

Finalised assessment of South African round herring, using data from 1987 to 2021

Small Pelagic Scientific Working Group
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Stock Assessment of Round Herring

- A quantitative stock assessment was attempted in 2010, but the model did not provide an adequate fit to the data
- Initial results for feedback - FISHERIES/2022/AUG/SWG-PEL/21
- With thanks to the RH TG!

Stock Assessment of Round Herring

- All landings west of Cape Agulhas
- Some base case assumptions
 - Single panmictic stock (RH_{west})
 - Multiple cohorts (Prolonged spawning season; two/three peak periods of spawning)
 - Maturity ogive based on data from males+females+juveniles
 - M selected from a grid (RH_{M1} , RH_{M2})

Stock Assessment of Round Herring

- M selected from a grid (RH_{M1} , RH_{M2})
- RH_{M3} estimates M_a , fitting to proportion of numbers-at-age in Nov 2005

+ 0.5/0.9

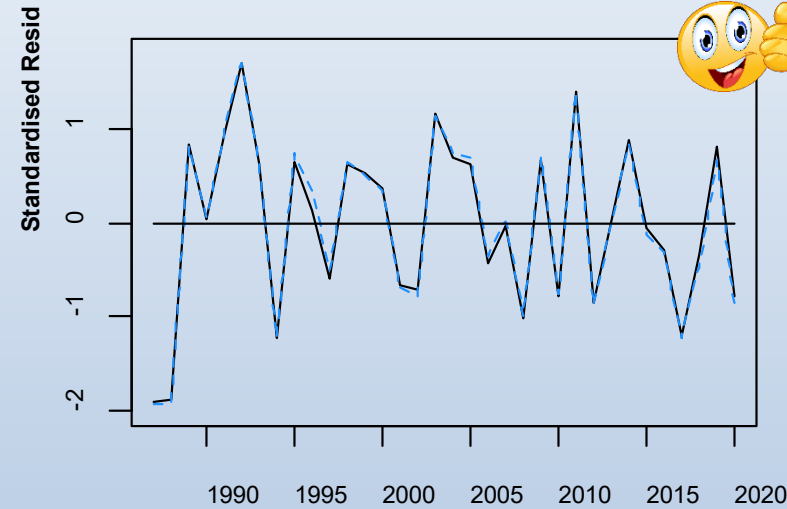
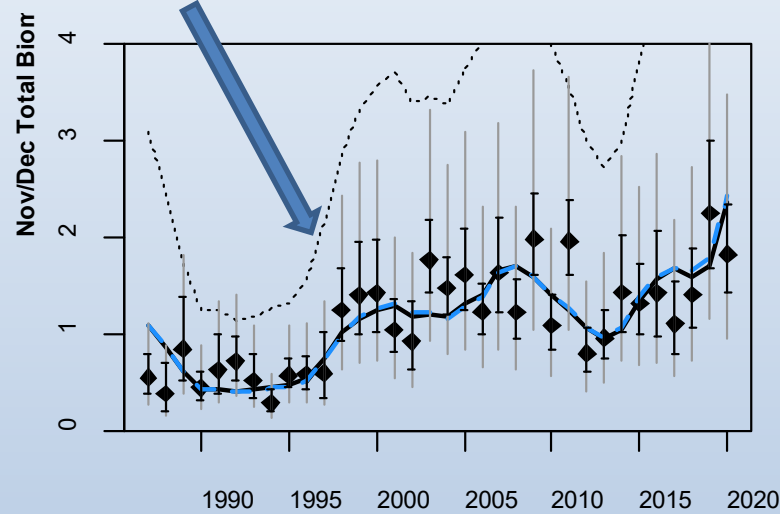
M_0	M_1	M_{2-4} / M_{5+}					
		0.5 / 0.5	0.7 / 0.5	0.7 / 0.7	0.9 / 0.5	0.9 / 0.7	0.9 / 0.9
0.5	0.5	-3019.8					+
0.7	0.5	-3018.8					
	0.7	-3017.0	-3016.2	-3015.8			
0.9	0.5	-3018.1					
	0.7	-3016.4	-3015.7	-3015.2			
	0.9	-3014.0	-3013.0	-3012.4	-3011.8	-3011.1	-3010.2

November/December Survey

Insensitive to underestimation of pre-2000 biomass (RH_{sur1})

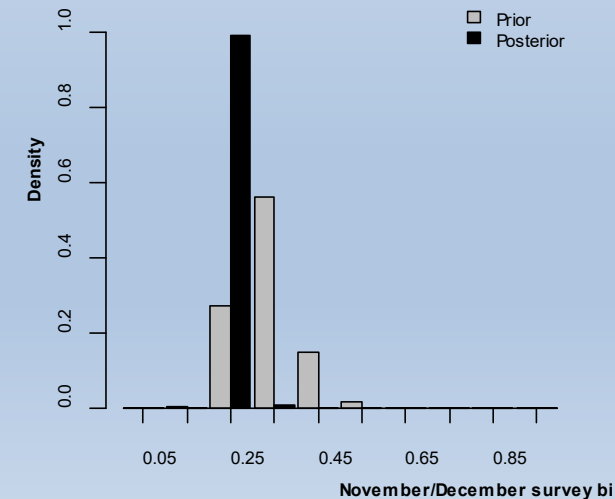
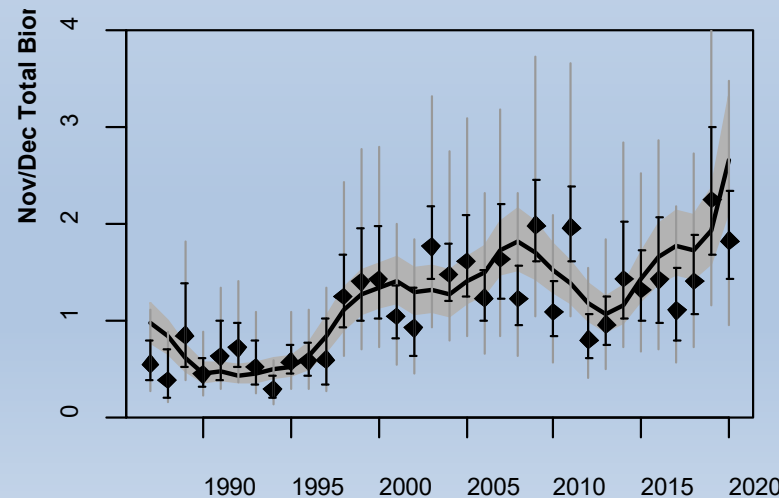
Additional imprecision in early surveys (RH_{sur2}) – better fit to comm data

True biomass



Model prefers even more bias (RH_k)

Model does not reflect relatively large inter-annual increases / decreases in B (additional variance)

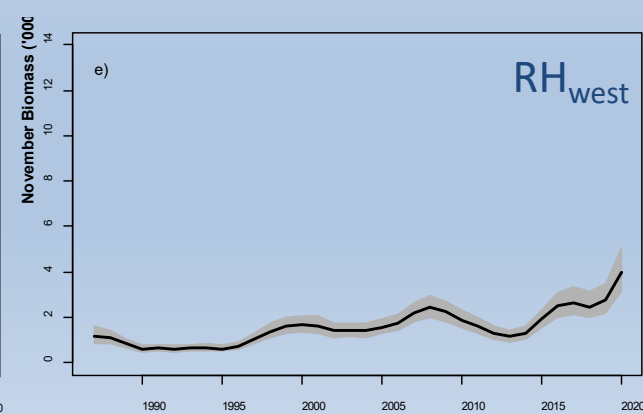
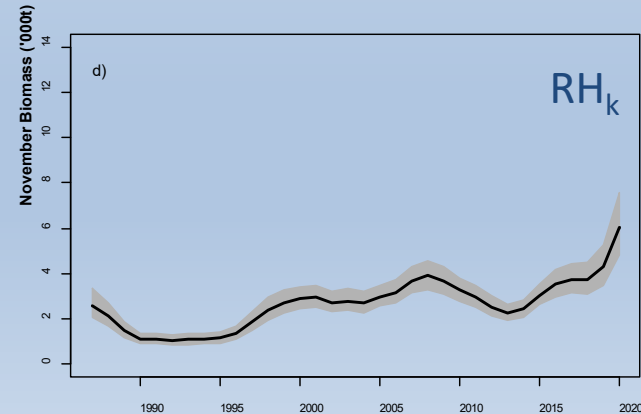
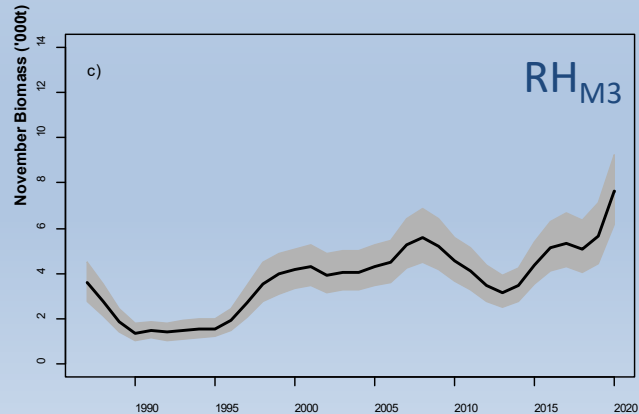
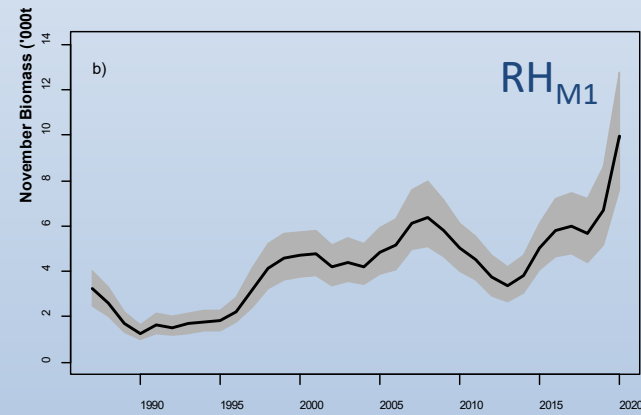
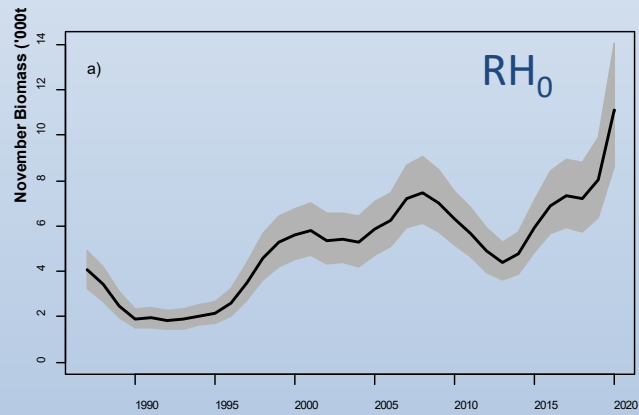


* New *

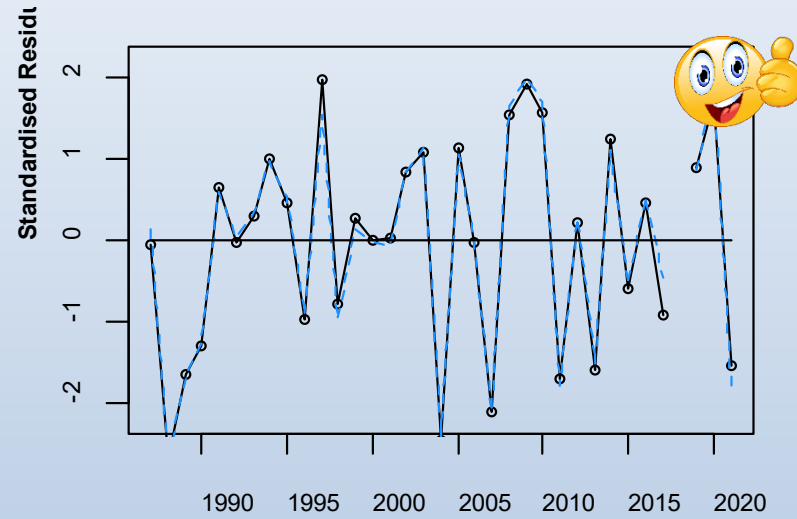
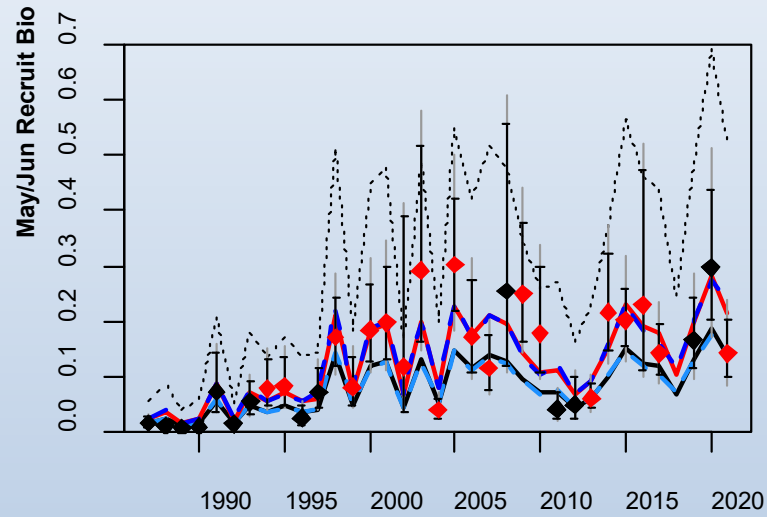
Survey assumed 15th Nov

November/December Survey

True biomass



May/June Survey



Model prefers even more bias (RH_k)

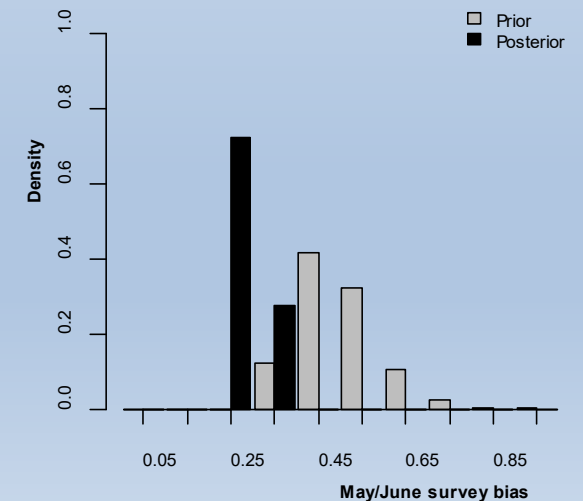
* New *

Recruit biomass up to Cape St. Francis

Recruit biomass up to Cape Infanta

Model estimate recruit biomass uses cut-off length

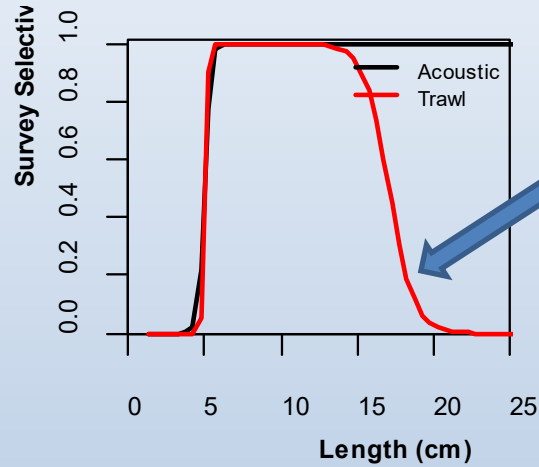
Beta prior on k_{CSF}



Survey Selectivity

* New *

Same selectivity for both surveys



Net avoidance by faster swimming fish

+ logistic trawl selectivity test

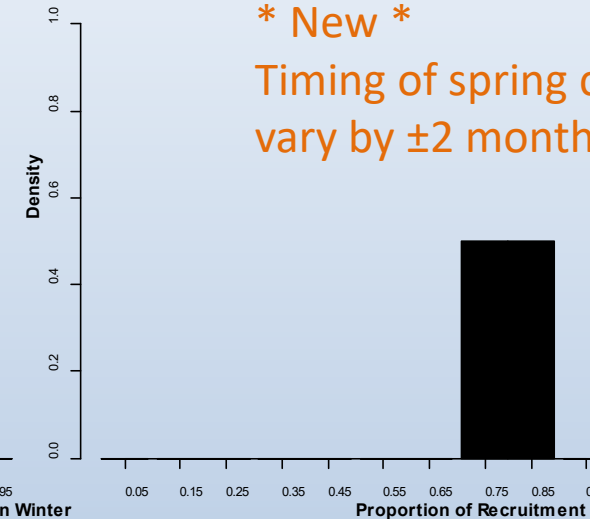
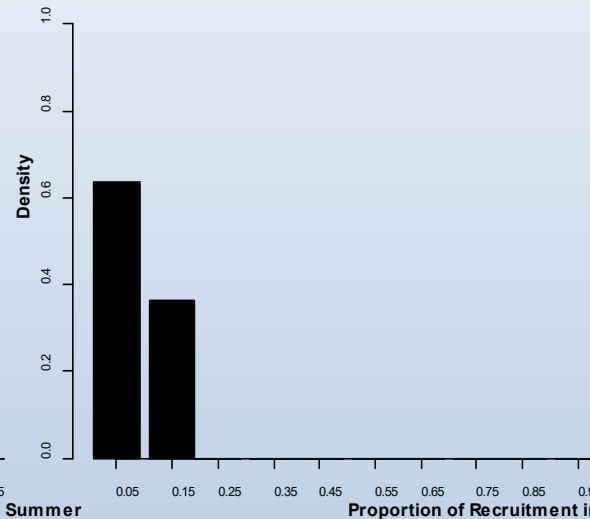
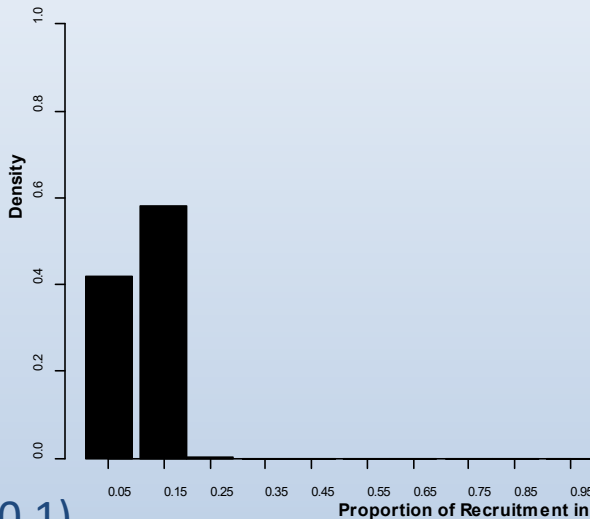
Three Cohorts

$$p_3 = (1 - p_1 - p_2)$$

RH_p :

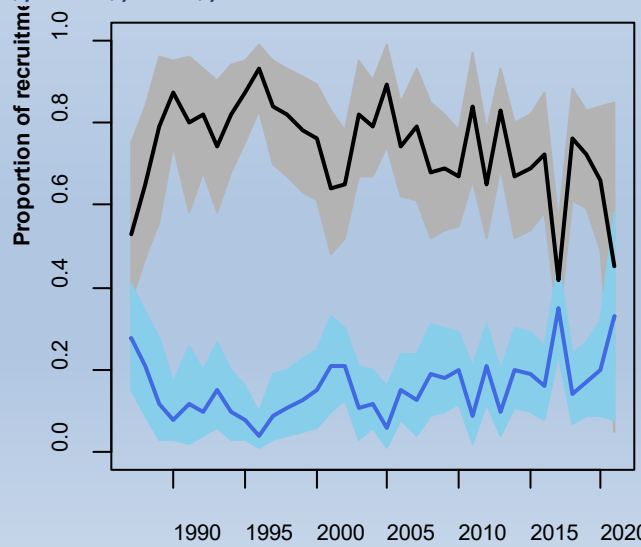
$$p_{3,y} \sim U(0,1)$$

$$p_{1,y} / (p_{1,y} + p_{2,y}) \sim U(0,1)$$

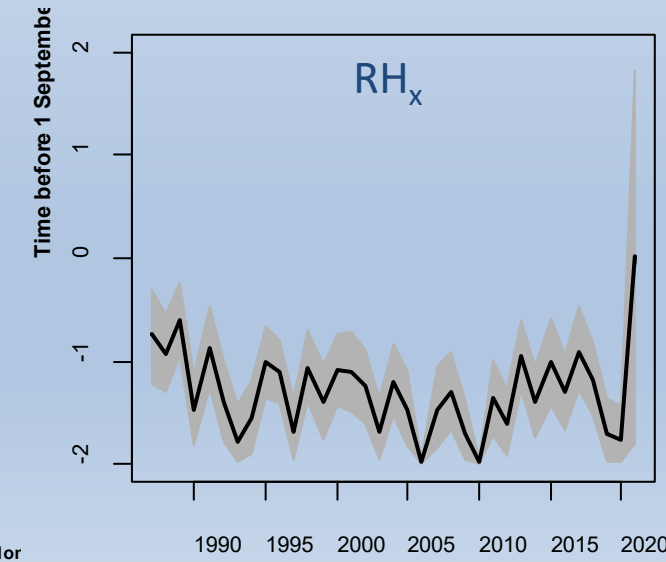
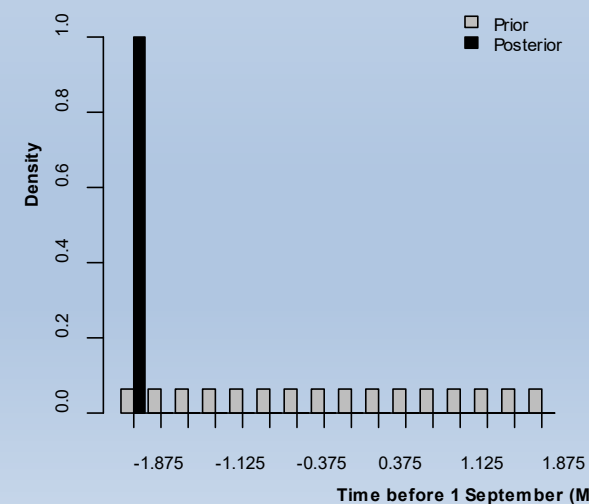


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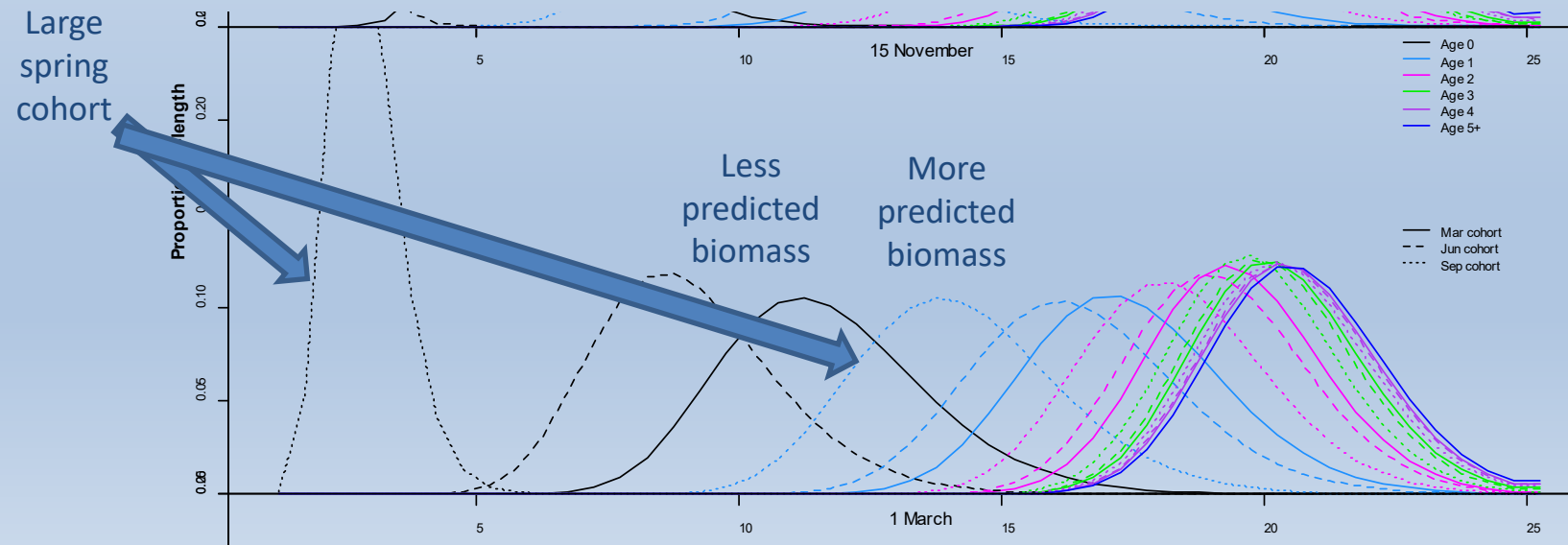
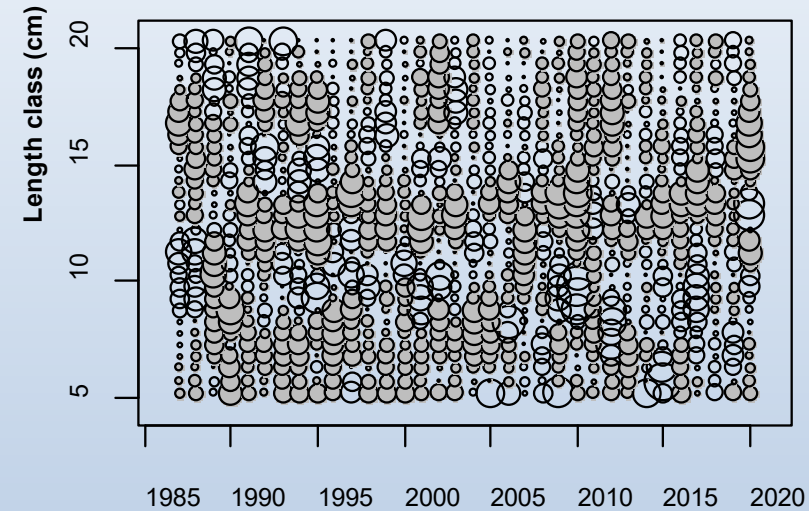
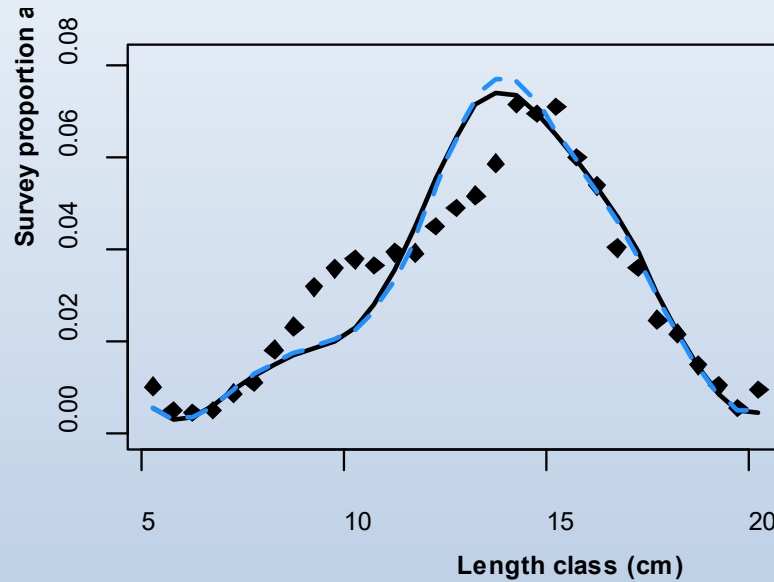
Timing of spring cohort estimated to vary by ± 2 months



Both these sensitivity tests were selected to investigate in an improved fit to the May/June prop@length could be obtained

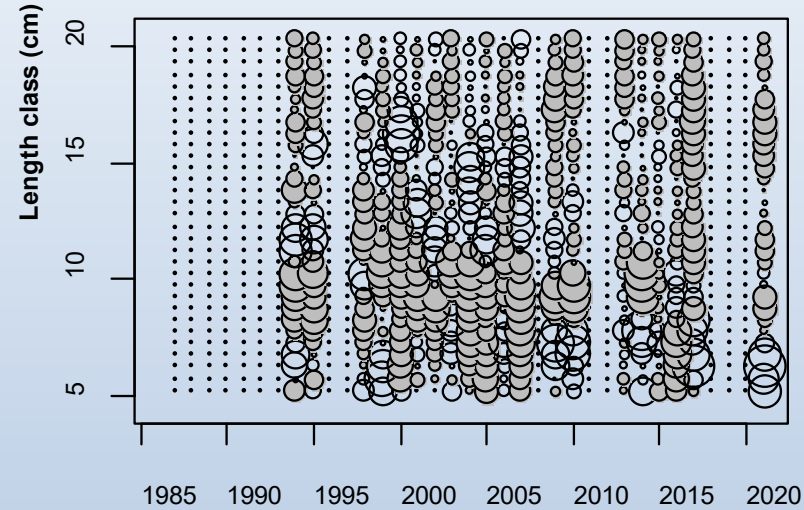
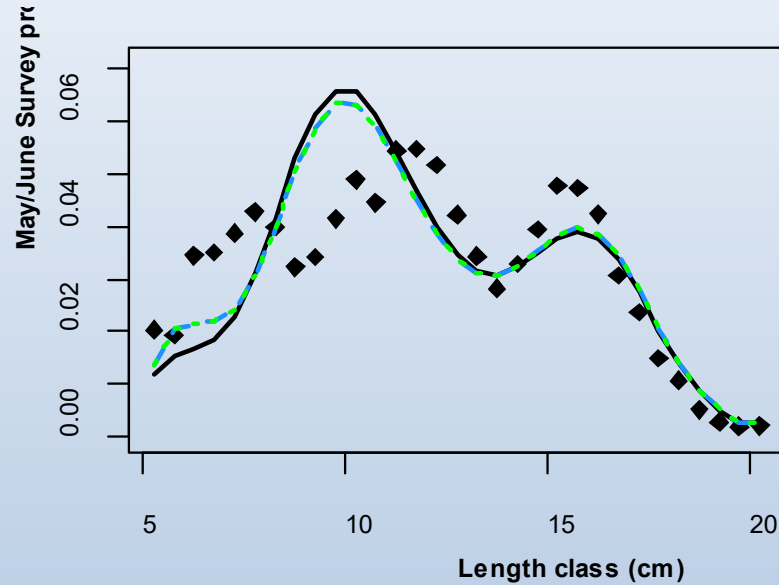


November/December Survey Prop@Length

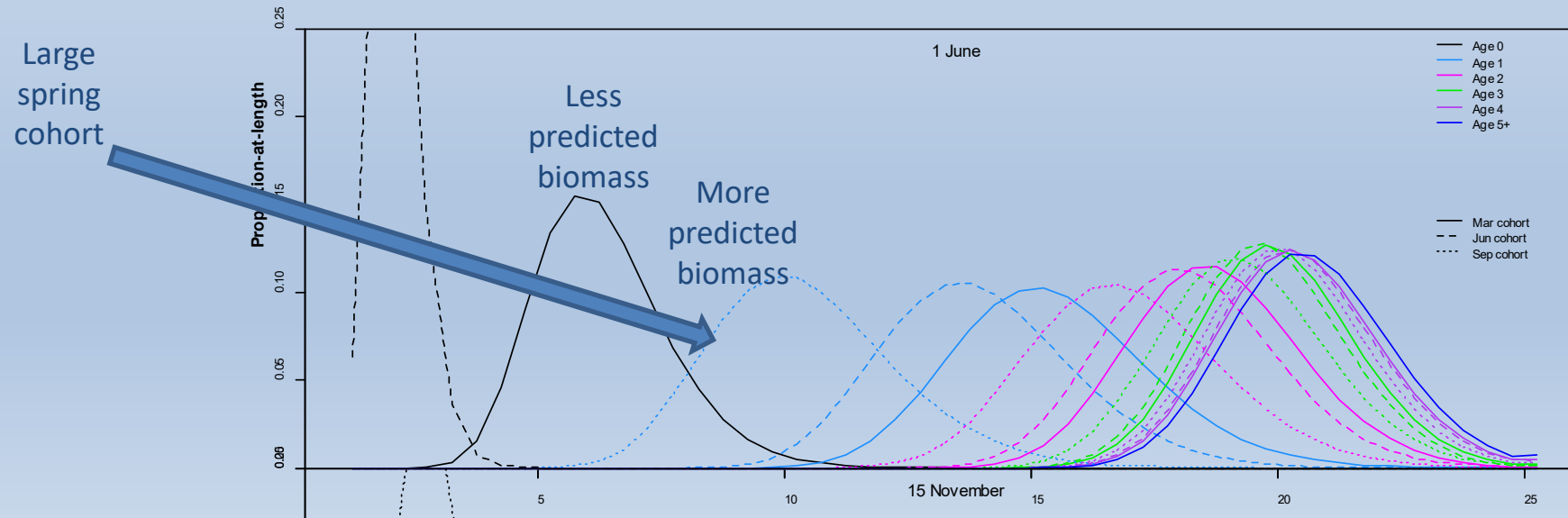


*** New ***
Priors on sigma
Sigma within year is linear interpolation
(Most observations <23cm)

May/June Survey Prop@Length

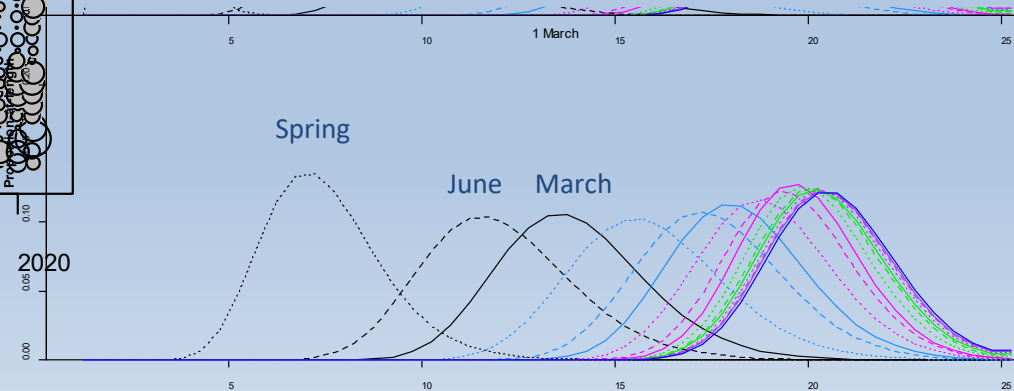
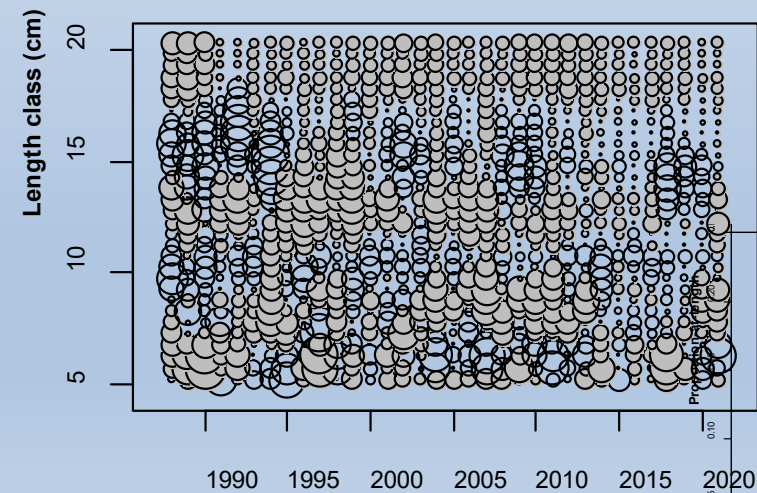
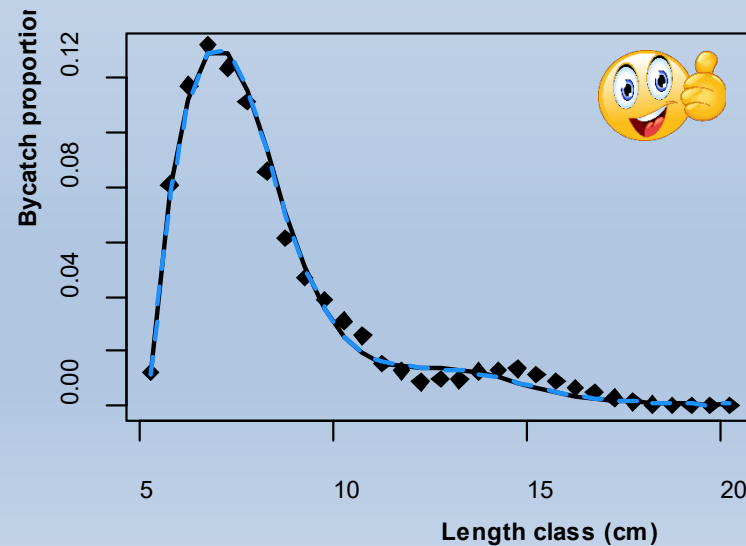
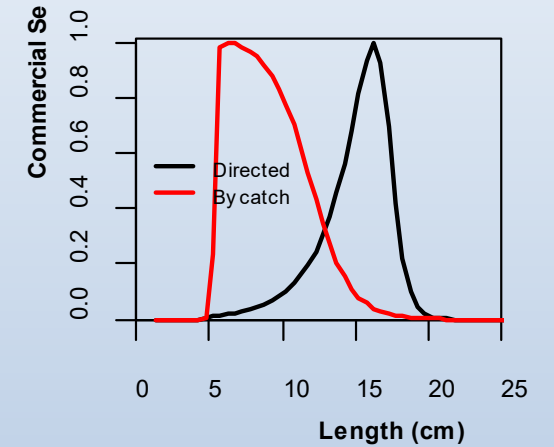
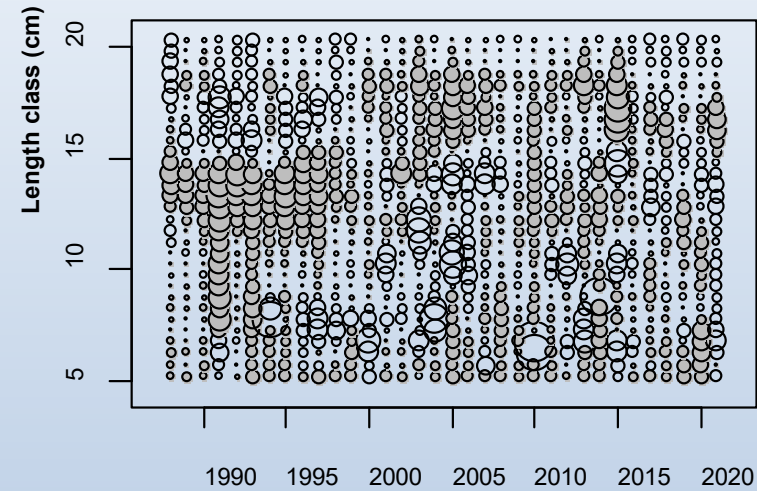
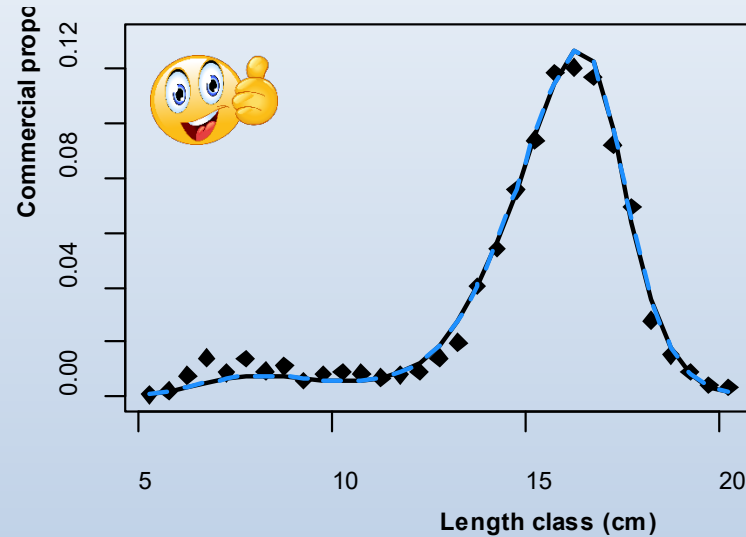


*** New ***
Data up to Cape St. Francis in
years for which available

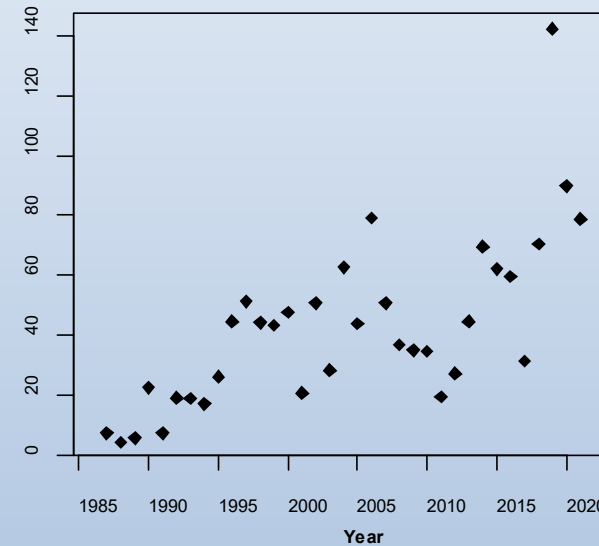
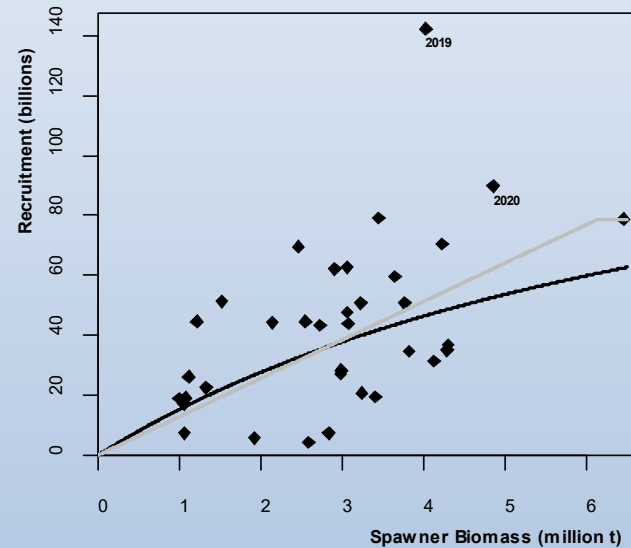


Sensitivity tests indicate
there may be some
conflict between fitting
bycatch and May/June
survey prop@length

Commercial Prop@Length



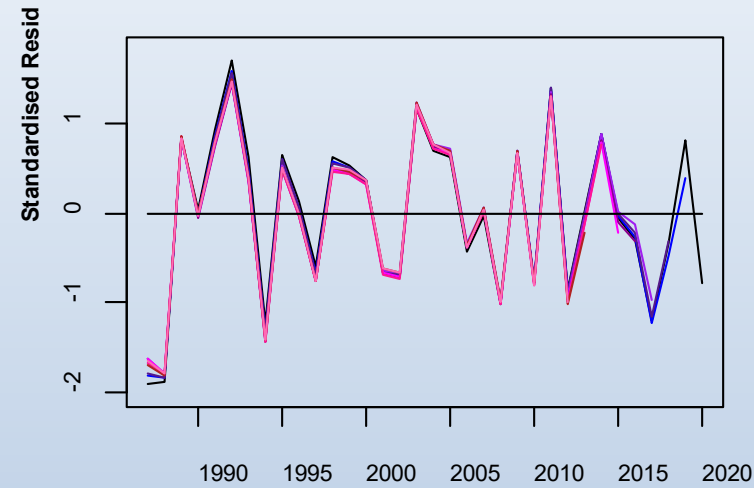
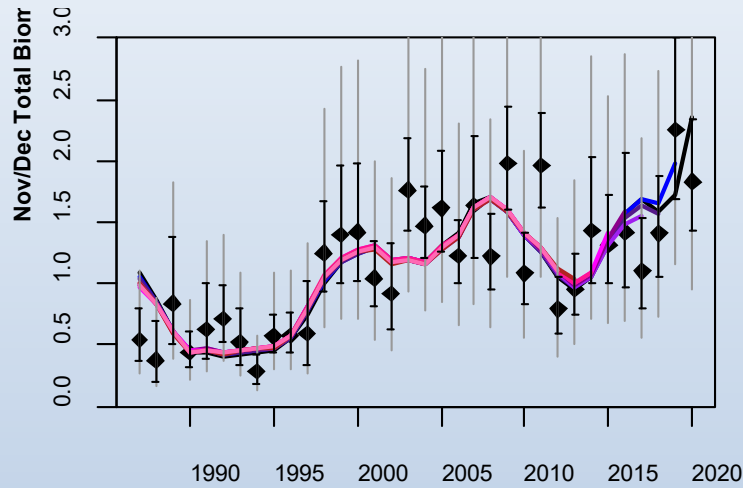
Recruitment



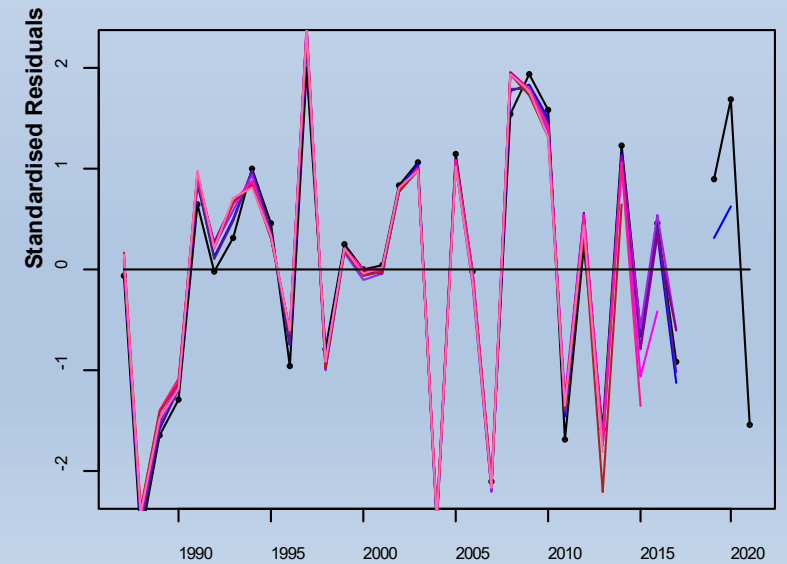
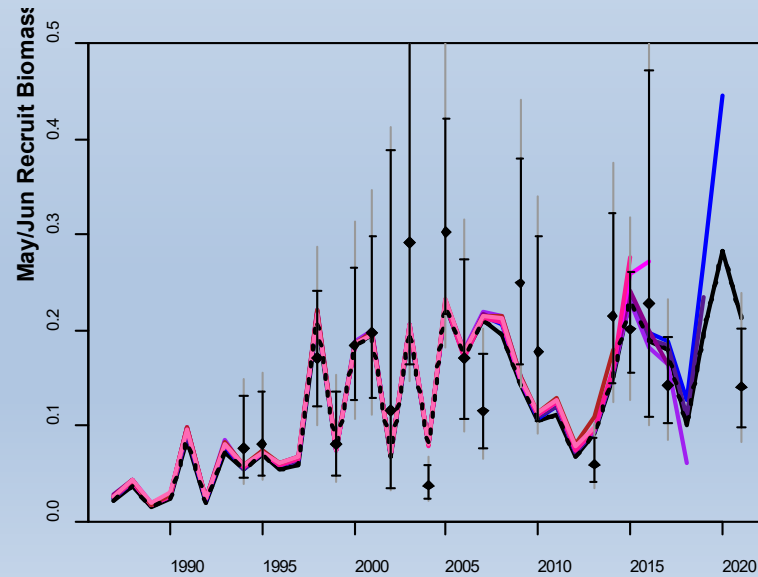
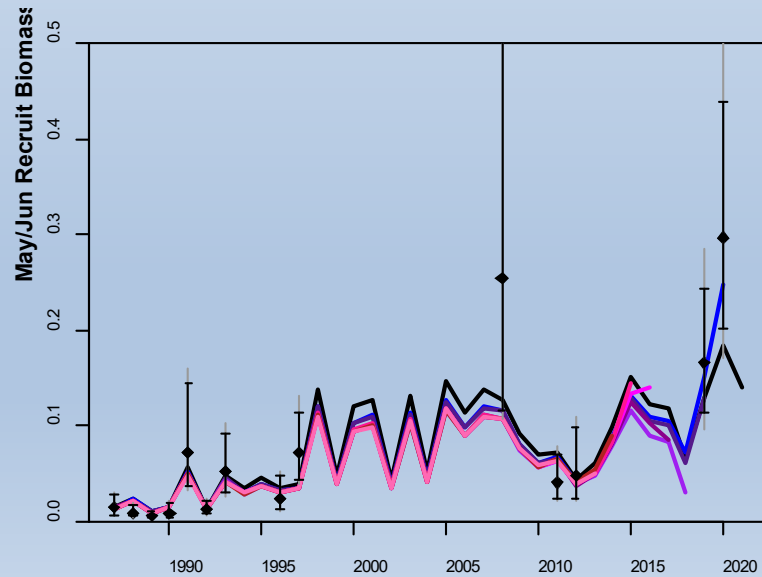
* New *
Prior for recruitment in final
year based on average of
previous 5 years

No SR relationship assumed within the model
Possible that recruitment has been more influenced by changes in
'regimes' over time than SSB

Retrospective Analysis



Some potential to over/under-estimate biomass/recruitment in final year



Summary

- First reliable quantitative stock assessment
- Never perfect
- Impact of missing Nov/Dec 2021 survey – prudent to wait until June 2024 rather than June 2023 (only 1 survey since break) before running updated assessment?
- Time next assessment to inform OM of MSE (after sardine/anchovy MSE)
- Any very-short term work (e.g. additional sensitivity tests, ‘basic’ dynamic B_0)?