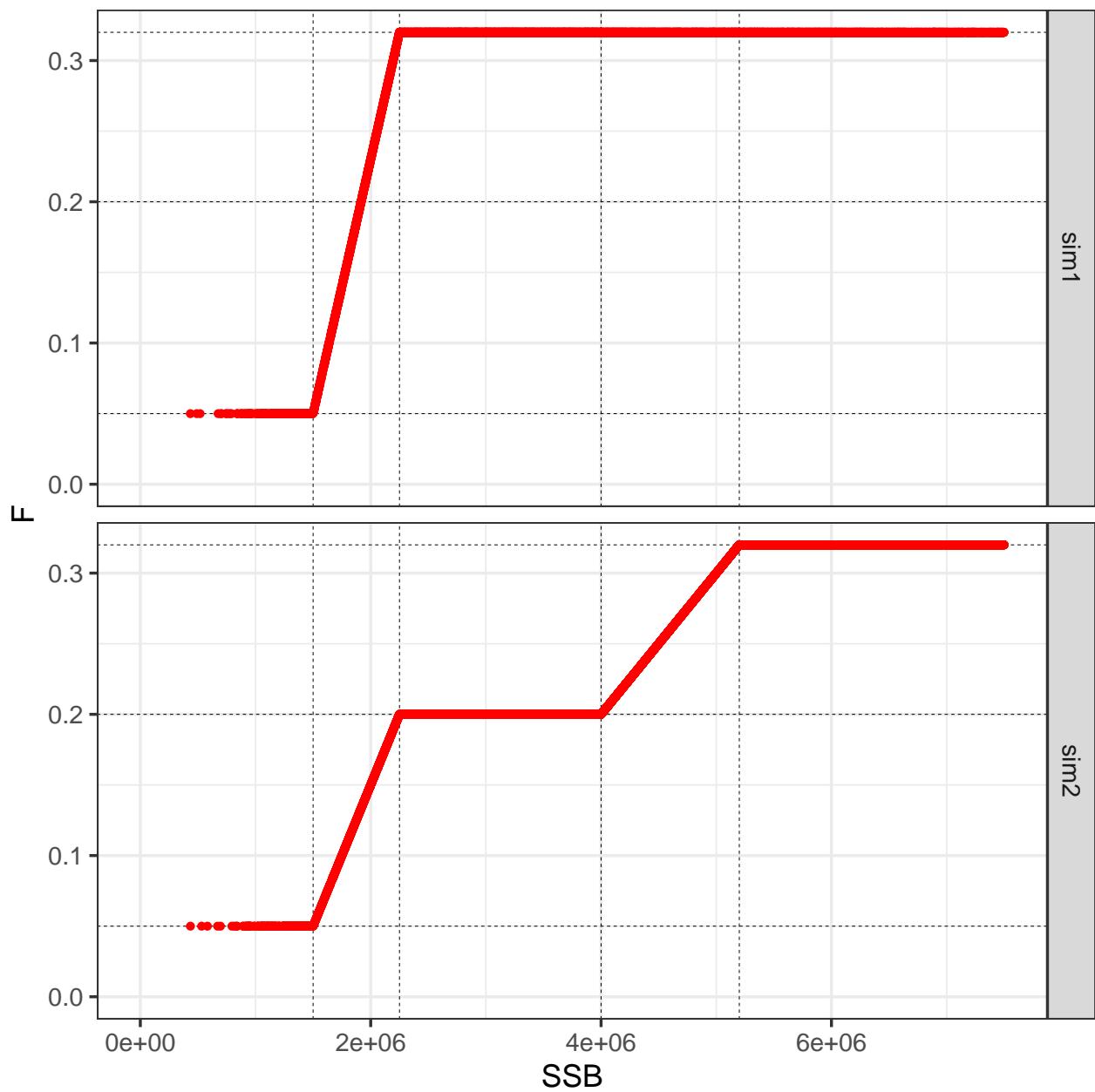
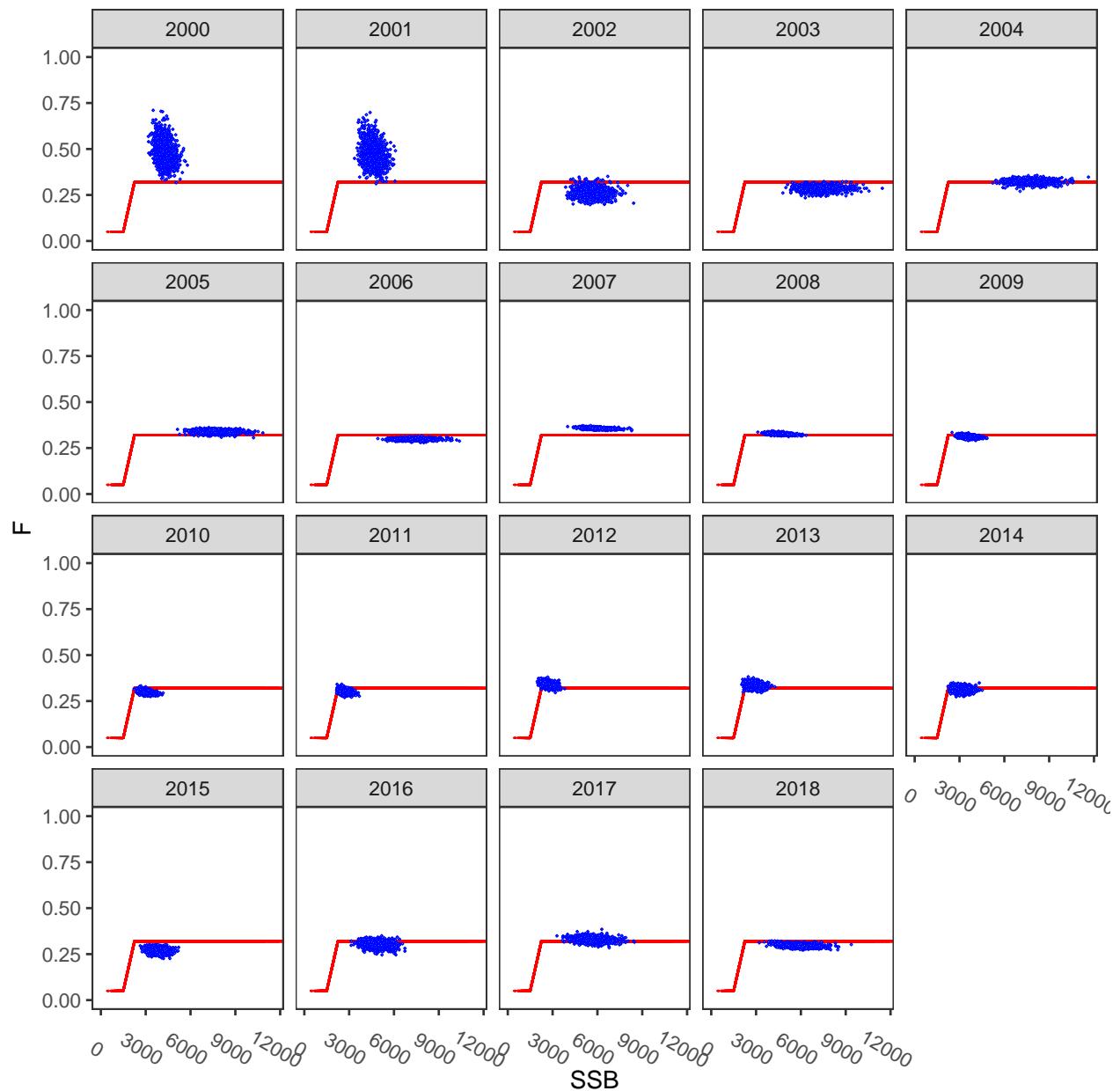
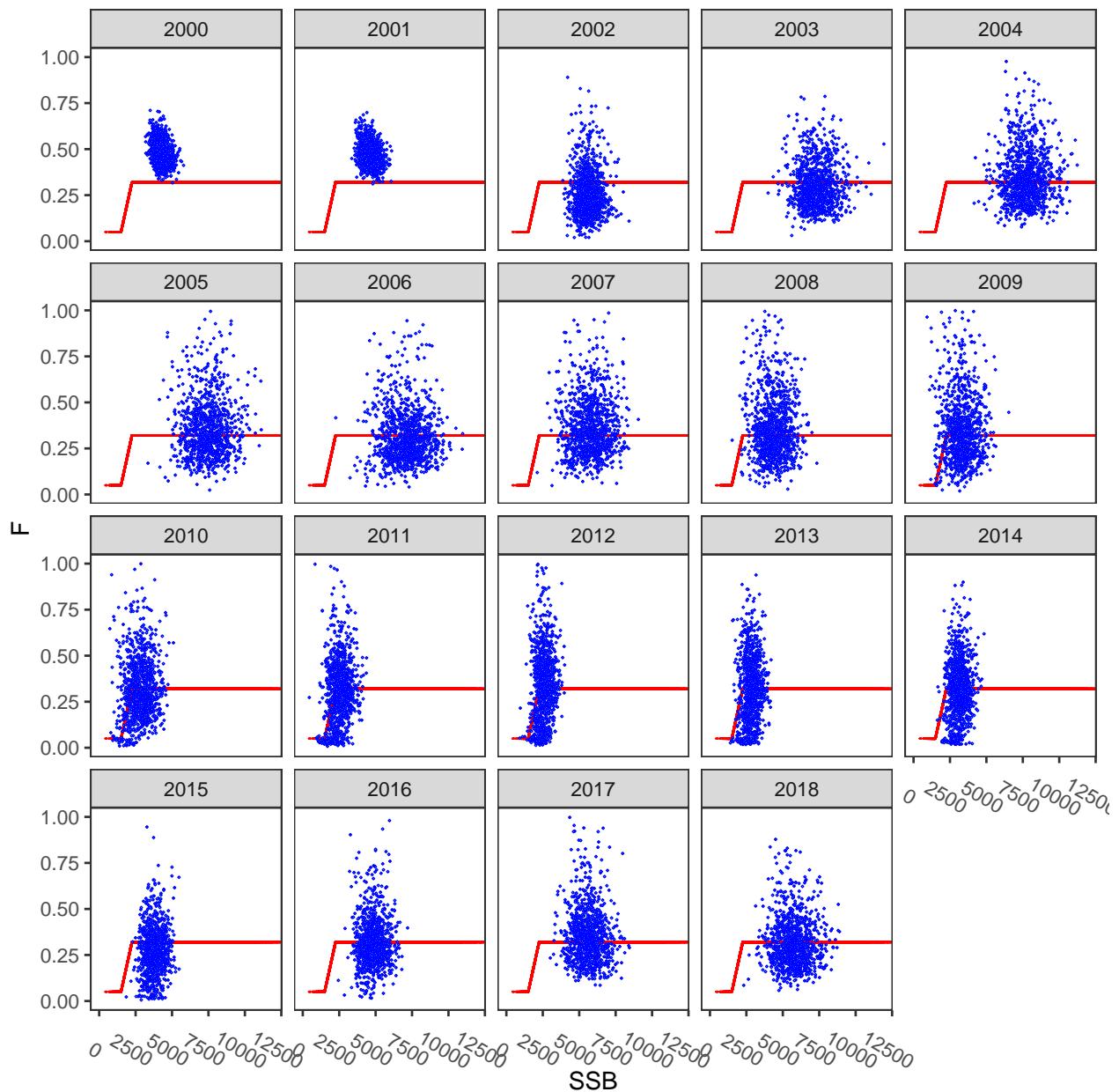


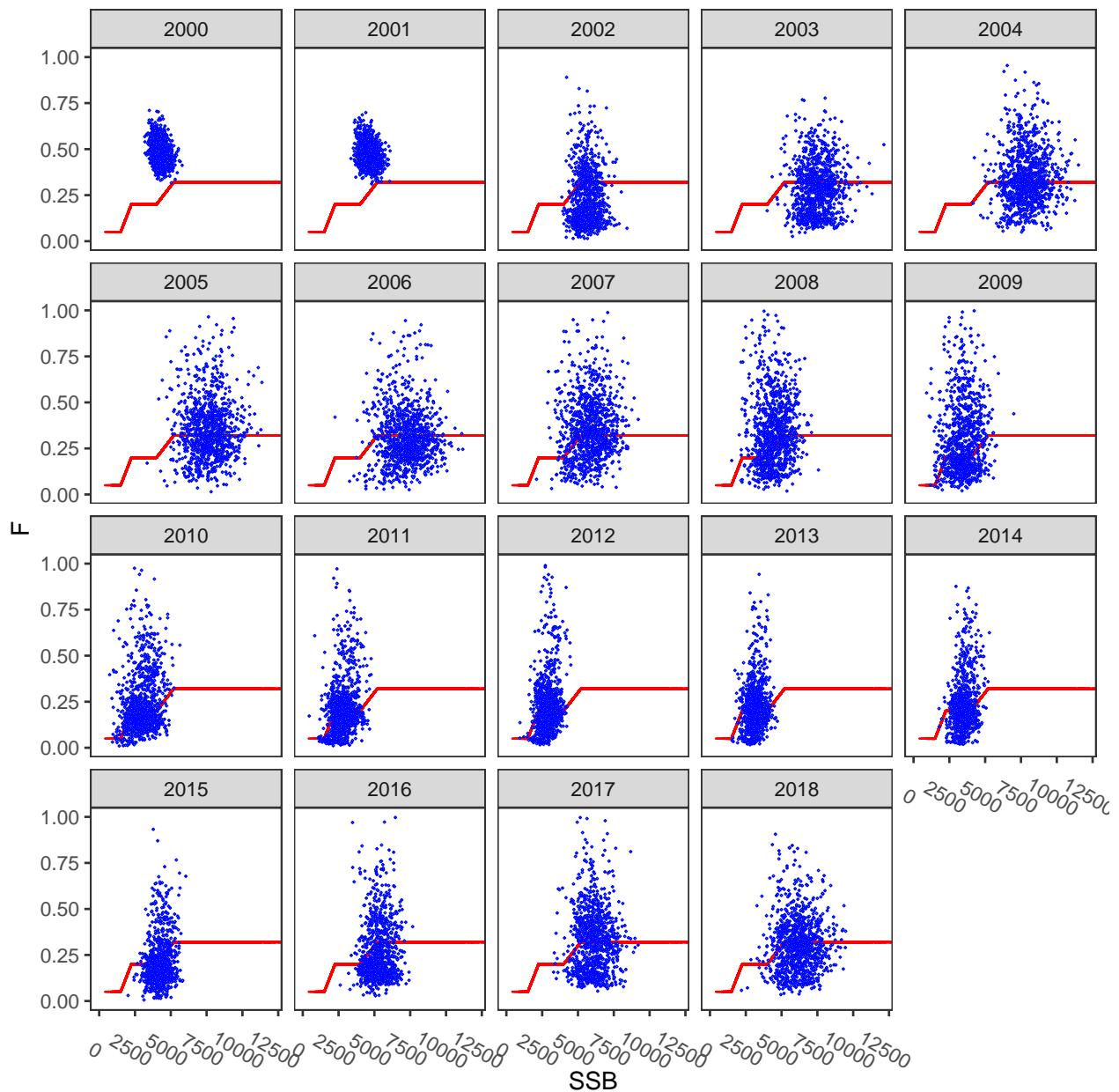
Figure 32 Values of F for assessed SSB from the HCR, as a check that the HCR is working as expected



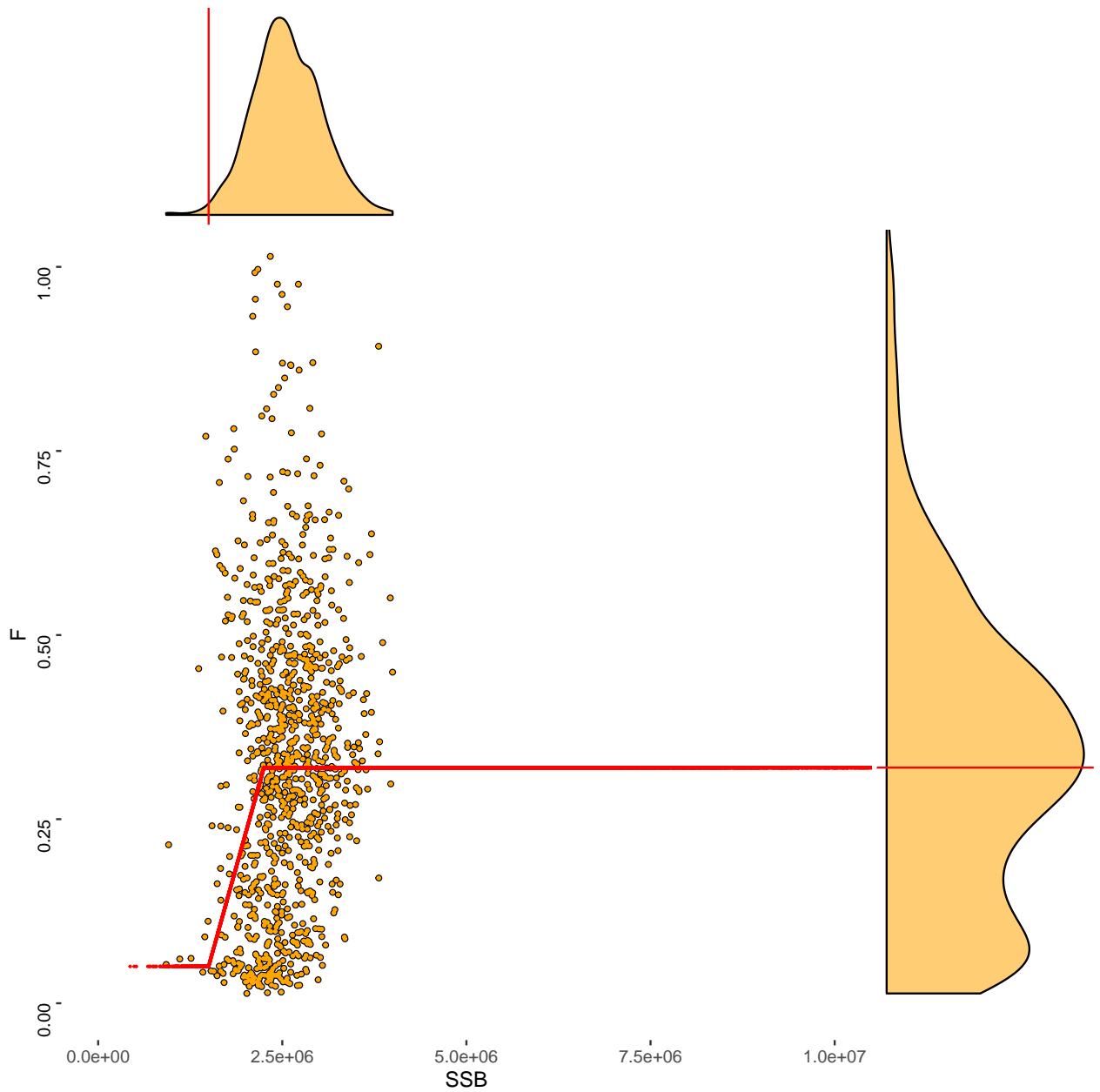
**Figure 33** Plot of F v SSB for HCR I without assessment error.



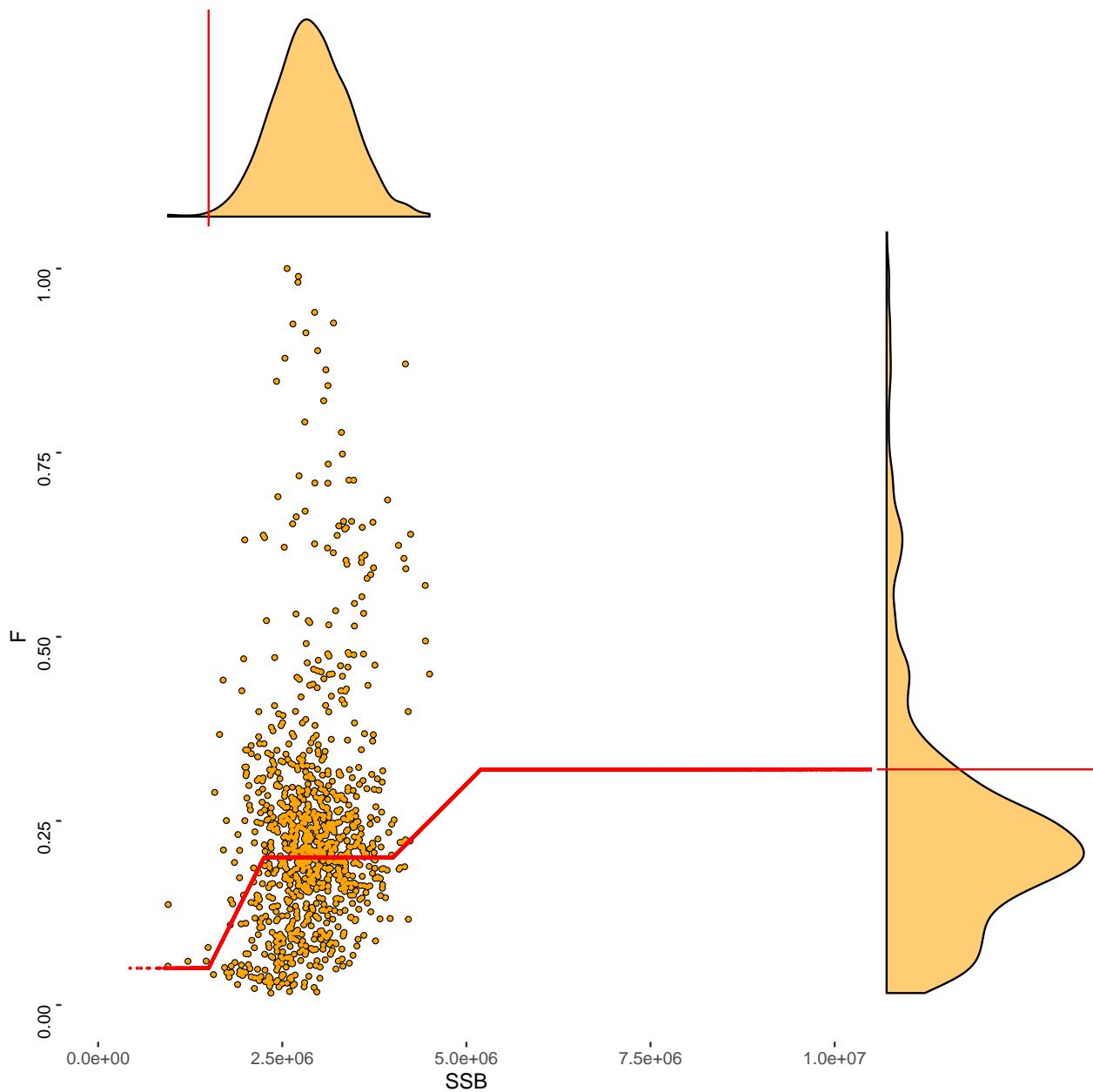
**Figure 34** Plot of F v SSB for HCR I.



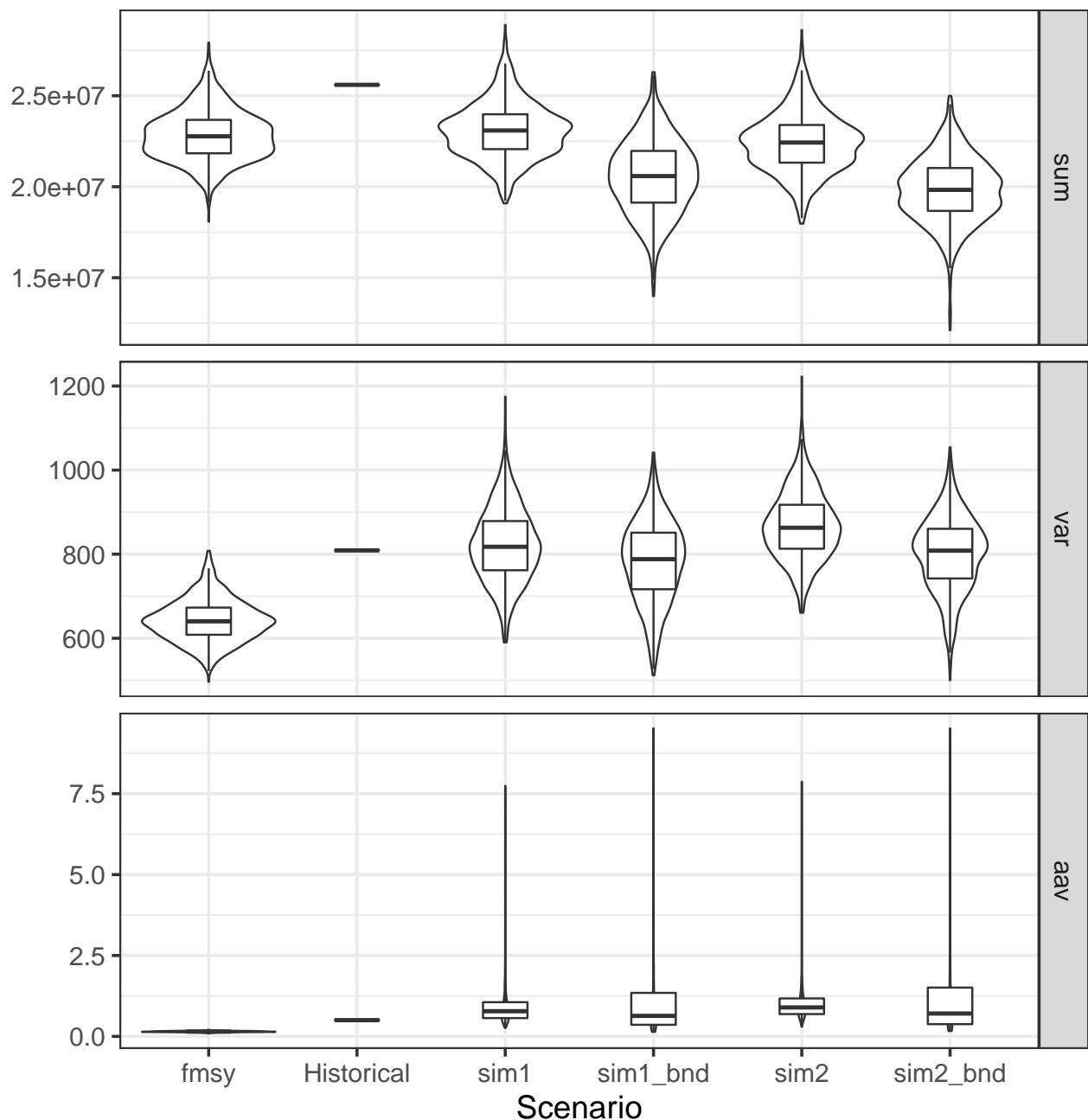
**Figure 35** Plot of F v SSB for HCR II.



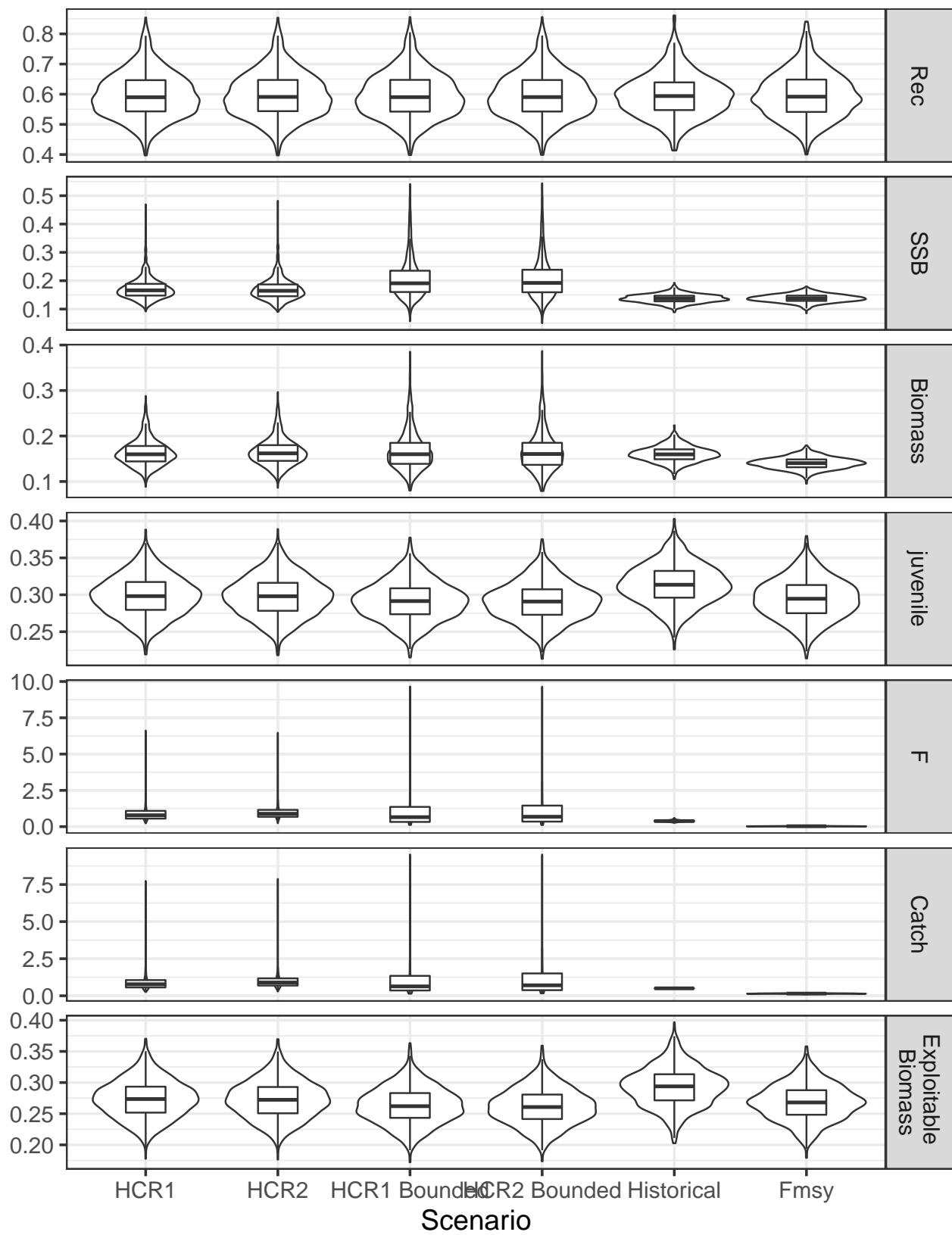
**Figure 36** HCR I plot of  $F$  v  $SSB$  for 2012 with marginal densities



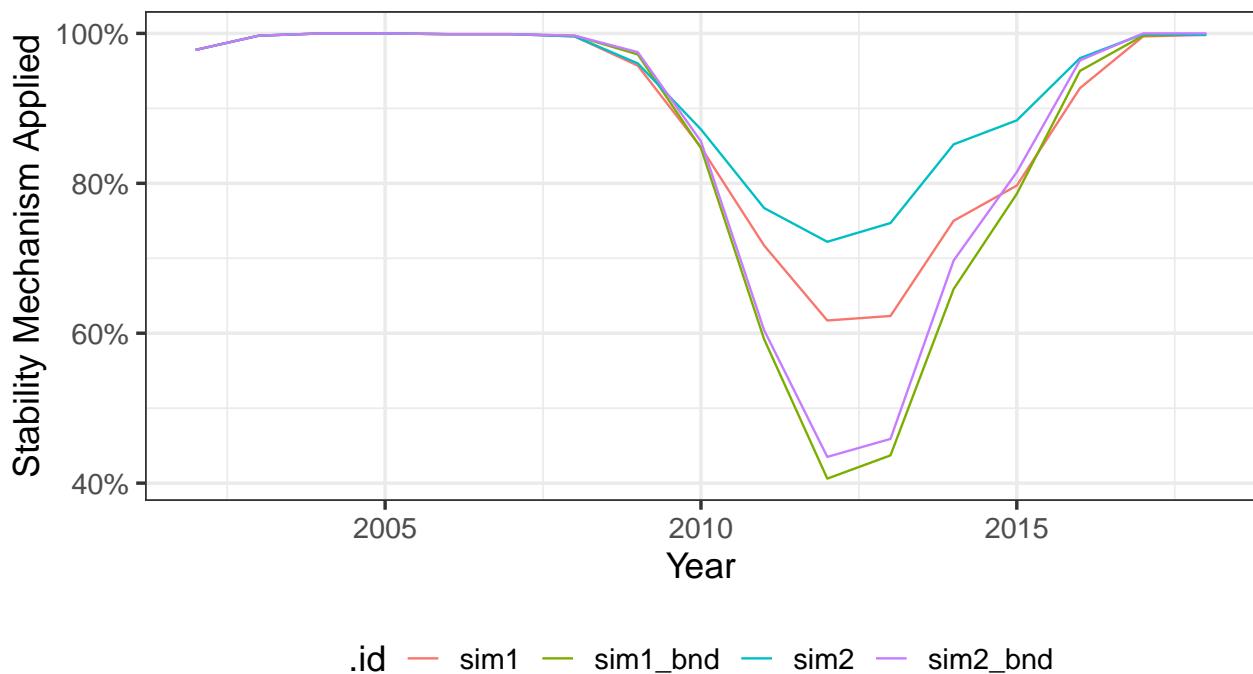
**Figure 37** HCR II plot of  $F$  v  $SSB$  for 2012 with marginal densities



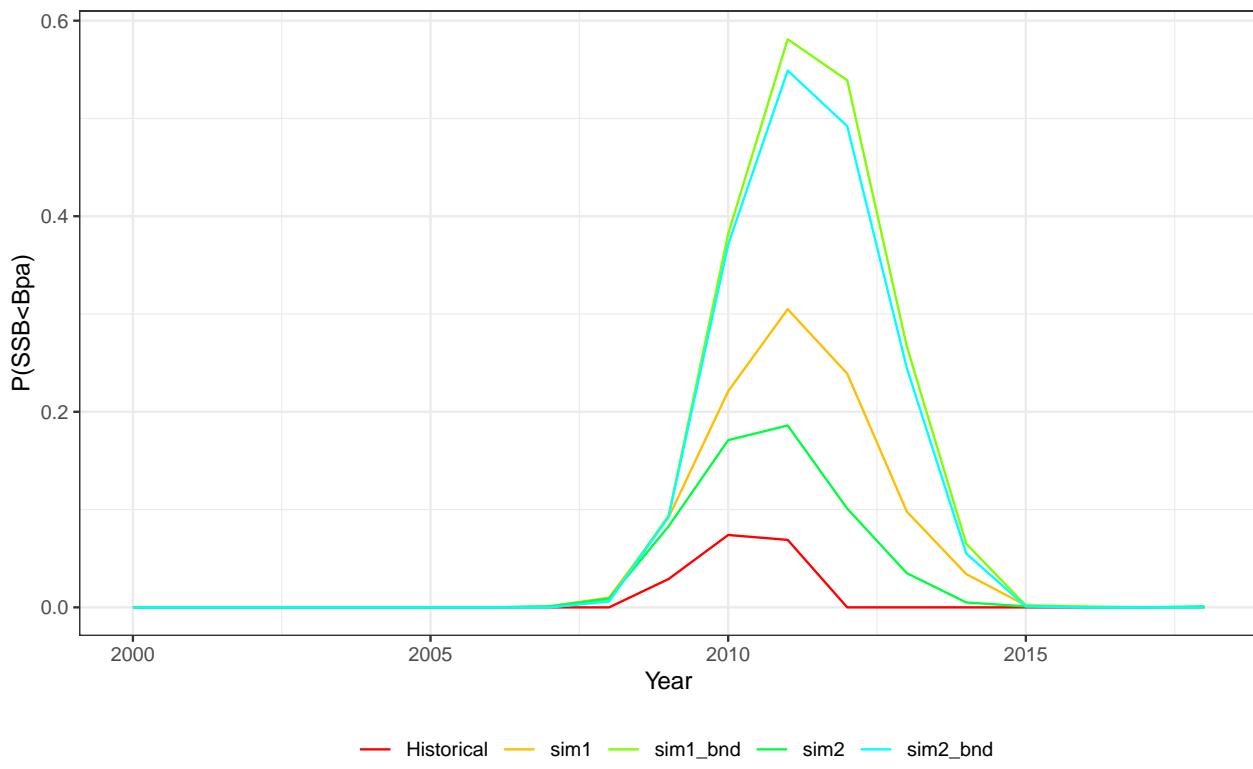
**Figure 38** Catch summary, total catch and AAV by iteration over simulated period



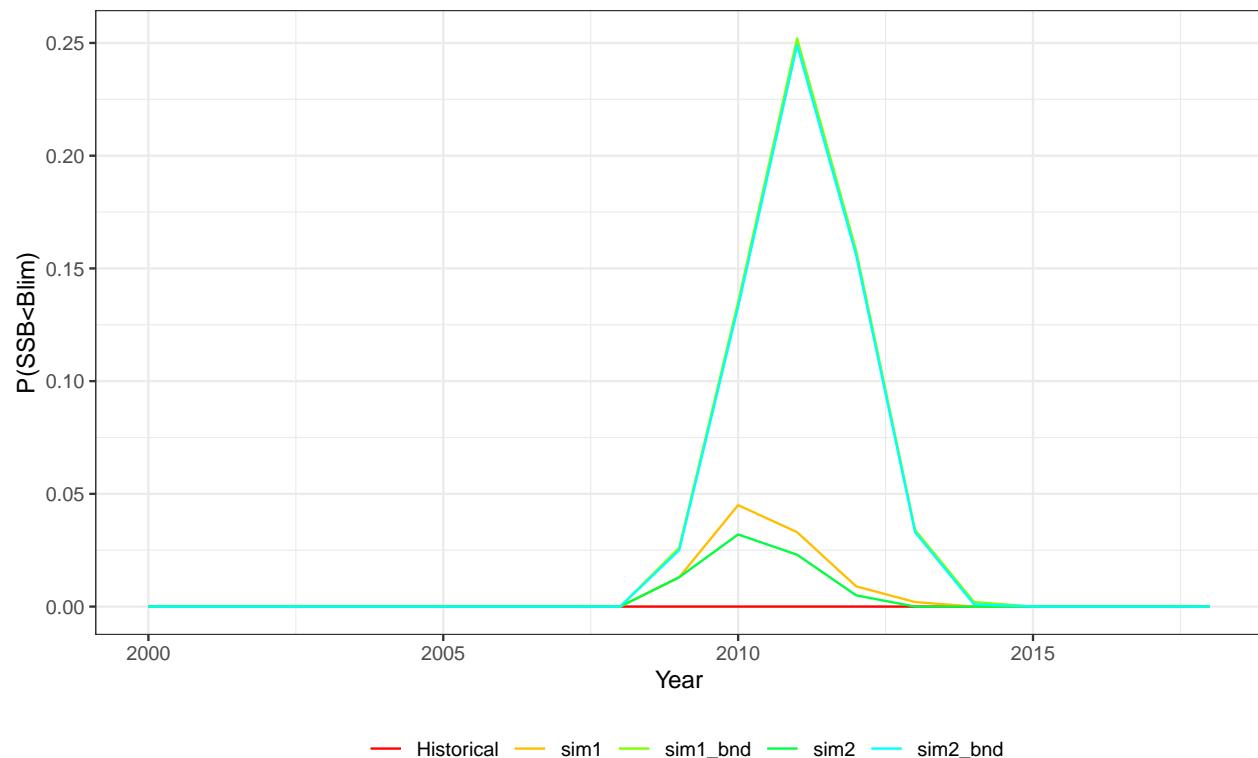
**Figure 39** Mean Interannual Annual Absolute Variation over time series by iteration.



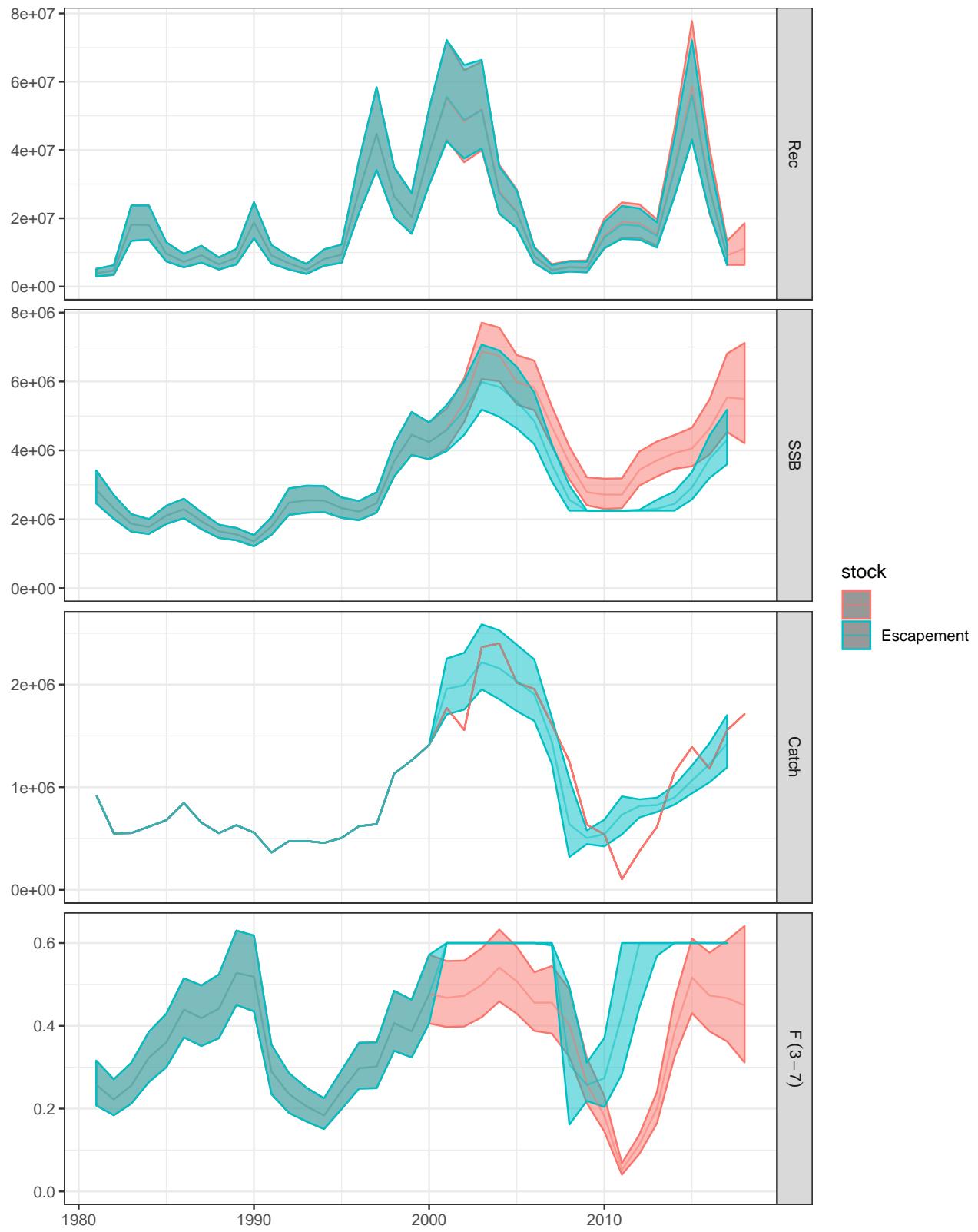
**Figure 40** The percentage by year when the stability mechanism was applied.



**Figure 41** Probability that SSB falls below Bpa



**Figure 42** Probability that SSB falls below BLim.



**Figure 43** Comparison of historical stock trends and an escapement harvesting strategy (take all biomass > Bpa) and an F cap of 0.5