GOA rougheye/blackspotted rockfish

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Outline for today's presentation

1. Remove 1984/1987 bottom trawl survey
2. Updates to the assessment model's biological assumptions
    a. Natural mortality, maturity, ageing error, growth
3. Apportionment (Appendix A)
    a. Update software, alternative parameterizations, and weighting the longline and trawl surveys
4. 2023 data preview

Link to Plan Team report

Updating the M prior

Current:

Lognormal (0.03, σ=0.1)

Based on GSI data

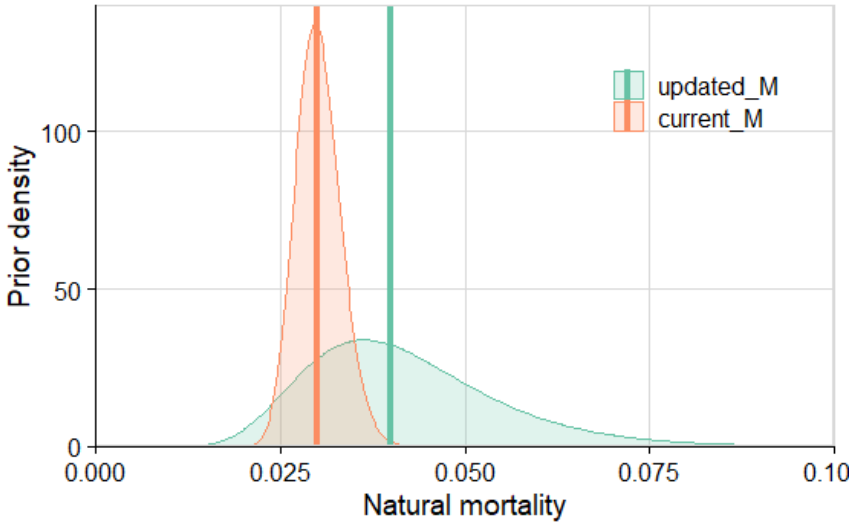
(McDermott 1994)

New:

Lognormal (0.04, σ=0.31)

Based on a max age of 135 y

(Hamel and Cope 2022)



Species	Region	Total N	Survey N	Fishery N	Max Age (y)	Mean Top 5 Ages	Survey years	Fishery years
REBS	**GOA**	**8,208**	**4,493**	**3,715**	**132**	**127.6**	**1978, 1979, 1984, 1987, 1990, 1993, 1996, 1999, 2003, 2005, 2009**	**1990, 2004, 2006, 2008, 2009, 2010, 2012, 2014, 2016, 2018, 2020**
RE	**GOA**	**2,196**	**2,196**	**-**	**135**	**113.4**	**2007, 2009, 2011, 2013, 2015, 2017, 2019**	
BS	**GOA**	**2,037**	**2,037**	**-**	**103**	**94.2**	**2007, 2009, 2011, 2013, 2015, 2017, 2019**	
REBS	EBS	958	320	638	130	120.2	2002, 2004	2004, 2005, 2007, 2008, 2009, 2011, 2013, 2015, 2017, 2019, 2020
RE	EBS	208	208	-	107	104.2	2008, 2010, 2012, 2016	
BS	EBS	439	439	-	84	72.6	2008, 2010, 2012, 2016	
REBS	AI	5,459	3,358	2,101	131	119.8	1986, 1991, 1994, 1997, 2000, 2002, 2004	2004, 2005, 2006, 2007, 2008, 2009, 2011, 2013, 2015, 2017, 2019, 2020
RE	AI	150	150	-	116	95.6	2006, 2010, 2012, 2014, 2018	
BS	AI	2,426	2,426	-	134	106.2	2006, 2010, 2012, 2014, 2016, 2018	

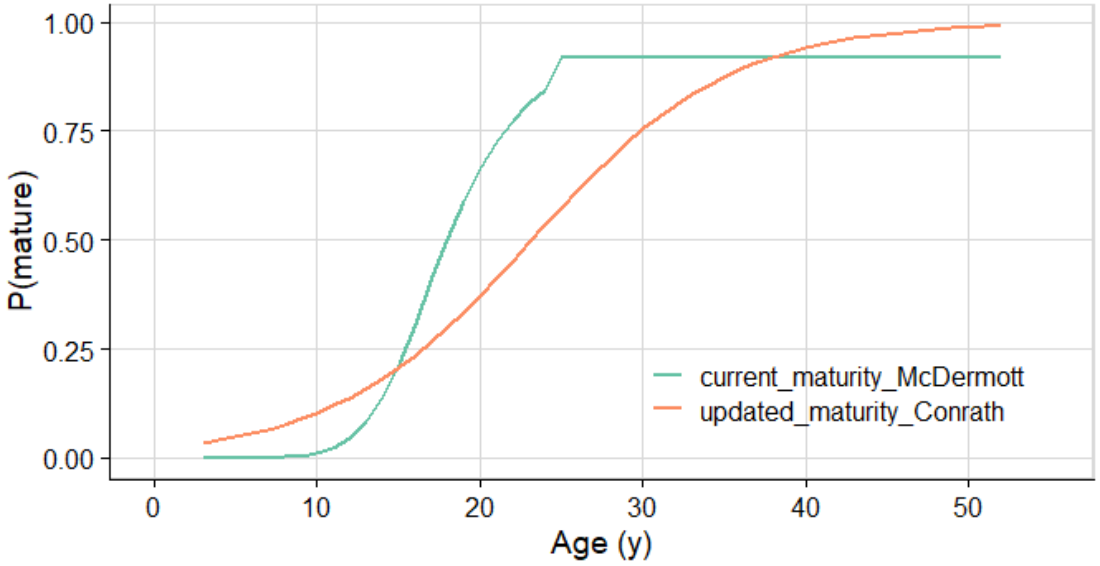
Updating maturity-at-age

Current:

Based on maturity-at-length collected in the EBS, AI, GOA, BC, and WC (McDermott 1994) converted to maturity-at-age using the 2015 size-age transition matrix

New:

Based on maturity-at-age data collected in the GOA (Conrath 2017, Conrath and Hulson 2021)

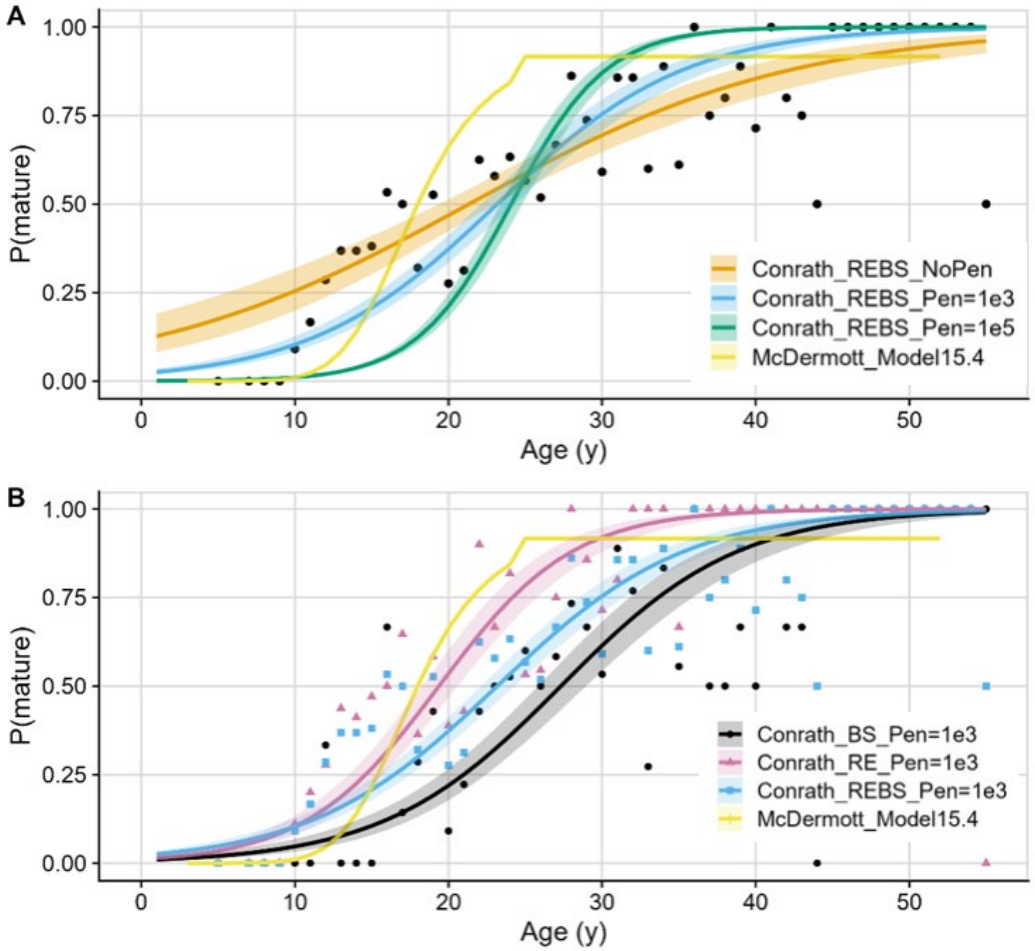


Maturity analysis

We used the same likelihood penalty as Conrath and Hulson 2021 (Pen=1e3)

Species-specific data were combined, but just a reminder: blackspotted rockfish mature more slowly and at older ages

Model	Age at 50% maturity (a_{50})	Maturation rate (δ)
Conrath_REBS_Pen=1e3	**23.2**	**-0.16**
Conrath_BS_Pen=1e3	27.3	-0.17
Conrath_RE_Pen=1e3	19.4	-0.23



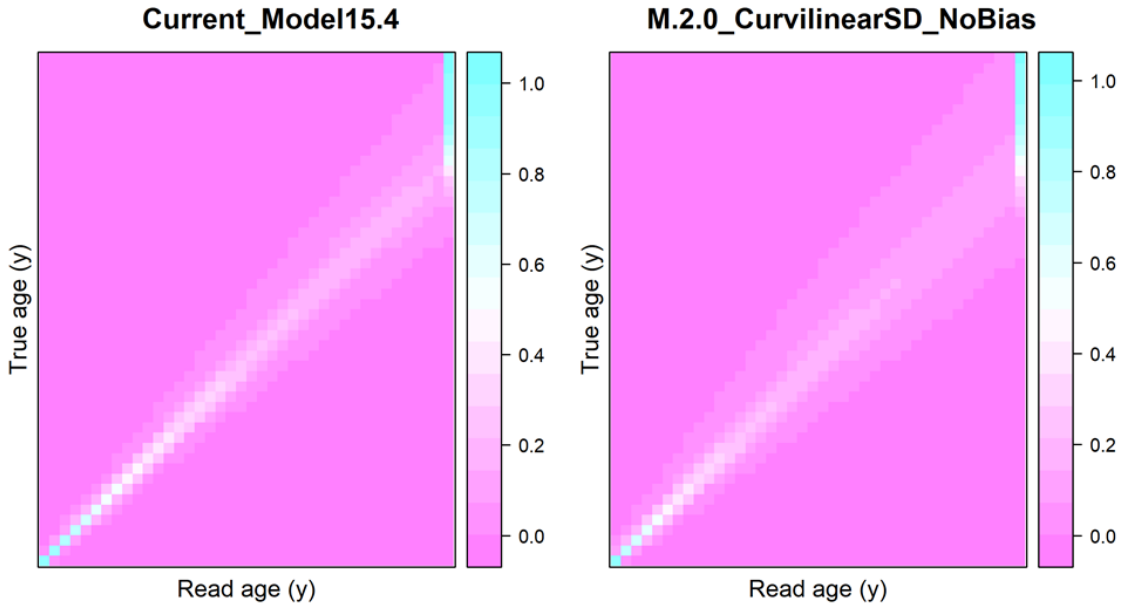
Updating ageing error

Current:

Custom ADMB model based on on the percent agreement for each age class. Last updated in 2015 (N=1,589)

New:

Used the *nwfscAgeingError* R library (Punt et al. 2008; Thorson et al. 2012). Several options for uncertainty and bias

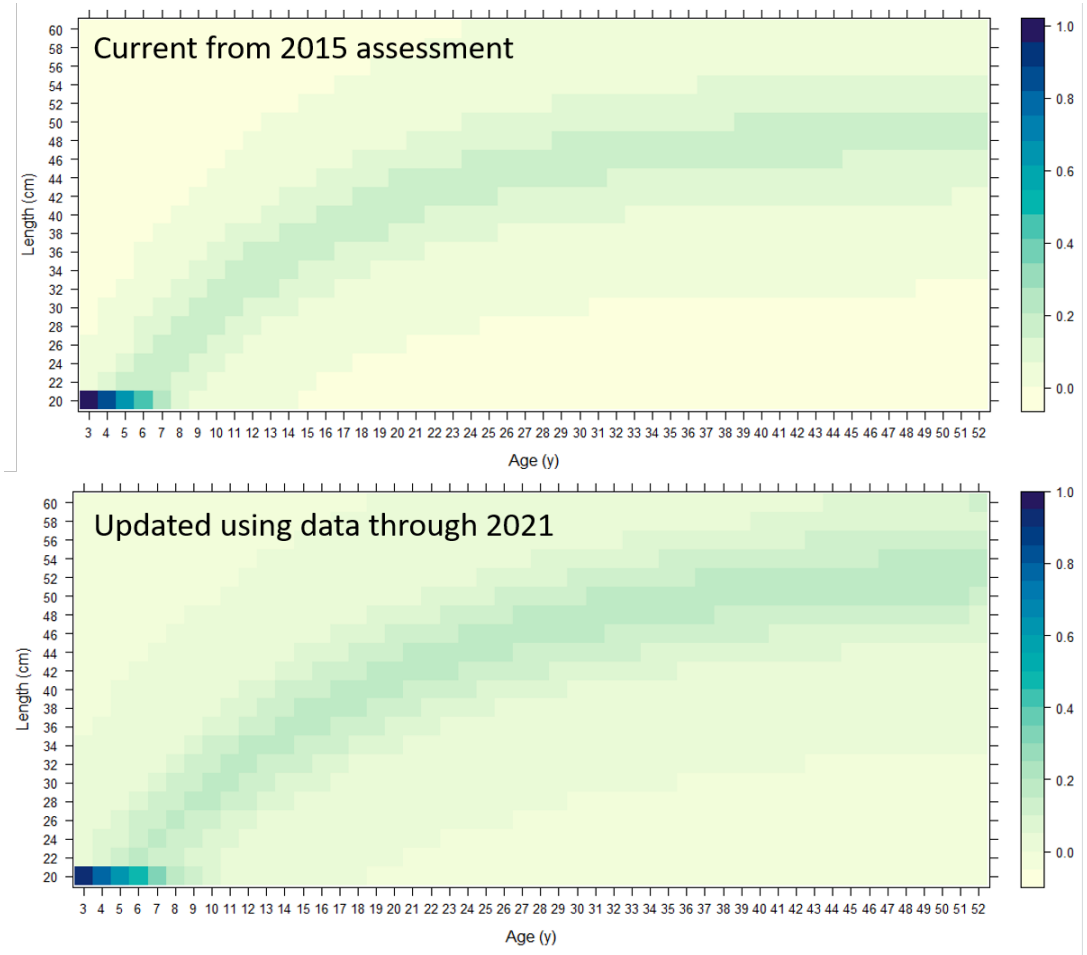


Updating the size-age transition matrix

Used to convert predicted numbers-at-age to numbers-at-length when fitting marginal length comps

Current method updated with new data:

Von Bertalanffy growth function fit to mean trawl survey length-at-age and SD, corrected for length-stratified sampling (Bettoli and Miranda 2001). Last updated in 2015.



Old (2015) length-at-age parameters: L_∞= 49.6 cm, k =0.09, t_0=-0.69, n=6,738
New (2021) length-at-age parameters: L_∞= 54.2 cm, k =0.07, t_0=-1.5, n=7,638

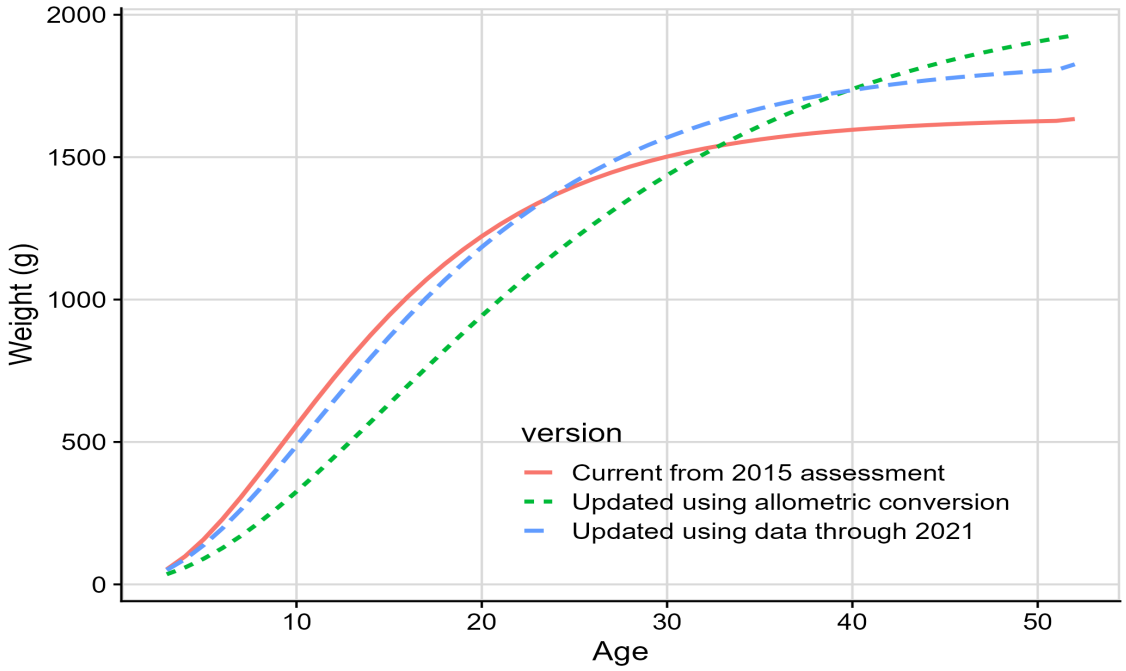
Updating the weight-at-age vector

Current:

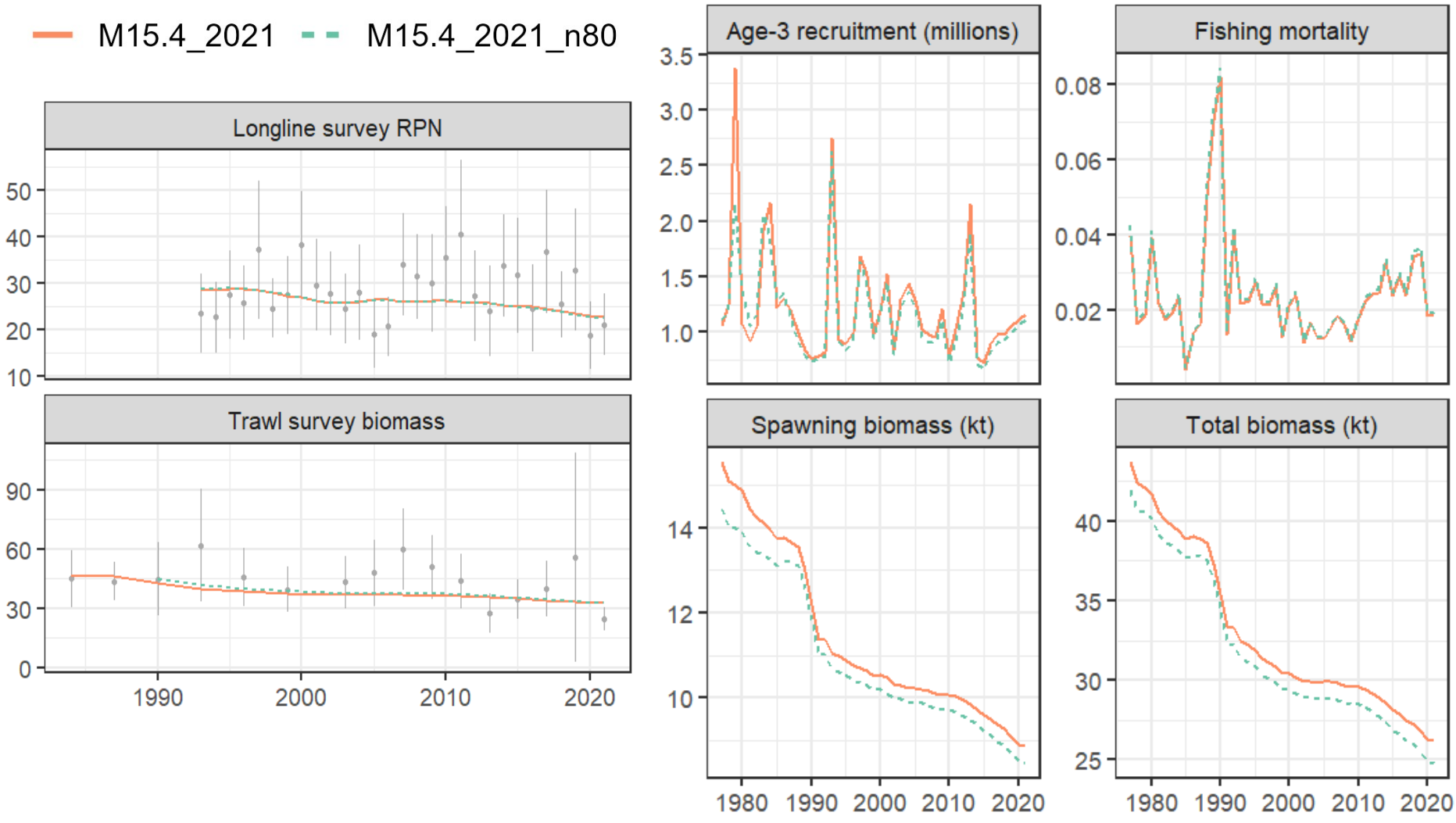
Weight-based vonB growth function fit to mean trawl survey weight-at-age and SD, corrected for length-stratified sampling. Last updated in 2015.

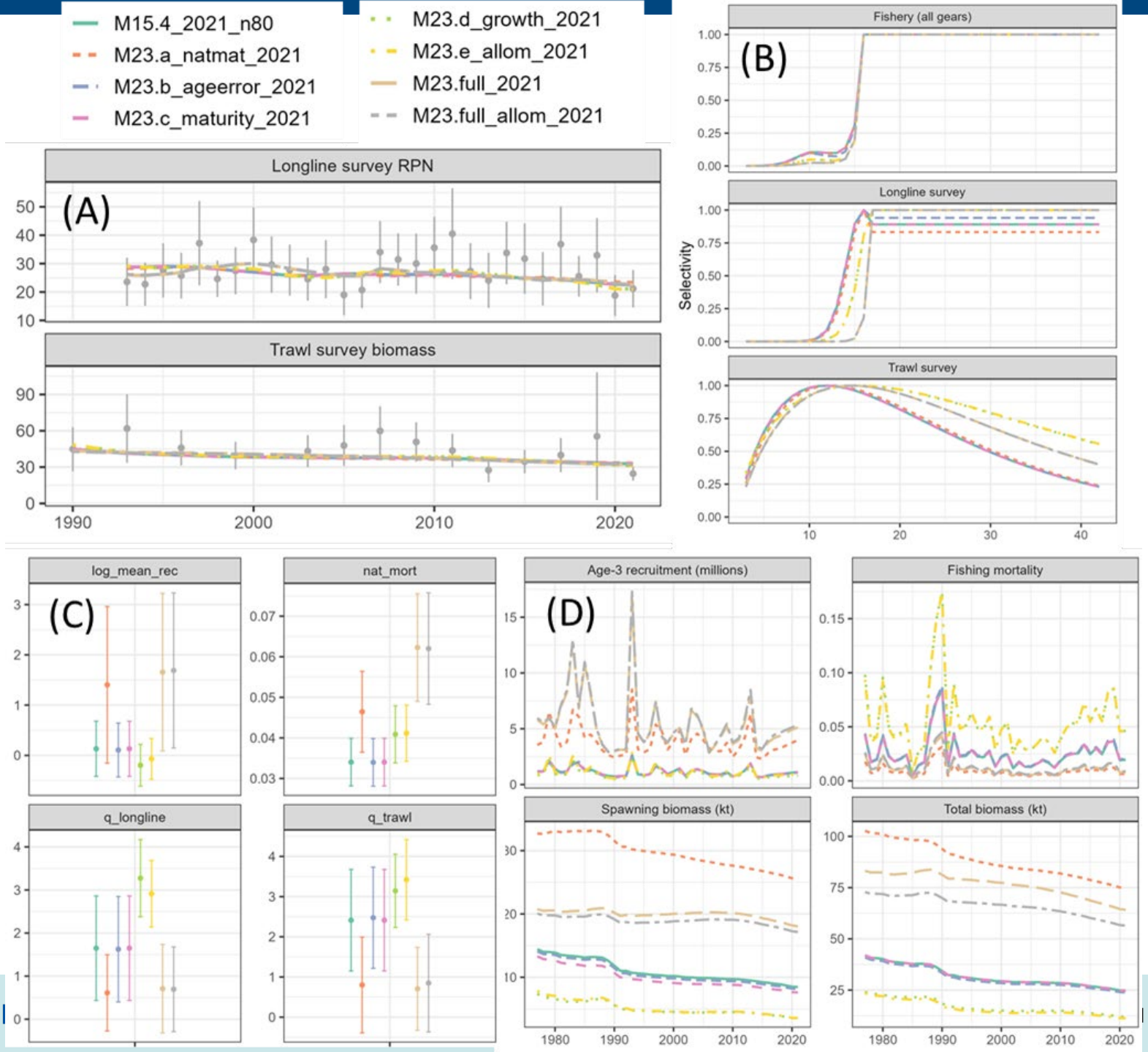
New:

1) Same method with updated data.
2) Length-at-age converted to weight-at-age using allometric function.



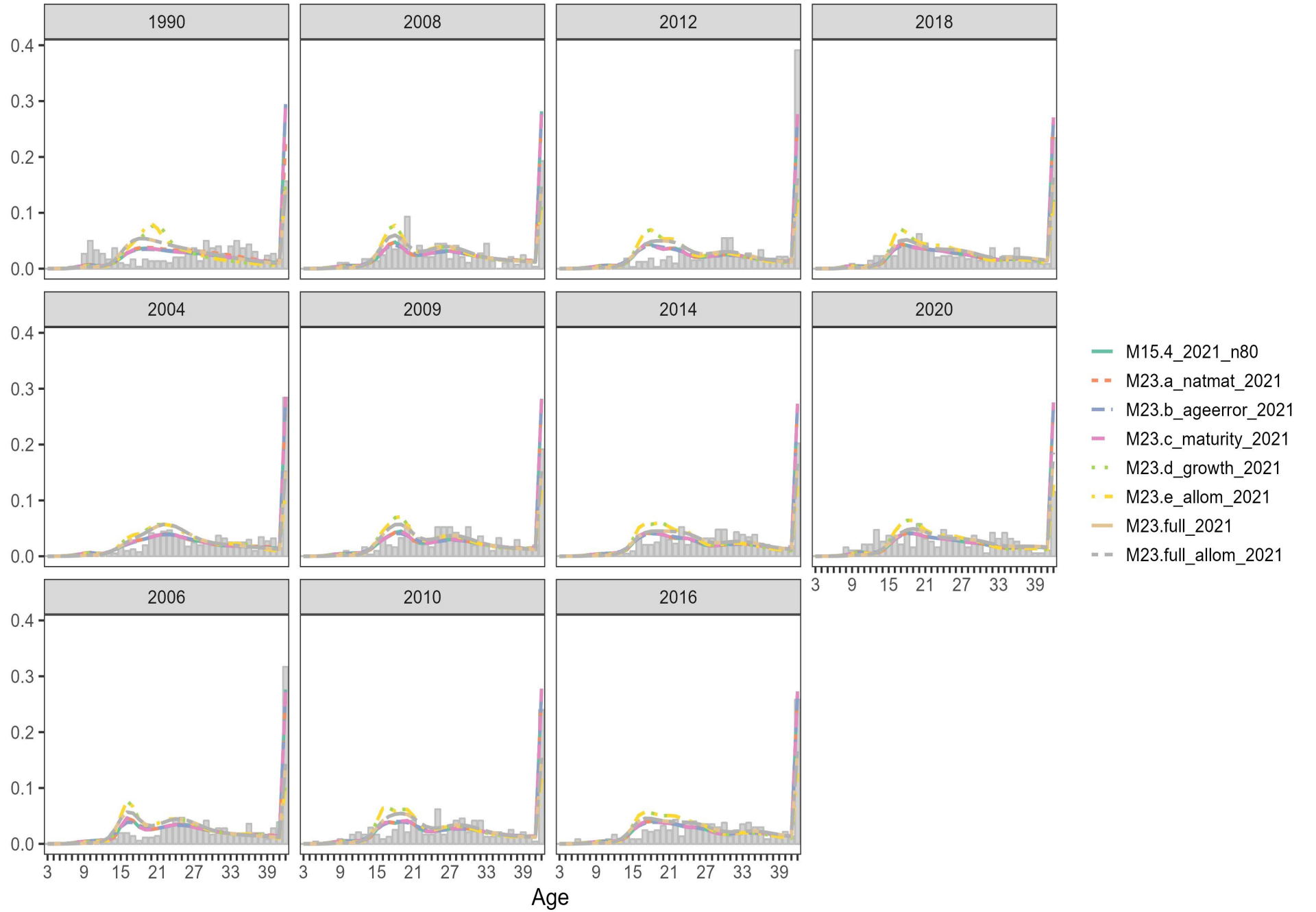
Removing the 1984/87 trawl surveys



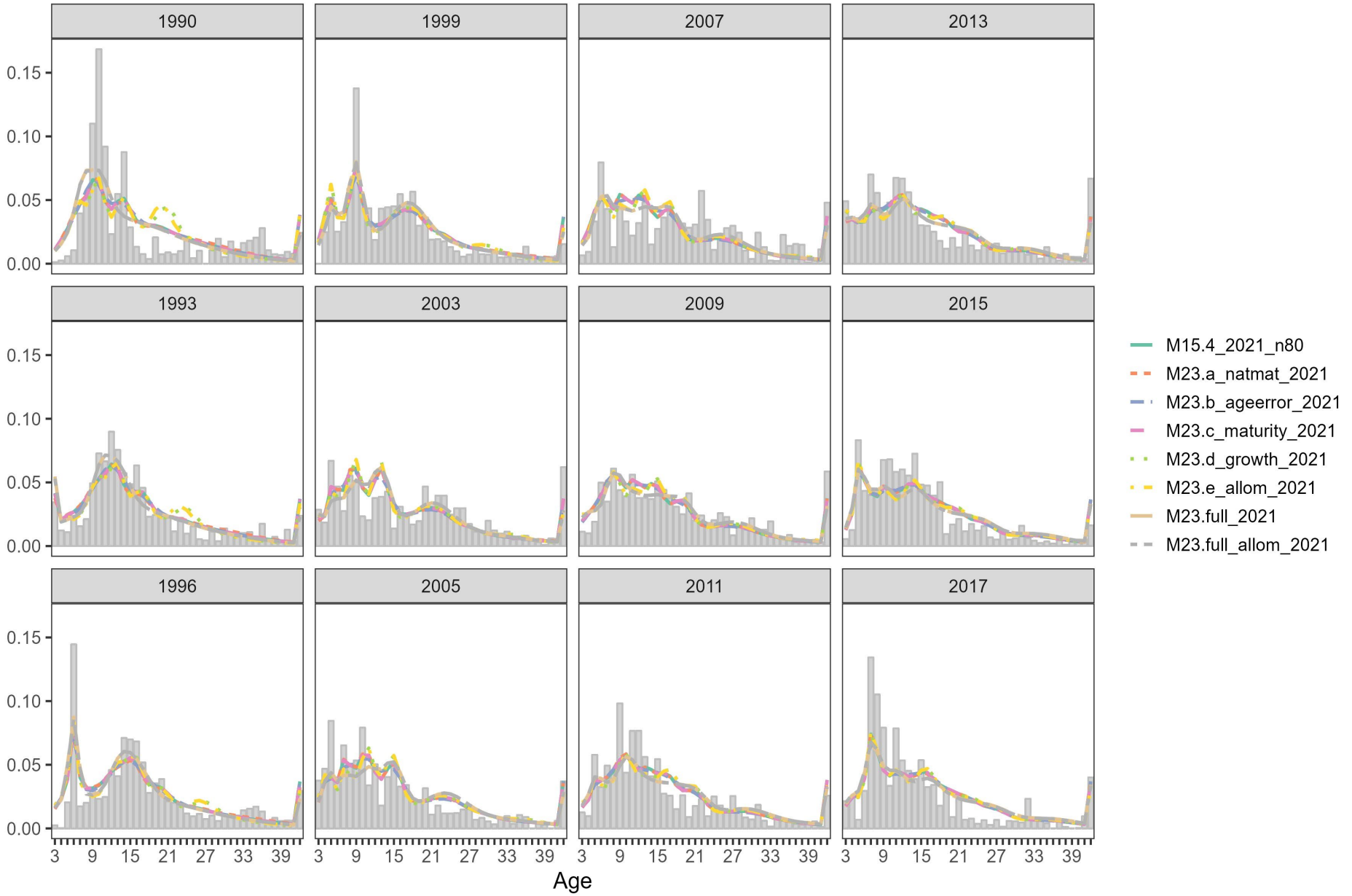

M15.4_2021_n80
M23.a_natmat_2021
M23.b_ageerror_2021
M23.c_maturity_2021
M23.d_growth_2021
M23.e_allom_2021
M23.full_2021
M23.full_allom_2021
(A)
Longline survey RPN
Trawl survey biomass
(B)
Fishery (all gears)
Longline survey
Trawl survey
Selectivity
(C)
log_mean_rec
nat_mort
q_longline
q_trawl
(D)
Age-3 recruitment (millions)
Fishing mortality
Spawning biomass (kt)
Total biomass (kt)

Description	M15.4 2021	M15.4_2 021_n80	M23.a_nat mat_2021	M23.b_age error_2021	M23.c_mat urity_2021	M23.d_gro wth_2021	M23.e_all om_2021	M23.full 2021	M23.full_all om_2021
Age-3+ biomass in 2022	26,053	24,619	72,953	25,284	26,053	15,738	13,158	50,122	44,702
Age-3+ biomass in 2023	25,985	24,550	71,795	25,230	26,031	15,862	13,355	49,440	44,197
SSB in 2022	8,645	8,239	23,850	8,372	7,784	5,093	4,032	13,213	12,771
SSB in 2023	8,621	8,213	23,376	8,350	7,777	5,140	4,116	12,953	12,563
B_{100}	14,776	14,125	27,698	14,553	13,871	12,180	10,886	16,893	16,812
B_{40}	5,911	5,650	11,079	5,821	5,548	4,872	4,355	6,757	6,725
B_{35}	5,172	4,944	9,694	5,094	4,855	4,263	3,810	5,912	5,884
F_{40}	0.0381	0.0377	0.0491	0.0383	0.0333	0.0386	0.0409	0.0541	0.0482
F_{35}	0.0460	0.0455	0.0590	0.0462	0.0399	0.0464	0.0490	0.0654	0.0578
F_{ABC} in 2022	0.0381	0.0377	0.0491	0.0383	0.0333	0.0386	0.0377	0.0541	0.0482
F_{ABC} in 2023	0.0381	0.0377	0.0491	0.0383	0.0333	0.0386	0.0386	0.0541	0.0482
ABC in 2022	788	743	2,779	763	689	470	369	1,936	1,627
ABC in 2023	780	735	2,706	756	683	471	382	1,885	1,593
F_{OFL} in 2022	0.0460	0.0455	0.0590	0.0462	0.0399	0.0464	0.0452	0.0654	0.0578
F_{OFL} in 2023	0.0460	0.0455	0.0590	0.0462	0.0399	0.0464	0.0462	0.0654	0.0578
OFL in 2022	946	892	3,328	916	824	562	441	2,325	1,941
OFL in 2023	937	883	3,240	908	817	564	456	2,265	1,900

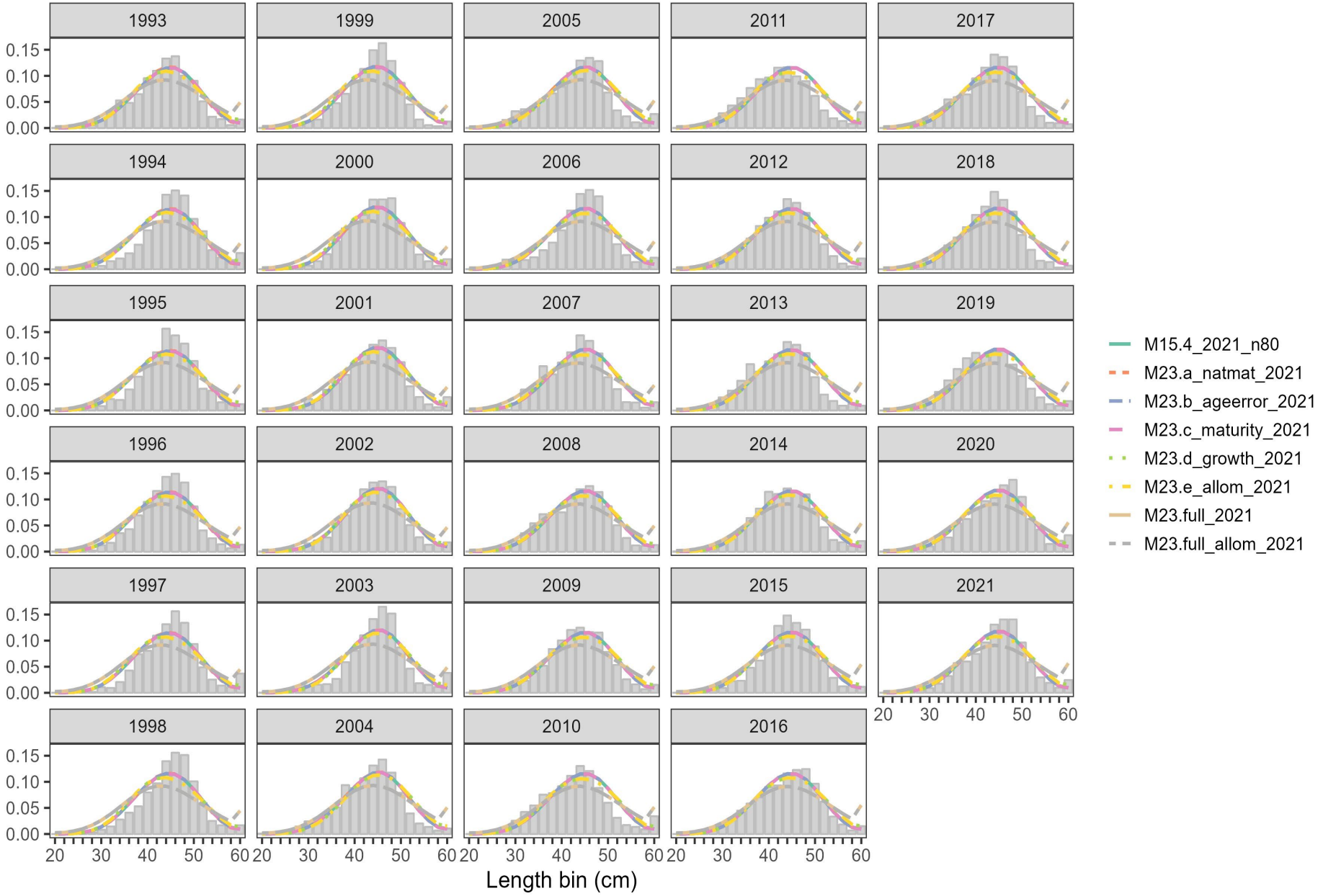
Fishery age comps



Trawl survey age comps

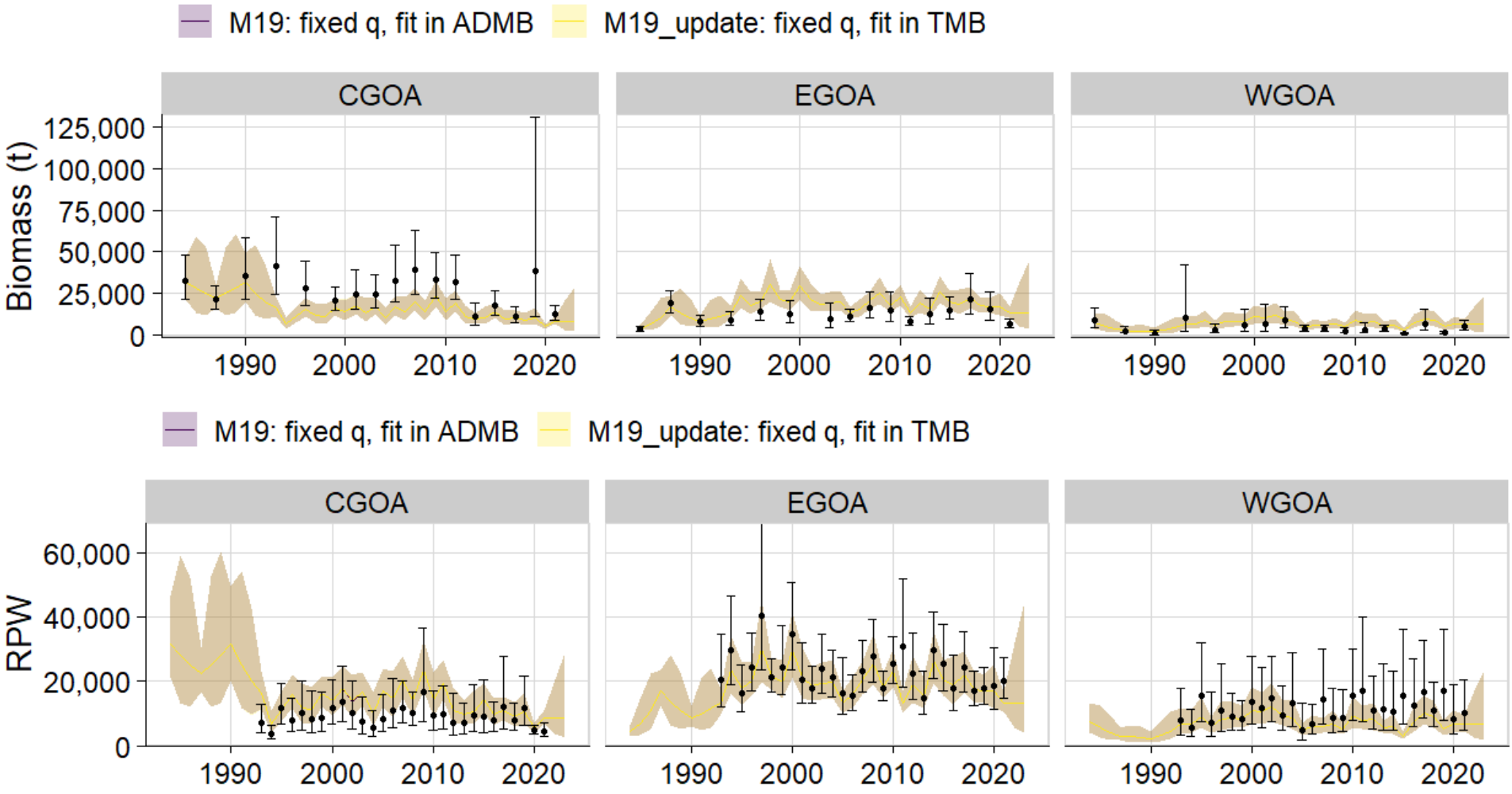


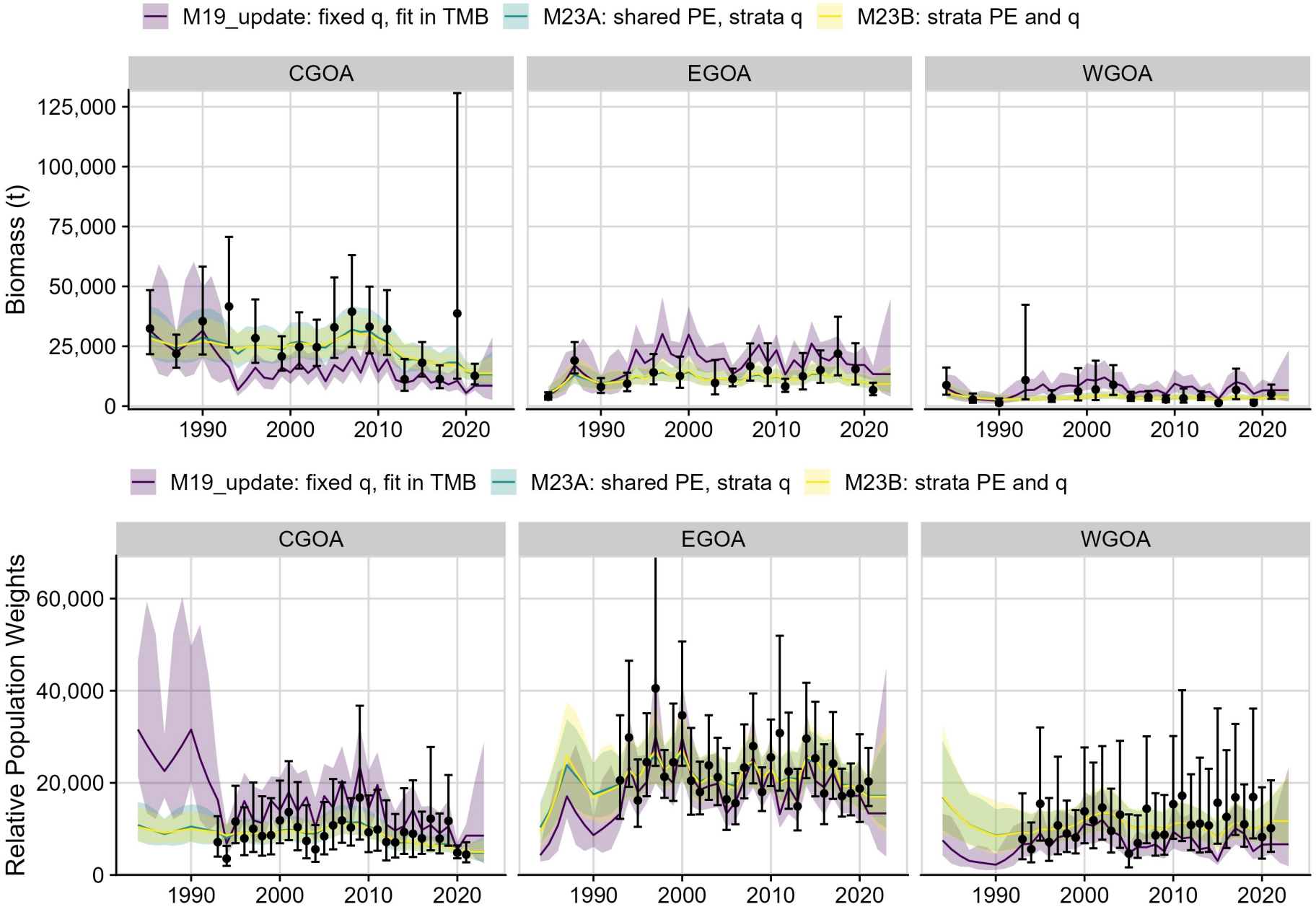
Longline survey length comps



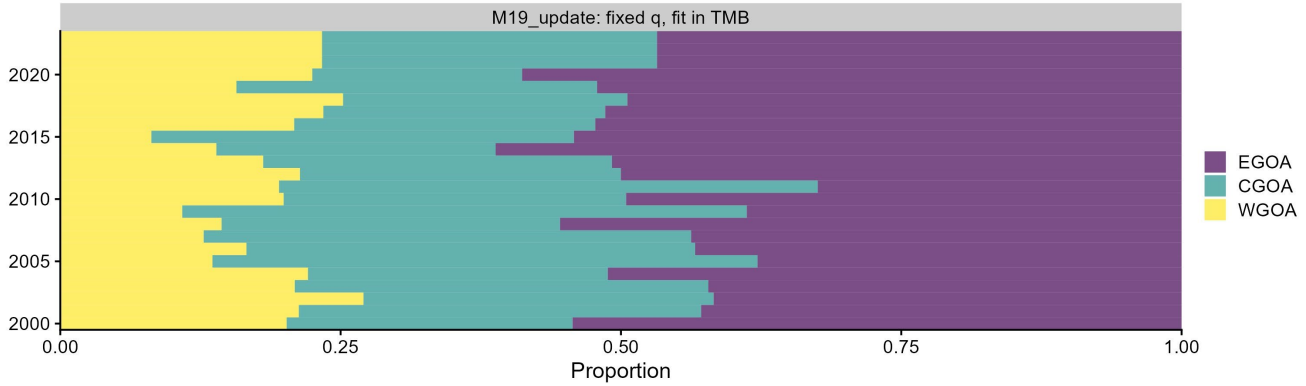
Apportionment

Fixed q = horrible fits, regardless of software

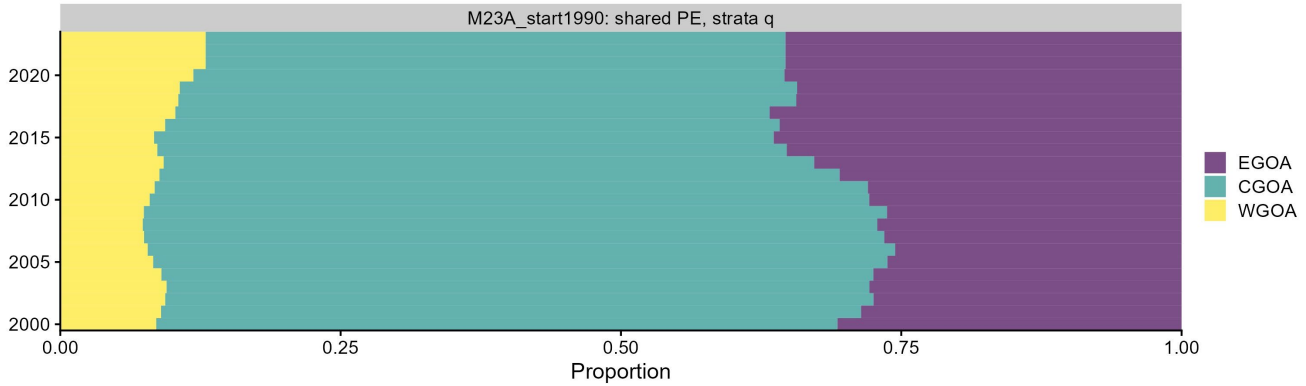



M19_update: fixed q, fit in TMB
M23A: shared PE, strata q
M23B: strata PE and q
CGOA
EGOA
WGOA
Biomass (t)
125,000
100,000
75,000
50,000
25,000
0
1990
2000
2010
2020
M19_update: fixed q, fit in TMB
M23A: shared PE, strata q
M23B: strata PE and q
CGOA
EGOA
WGOA
Relative Population Weights
60,000
40,000
20,000
0
1990
2000
2010
2020

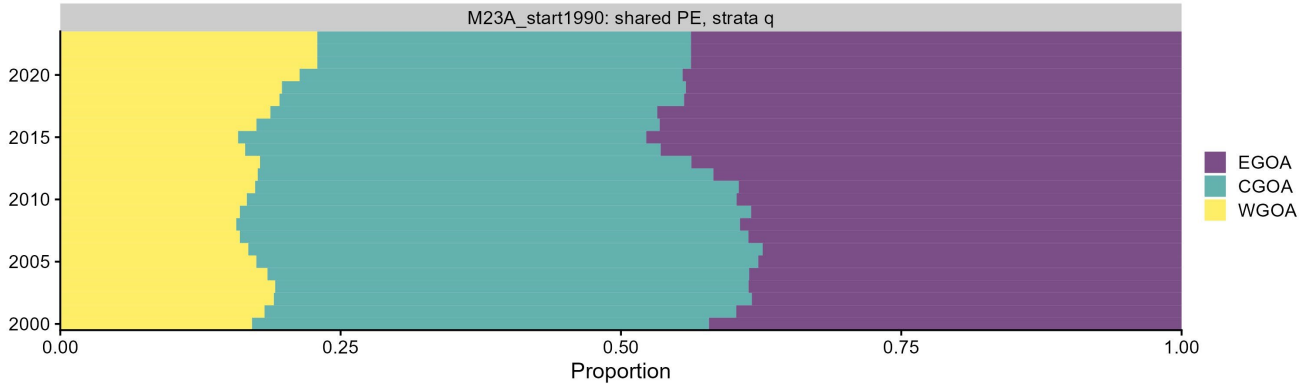
Apportionment based on fixed q and predicted biomass by area (CURRENT)



Apportionment based on predicted biomass by area (STANDARD)



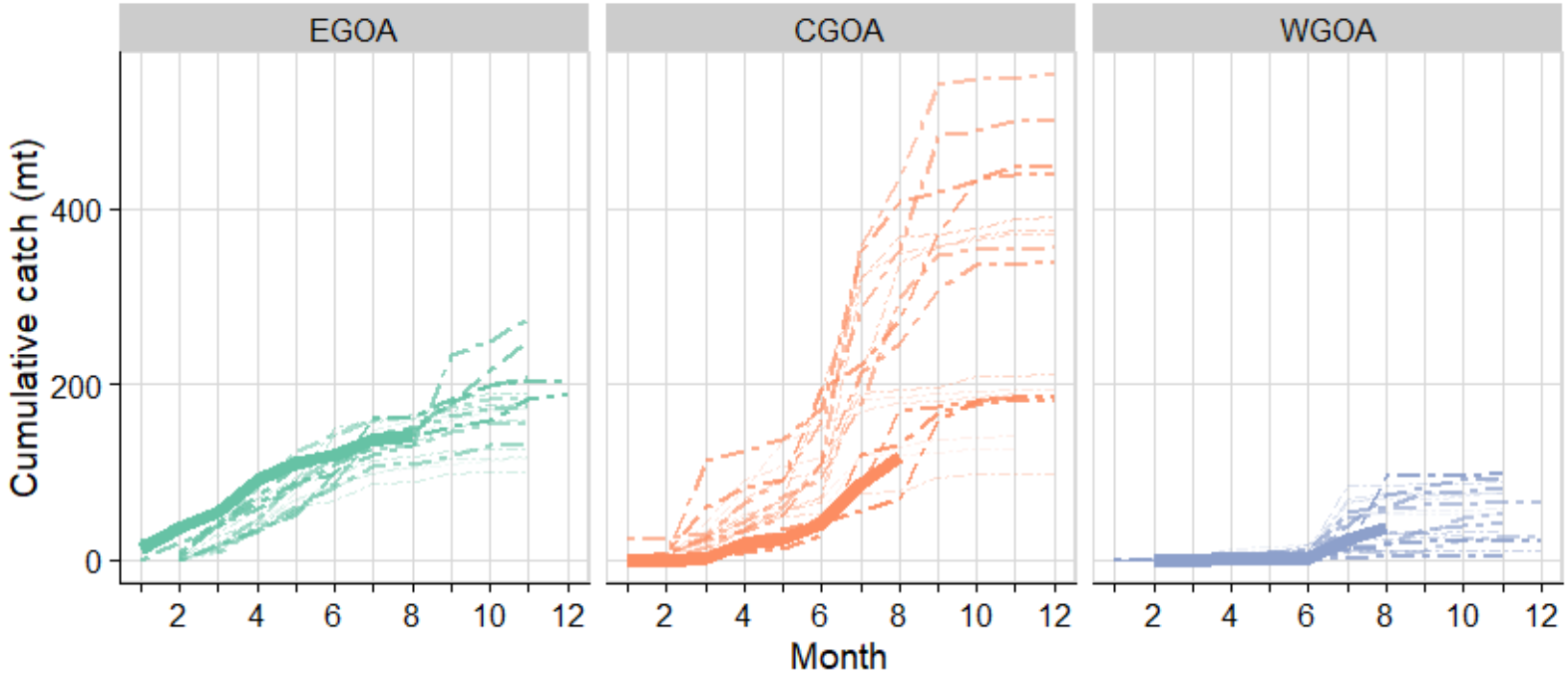
Apportionment based on predicted biomass and RPWs by area (PROPOSED)

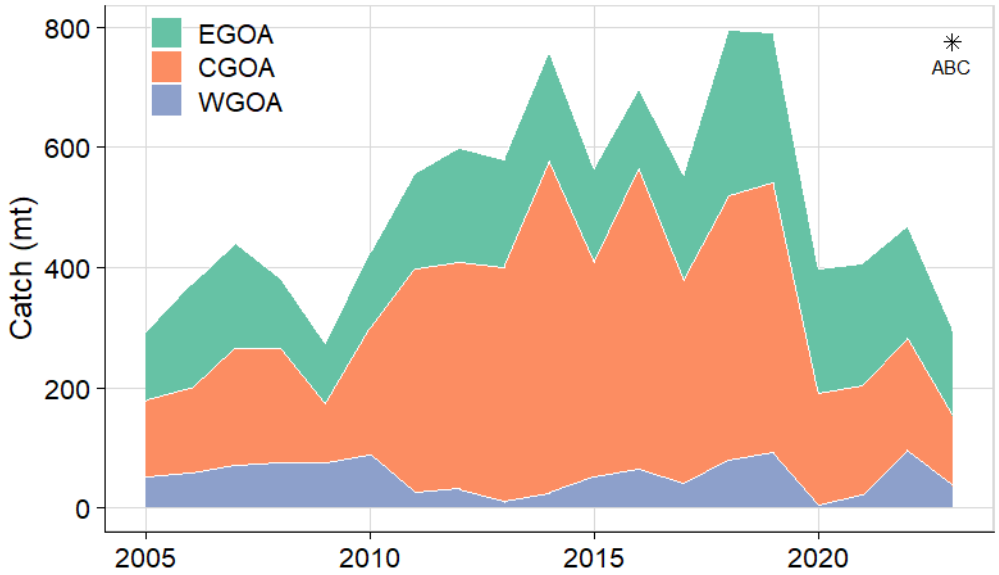


Recommendations

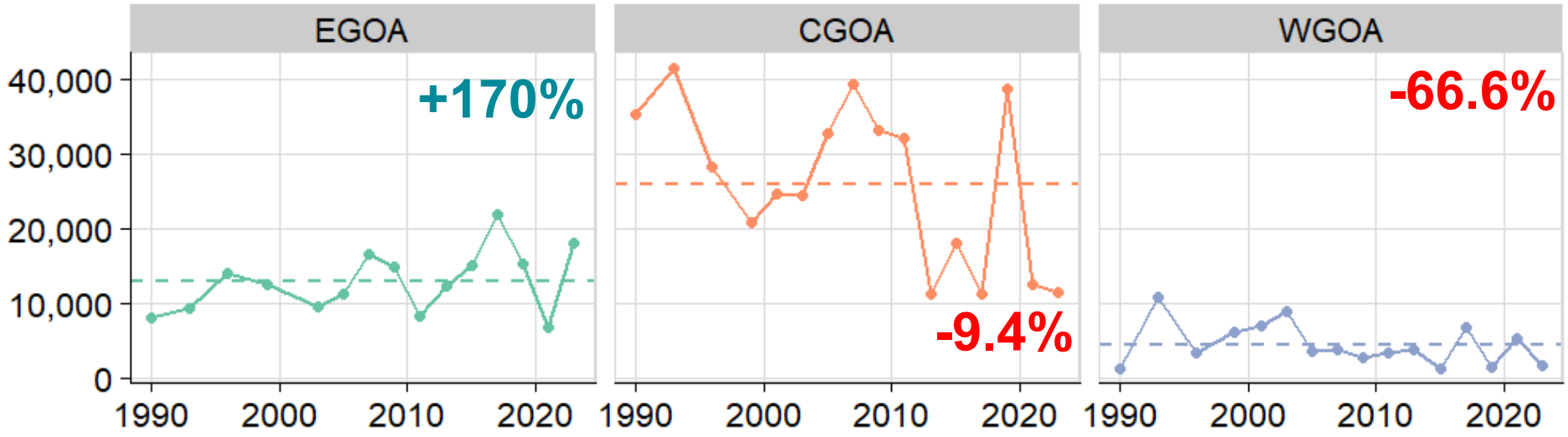
1. Update M, maturity, growth, and ageing error
    1. Prefer growth alternative that bases weight-at-age on L-W relationship
2. Base apportionment on BTS and LLS

Data updates for 2023


EGOA
CGOA
WGOA
Cumulative catch (mt)
0
200
400
2
4
6
8
10
12
Month


EGOA
CGOA
WGOA
ABC
Catch (mt)
0
200
400
600
800
2005
2010
2015
2020

Trawl survey biomass (mt)



Longline survey RPNs