

Bayesian methods and the assessment for snow crab

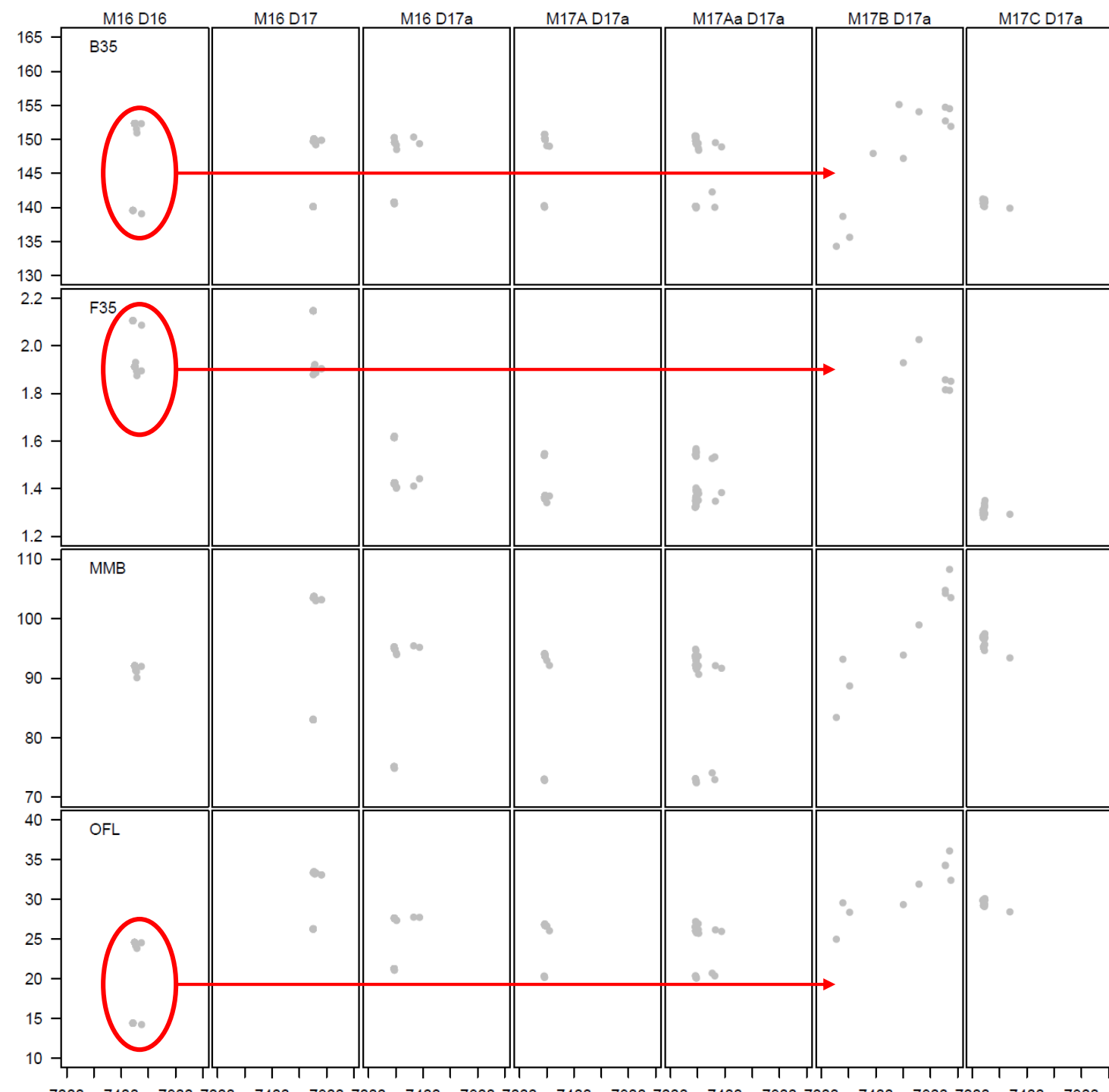
January 9, 2018

Crab Modeling Workshop

- Why did we try Bayesian methods?
 - Bimodal management quantities
 - Distributions of the OFL to produce TAC
- New developments
 - New growth data
 - Comparison of distributions of management quantities from MCMC and MLE methods
- Final thoughts:
 - Hooray growth data
 - we probably don't need to use Bayesian methods next time through.

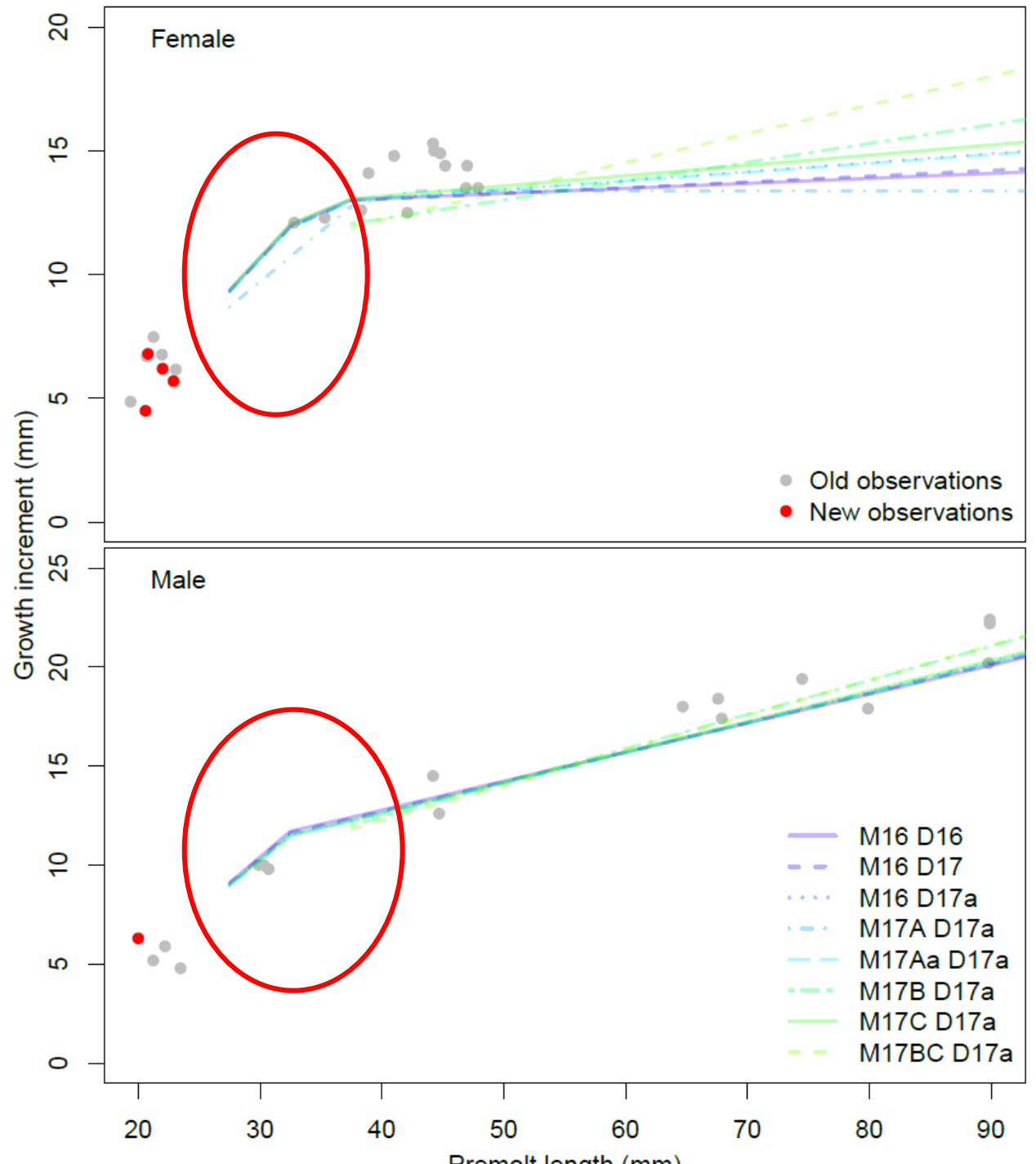
Bimodal management quantities

- Depending on where the model starts, the answer is different at the end.



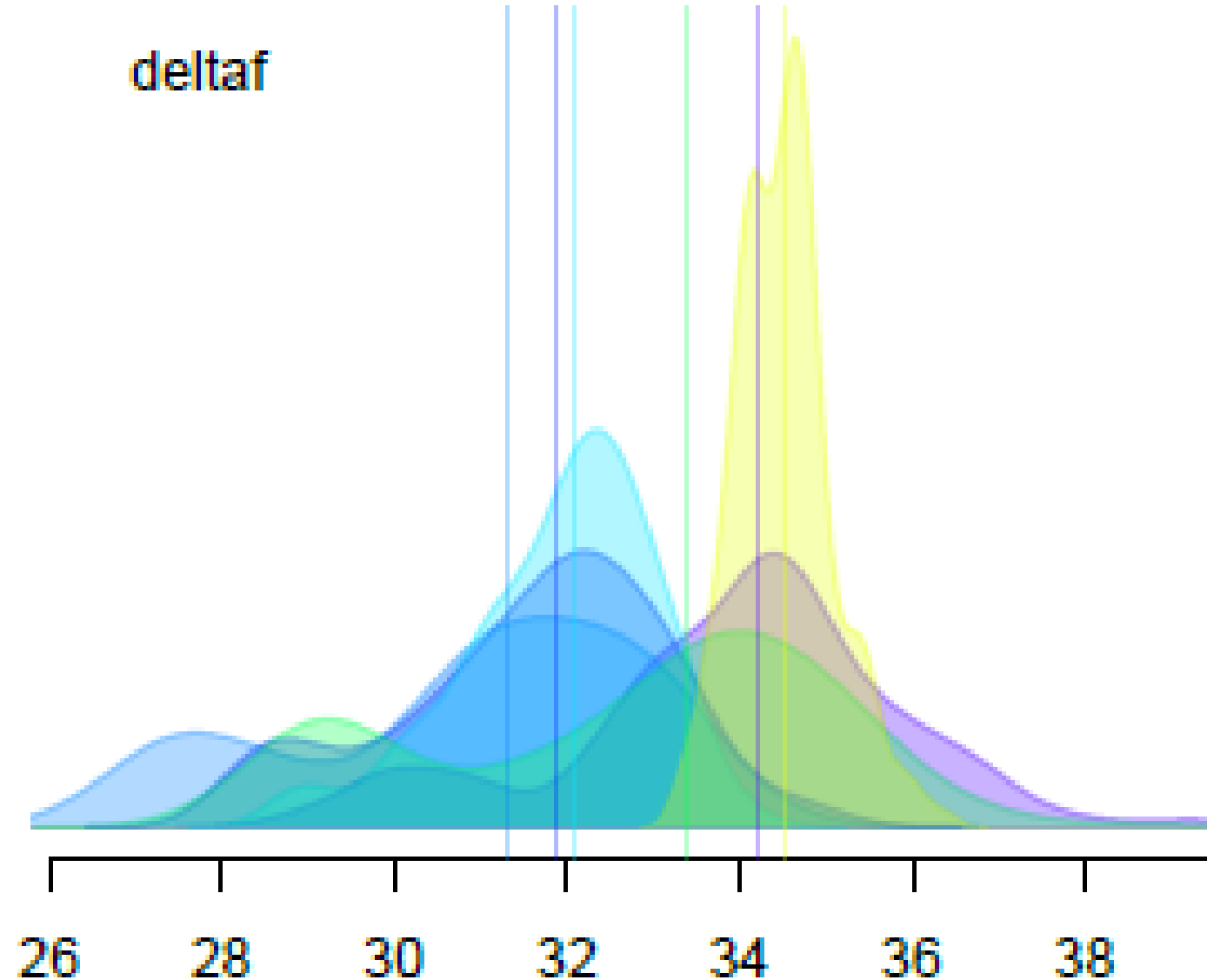
Bimodal management quantities

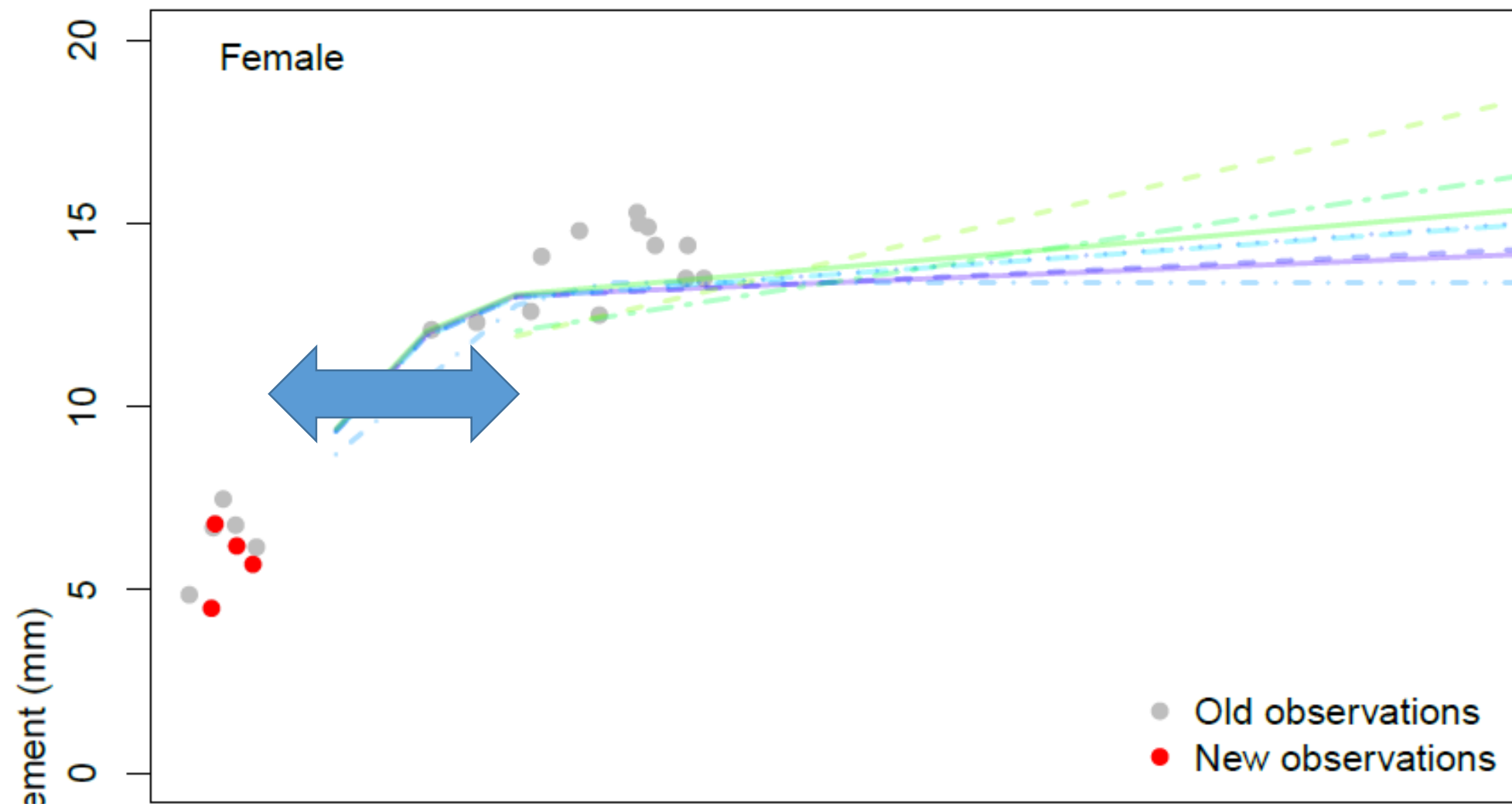
- Depending on where the model starts, the answer is different at the end.
- We tracked the problem to the gap in the growth data and the change point model.

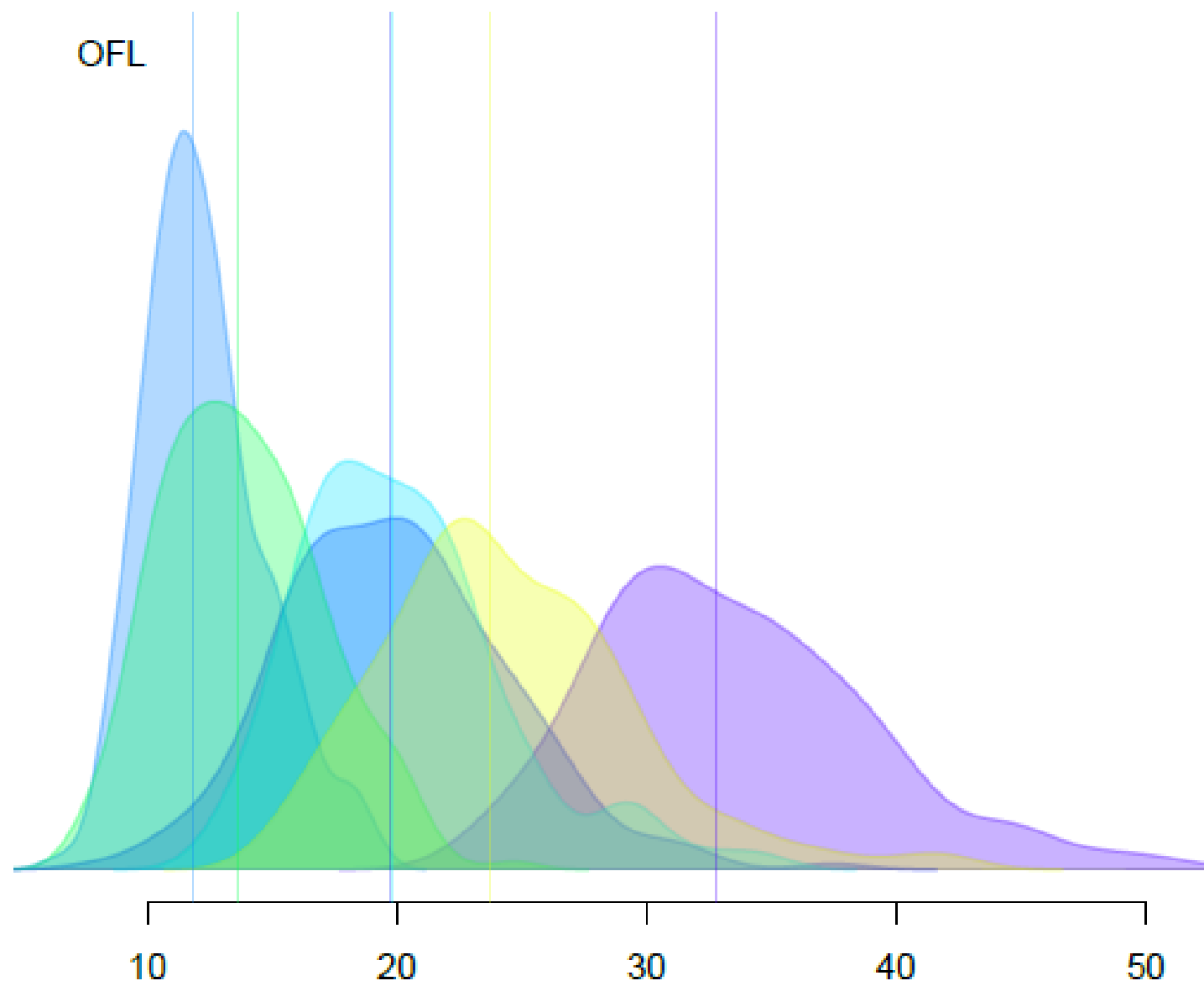


Bimodal management quantities

- Depending on where the model starts, the answer is different at the end.
- We tracked the problem to the gap in the growth data and the change point model.
- Although the model can find a solution, there are other values for the growth parameters that provide similar fits.







Using Bayesian output in management

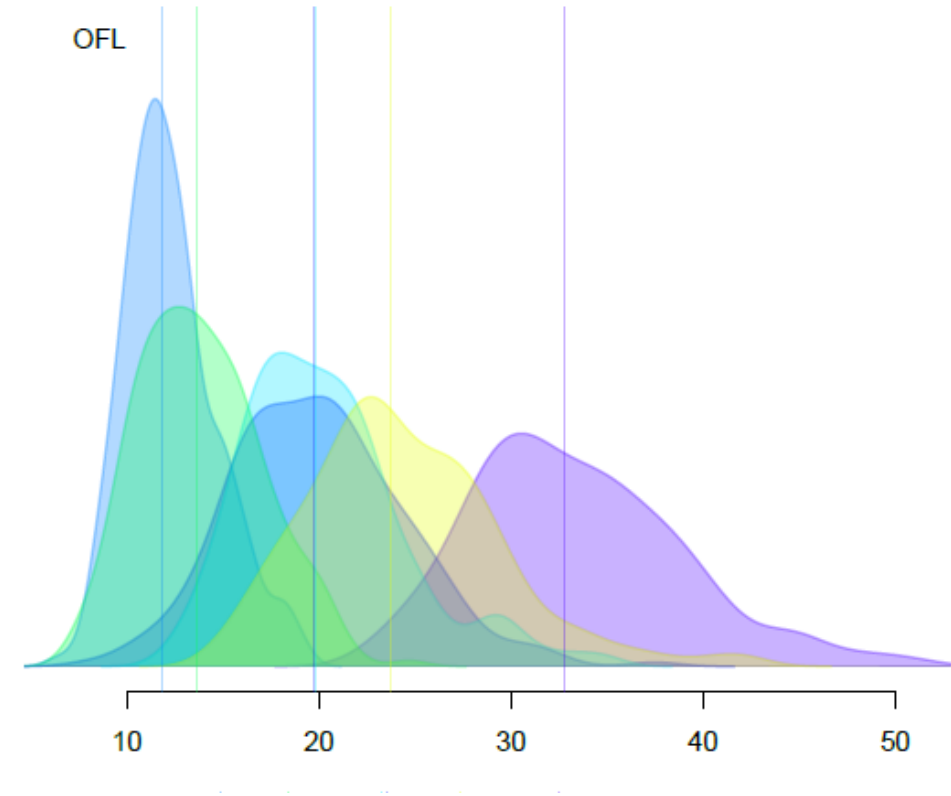
Goal: set a TAC that accounts for scientific uncertainty

Historical methods:

- estimate parameters via ML
- input parameters into projection script
- Input numbers at length for the final year in the projection script with error
- Calculate a distribution of the OFL based on the error added to the numbers at length

Problems with historical methods:

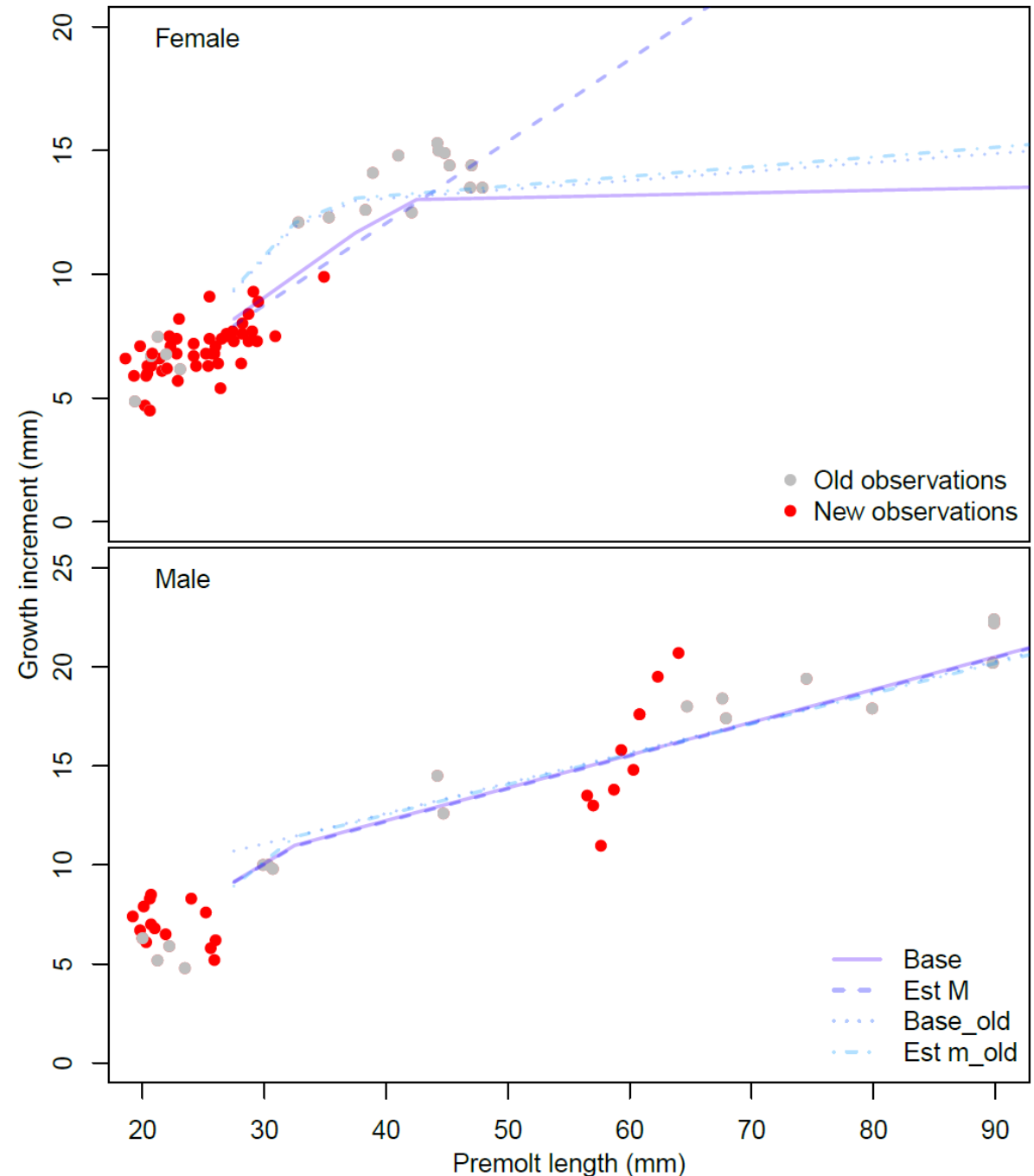
- Parameter values are not perfectly known, but are assumed so.
- Error added to numbers at length is arbitrary, but determines the distribution of the OFL.
- Jittering was required to ensure MLEs were found



Where are we now?

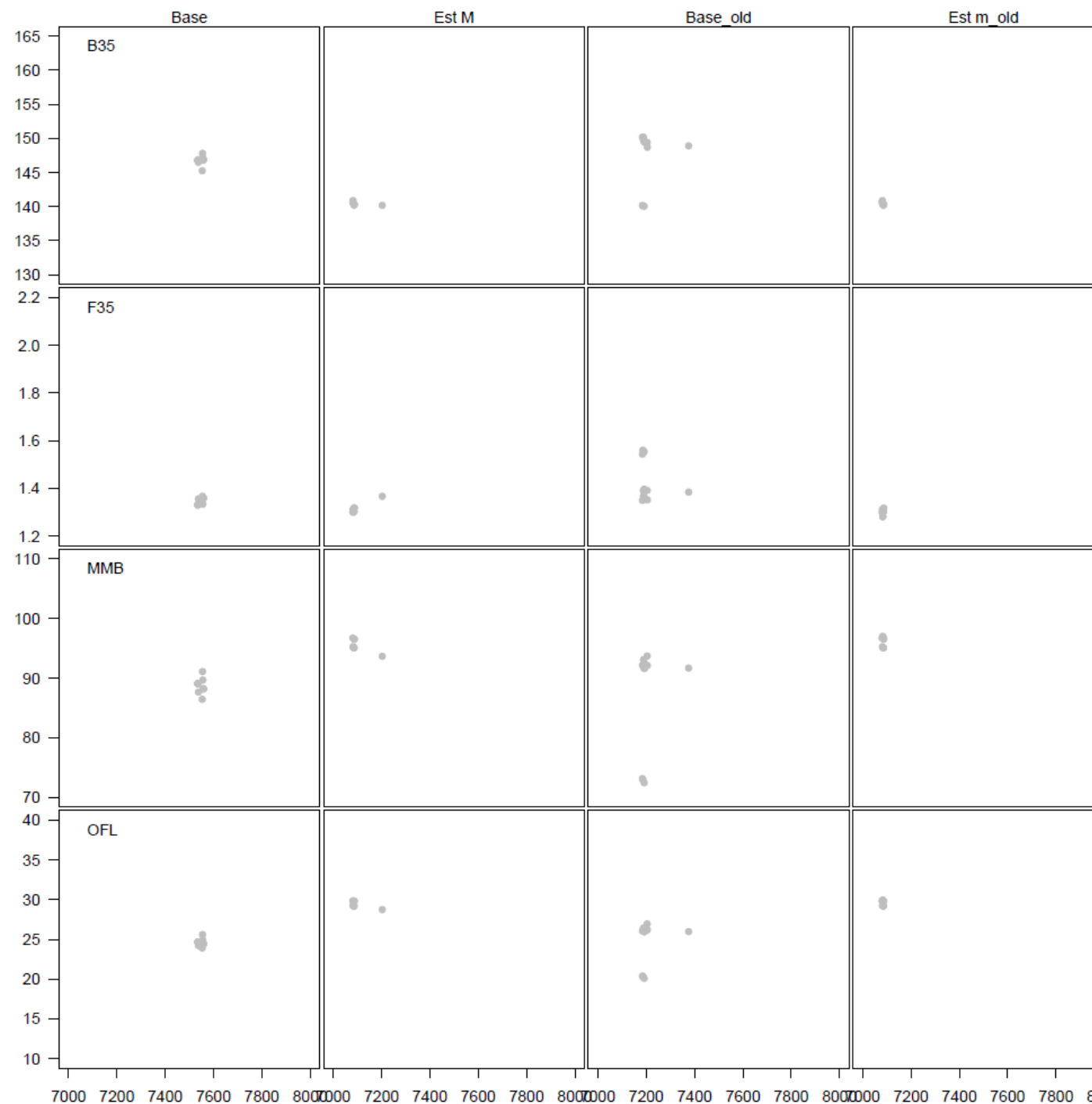
New developments in the snow crab assessment

- New growth data!
- Removes the kink in the female growth curve
- Doesn't change males much
- Still not very much information for change point for males



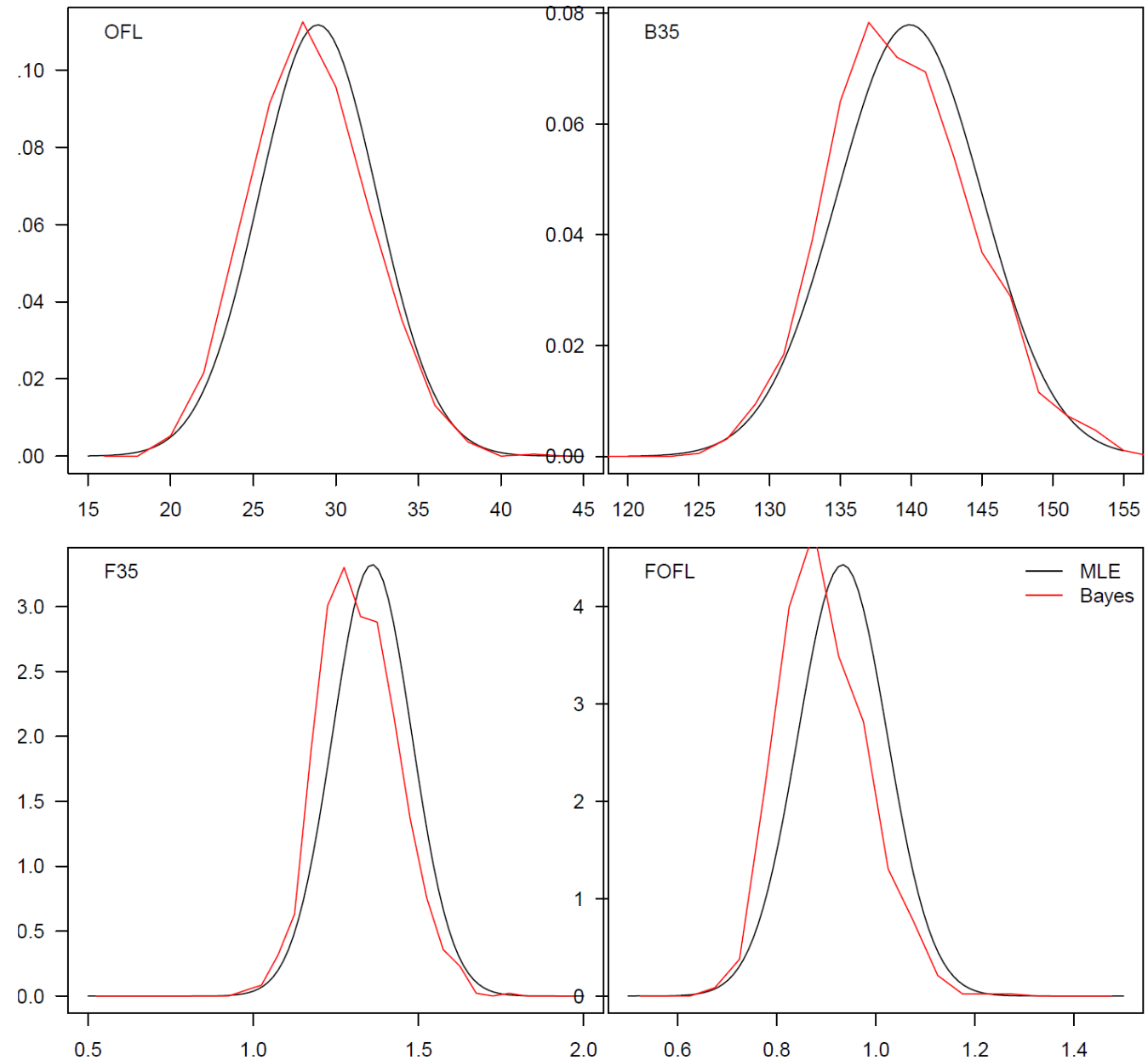
New developments in the snow crab assessment

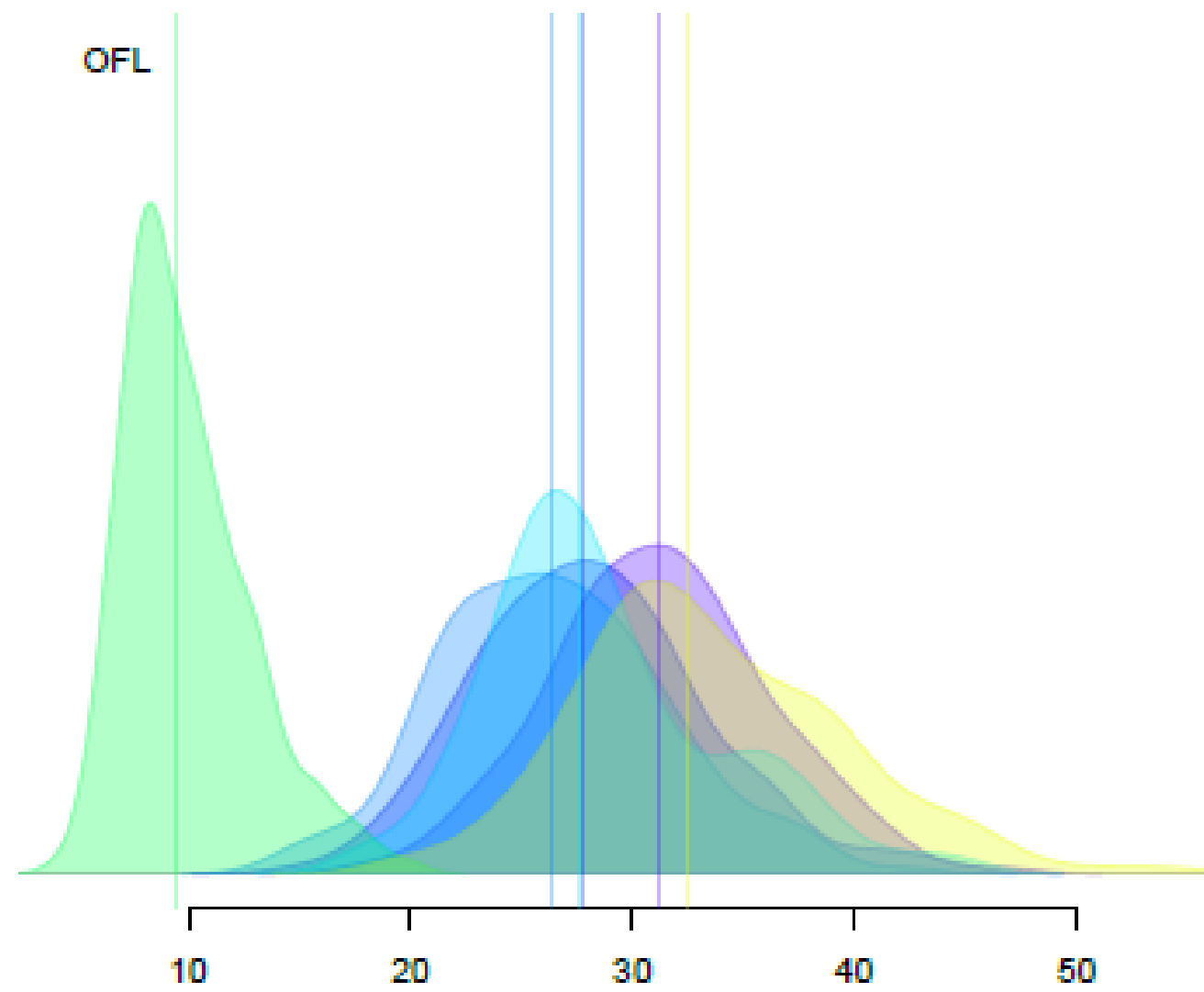
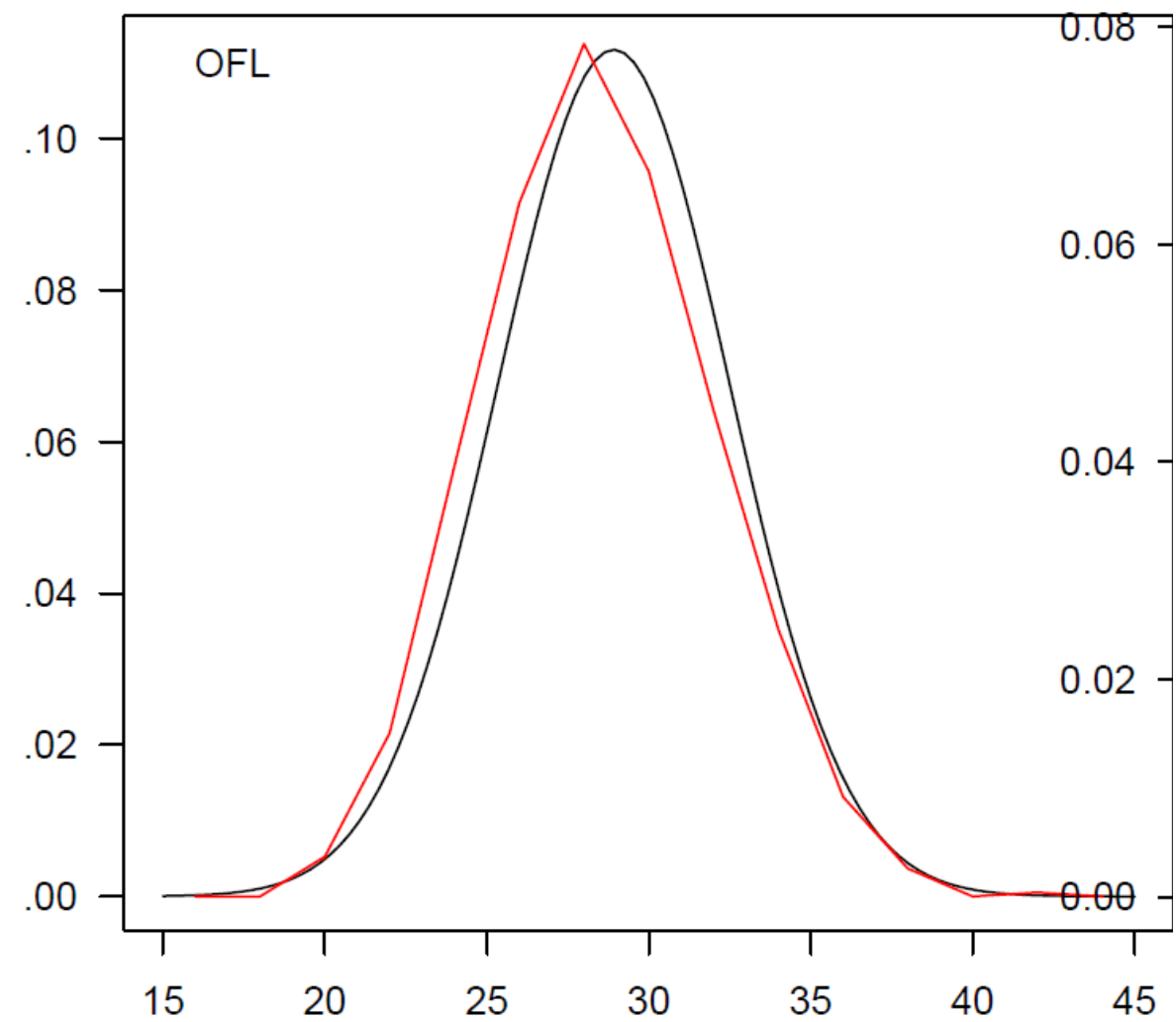
- New growth data!
- Removes the kink in the female growth curve
- Doesn't change males much
- Still not very much information for change point for males
- Bimodality is removed (as seen through jittering) with the addition of the growth data

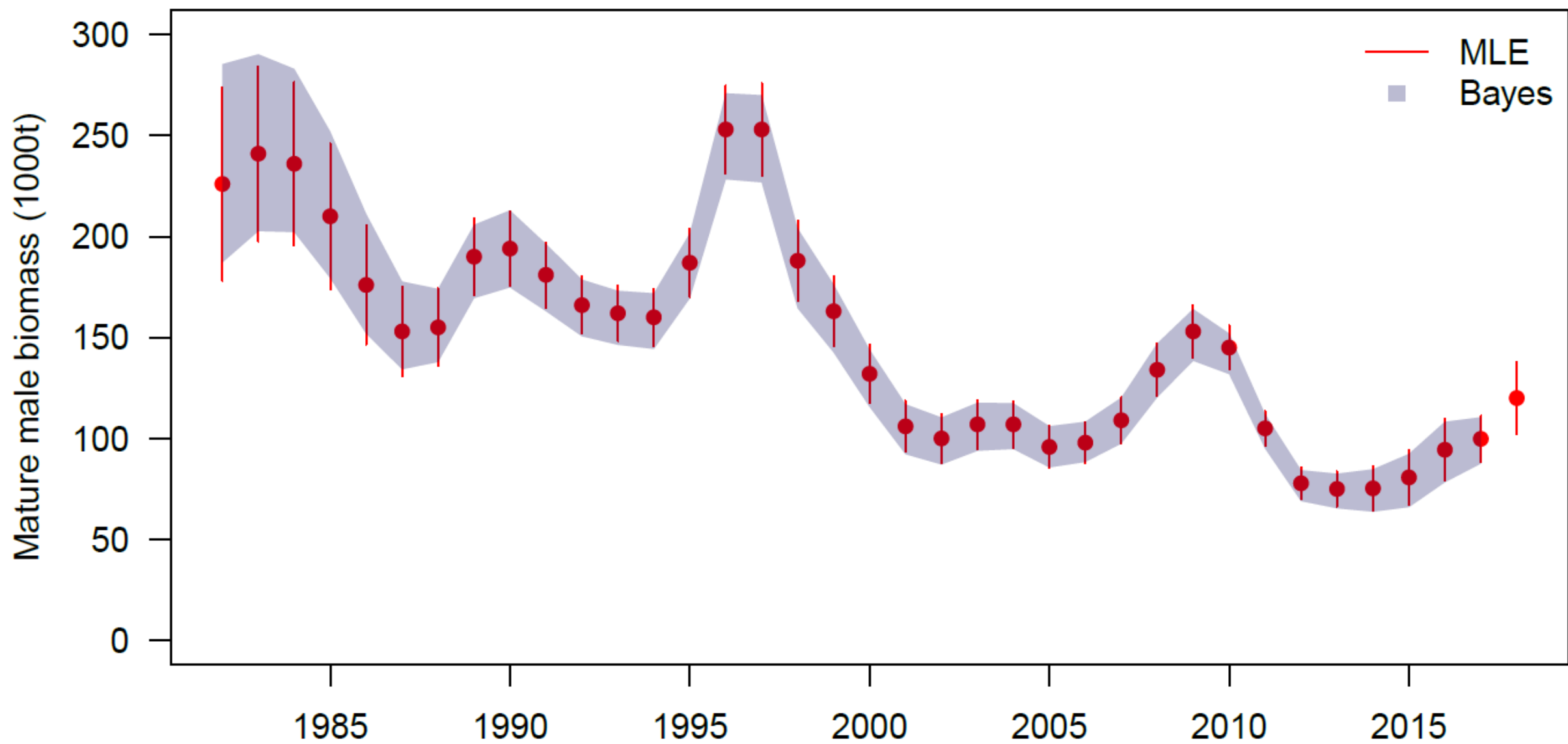


New developments in the snow crab assessment

- TAC: accounting for scientific uncertainty
- The Bayesian methods did this nicely, but it can be done in ML frameworks too.
- Assume normality (i.e. you don't get funky distributions of the OFL)







Closing thoughts

- The problems that pushed me towards Bayesian methods are no longer present in the last chosen snow crab model.
- We should attempt to represent scientific uncertainty based on the data rather than buffers.
- HOORAY FOR MORE GROWTH DATA!