



NIWA

Taihoror Nukurangi

2019 hake stock assessment in West Coast of the South Island (HAK 7) project HAK2018-01

Vidette McGregor, Matt Dunn, Marco Kienzle
9 May 2019

This presentation is not for publication, release or quotation in any form without prior written approval from the MPI Principal Adviser Fisheries Science and the author

Overview

CPUE model:

Checked YCS free years – ‘seen’ at least 3 times

Changed double normal ogives to logistic

For the survey model:

Fix age data for 2016

Cut out ages 1 and 2 - then rescaled to 1

Put in new survey biomass index - revised biomass index for trawl survey without small fish - to be good to use with the run dropping ages 1 and 2 (cut-off was 53 cm). CORE and ALL versions.

Checked YCS free years – ‘seen’ at least 3 times

Reweighting composition data sample sizes using Francis re-weighting method. Compared initial sample sizes using number of fish aged, number of fish measured, number of tows from which fish were aged

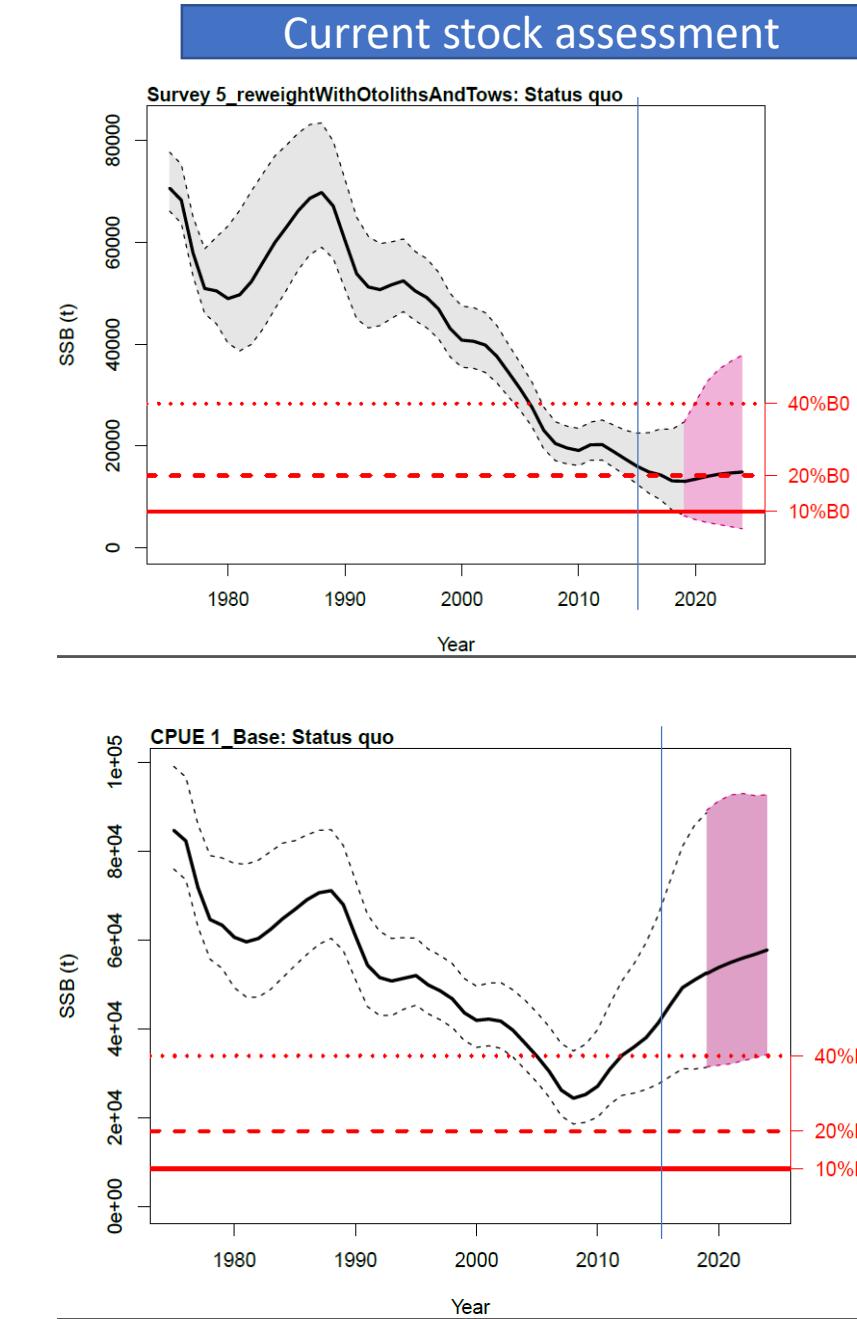
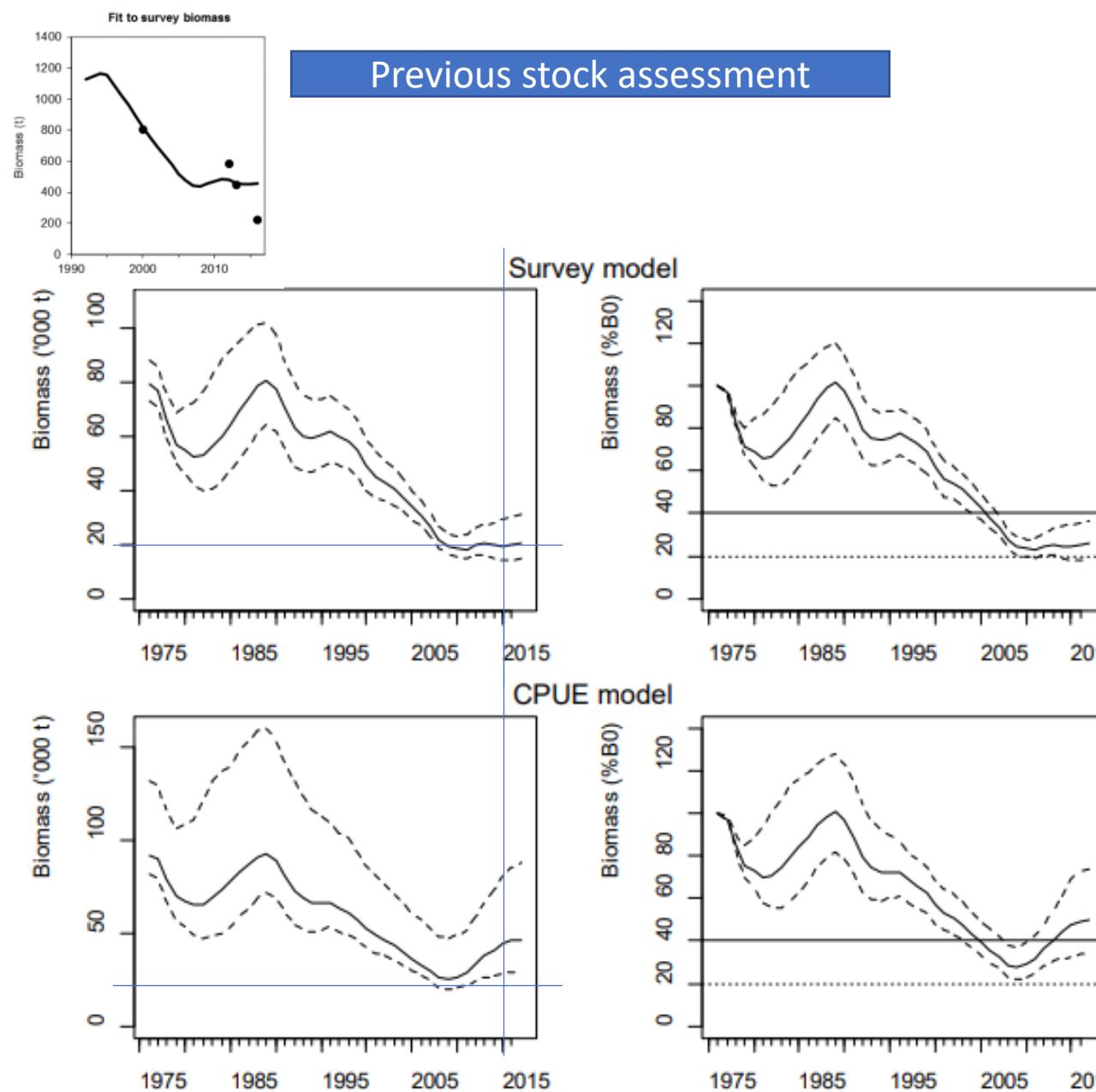
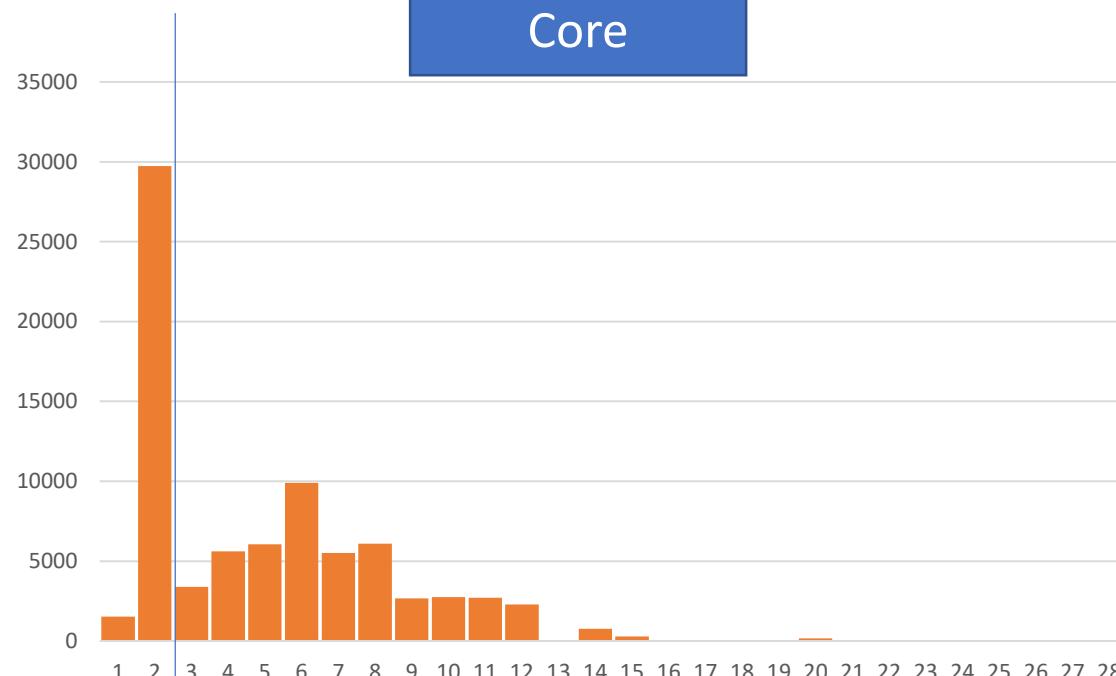


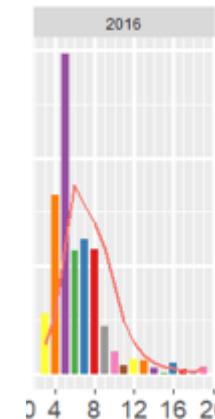
Figure 9: Estimated median trajectories (with 95% credible intervals shown as dashed lines) for the WCSI stock 'survey' and 'CPUE' models for absolute biomass and biomass as a percentage of B_0 . The management target (40% B_0 , solid horizontal line) and soft limit (20% B_0 , dotted horizontal line) are shown on the right-hand panel.

Catch-at-age data for 2016

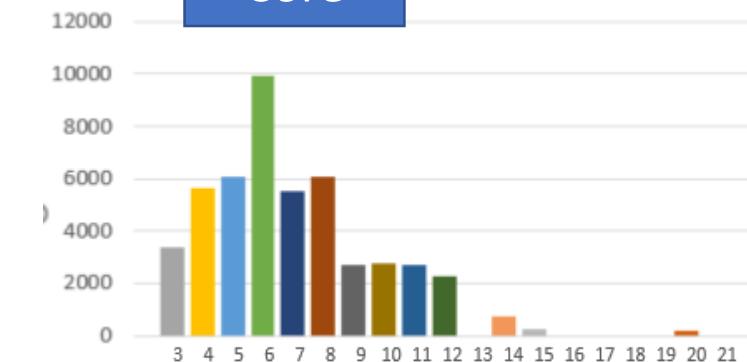
Core



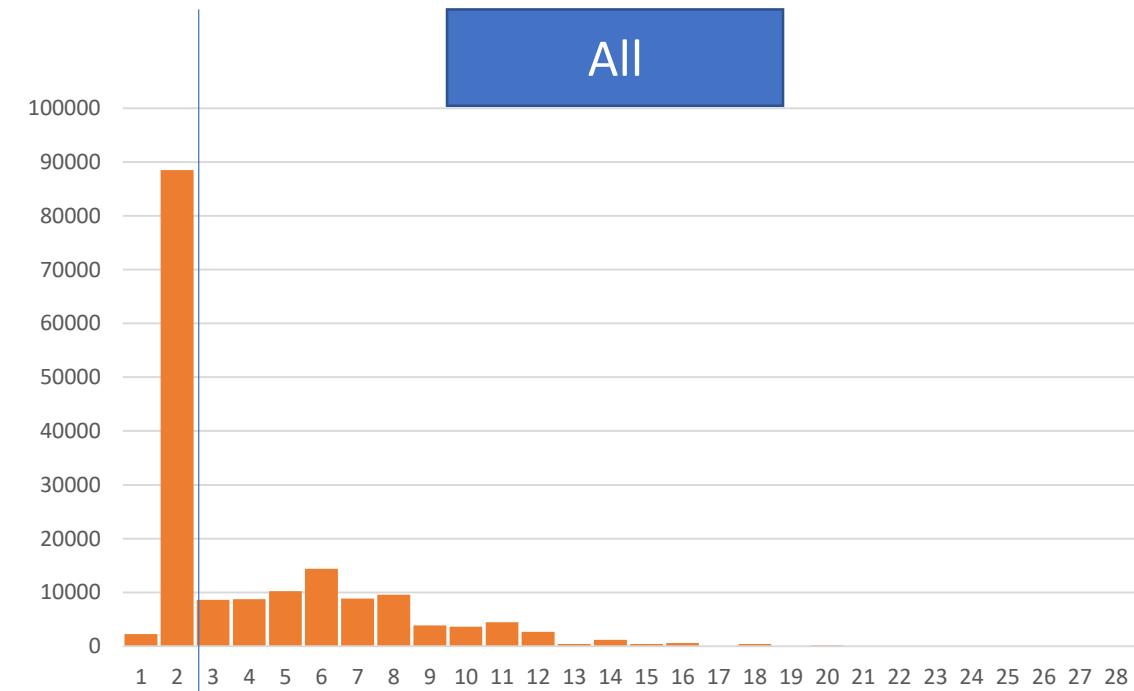
Previous



Core



All



Biomass (fish > 53 cm, to exclude fish less than 3 years old)

	Survey biomass estimates, in tonnes, with CV				
	Survey core areas		Survey all areas		
Year	Previous	New	Previous	New	
2000	803 (0.134)	802 (0.134)			
2012	583 (0.128)	579 (0.129)	1103 (0.13)	1096 (0.131)	
2013	331 (0.174)	328 (0.174)	747 (0.213)	740 (0.215)	
2016	221 (0.239)	208 (0.247)	355 (0.161)	316 (0.176)	
2018	229 (0.326)	227 (0.330)	559 (0.176)	549 (0.178)	

Core: check

	Proportion of weight <3	Proportion of numbers <3
2018	0.0134	0.1166
2016	0.0688	0.3931
2013	0.0039	0.1402
2012	0.0022	0.0253
2000	0.0004	0.0108

YCS – check 3 years of observations for each estimated year class

Recruited in 2015 at age 1:

3 years old in 2017 (x1 observation)

4 years old in 2018 (x2 observations)

have 2 observations in 2018 (survey and fishery), and one in 2017 (fishery)

Minimum age observed:

3 years old

Maximum age observed:

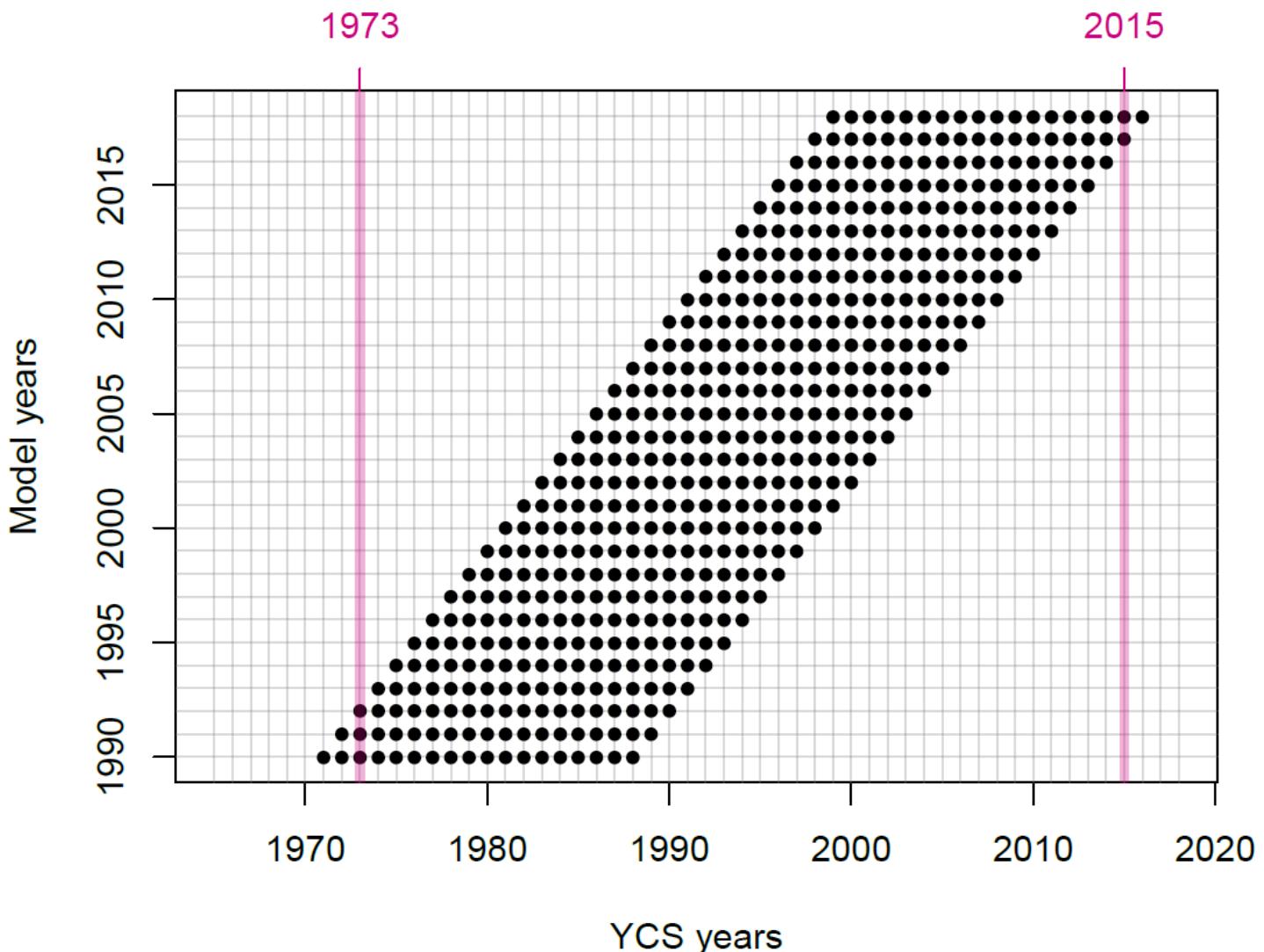
19 years (+ year)

First free year:

1974

gives 3 observations that are continuous and not '+' years

CPUE version has 1974-2014 free



Re-weighted sample sizes – Tangaroa Survey

	CORE strata					ALL strata				
	Previous starting values	Number of fish aged	Number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	NA	NA	NA	NA	NA
2000	279	26	255	23	36	9	333	14	NA	NA
2012	235	22	332	30	36	9	433	19	433	47
2013	139	13	371	33	34	9	457	20	457	48
2016	48	4	210	19	17	4	129	6	129	14
2018	42	4	277	25	15	4	151	7	151	16

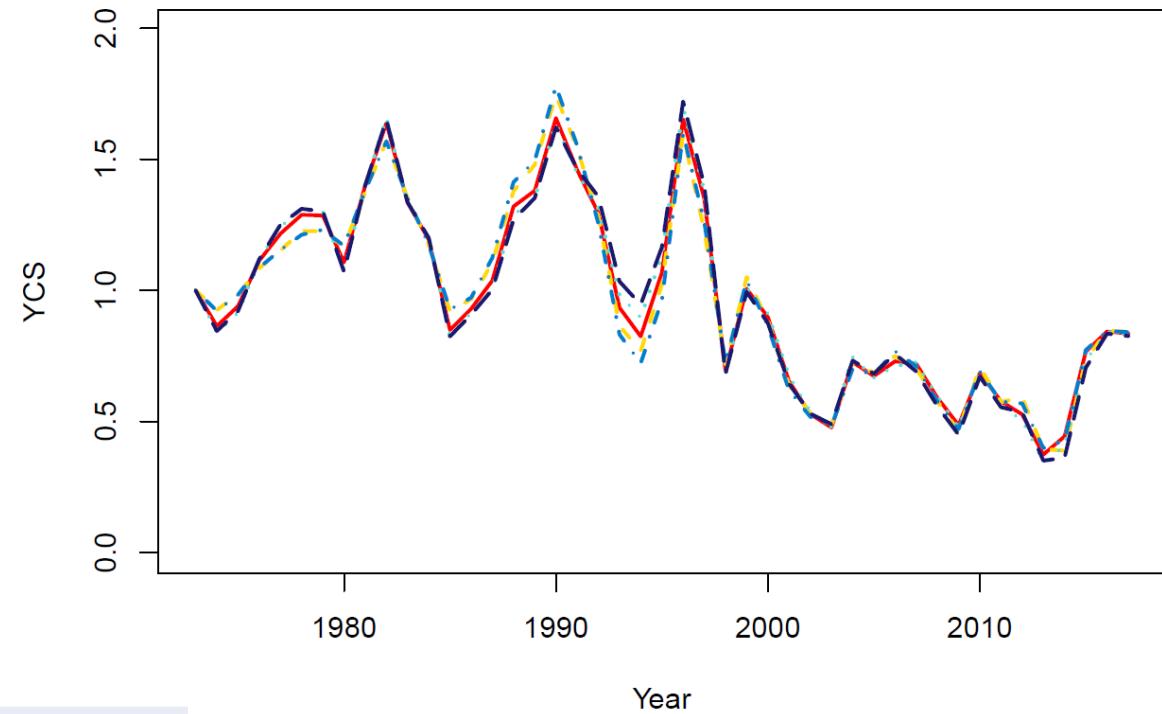
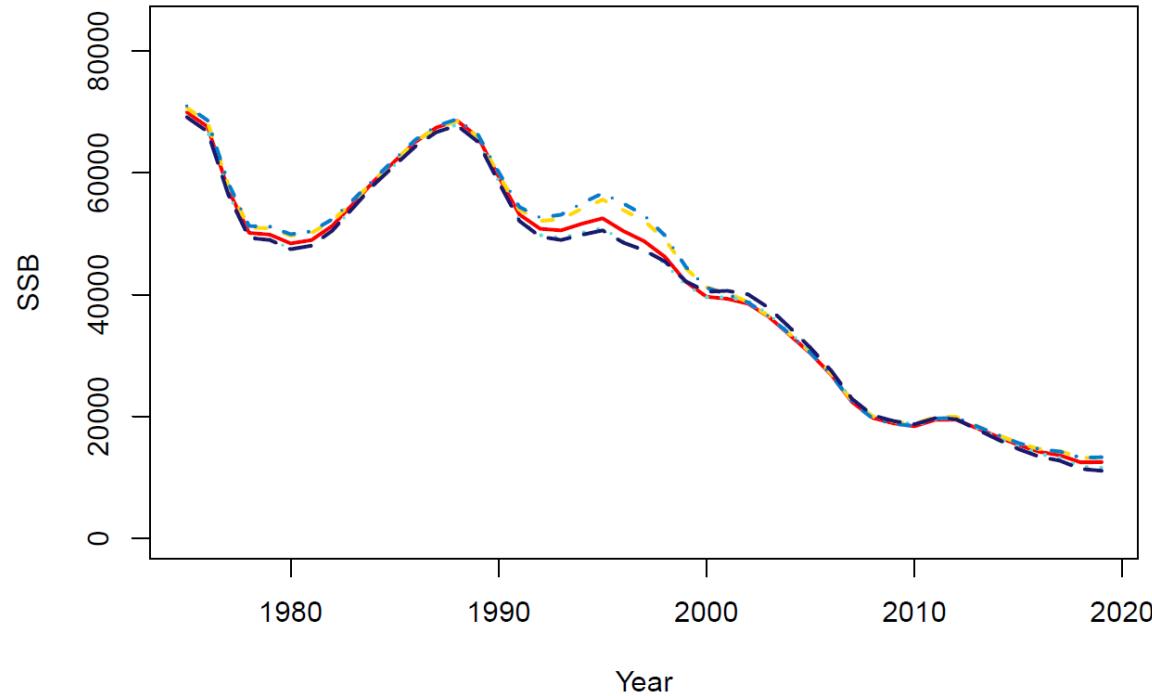
Re-weighted sample sizes – WCSI Trawl fishery PRE 2005

CPUE	Trawl survey : CORE strata						Trawl survey: ALL strata			
	Previous starting values		Number of fish aged		Number of fished aged, weighted by number of tows from which fish were aged			Number of fished aged, weighted by number of tows from which fish were aged		
	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	Number of fished aged, weighted by number of tows from which fish were aged	
1979	317	16	317	7	317	22	317	22	317	22
1990	286	15	286	7	286	20	286	20	286	20
1991	474	25	474	11	474	33	474	32	474	33
1992	287	15	287	7	287	20	287	20	287	20
1993	212	11	212	5	212	15	212	15	212	15
1994	186	10	186	4	186	13	186	13	186	13
1995	245	13	245	6	245	17	245	17	245	17
1996	359	19	359	8	359	25	359	25	359	25
1997	326	17	326	8	326	23	326	22	326	23
1998	349	18	349	8	349	24	349	24	349	24
1999	637	33	637	15	637	44	637	44	637	45
2000	440	23	440	10	440	31	440	30	440	31
2001	319	17	319	7	319	22	319	22	319	22
2002	358	19	358	8	358	25	358	24	358	25
2003	439	23	439	10	439	30	439	30	439	31
2004	416	22	416	10	416	29	416	28	416	29

Re-weighted sample sizes – WCSI Trawl fishery FROM 2005

CPUE	Trawl survey : CORE strata						Trawl survey: ALL strata			
	Number of fished aged, weighted by number of tows from which fish were aged			Previous starting values			Number of fish aged			
2005	276	13	276	12	276	15	276	14	276	14
2006	479	22	479	21	479	26	479	24	479	25
2007	508	23	508	22	508	28	508	26	508	26
2008	509	23	509	22	509	28	509	26	509	26
2009	398	18	398	17	398	22	398	20	398	20
2010	218	10	218	9	218	12	218	11	218	11
2011	491	23	491	21	491	27	491	25	491	25
2012	739	34	739	32	739	40	739	38	739	38
2013	753	35	753	32	753	41	753	38	753	39
2014	784	36	784	34	784	43	784	40	784	40
2015	780	36	780	33	780	42	780	40	780	40
2016	728	33	728	31	728	39	728	37	728	37
2017	754	35	754	32	754	41	754	38	754	39
2018	699	32	699	30	699	38	699	36	699	36

Effect of initial sample sizes at MPD



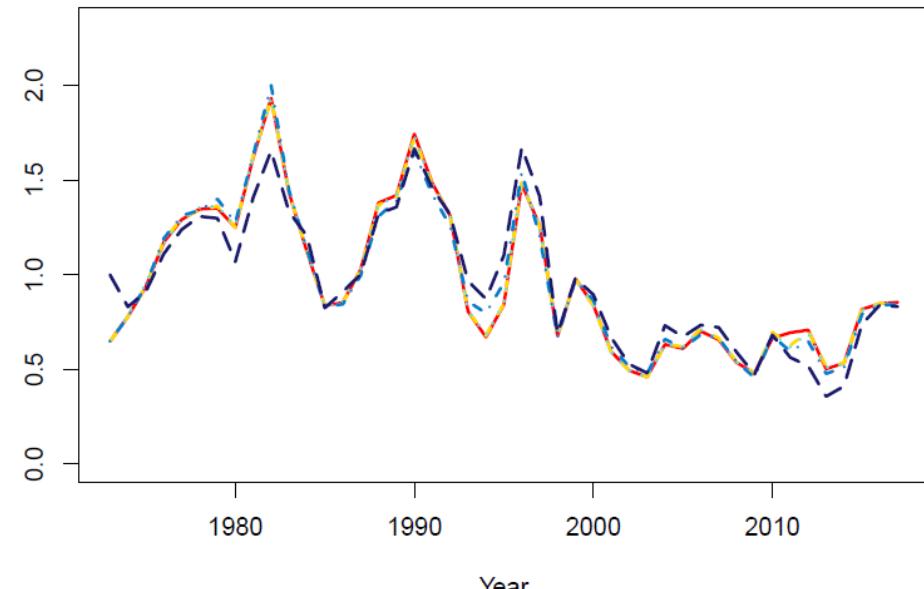
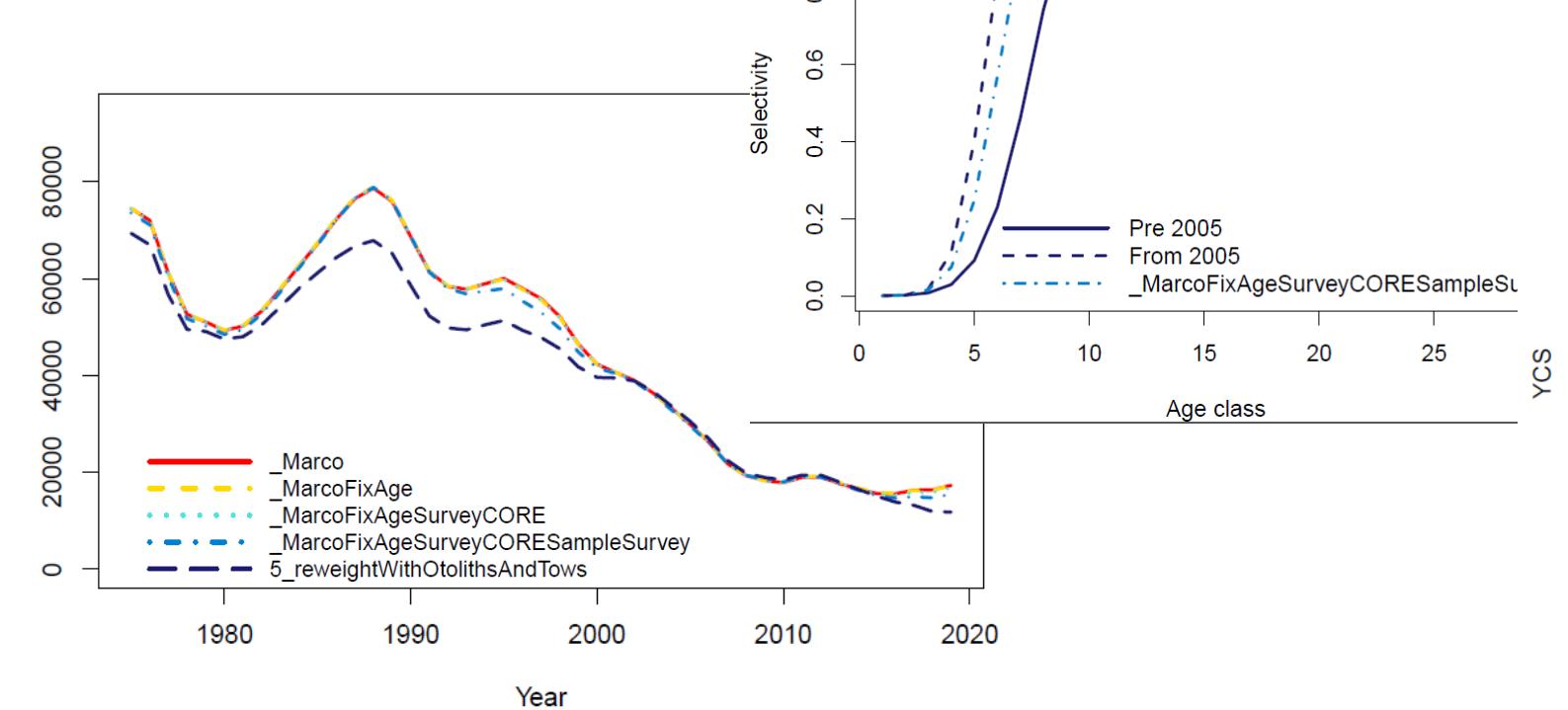
	2_reweight	5_reweightWithOtolithsAndTows
B0	70000	69400
Bcurrent	12500	11800
Bcurr(%B0)	0.179	0.17
Total likelihood	439	485
wcsiTANbio	-3.87	-4.16
wcsiTANage	53.5	54.2
wcsiTRLageFrom2005	202	210
wcsiTRLagePre2005	209	246

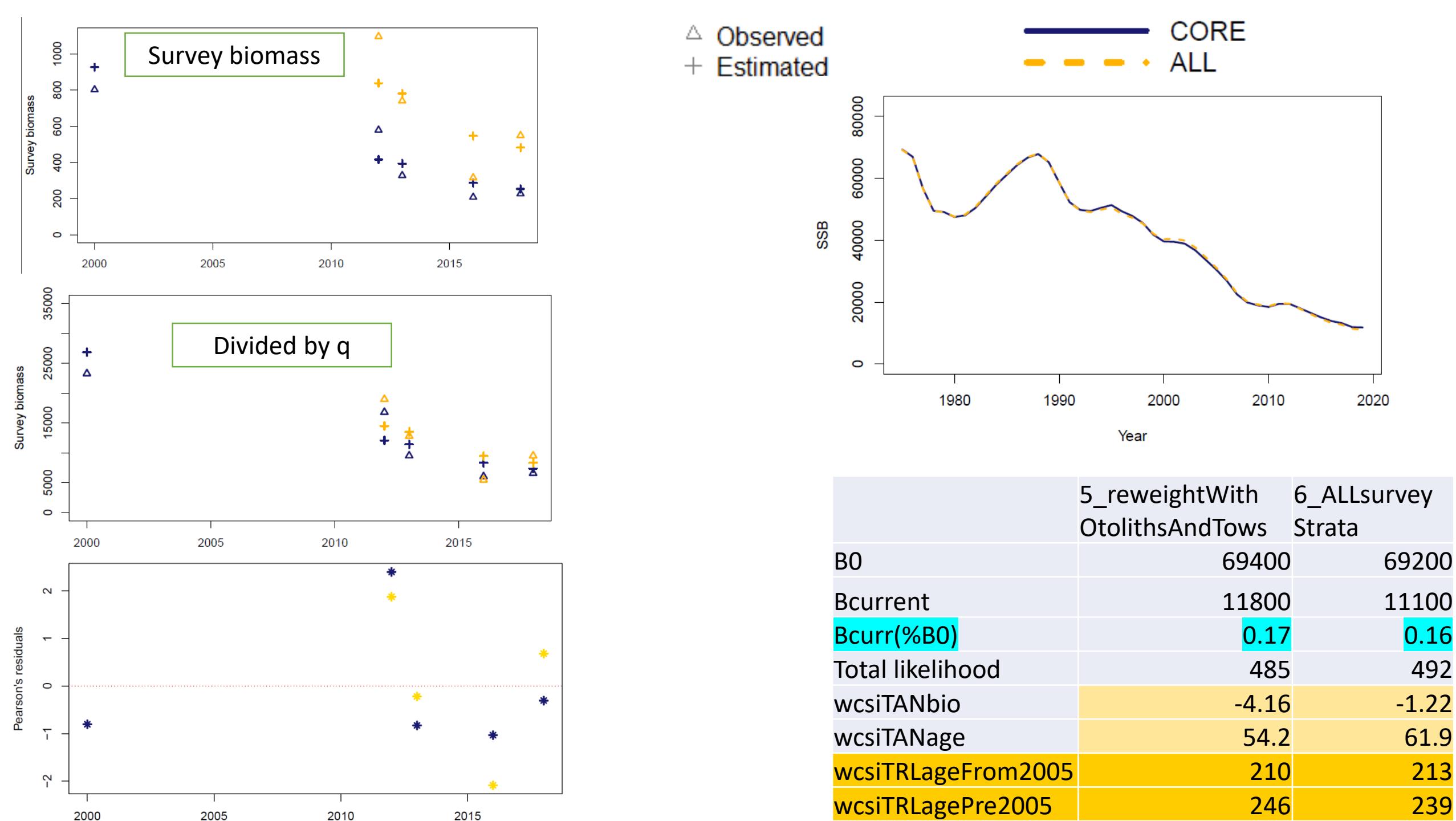
- 2_reweight
- 3_reweight_notoliths
- 4_reweightWithTows
- . -.- 5_reweightWithOtolithsAndTows
- -.- 6_ALLsurveyStrata

Compare Marco's survey model with free YCS 2015

Main remaining difference is split selectivity for trawl fishery at 2005

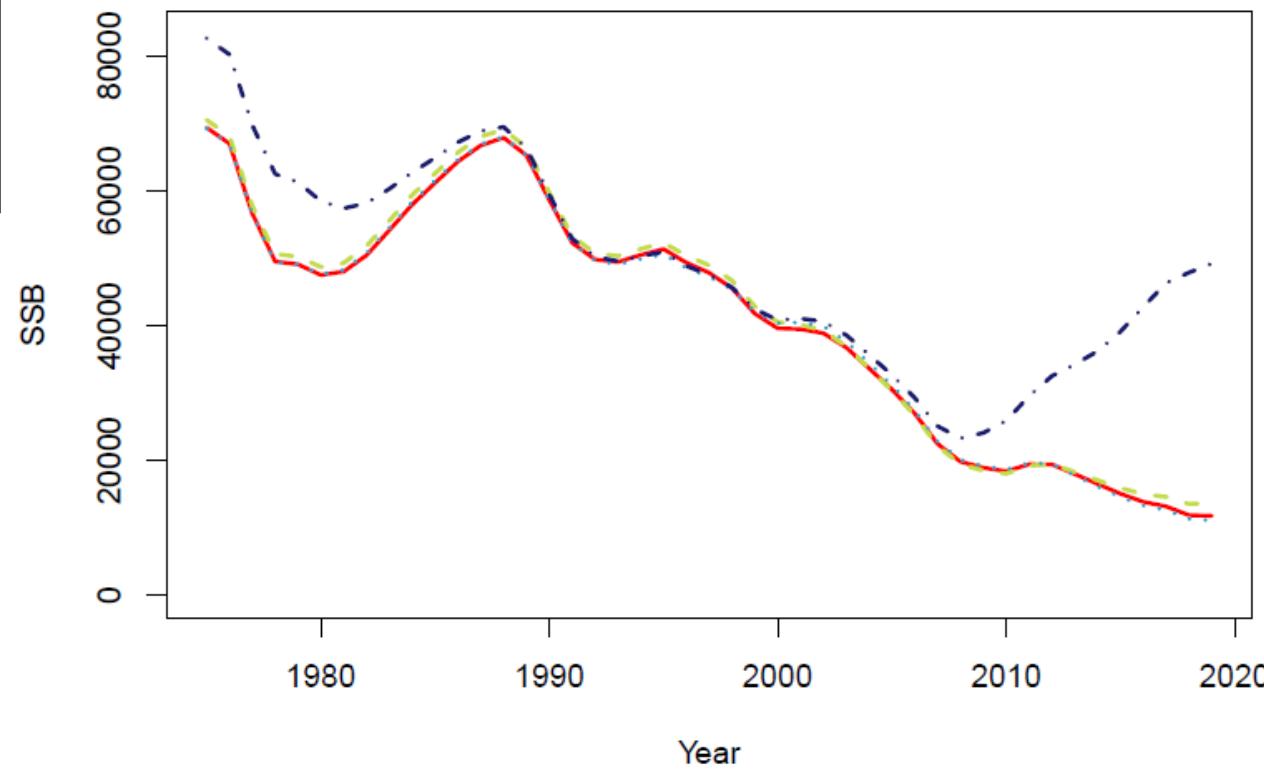
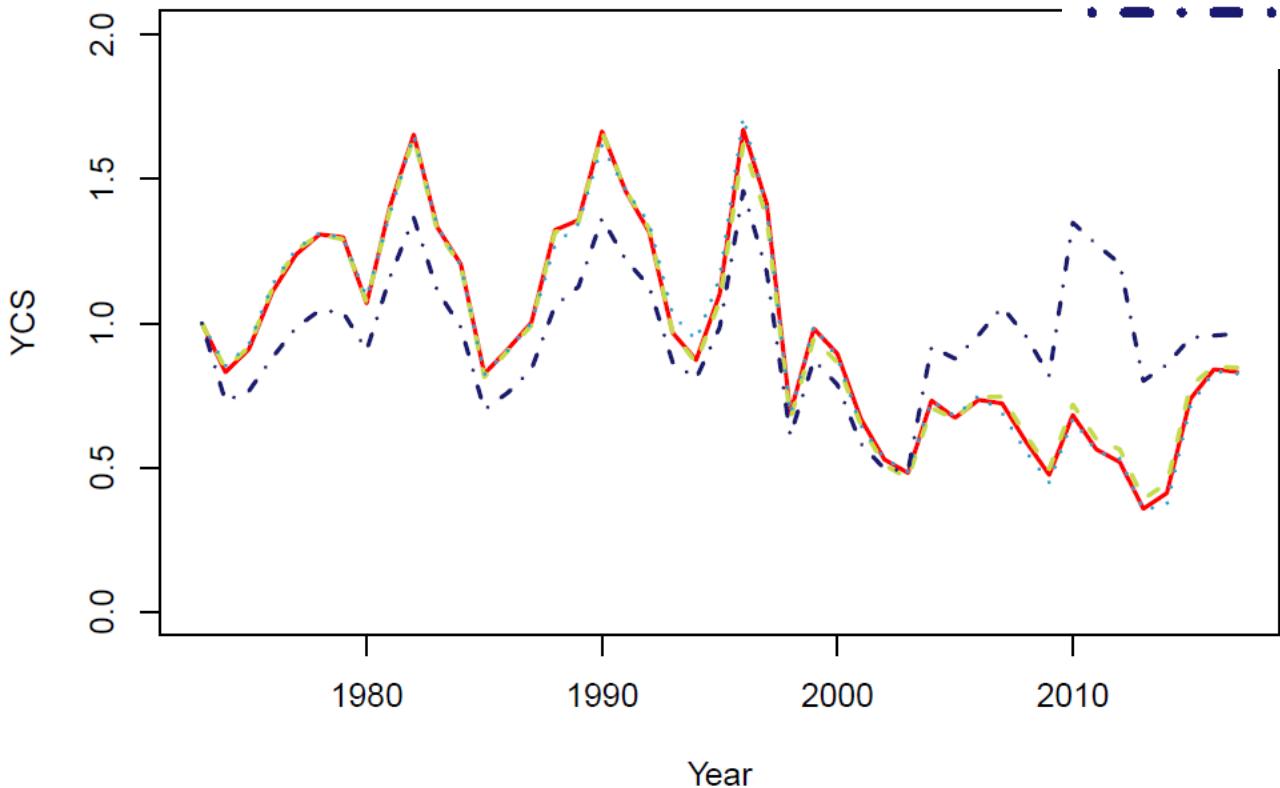
	YCS 2015 model presented (11 th April)	YCS 2015 + fixed age	YCS 2015 + fixed age + CORE survey >53 cm	YCS 2015 + fixed age + sample sizes	5_reweightWithOtolithsAndTows
B0	74500	74600	74400	73600	69400
Bcurrent	17300	17300	16800	15500	11800
Bcurr(%B0)	0.232	0.232	0.226	0.211	0.17



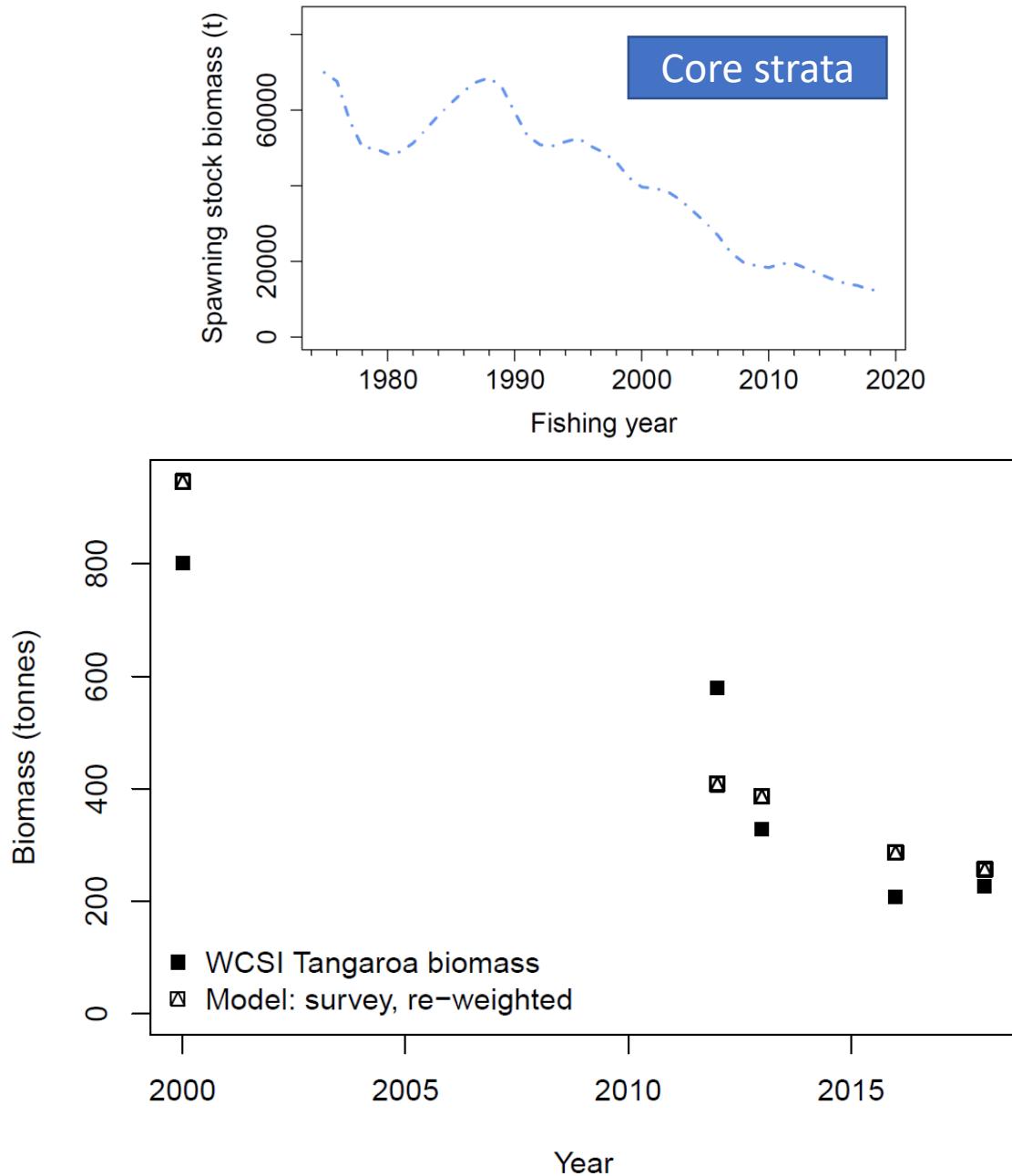
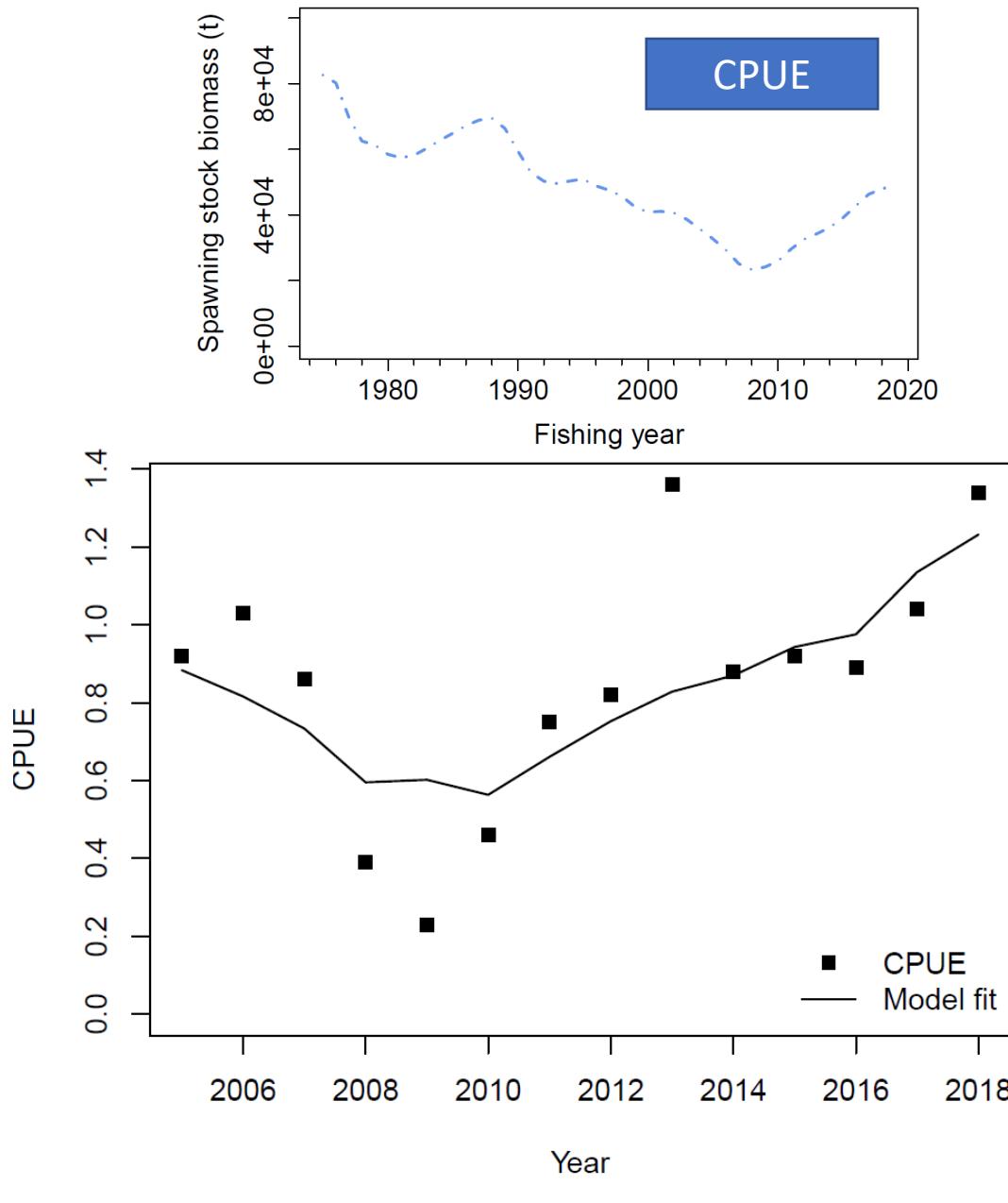


Compare model outputs

- CORE strata, reweighted using O&T
- - - CORE strata, reweighted using O&T, increased process error
- · · ALL strata, reweighted using O&T
- - · - · CPUE



SSB and the fit to biomass: 60% or 17% BO



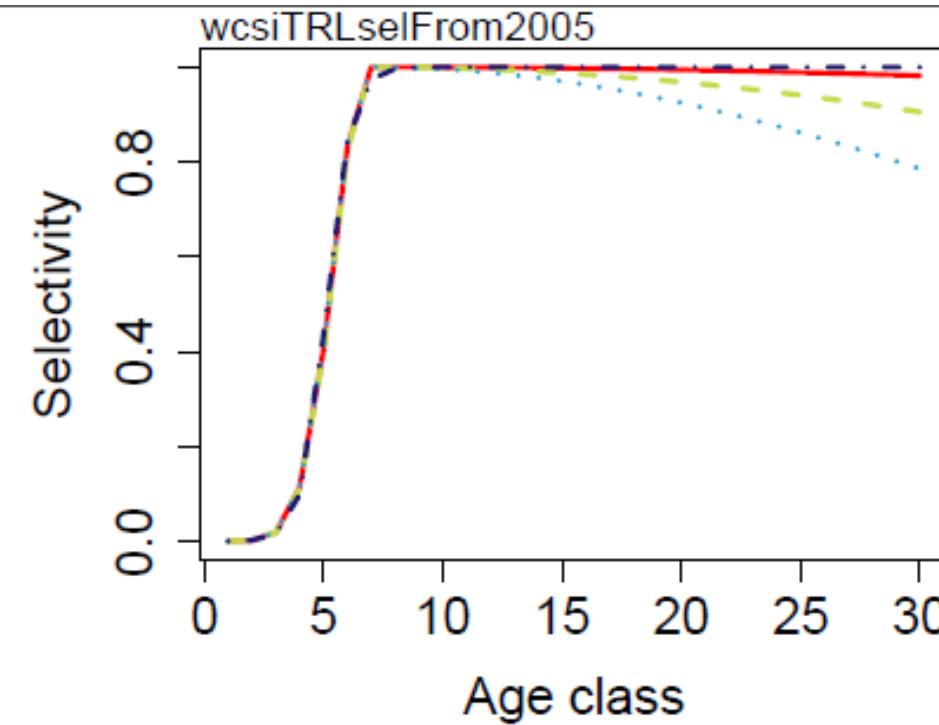
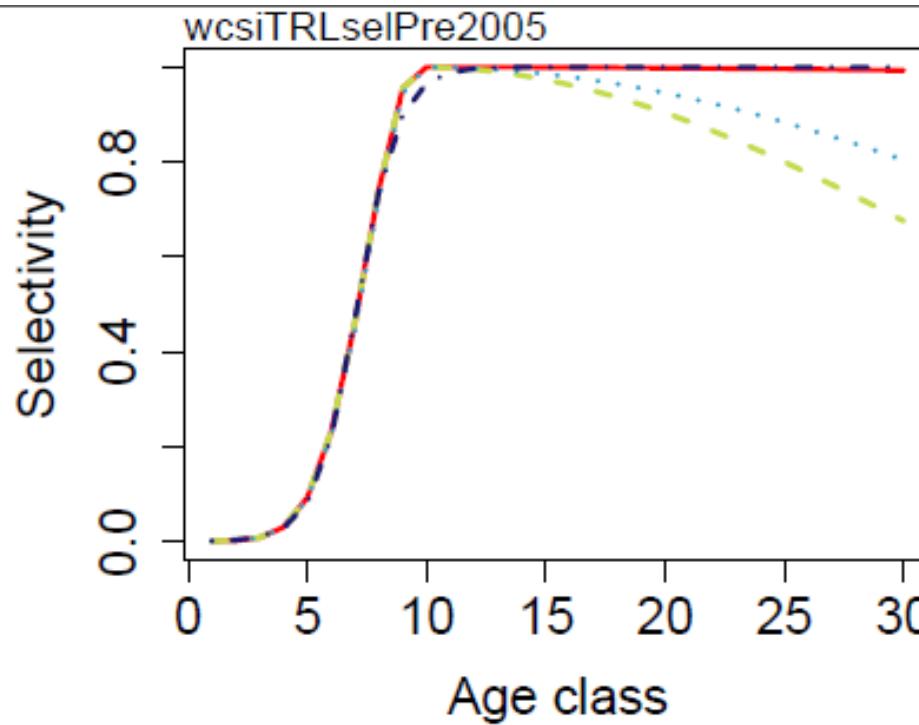
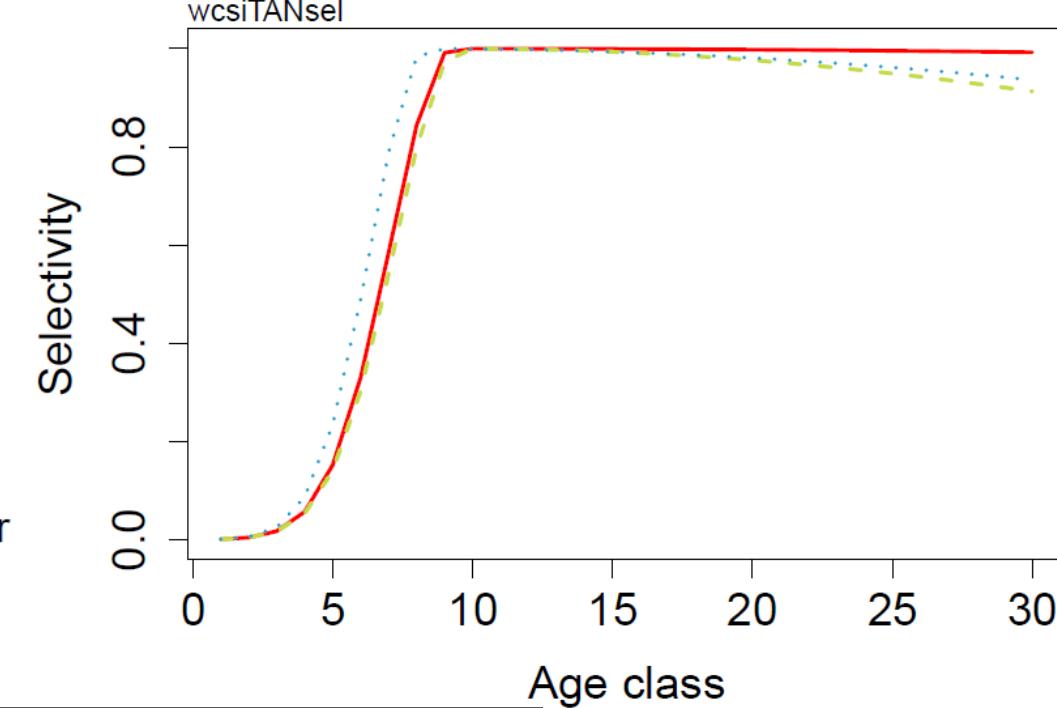
Selectivity's

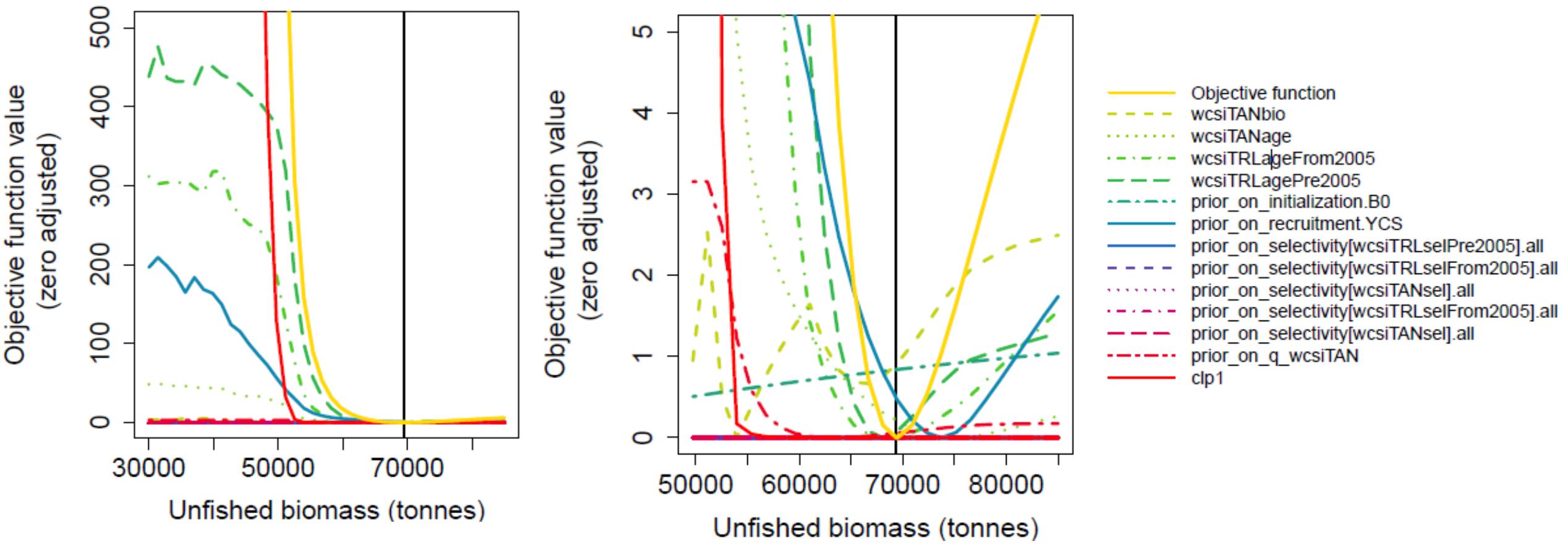
CPUE: logistic

Survey: double normal; logistic sensitivity at MCMC

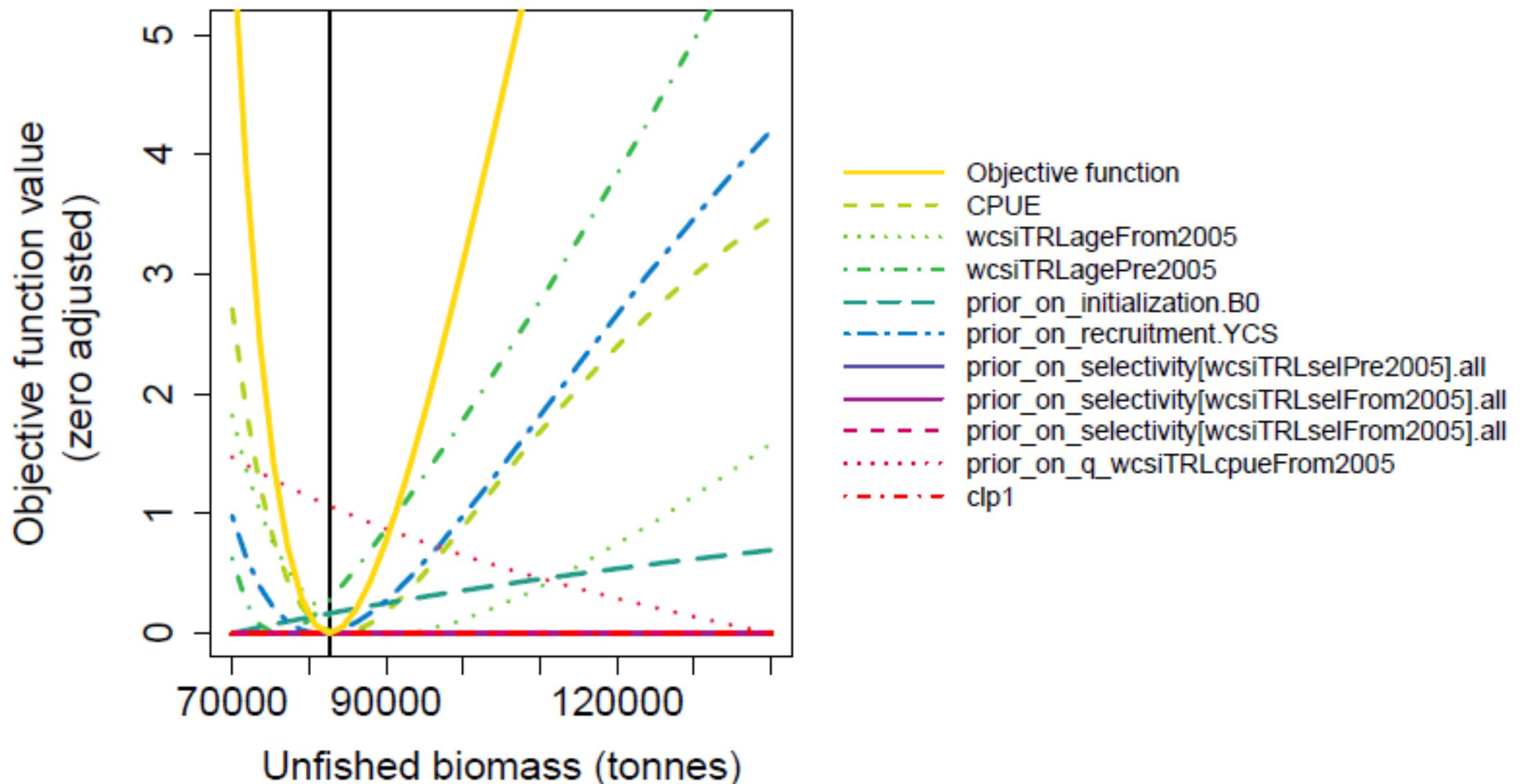
19 year plus group

- CORE strata, reweighted using O&T
- - - CORE strata, reweighted using O&T, increased process error
- ALL strata, reweighted using O&T
- CPUE

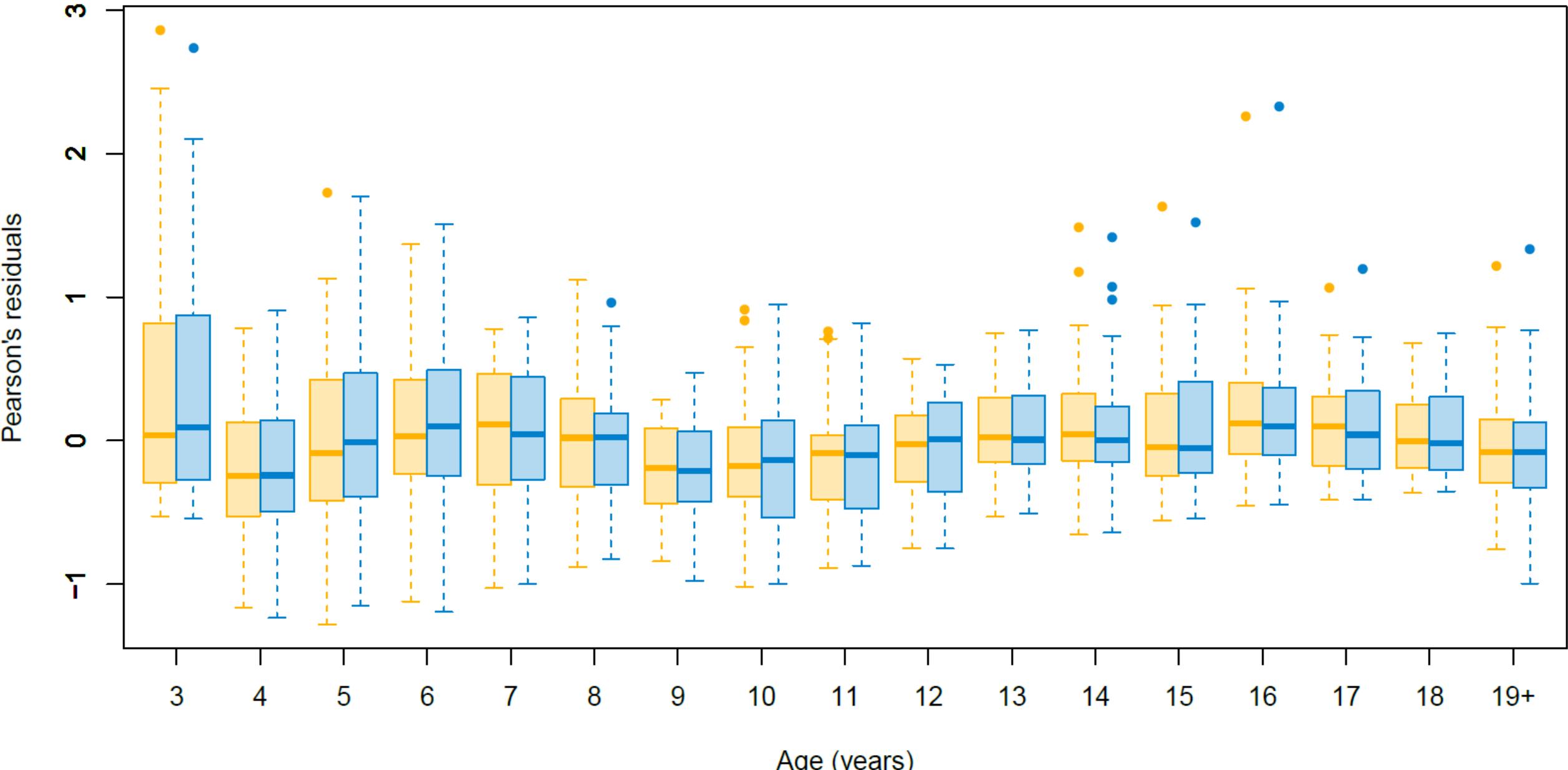
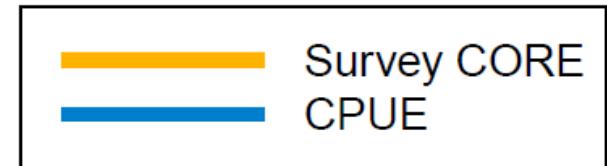




Same profile likelihood, different scale



Comparing residuals to composition data

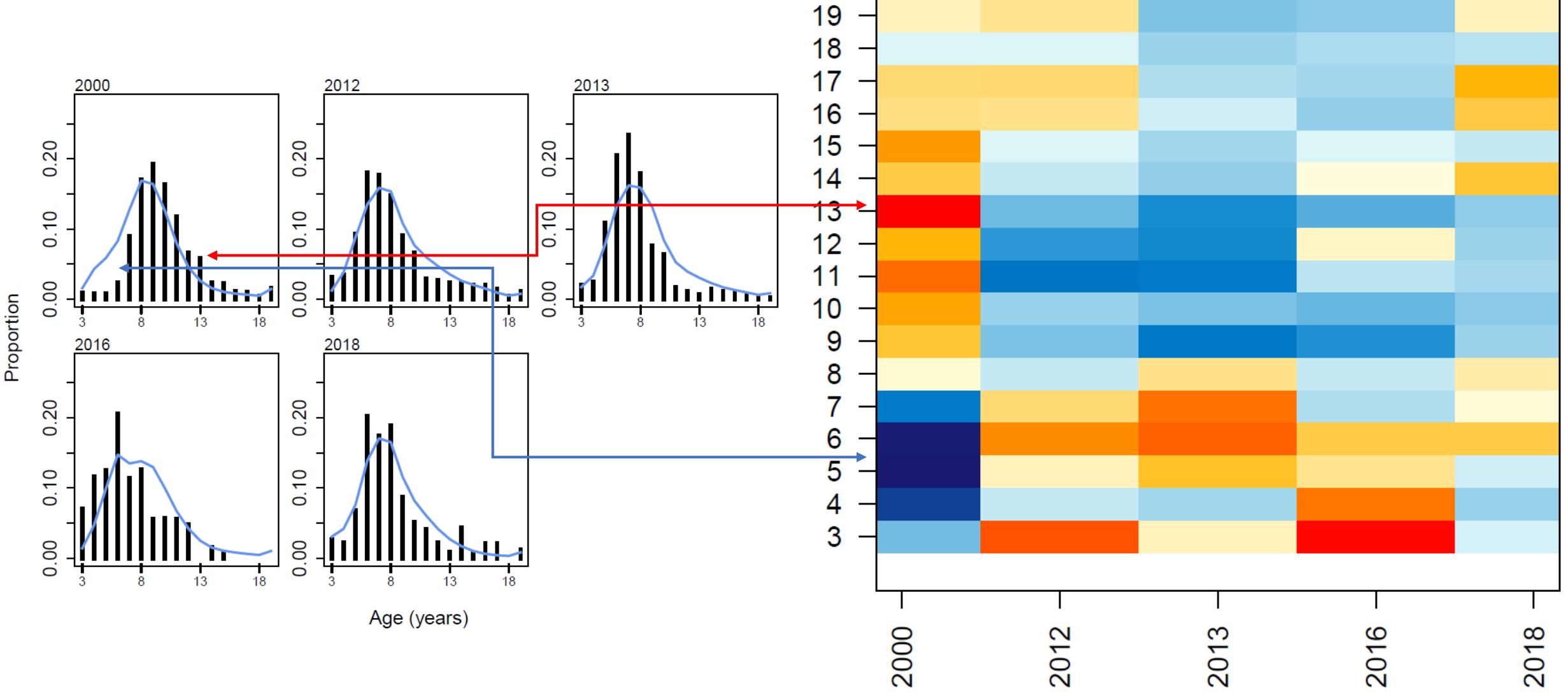


Comparing residuals to composition data

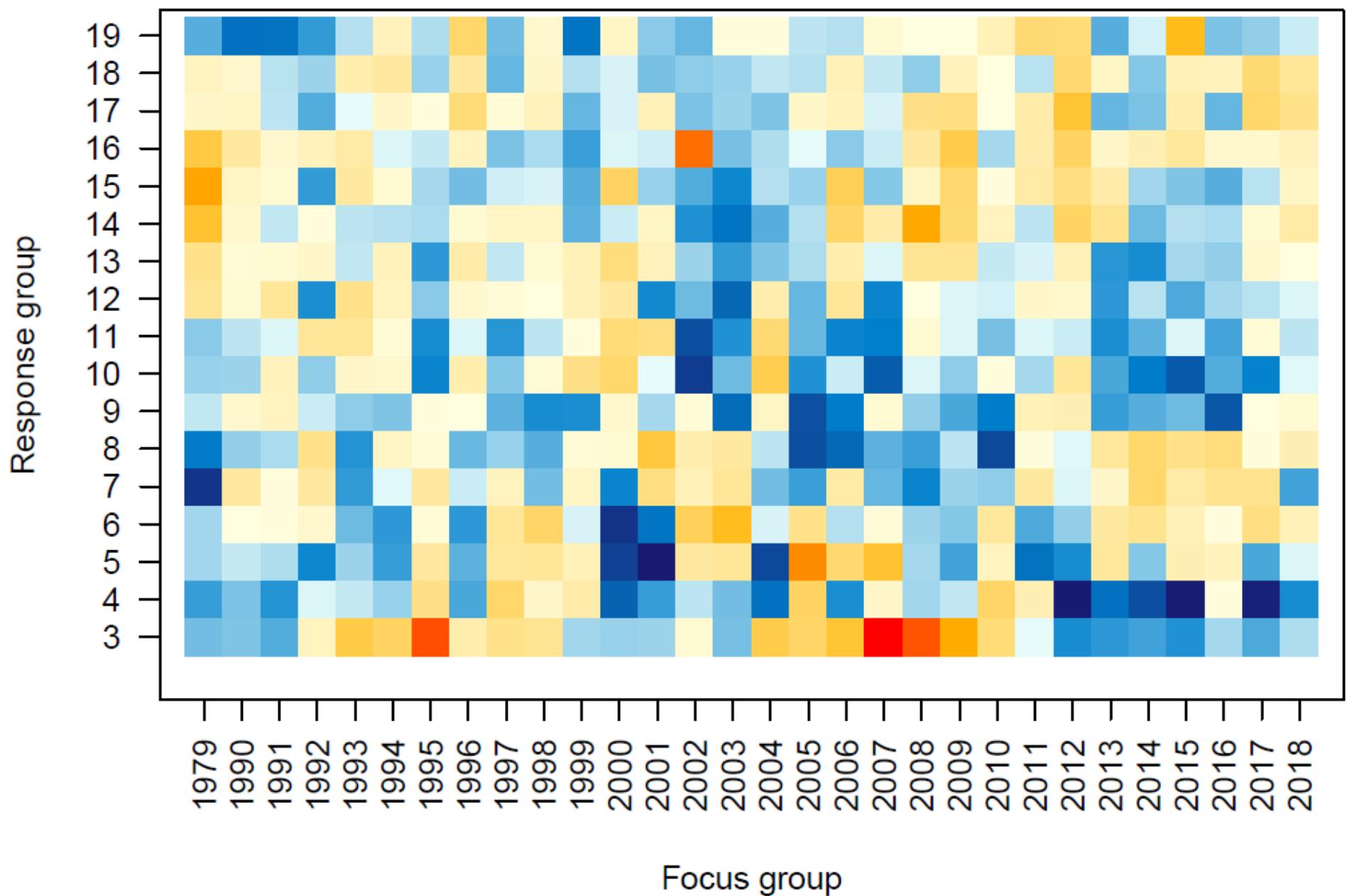
Survey CORE
CPUE



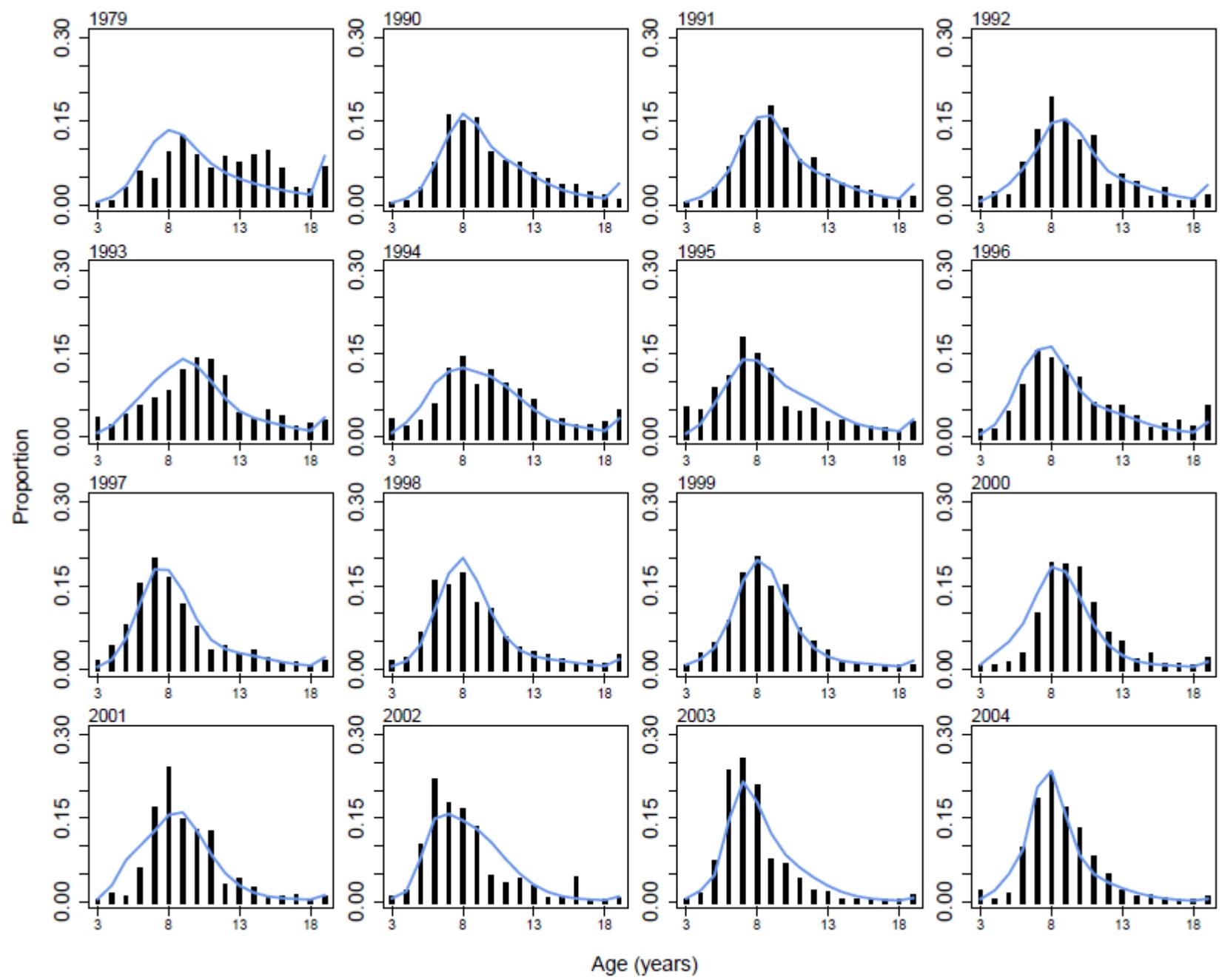
Pearson's residuals – Tangaroa trawl survey



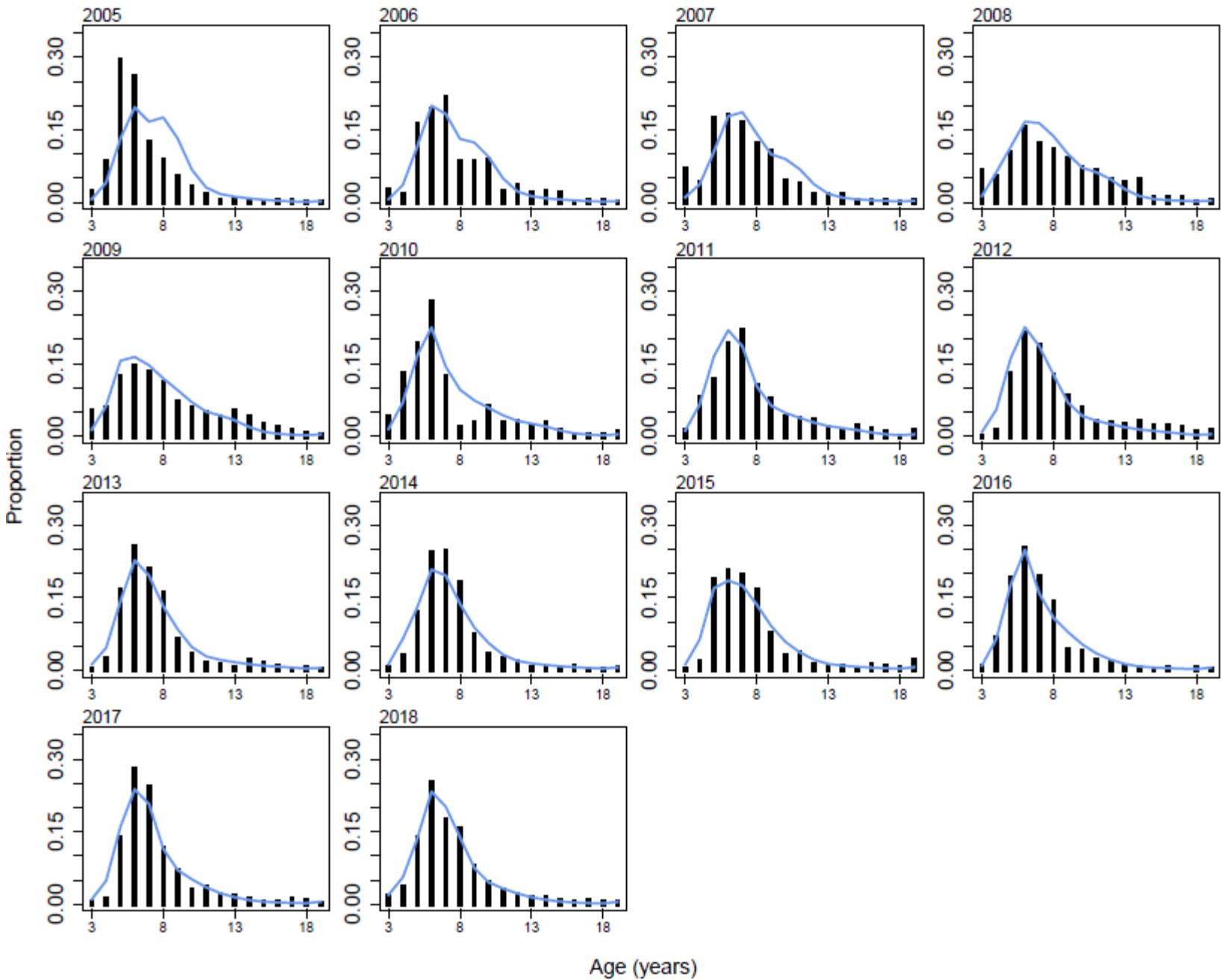
Pearson's residuals – Trawl fishery, Survey CORE model



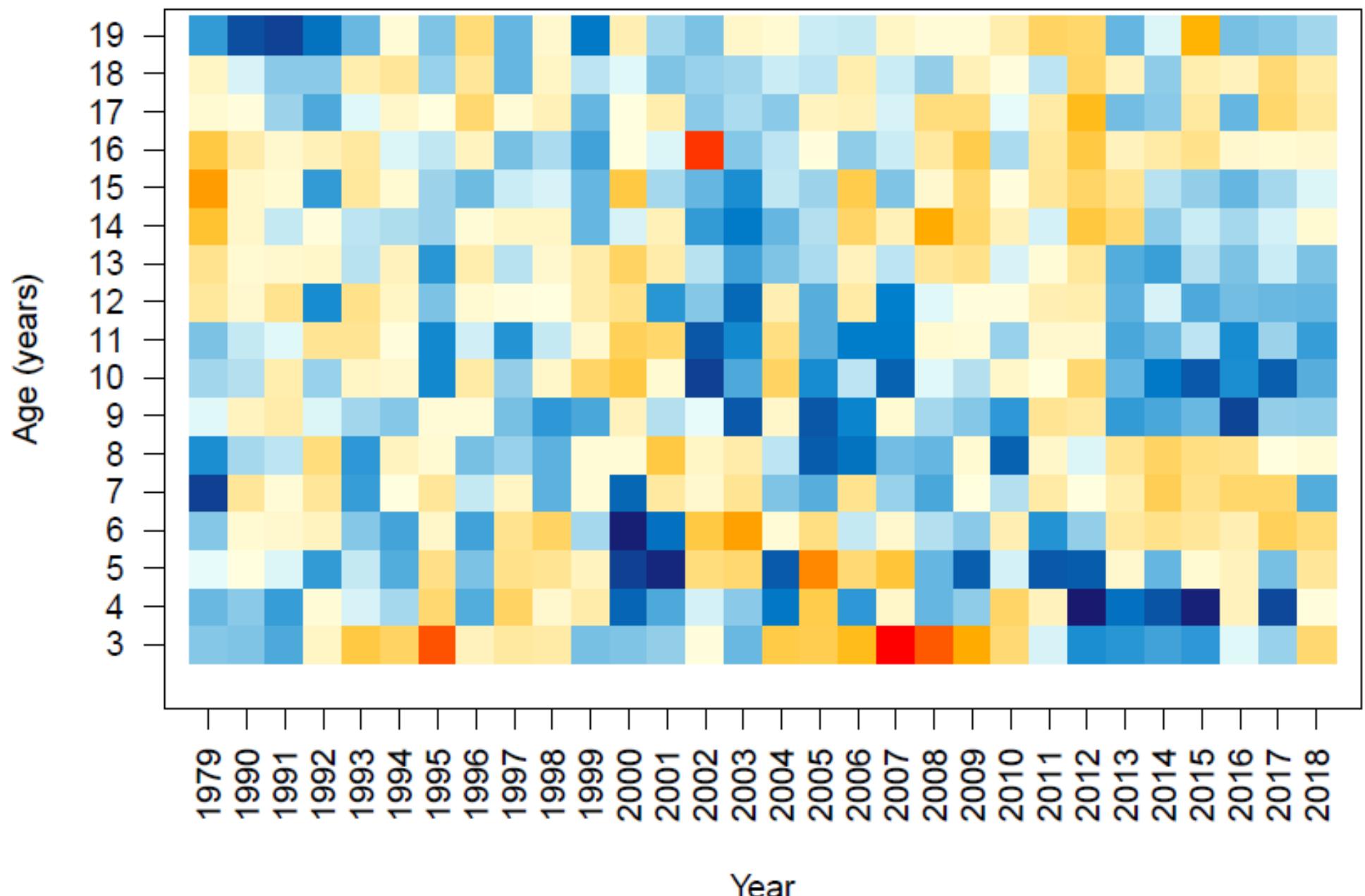
Fits to composition data – Trawl fishery, Survey CORE model



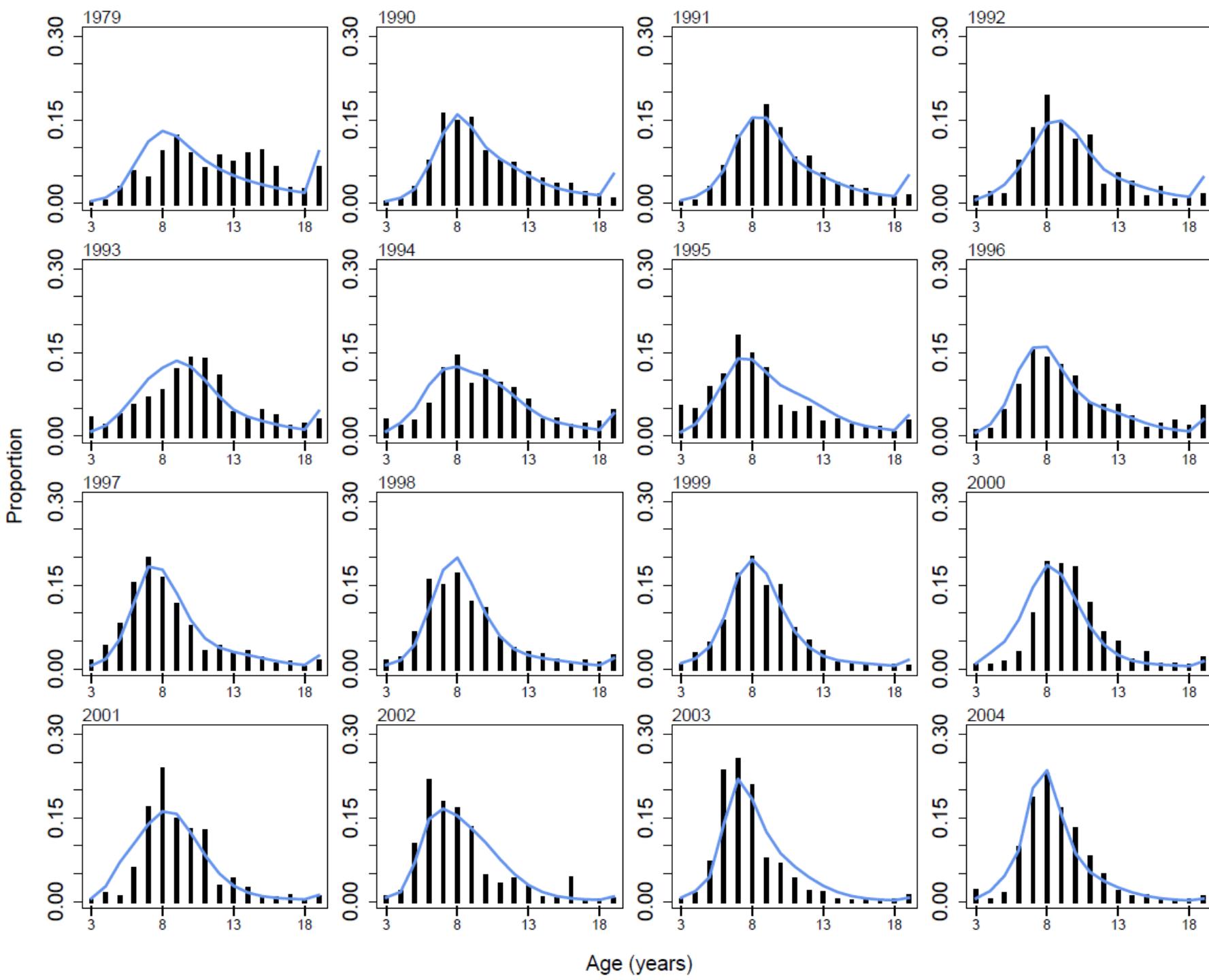
Fits to composition data – Trawl fishery, Survey CORE model



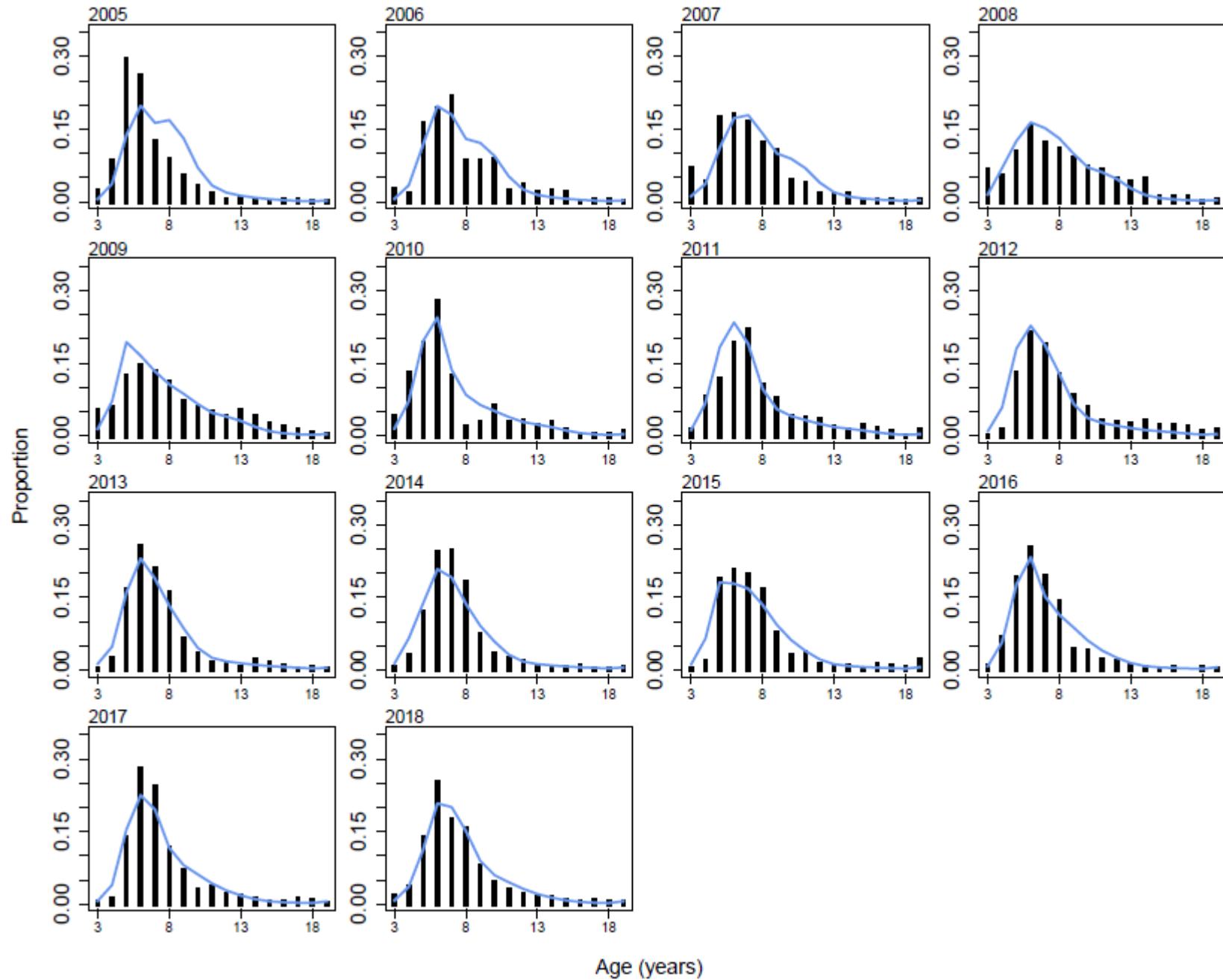
Pearson's residuals – Trawl fishery, CPUE model



Fits to composition data – Trawl fishery, CPUE model



Fits to composition data – Trawl fishery, CPUE model

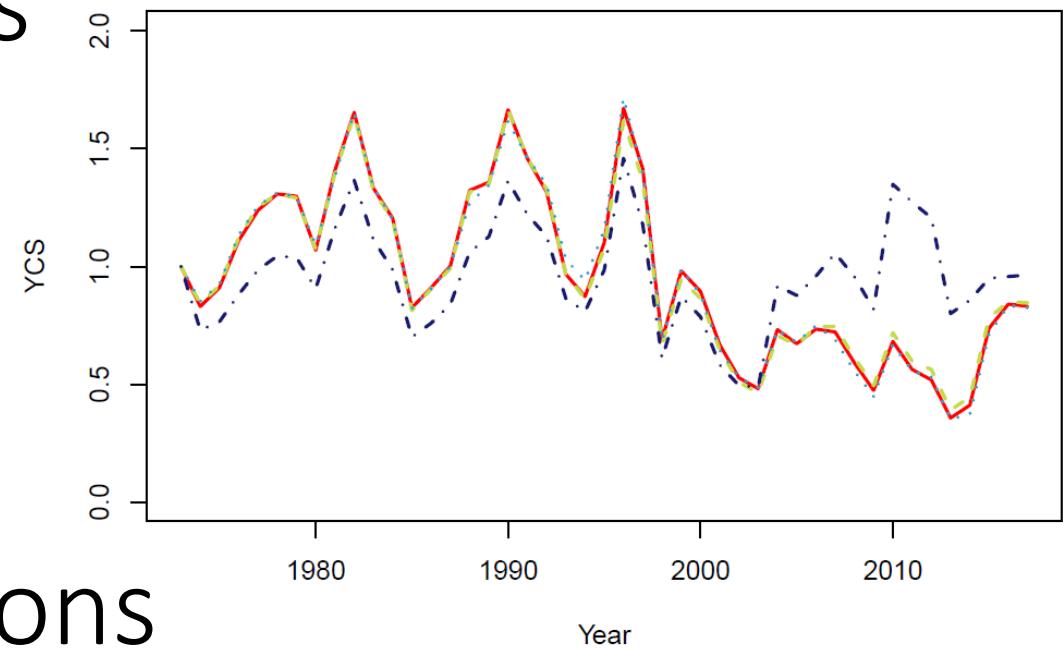


	1_CPUEB	2_reweight	5_reweightWith OtolithsAndTows	5d_UpProcess Error	6_ALLsurvey Strata
B0	82600	70000	69400	70500	69200
Bcurrent	49200	12500	11800	13700	11100
Bcurr(%B0)	0.596	0.179	0.17	0.194	0.16
Total likelihood	418	439	485	484	492
wcsiTANbio		-3.87	-4.16	-3.86	-1.22
wcsiTANage		53.5	54.2	53.8	61.9
wcsiTRLageFrom2005	215	202	210	209	213
wcsiTRLagePre2005	241	209	246	246	239
prior_on_initialization.B0	11.3	11.2	11.2	11.2	11.2
prior_on_recruitment.YCS	-30.4	-29.6	-29.4	-29.7	-29.2
prior_on_selectivity[wcsiTRLselPre2005].all	0	0	0	0	0
prior_on_selectivity[wcsiTRLselFrom2005].all	0	0	0	0	0
prior_on_selectivity[wcsiTANsel].all		0	0	0	0
prior_on_q_wcsiTAN		-2.89	-2.84	-2.84	-2.81
clp1	0	0	0	0	0
prior_on_relative_abundance[wcsiTANbio].cv_process_error					
CPUE	-8.59				
prior_on_q_wcsiTRLcpueFrom2005	-10.4				
prior_on_natural_mortality.all					

Year classes for projections

- CPUE: all free years (1974 – 2014)
- Survey: last 10 free years (2006 – 2015)

— CORE strata, reweighted using O&T
— CORE strata, reweighted using O&T, increased process error
··· ALL strata, reweighted using O&T
- - - CPUE



Future catches for projections

- Status quo – most recent catch (2968 tonnes)
- TACC (5064 tonnes)
- Zero – survey CORE model (0 tonnes)

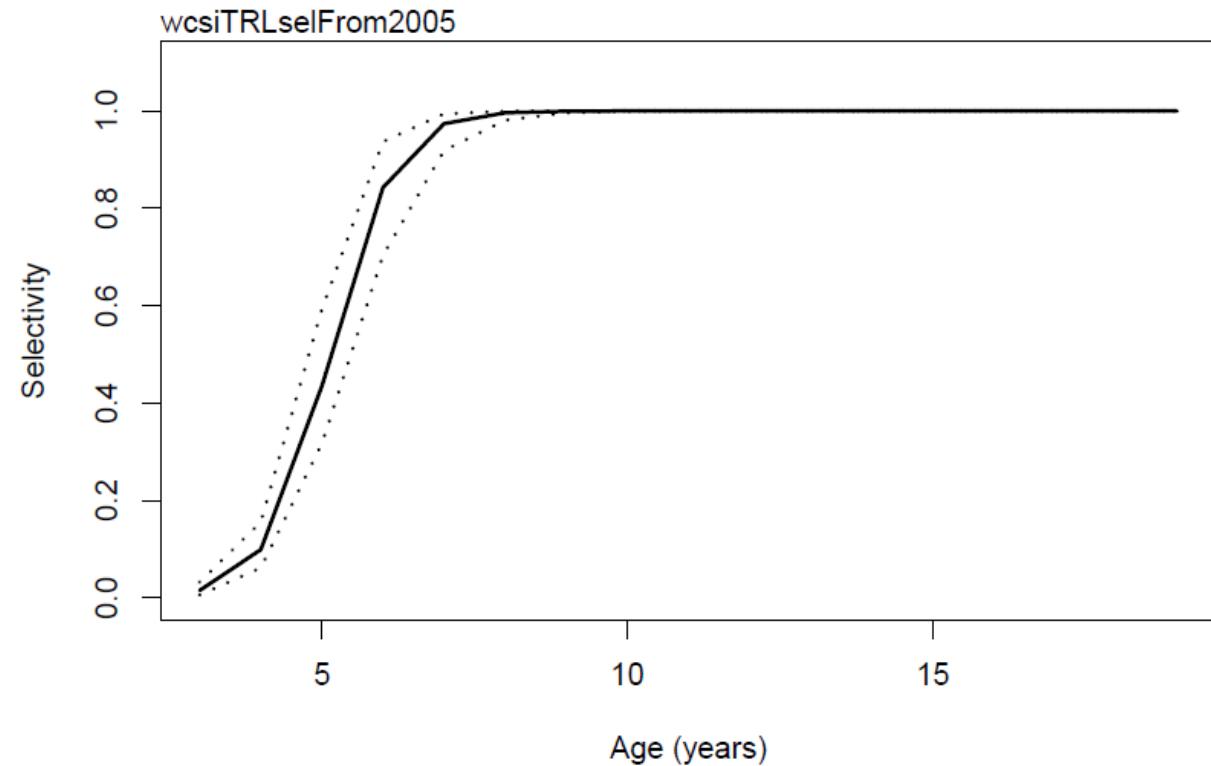
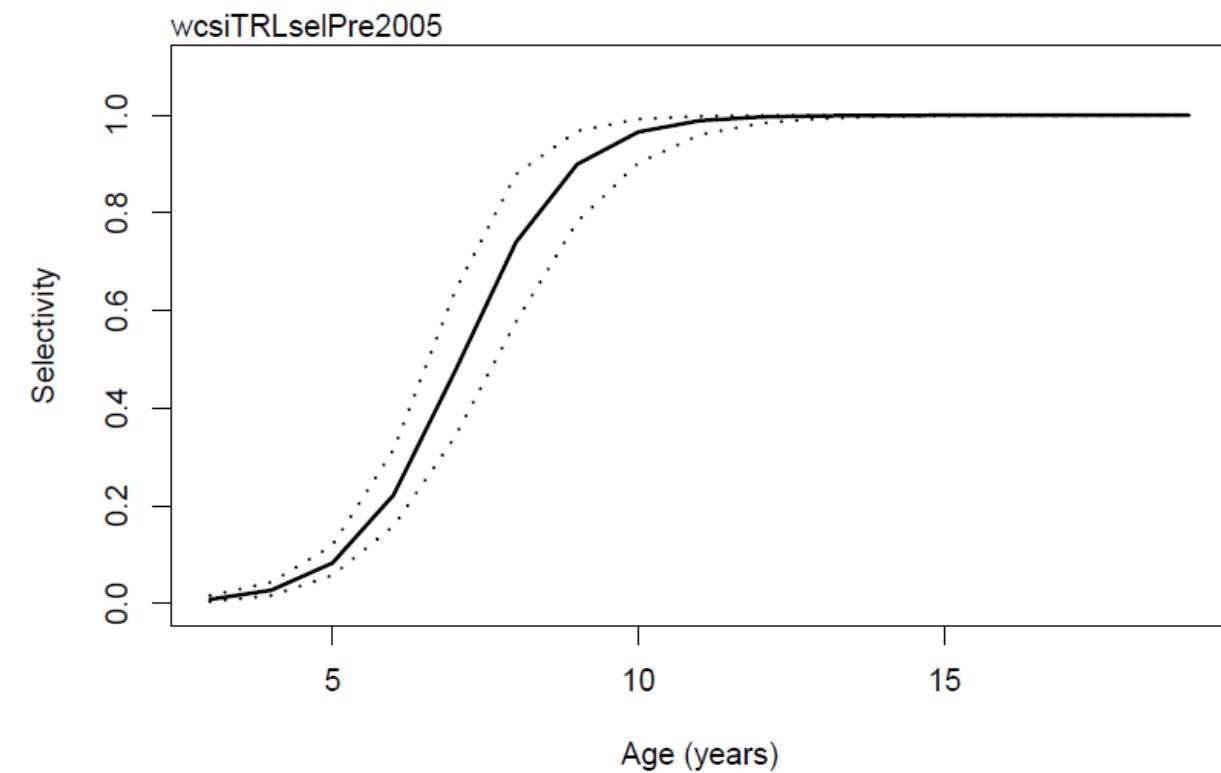
MCMC Bcurrent (%B0)

Run	Median	CV	Lower CI	Upper CI
CPUE	60.41	20.04	43.00	82.97
Survey CORE	18.46	27.53	11.73	28.51
Survey CORE, process error	21.11	34.27	11.95	35.99
Survey CORE, logistic	18.49	27.38	11.46	28.57
Survey ALL, logistic	17.29	23.38	11.86	25.38

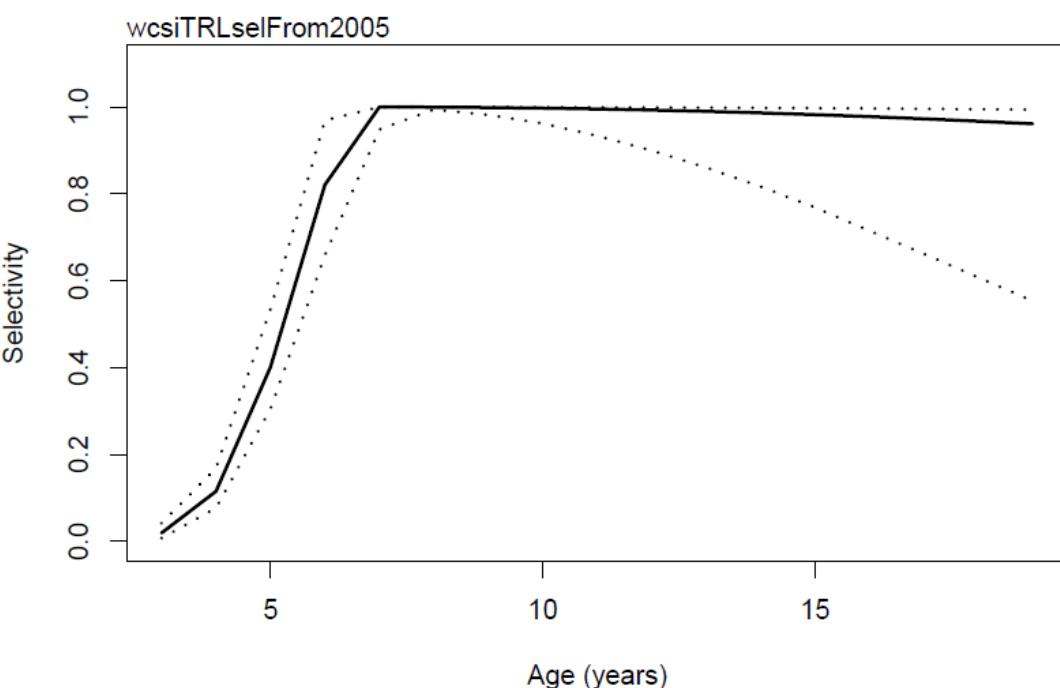
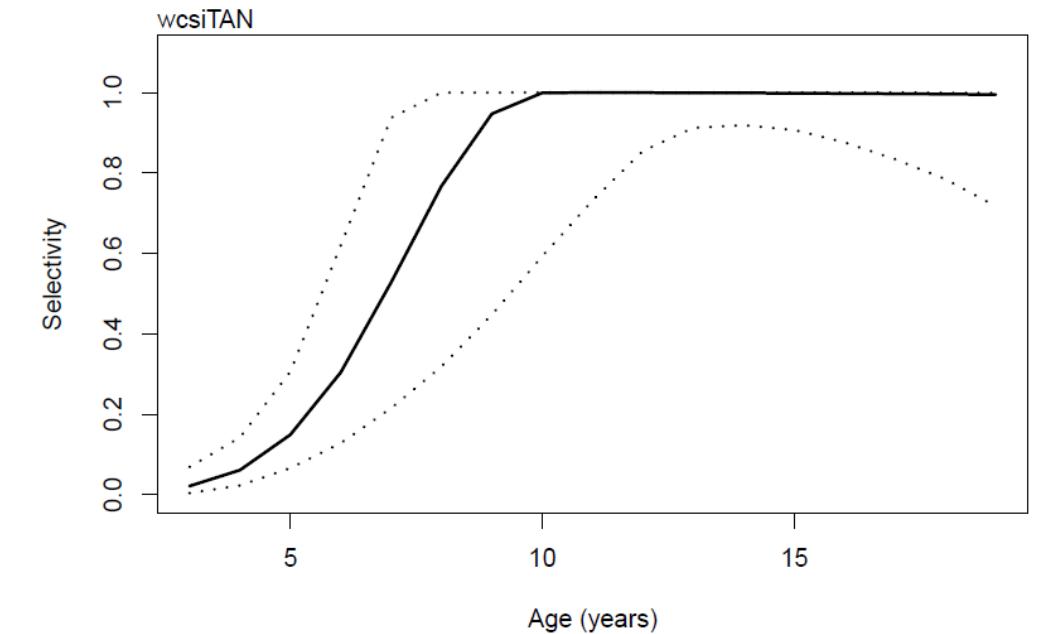
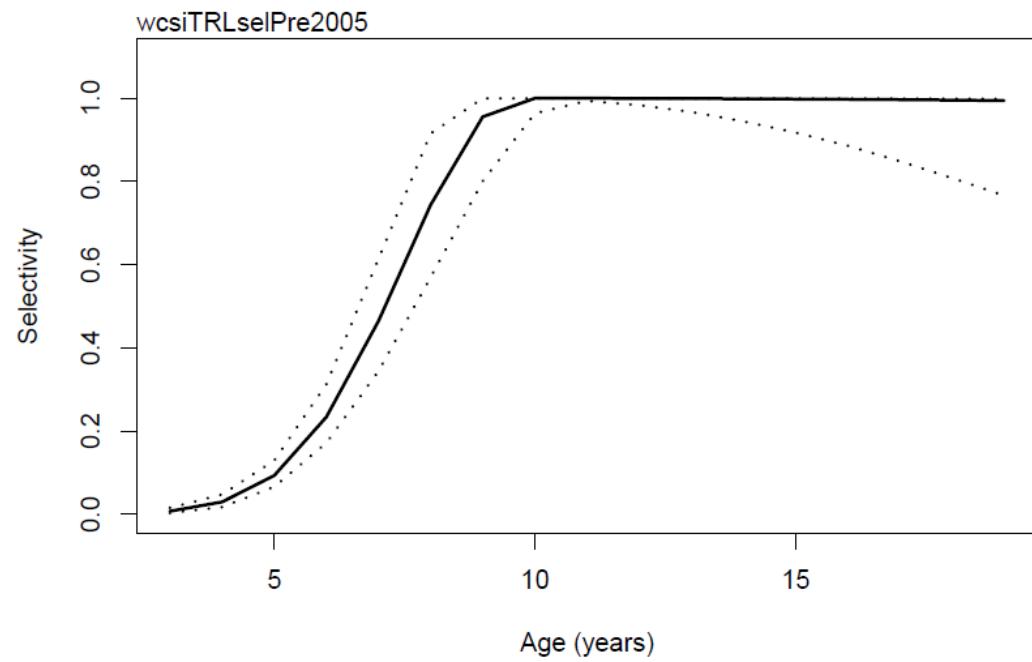
Recap: previous assessment

Model run	B ₀	SSB ₂₀₁₆	SSB ₂₀₁₆ /B ₀ (%)
Survey (base case)	79 190 (73 000-87 990)	20 490 (14 640-30 880)	25.7 (19.1-36.5)
CPUE	92 100 (81 410-131 360)	46 550 (29 190-87 710)	50.3 (34.6-73.6)

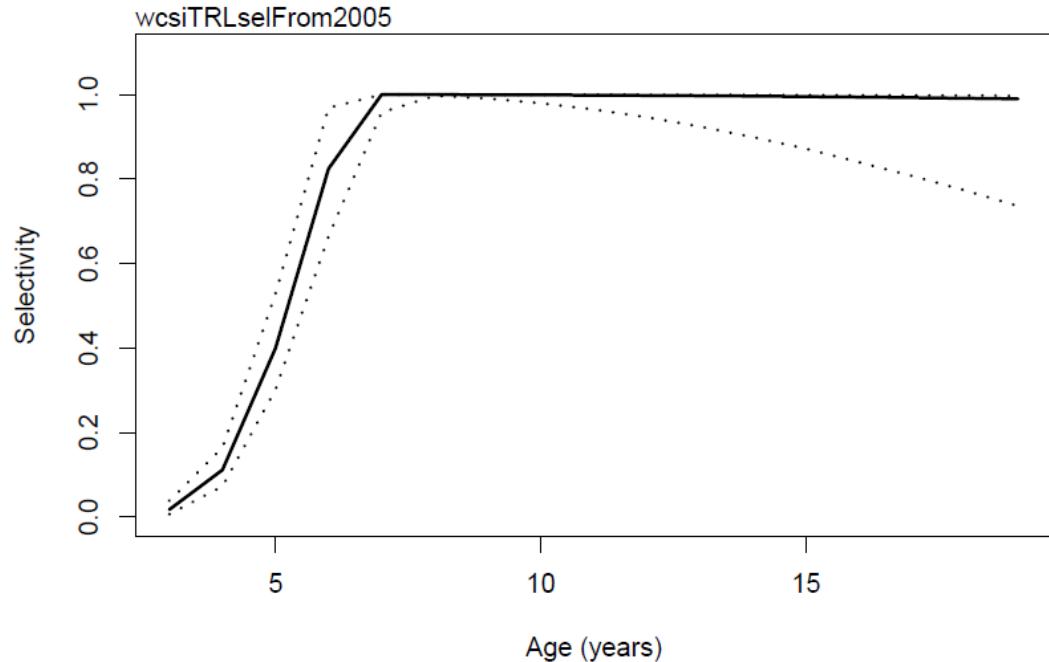
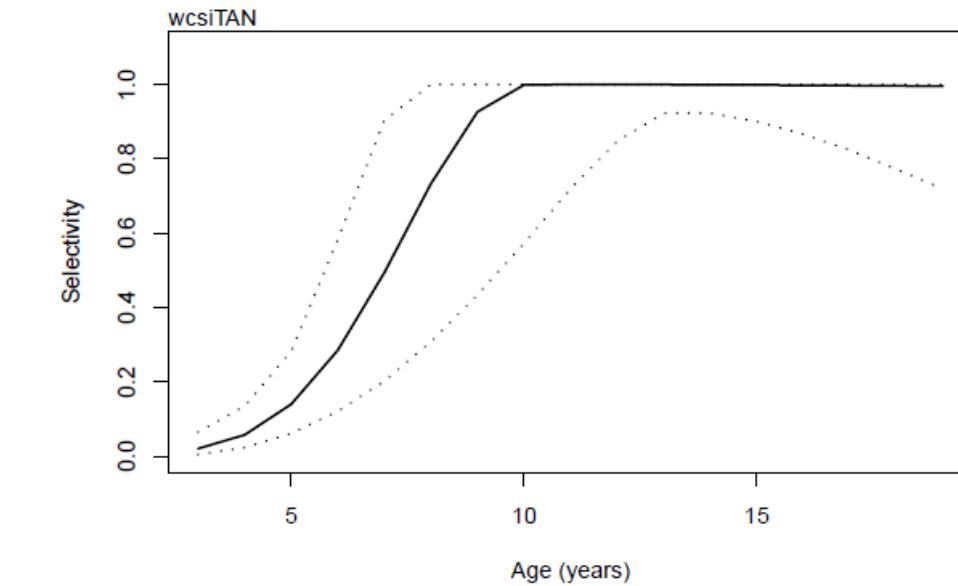
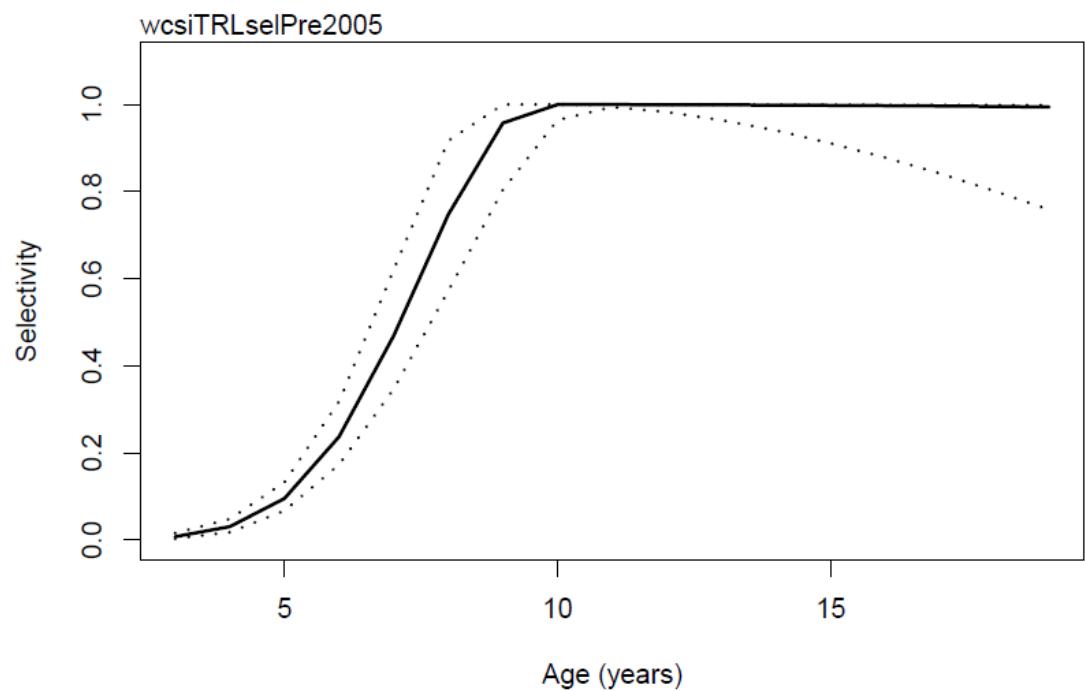
MCMC selectivity's: CPUE



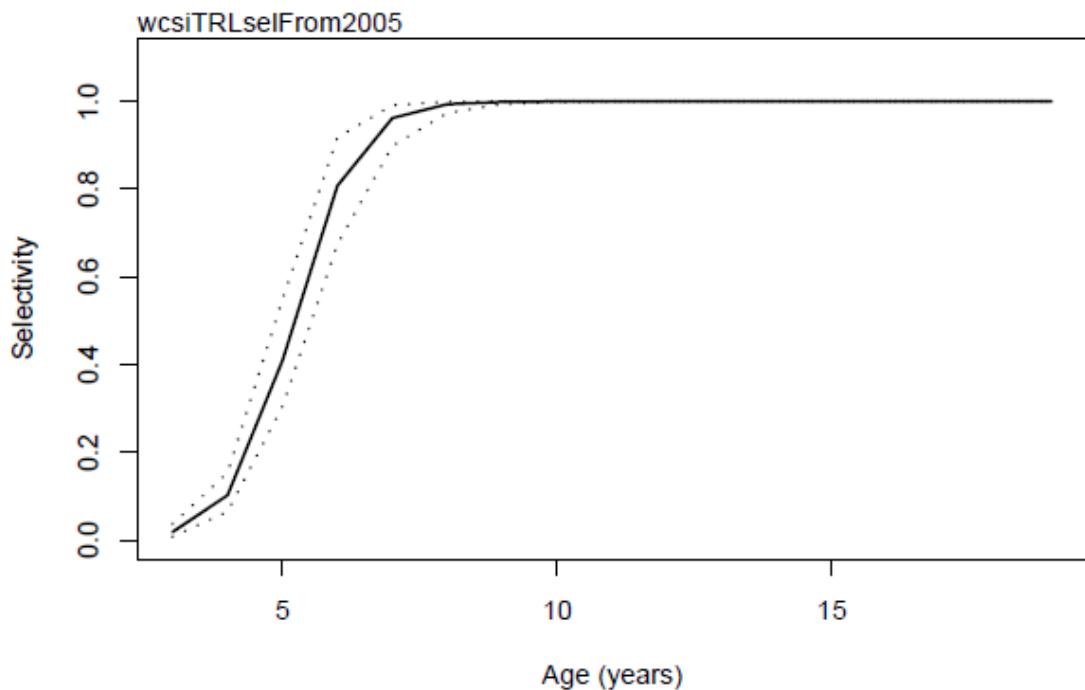
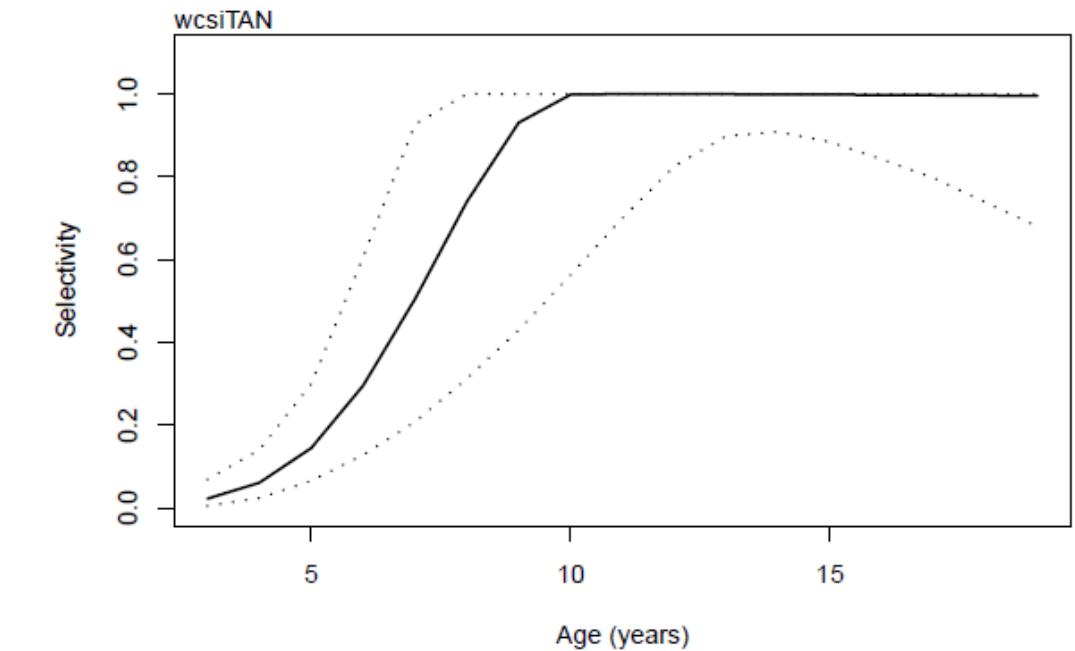
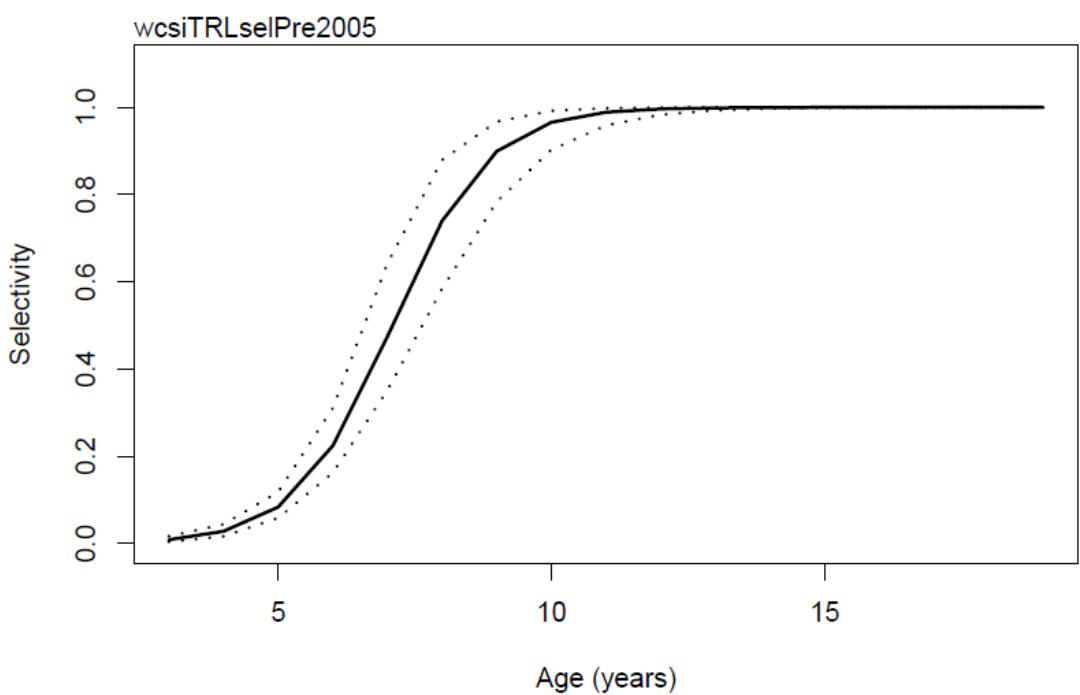
MCMC selectivity's: Survey CORE



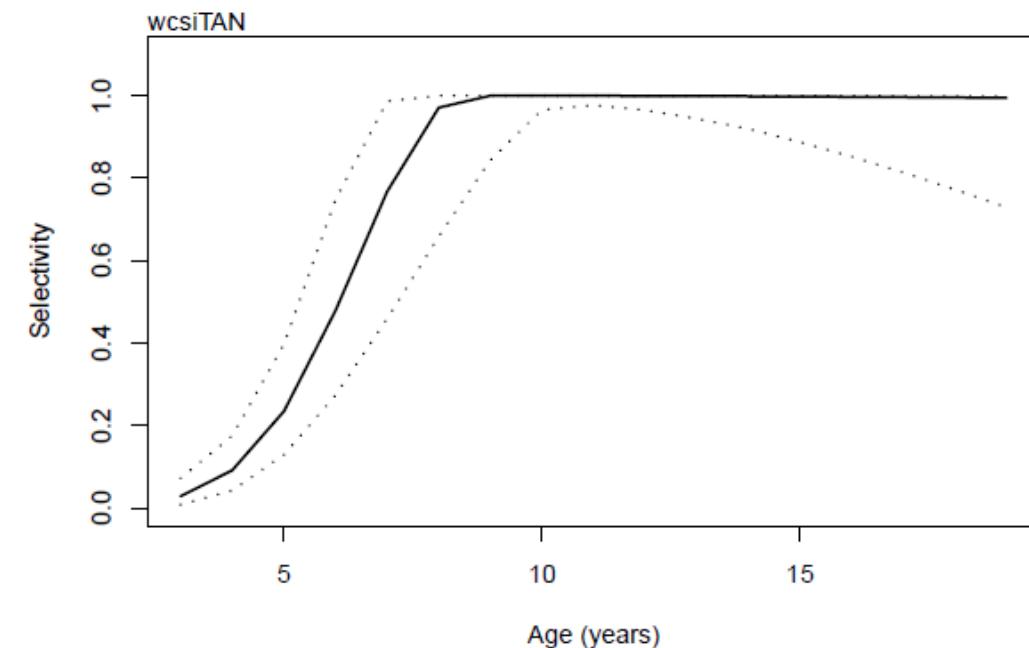
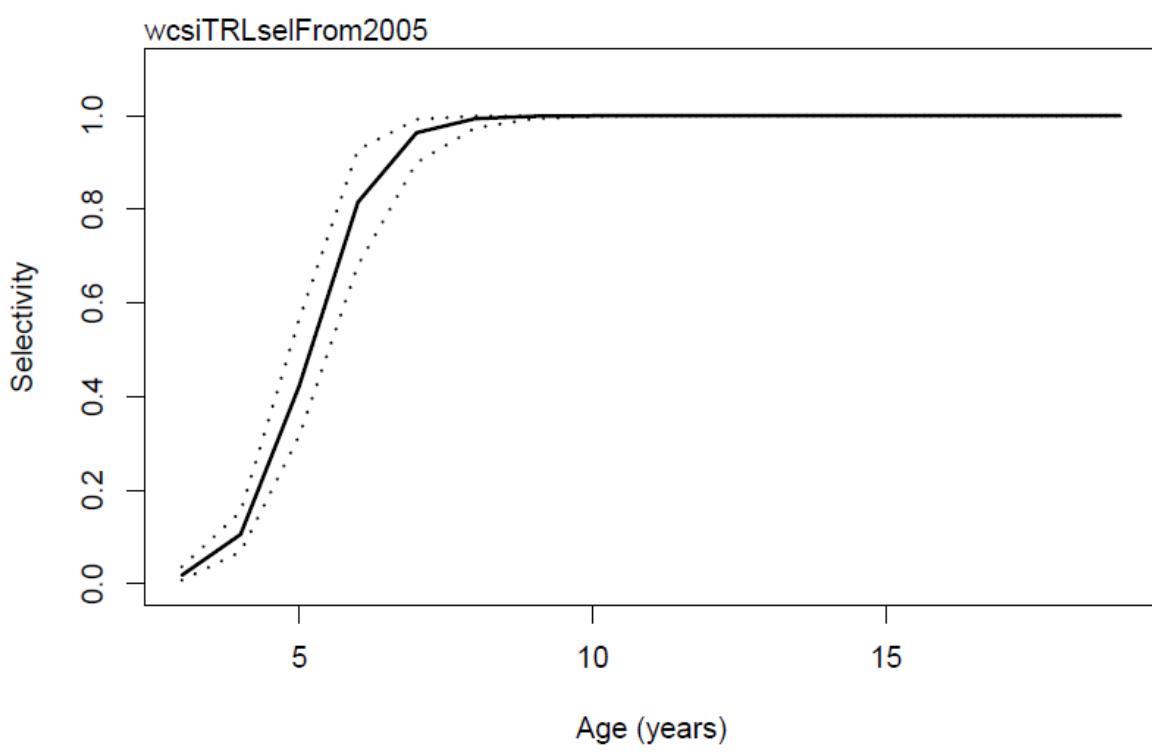
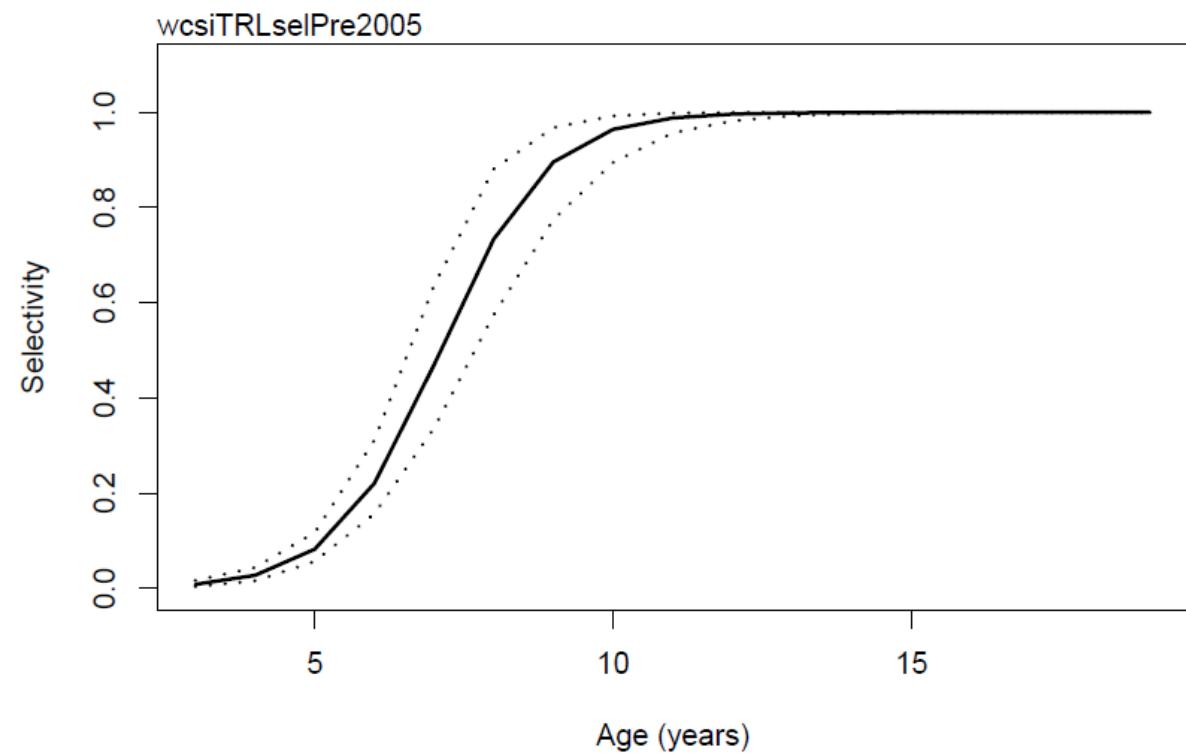
MCMC selectivity's: Survey CORE increased process error



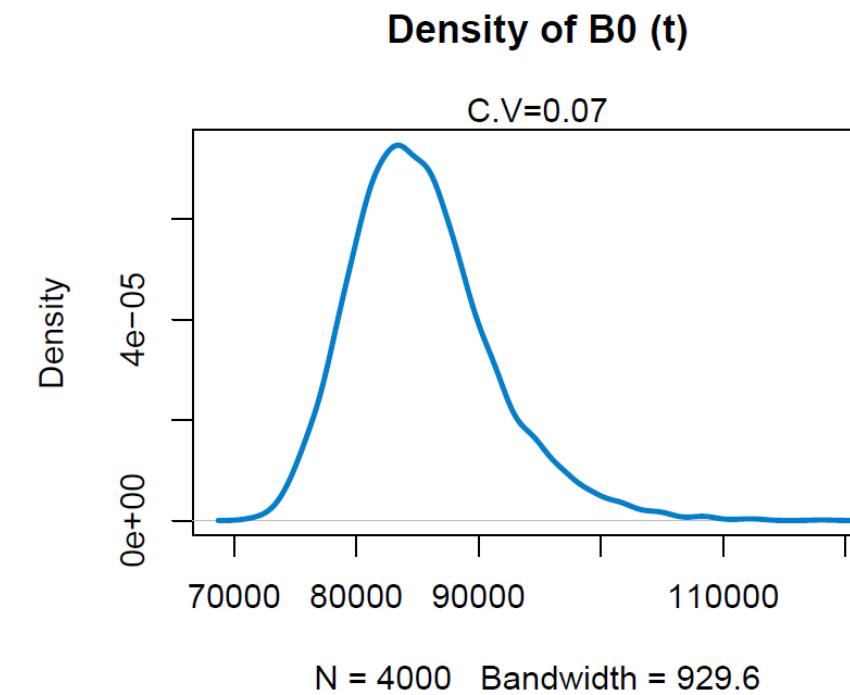
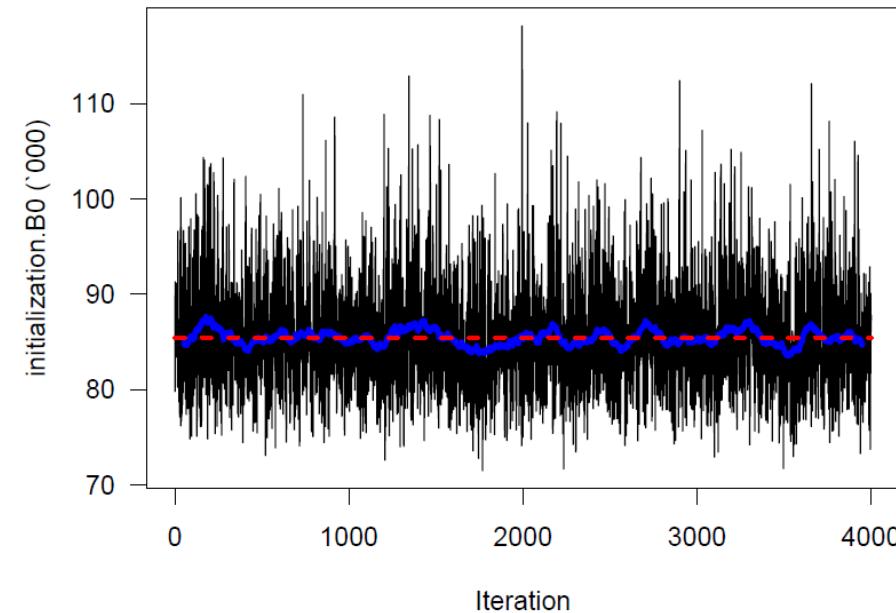
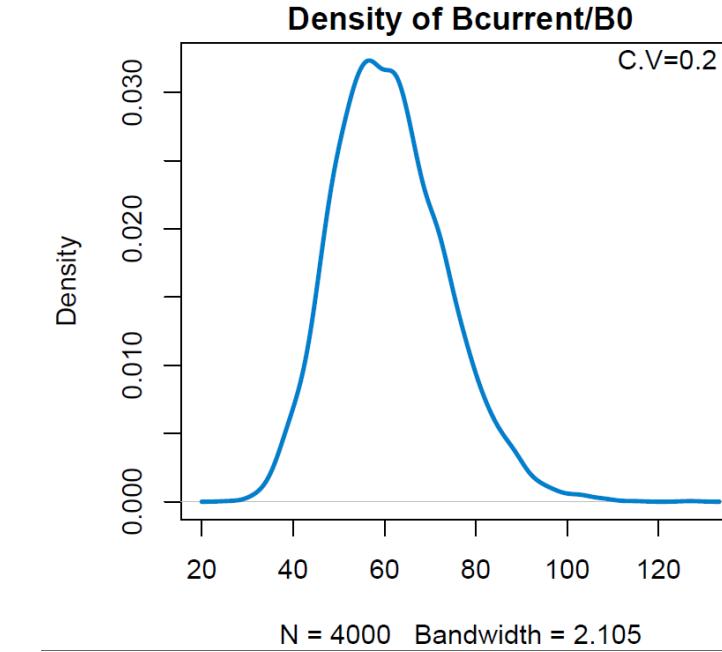
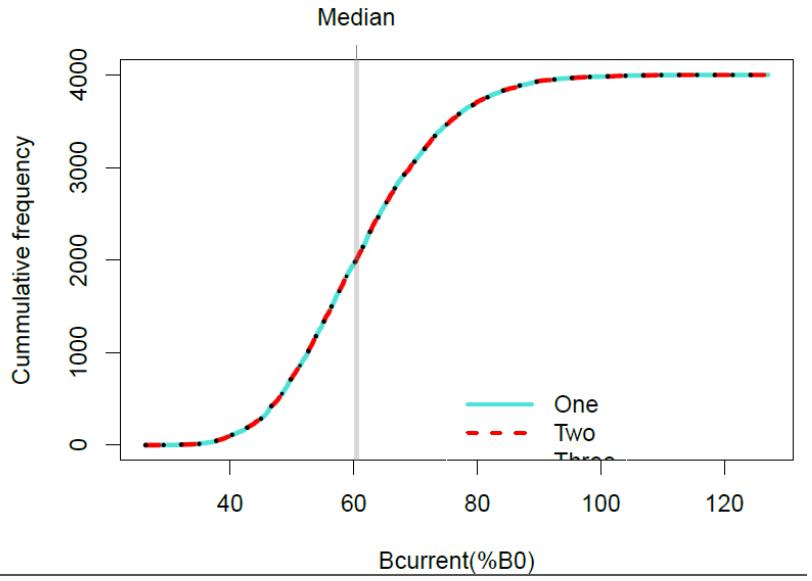
MCMC selectivity's: Survey CORE logistic



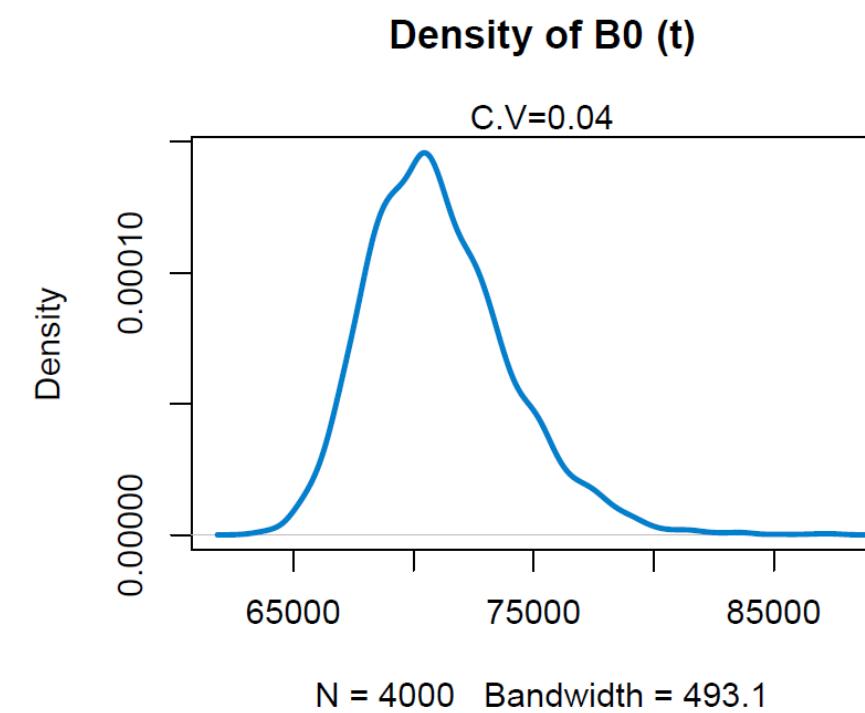
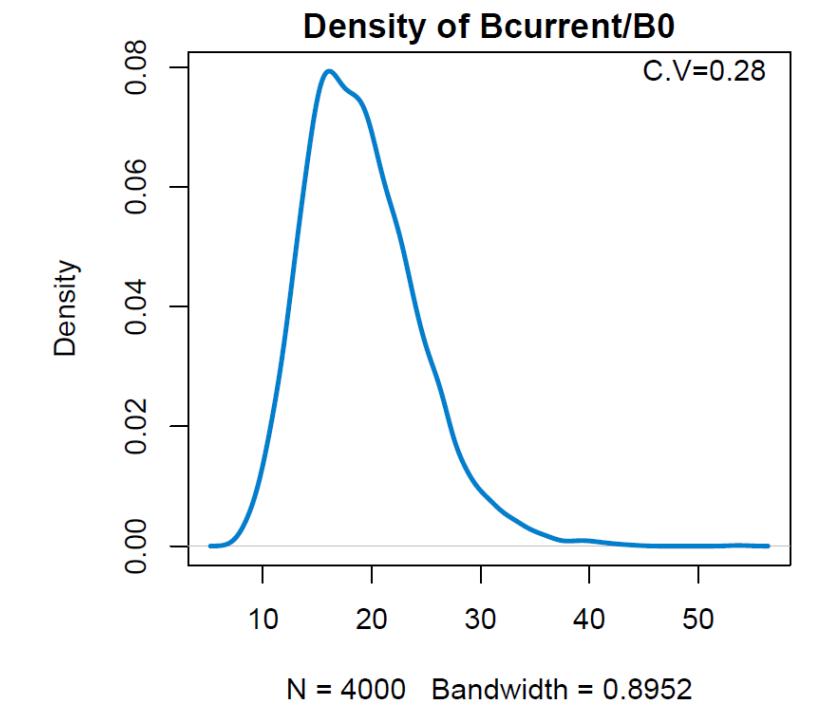
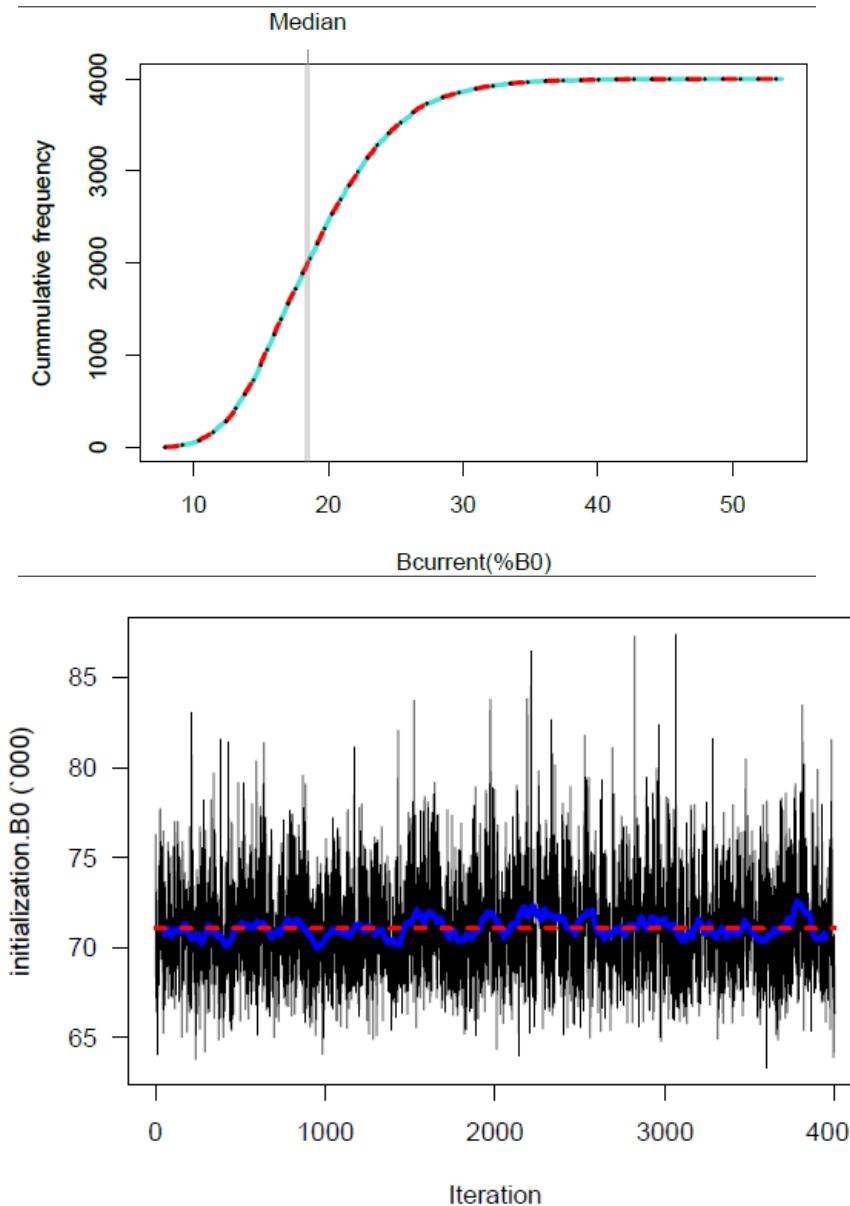
MCMC selectivity's: Survey ALL logistic



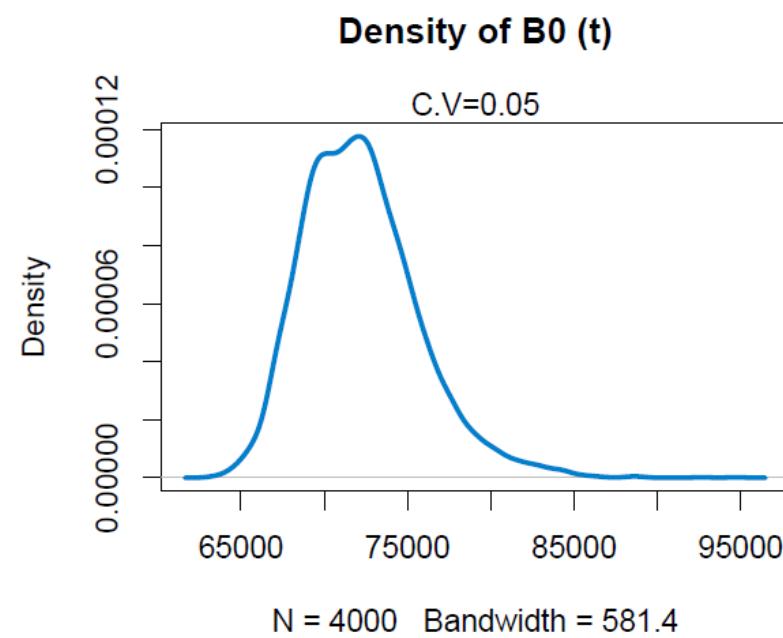
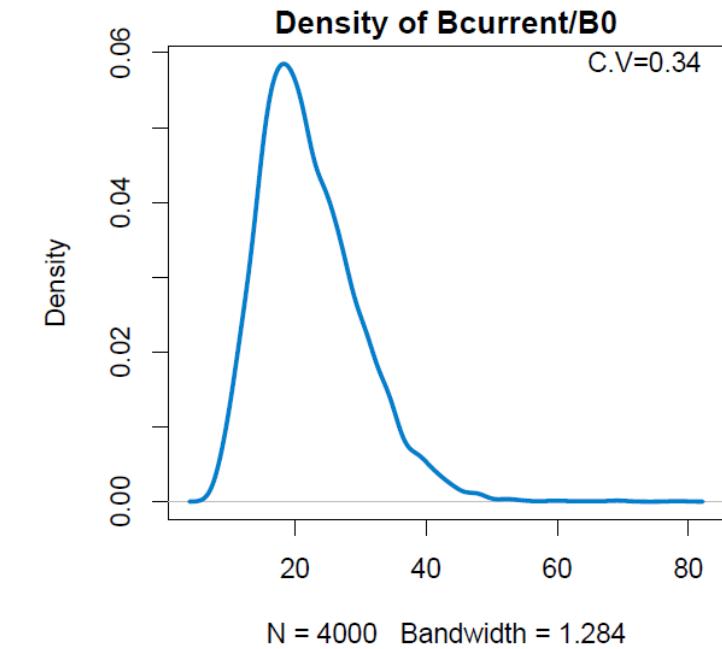
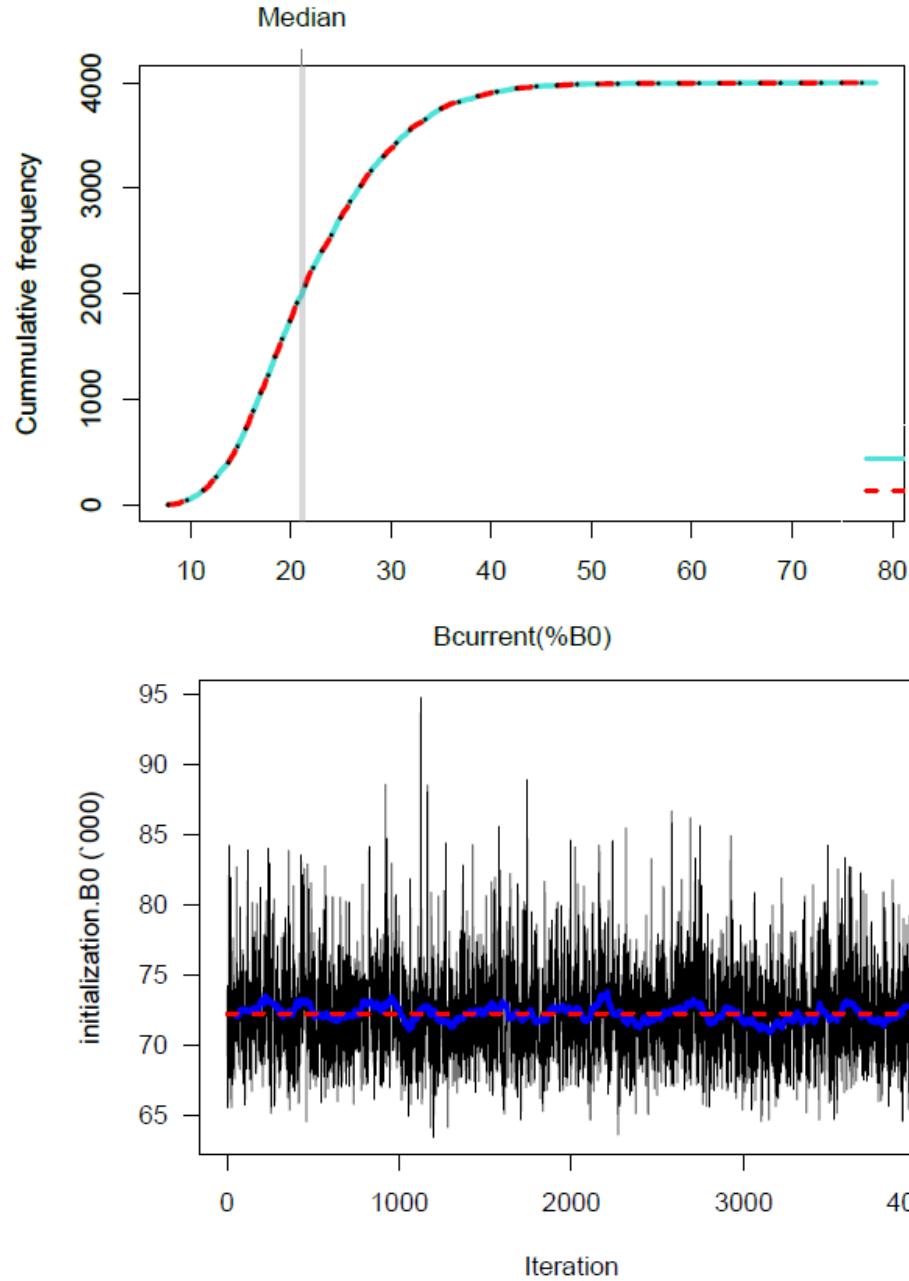
MCMC: CPUE model



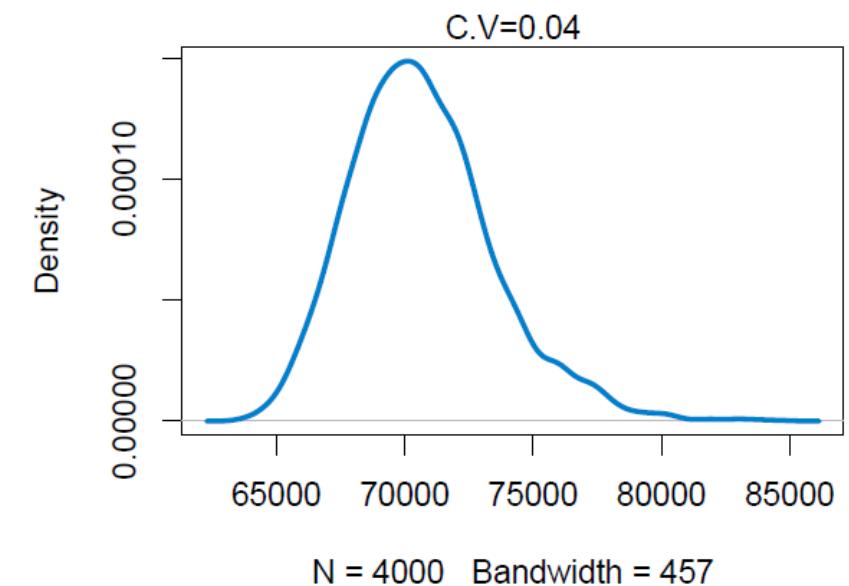
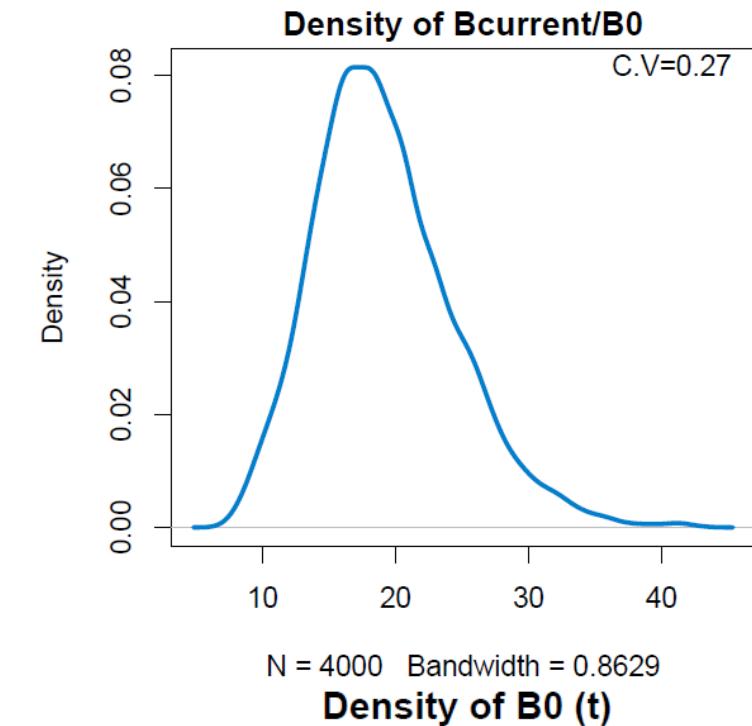
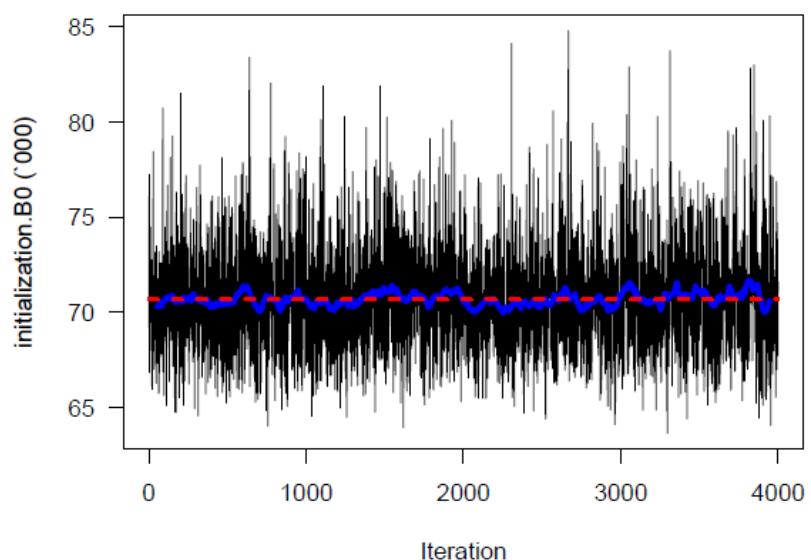
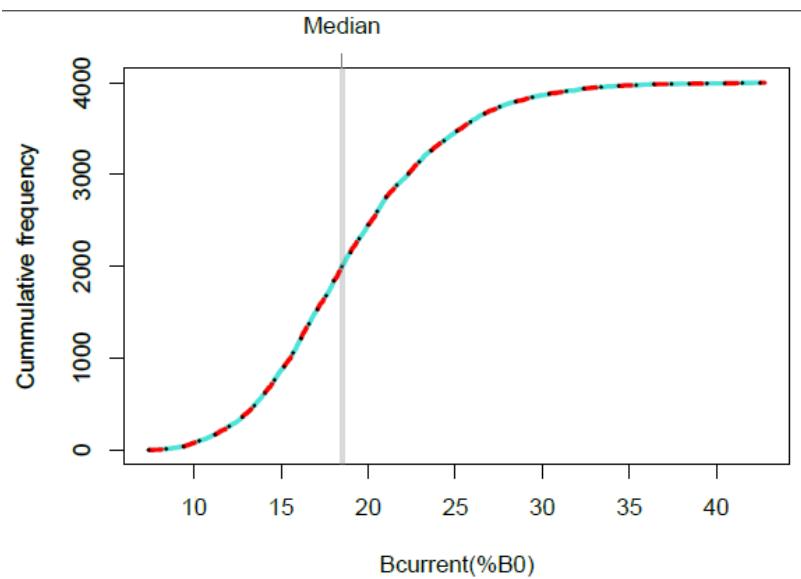
MCMC: Survey CORE



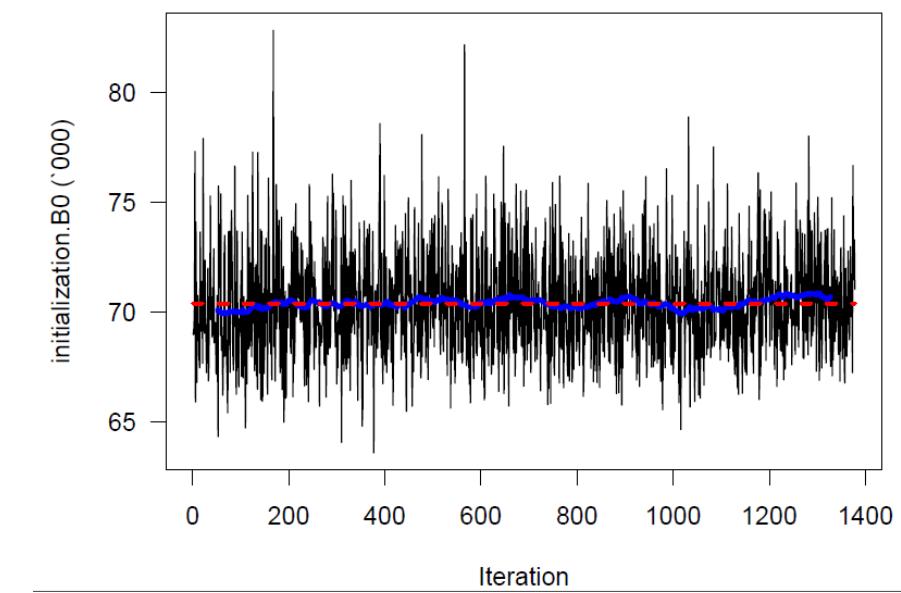
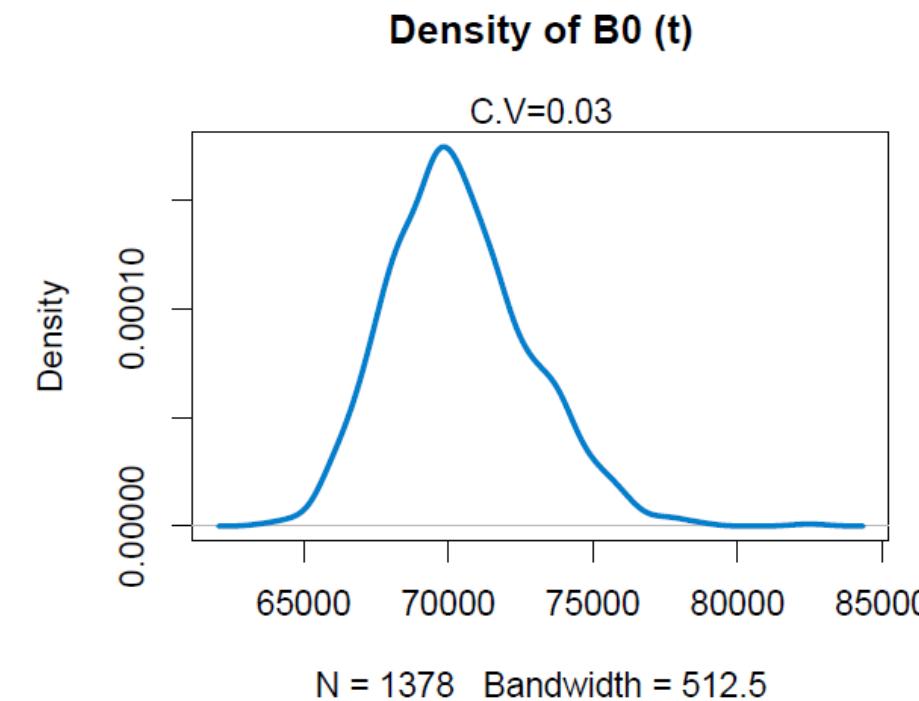
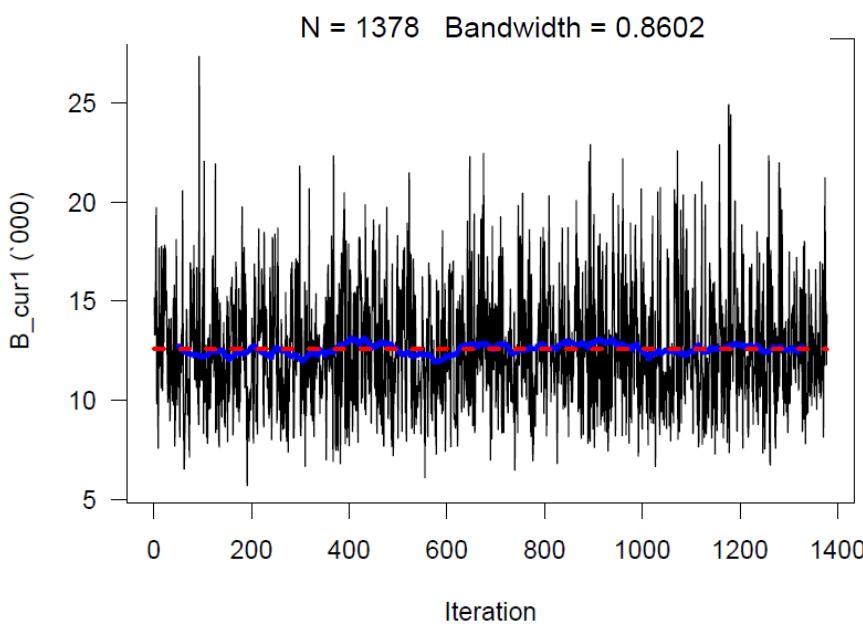
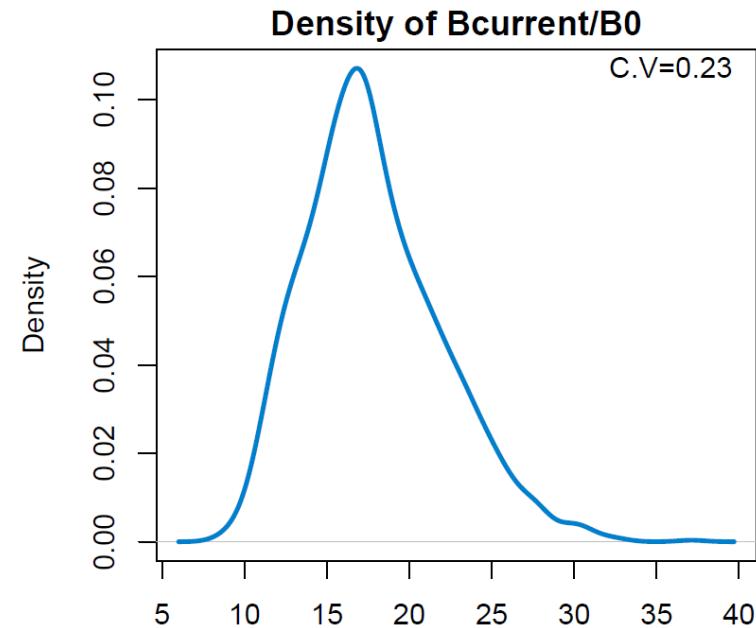
MCMC: Survey CORE increased process error



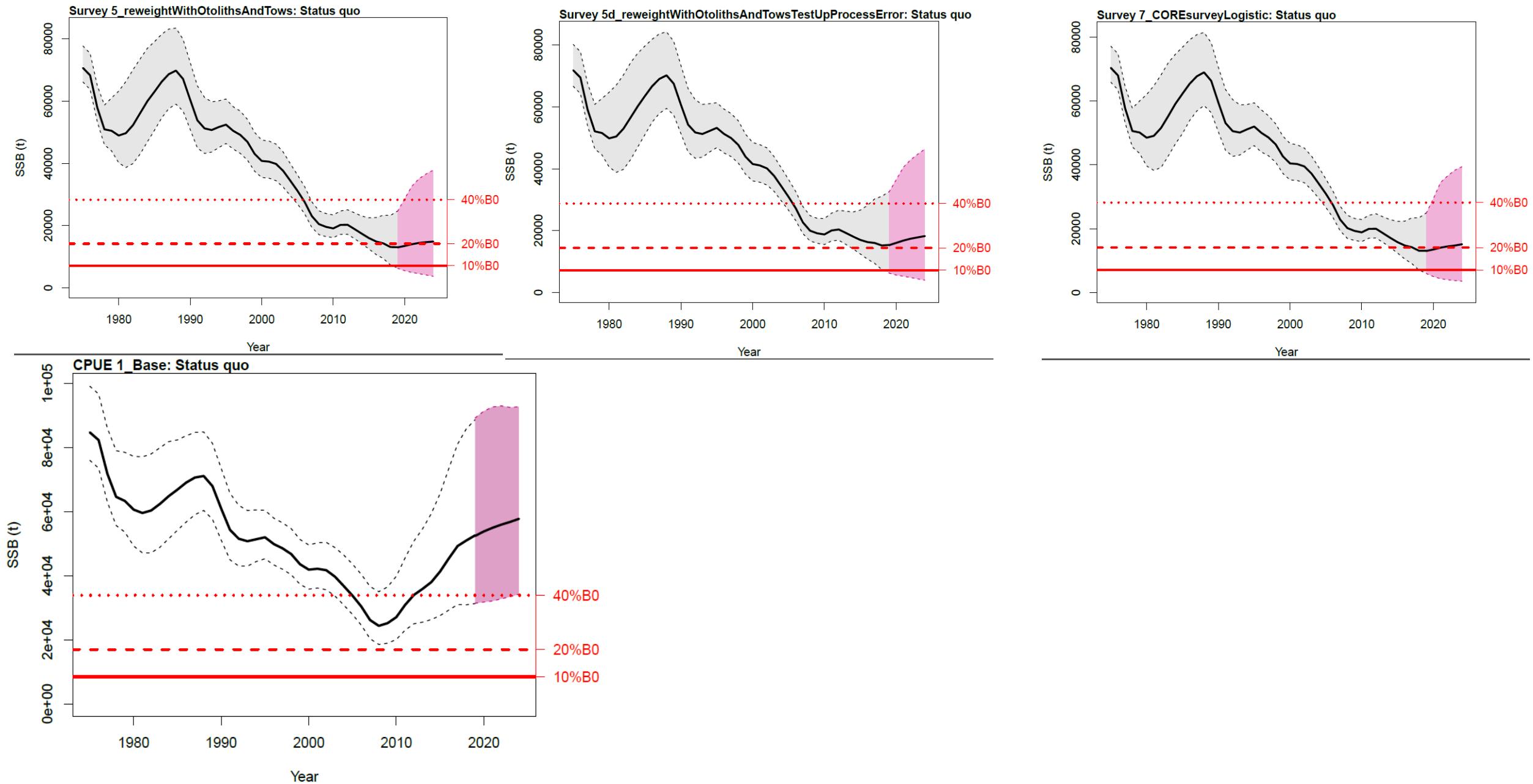
MCMC: Survey CORE logistic



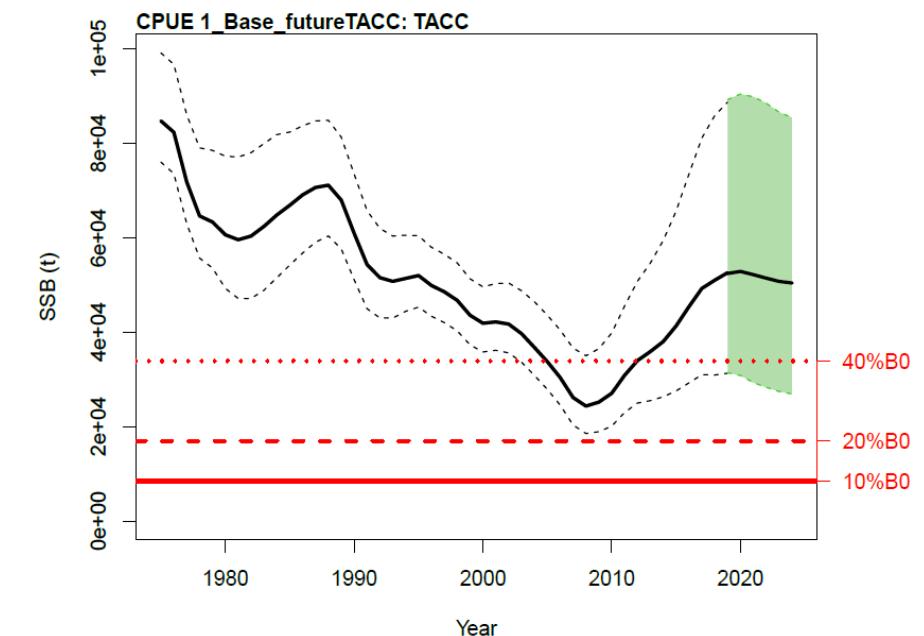
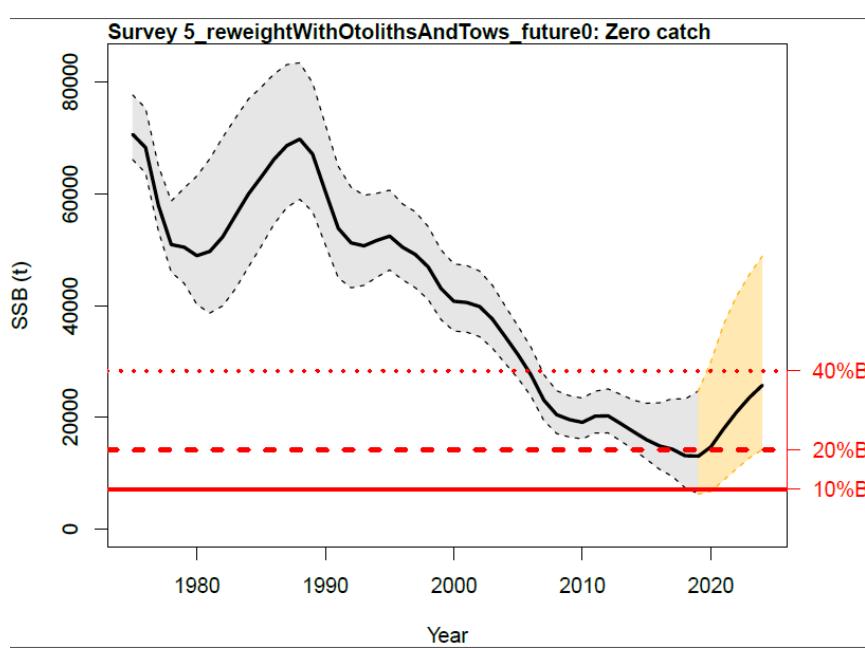
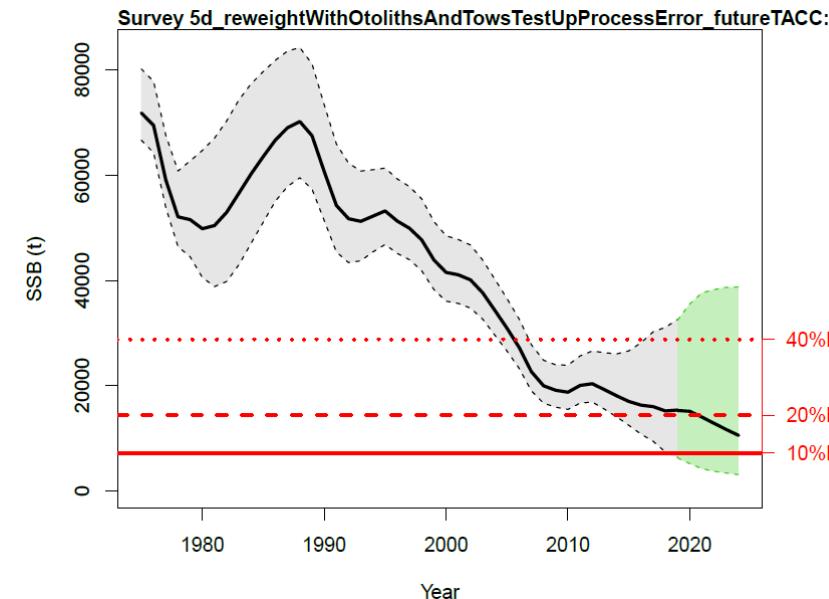
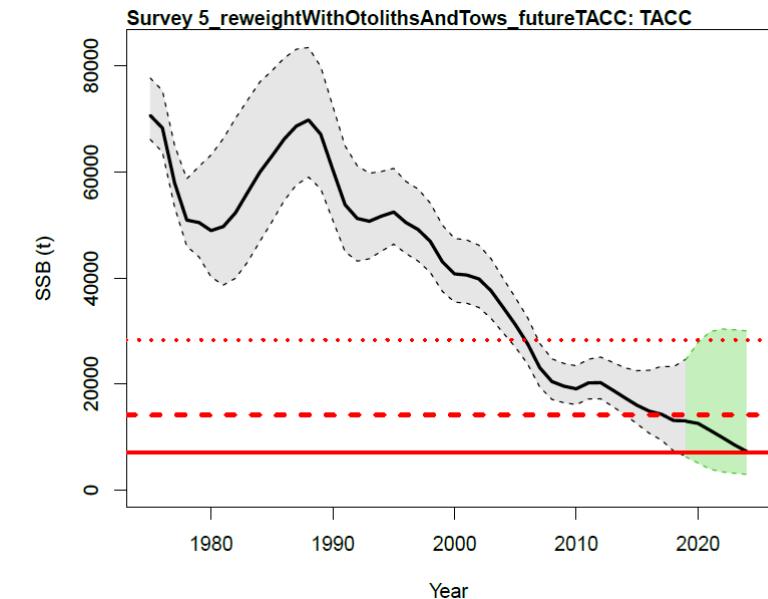
MCMC: Survey ALL logistic



Projections: Under status quo



Projections: Under TACC or Zero catch



Thank you

Thanks to Peter Horn and Sira Ballara for updated data inputs for the trawl survey