THE BR CMP AS AT END AUGUST 2022

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SUMMARY

The BR CMP is tuned to meet the specifications arising from the July Panel 2 meeting. The application of the Carruthers TAC variation reduction adjustment is explored. For a baseline choice of the associated control parameter VarCadj of 0.5, the median values for the associated VarC performance statistic are reduced by about 25%, with scarcely any deterioration in the values of the other performance statistics.

RÉSUMÉ

La CMP BR est calibrée pour répondre aux spécifications découlant de la réunion de la Sous-commission 2 de juillet. L'application de l'ajustement de la réduction de la variation du TAC de Carruthers est étudiée. Pour un choix de base du paramètre de contrôle associé VarCadj de 0,5, les valeurs de la médiane pour la statistique de performance associée VarC sont réduites d'environ 25%, n'entraînant pratiquement aucune détérioration des autres statistiques de performance.

RESUMEN

El CMP BR se calibrado para cumplir las especificaciones derivadas de la reunión de la Subcomisión 2 de julio. Se explora la aplicación del ajuste de reducción de la variación del TAC de Carruthers. Para una elección de la línea de base del parámetro de control asociado VarCadj de 0,5, los valores de la mediana de la estadística de desempeño VarC asociada se reducen en un 25 % aproximadamente, sin que apenas se deterioren los valores de las demás estadísticas de desempeño.

KEYWORDS

Management Strategy Evaluation, Candidate Management Procedure, Operating Model grid, Atlantic bluefin tuna, performance tuning

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Introduction

This document reports results for the BR CMP (tuned to meet the specifications arising from the July Panel 2 meeting). The most recent package ABTMSE v7.7.1 has been used to generate the results reported.

The BR CMP's mathematical description has not been changed from Butterworth and Rademeyer (2022a)[2] except for BR5d/e/f and 6e/f (see below); only the tuning parameter values have been adjusted as necessary.

As agreed during the July Panel 2 meeting, and unless specified otherwise, all the CMPs presented here include:

- Either 2-year ("a") or 3-year ("b") TAC intervals.
- TAC settings constrained to a maximum of 20% up and 30% down, with the first two (in the case of the 2-year interval) and first one (in the case of the 3-year interval) TAC settings constrained to a maximum of 20% up and 10% down.

Results are provided for five tunings:
"1": 1.25 (W)- 1.25 (E) median Br30,
"2": 1.25 (W)- 1.50 (E) median Br30,
"5": 0.60 (both W and E) mean PKG,
"6": 0.70 (both W and E) mean PKG, and
"7": 0.65 (both W and E) mean PKG.

Also, further BR CMP results are included as follows:

a) "BR5c": As requested by Panel-2, allowing a maximum of 35% decrease in TAC from one year to the next when using a 3-year TAC interval, and tuned to PGK=0.6.
b) "BR5d": includes the "Carruthers TAC variation reduction adjustment" to reduce variance in TAC changes each time these are adjusted, with *VarCadj*=0.5 (see Appendix A in Butterworth and Rademeyer (2022b)) for a 2-year interval and PGK=0.6.
c) "BR5e": as BR5d, with *VarCadj*=0.3 to reduce VarC further (but without notable associated deterioration in resource risk statistics) for a 2-year interval and PGK=0.6.
d) "BR5f", "BR6e" and "BR6f": BR5e with *VarCadj*=0.3 is the new baseline BR CMP, and these three CMPs are variants on the tuning (PKG=0.6 vs 0.7) and the number of years for the TAC intervals (2 vs 3).

Results

Table 1 lists the BR CMP variants presented here, with their control parameter values.

The stochastic Br30, PKG, LD*15%, LD*10%, AvC30, C1 (TAC for 2023/2024) and VarC results for all these CMPs are given in Table 2. These results are shown by recruitment levels in Table 3 for BR5e, BR5f, BR6e and BR6f.

SSB and TAC projections (medians) are shown in **Figure 1** for the CMP tunings and variants considered and separated by recruitment levels for BR5e in **Figure 2**.

Discussion

Note that performance tuning (which is very time intensive) to PGK values is generally achieved within 0.005. Occasional cases see tuning that (on rounding) differs by 0.01, but that would not affect the results shown to any great extent.

[2] The updated specifications may be found in Appendix A of Butterworth and Rademeyer (2022b).

Key features of the results are as follows:

- There is hardly any difference in terms of performance statistics between the 2 and 3 year interval CMPs, apart from a slight increase in VarC for the 3 year intervals.
- Comparing the maximum decrease options of 30% and 35% for a 3-year interval, it is evident that there is a notable improvement in the lower 5%ile of SSB/SSB_{MSY} in the East with a corresponding slight increase in VarC. In the West, the corresponding improvement in that lower 5%ile is only marginal when allowing for this greater decrease in TAC. (See Table 2 and Figure 1c)
- Application of the Carruthers TAC variation reduction adjustment (BR5d) reduces the median values of the associated VarC performance statistic by about 25%, with scarcely any deterioration in the values of the other performance statistics, particularly the risk-related ones.
- As the value of *VarCadj* is decreased to 0.3, VarC is substantially reduced – by about 35% for the East area and about 50% for the West (Table 2), without much compensatory deterioration in performance for other statistics.
- However, further decreases still in *VarCadj* lead to increasingly poor performance in the lower 5%ile of SSB/SSB_{MSY} after 2050 for the eastern population (Figure 1d). This trade-off is why lower values of *VarCadj* were not considered.
- Lower values of *VarCadj* lead to smoother median TAC trends over time, with the initial peak in catches reduced so that the larger catches are spread over a longer period (Figure 1d).
- Over the four performance tunings (2-/3-year intervals; 0.60/0.70 PGK), the combination of a 3-year interval and 0.6 PGK (BR5f) does in due course show adverse resource abundance levels at the lower 5%-ile for the eastern stock (Figure 1e). From Table 3, it is evident that this poor performance arises mainly from the R3 scenarios which include a regime shift.

References

Butterworth DS and Rademeyer RA: 2022a. BR CMP as of June 2022. ICCAT Document SCRS/2022/126.

Butterworth DS and Rademeyer RA: 2022b. The BR CMP as submitted to the September 2022Bluefin Species Group meeting. ICCAT Document SCRS/2022/183.

Table 1. Control parameter values for each of the CMPs presented in this document.

CMP name	TAC intervals (years)	Tuned to	α_0	$\Delta\alpha$	β_0	$\Delta\beta$	Maximum change in TAC Up	Maximum change in TAC Down	Notes
BR1a	2	Br30 = 1.25E/1.25W	1.235	0.167	0.81	-0.0225	20%	10 then 30%	
BR2a	2	Br30 = 1.50E/1.25W	1.235	0.023	0.81	-0.0200	20%	10 then 30%	
BR5a	2	PKG=0.6	1.235	0.180	0.81	-0.0180	20%	10 then 30%	
BR6a	2	PKG=0.7	1.235	0.097	0.81	-0.0350	20%	10 then 30%	
BR7a	2	PKG=0.65	1.235	0.137	0.81	-0.0270	20%	10 then 30%	
BR2b	3	Br30 = 1.50E/1.25W	1.235	0.017	0.81	-0.0205	20%	10 then 30%	
BR5b	3	PKG=0.6	1.235	0.136	0.81	-0.0220	20%	10 then 30%	
BR6b	3	PKG=0.7	1.235	0.066	0.81	-0.0360	20%	10 then 30%	
BR7b	3	PKG=0.65	1.235	0.097	0.81	-0.0295	20%	10 then 30%	
BR5c	3	PKG=0.6	1.235	0.165	0.81	-0.0180	20%	10 then 35%	
BR5d	2	PKG=0.6	1.235	0.145	0.81	-0.0218	20%	10 then 30%	Carruthers TAC variation reduction adjustment, VarCadj=0.5
BR5e	2	PKG=0.6	1.235	0.113	0.81	-0.0280	20%	10 then 30%	Carruthers TAC variation reduction adjustment, VarCadj=0.3
BR5f	3	PKG=0.6	1.235	0.071	0.81	-0.0340	20%	10 then 30%	Carruthers TAC variation reduction adjustment, VarCadj=0.3
BR6e	2	PKG=0.7	1.235	0.045	0.81	-0.0420	20%	10 then 30%	Carruthers TAC variation reduction adjustment, VarCadj=0.3
BR6f	3	PKG=0.7	1.235	0.013	0.81	-0.0480	20%	10 then 30%	Carruthers TAC variation reduction adjustment, VarCadj=0.3

Table 2: **Stochastic** Br30, AvC30, C1 (TAC in 2023/2024) and VarC values (weighted medians and 90%iles for the OM grid across all simulations) for all 10 CMPs reported in this paper for all OMs in the grid. AvC30 values are in '000 mt. Note that the TACs for 2022 are 36000 mt for the East, and 2726 mt for the West area. The values in bold (either weighted median Br30, or weighted mean PKG) are those to which the corresponding CMP has been tuned.

			Br30	LD15%	LD10%	AvC30	C1	VarC
EAST								
Zero catch		1.00	2.77 (1.46; 4.03)	1.30	1.18	0.00 (0.00; 0.00)	0.00 (0.00; 0.00)	0.00 (0.00; 0.00)
Different tunings, 2 year TAC intervals								
BR1a	2	0.62	**1.25** (0.54; 2.23)	0.52	0.44	38.20 (11.82; 71.61)	43.20 (34.68; 43.20)	18.31 (11.50; 24.33)
BR2a	2	0.78	**1.51** (0.72; 2.51)	0.61	0.52	32.17 (10.82; 58.15)	43.20 (34.68; 43.20)	16.83 (9.21; 24.00)
BR5a	2	**0.60**	1.24 (0.53; 2.20)	0.51	0.43	38.51 (11.90; 72.69)	43.20 (34.68; 43.20)	18.37 (11.52; 24.17)
BR7a	2	**0.65**	1.30 (0.58; 2.28)	0.54	0.46	37.06 (11.59; 69.19)	43.20 (34.68; 43.20)	17.93 (10.82; 24.00)
BR6a	2	**0.70**	1.37 (0.63; 2.35)	0.57	0.49	35.55 (11.27; 65.78)	43.20 (34.68; 43.20)	17.46 (10.27; 24.00)
Different tunings, 3 year TAC intervals								
BR2b	3	0.75	**1.50** (0.59; 2.57)	0.53	0.44	32.19 (11.91; 56.82)	43.20 (34.68; 43.20)	19.52 (10.18; 26.67)
BR5b	3	**0.60**	1.27 (0.39; 2.30)	0.45	0.37	38.00 (12.45; 67.83)	43.20 (34.68; 43.20)	20.50 (12.61; 26.67)
BR7b	3	**0.65**	1.34 (0.44; 2.39)	0.49	0.39	36.27 (12.29; 64.89)	43.20 (34.68; 43.20)	20.23 (11.96; 26.36)
BR6b	3	**0.70**	1.40 (0.50; 2.46)	0.51	0.41	34.91 (12.11; 62.05)	43.20 (34.68; 43.20)	19.96 (11.36; 26.51)
Down 30% vs 35%, 3 year TAC intervals								
BR5b	3	**0.60**	1.27 (0.39; 2.30)	0.45	0.37	38.00 (12.45; 67.83)	43.20 (34.68; 43.20)	20.50 (12.61; 26.67)
BR5c	3	**0.60**	1.25 (0.46; 2.29)	0.49	0.41	38.18 (11.61; 69.85)	43.20 (34.68; 43.20)	21.48 (13.19; 28.04)
Different VarC, 2 year TAC intervals								
BR5a	2	**0.60**	1.24 (0.53; 2.20)	0.51	0.43	38.51 (11.90; 72.69)	43.20 (34.68; 43.20)	18.37 (11.52; 24.17)
BR5d	2	**0.60**	1.24 (0.52; 2.26)	0.51	0.44	38.07 (11.68; 70.08)	39.47 (35.33; 43.20)	14.98 (7.85; 22.71)
BR5e	2	**0.60**	1.27 (0.49; 2.30)	0.48	0.40	37.59 (11.92; 65.92)	38.04 (35.60; 40.43)	11.93 (5.57; 21.52)
New baseline, different tunings and 2 vs 3 year TAC intervals								
BR5e	2	**0.60**	1.27 (0.49; 2.30)	0.48	0.40	37.59 (11.92; 65.92)	38.04 (35.60; 40.43)	11.93 (5.57; 21.52)
BR5f	3	**0.60**	1.32 (0.60; 2.49)	0.43	0.34	36.54 (12.88; 59.62)	38.04 (35.60; 40.43)	13.56 (5.87; 24.39)
BR6e	2	**0.70**	1.41 (0.49; 2.30)	0.54	0.46	34.83 (11.27; 59.09)	38.04 (35.60; 40.43)	11.39 (4.54; 22.15)
BR6f	3	**0.70**	1.46 (0.39; 2.42)	0.47	0.39	33.69 (12.38; 54.11)	38.04 (35.60; 40.43)	12.69 (4.53; 24.35)
WEST								
Zero catch		1.00	2.66 (1.40; 4.04)	0.96	0.81	0.00 (0.00; 0.00)	0.00 (0.00; 0.00)	0.00 (0.00; 0.00)
Different tunings, 2 year TAC intervals								
BR1a	2	0.62	**1.25** (0.49; 2.35)	0.46	0.32	2.53 (0.88; 3.78)	2.71 (2.45; 3.15)	12.92 (8.55; 21.89)
BR2a	2	0.63	**1.25** (0.51; 2.36)	0.47	0.33	2.70 (0.92; 4.02)	2.71 (2.45; 3.15)	12.76 (8.44; 21.72)
BR5a	2	**0.60**	1.21 (0.47; 2.31)	0.45	0.32	2.61 (0.89; 3.88)	2.71 (2.45; 3.15)	13.10 (8.65; 22.08)
BR7a	2	**0.65**	1.29 (0.52; 2.41)	0.47	0.32	2.46 (0.88; 3.69)	2.71 (2.45; 3.15)	12.88 (8.53; 21.99)
BR6a	2	**0.70**	1.38 (0.55; 2.49)	0.48	0.32	2.32 (0.86; 3.50)	2.71 (2.45; 3.15)	12.70 (8.34; 22.14)
Different tunings, 3 year TAC intervals								
BR2b	3	0.63	**1.25** (0.46; 2.36)	0.45	0.30	2.69 (0.93; 3.96)	2.71 (2.45; 3.15)	15.18 (9.49; 25.00)
BR5b	3	**0.60**	1.23 (0.43; 2.35)	0.44	0.30	2.58 (0.93; 3.83)	2.71 (2.45; 3.15)	15.36 (9.69; 25.00)
BR7b	3	**0.65**	1.31 (0.47; 2.43)	0.45	0.30	2.46 (0.91; 3.66)	2.71 (2.45; 3.15)	15.05 (9.34; 25.00)
BR6b	3	**0.71**	1.39 (0.50; 2.50)	0.46	0.31	2.33 (0.88; 3.48)	2.71 (2.45; 3.15)	14.94 (9.25; 25.00)
Down 30% vs 35%, 3 year TAC intervals								
BR5b	3	**0.60**	1.23 (0.43; 2.35)	0.44	0.30	2.58 (0.93; 3.83)	2.71 (2.45; 3.15)	15.36 (9.69; 25.00)
BR5c	3	**0.59**	1.21 (0.46; 2.30)	0.44	0.32	2.64 (0.88; 3.90)	2.71 (2.45; 3.15)	15.74 (9.99; 26.95)
Different VarC, 2 year TAC intervals								
BR5a	2	**0.60**	1.21 (0.47; 2.31)	0.45	0.32	2.61 (0.89; 3.88)	2.71 (2.45; 3.15)	13.10 (8.65; 22.08)
BR5d	2	**0.60**	1.22 (0.48; 2.32)	0.43	0.32	2.61 (0.90; 3.86)	2.72 (2.56; 2.93)	8.81 (5.15; 21.67)
BR5e	2	**0.60**	1.25 (0.46; 2.36)	0.41	0.28	2.57 (0.90; 3.74)	2.72 (2.63; 2.85)	6.29 (3.28; 19.06)
New baseline, different tunings and 2 vs 3 year TAC intervals								
BR5e	2	**0.60**	1.25 (0.46; 2.36)	0.41	0.28	2.57 (0.90; 3.74)	2.72 (2.63; 2.85)	6.29 (3.28; 19.06)
BR5f	3	**0.60**	1.29 (0.36; 2.44)	0.37	0.26	2.53 (0.96; 3.57)	2.72 (2.63; 2.85)	7.26 (3.36; 21.82)
BR6e	2	**0.71**	1.41 (0.54; 2.54)	0.44	0.30	2.34 (0.88; 3.40)	2.72 (2.63; 2.85)	5.99 (3.14; 20.16)
BR6f	3	**0.71**	1.46 (0.43; 2.60)	0.41	0.26	2.29 (0.94; 3.22)	2.72 (2.63; 2.85)	6.91 (3.14; 22.00)

Table 3: **Stochastic** Br30, AvC30, C1 (TAC in 2023/2024) and VarC values (weighted medians and 90%iles for the OM grid across all simulations) for CMPS BR5e, BR5f, BR6e and BR6f by recruitment scenario. AvC30 values are in '000 mt. Note that the TACs for 2022 are 36000 mt for the East, and 2726 mt for the West area.

	TAC inter.		Br30	LD15%	LD10%	AvC30	C1	VarC
EAST								
Recruitment scenarios R1								
BR5e	2	0.90	1.51 (0.89; 2.45)	1.09	0.95	58.53 (32.77; 68.82)	38.87 (37.12; 40.84)	7.19 (4.97; 11.45)
BR5f	3	0.91	1.61 (0.96; 2.60)	1.24	1.11	53.61 (32.26; 62.17)	38.87 (37.12; 40.84)	7.75 (5.14; 12.50)
BR6e	2	0.94	1.67 (1.08; 2.64)	1.20	1.04	52.49 (30.58; 61.60)	38.87 (37.12; 40.84)	6.07 (4.11; 10.36)
BR6f	3	0.98	1.76 (1.14; 2.78)	1.32	1.23	48.49 (29.98; 56.12)	38.87 (37.12; 40.84)	6.48 (3.85; 11.58)
Recruitment scenarios R2								
BR5e	2	0.54	1.13 (0.55; 2.22)	0.38	0.34	16.78 (10.57; 30.45)	36.71 (35.23; 38.53)	15.21 (8.08; 23.78)
BR5f	3	0.55	1.10 (0.39; 2.24)	0.42	0.38	16.85 (11.89; 28.03)	36.71 (35.23; 38.53)	18.48 (9.83; 26.15)
BR6e	2	0.63	1.22 (0.60; 2.35)	0.32	0.26	15.78 (10.18; 27.86)	36.71 (35.23; 38.53)	15.46 (8.42; 23.91)
BR6f	3	0.63	1.18 (0.44; 2.35)	0.34	0.28	15.97 (11.57; 26.13)	36.71 (35.23; 38.53)	18.67 (10.17; 26.11)
Recruitment scenarios R3								
BR5e	2	0.35	0.96 (0.11; 1.68)	0.40	0.29	46.67 (26.42; 57.74)	38.71 (37.08; 40.68)	15.40 (11.90; 19.66)
BR5f	3	0.32	0.97 (0.09; 1.79)	0.59	0.49	44.67 (26.69; 53.57)	38.71 (37.08; 40.68)	15.55 (12.01; 20.90)
BR6e	2	0.51	1.14 (0.31; 1.91)	0.38	0.25	42.60 (24.27; 52.29)	38.71 (37.08; 40.68)	13.59 (9.90; 20.16)
BR6f	3	0.49	1.16 (0.24; 2.01)	0.57	0.43	40.91 (24.72; 48.85)	38.71 (37.08; 40.68)	14.37 (10.31; 19.79)
WEST								
Recruitment scenarios R1								
BR5e	2	0.88	1.54 (0.94; 2.81)	1.07	1.00	3.12 (2.27; 3.94)	3.12 (2.27; 3.94)	4.65 (2.89; 7.16)
BR5f	3	0.93	1.62 (0.99; 2.89)	1.22	1.16	3.00 (2.25; 3.72)	3.00 (2.25; 3.72)	5.01 (2.85; 8.37)
BR6e	2	0.98	1.73 (1.13; 2.98)	1.16	1.09	2.83 (2.06; 3.57)	2.83 (2.06; 3.57)	4.57 (2.71; 6.84)
BR6f	3	0.98	1.81 (1.17; 3.04)	1.30	1.22	2.72 (2.04; 3.35)	2.72 (2.04; 3.35)	4.84 (2.59; 7.67)
Recruitment scenarios R2								
BR5e	2	0.50	0.95 (0.37; 1.93)	0.22	0.18	1.40 (0.74; 1.87)	2.66 (2.62; 2.74)	10.40 (5.75; 21.95)
BR5f	3	0.49	0.91 (0.17; 1.91)	0.23	0.19	1.41 (0.84; 1.84)	2.66 (2.62; 2.74)	12.92 (7.12; 24.71)
BR6e	2	0.58	1.03 (0.41; 2.00)	0.18	0.12	1.30 (0.73; 1.70)	2.66 (2.62; 2.74)	10.92 (6.66; 23.34)
BR6f	3	0.56	0.98 (0.22; 2.00)	0.19	0.13	1.30 (0.83; 1.68)	2.66 (2.62; 2.74)	13.74 (8.23; 24.70)
Recruitment scenarios R3								
BR5e	2	0.42	0.95 (0.44; 1.96)	0.60	0.52	2.91 (2.17; 3.82)	2.76 (2.69; 2.86)	6.00 (3.59; 9.23)
BR5f	3	0.39	1.04 (0.48; 2.01)	0.79	0.72	2.85 (2.18; 3.65)	2.76 (2.69; 2.86)	6.63 (3.83; 10.57)
BR6e	2	0.57	1.17 (0.66; 2.13)	0.64	0.57	2.66 (1.99; 3.49)	2.76 (2.69; 2.86)	5.33 (3.46; 7.65)
BR6f	3	0.58	1.26 (0.68; 2.16)	0.83	0.78	2.59 (1.99; 3.30)	2.76 (2.69; 2.86)	6.04 (3.67; 9.20)

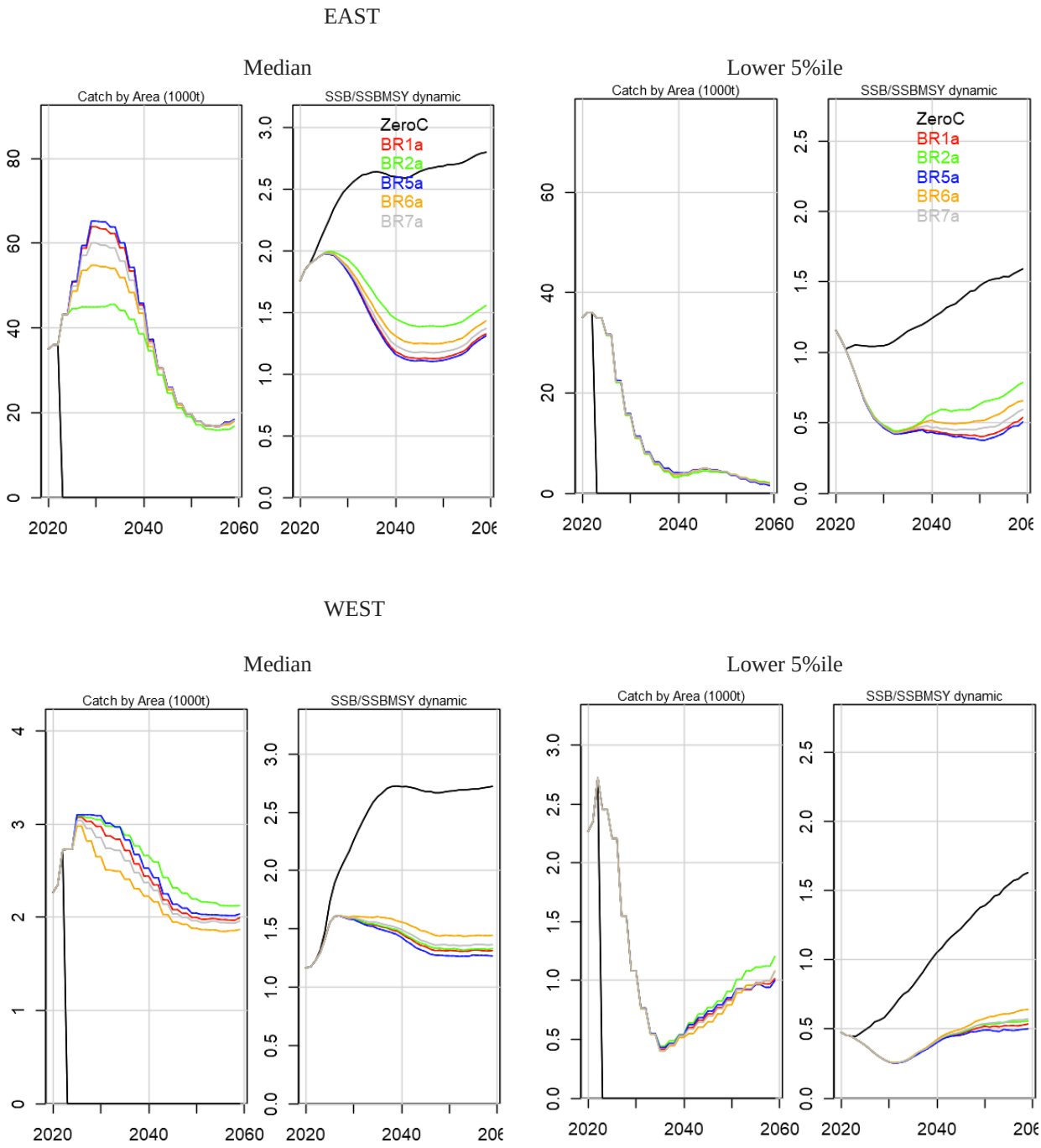


Figure 1a: Median (LHS) and lower 5%ile (RHS) catch (by area) and SSB (by stock) projections averaged over all OMs in the grid and the replicate simulations for BR1a, BR2a and BR5a to BR7a (**2 year TAC interval**, different tunings).

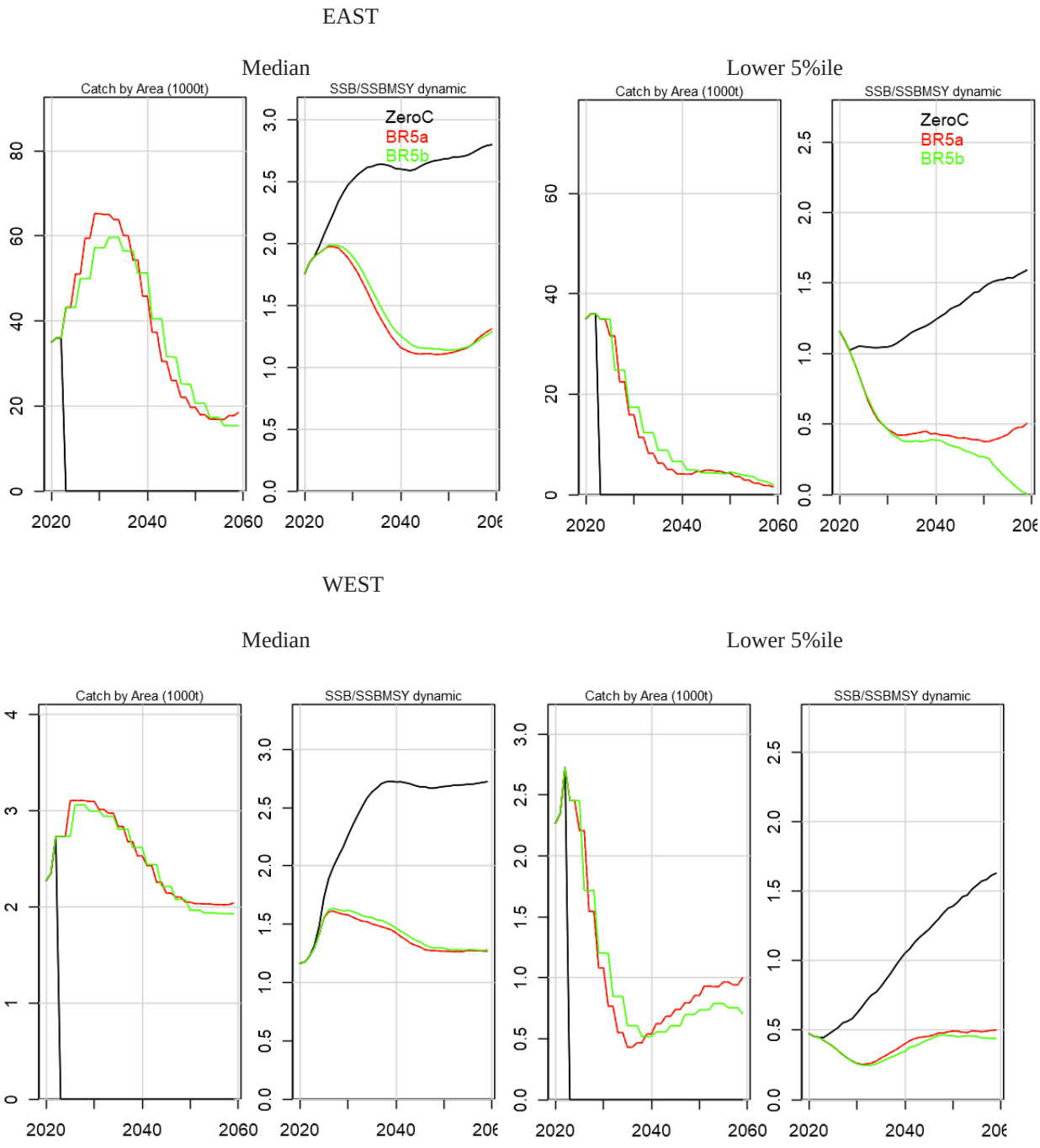


Figure 1b: Median (LHS) and lower 5%ile (RHS) catch (by area) and SSB (by stock) projections averaged over all OMs in the grid and the replicate simulations for BR5a and BR5b (2 vs 3 year TAC interval, PGK=0.6)

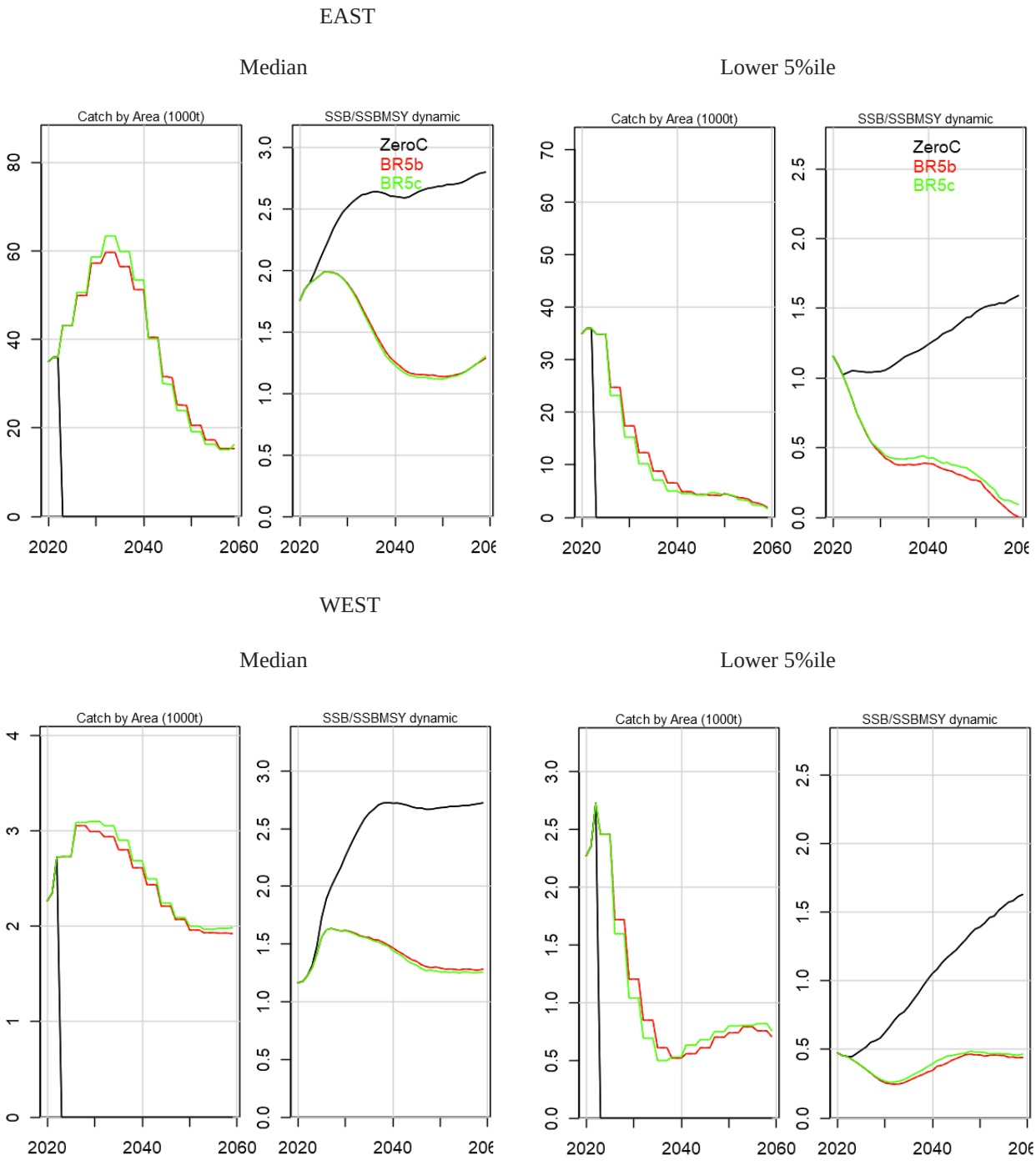


Figure 1c: Median (LHS) and lower 5%ile (RHS) catch (by area) and SSB (by stock) projections averaged over all OMs in the grid and the replicate simulations for BR5b and BR5c (3-yr TAC interval, PGK=0.6, maximum allowable TAC decrease of 30% vs 35%).

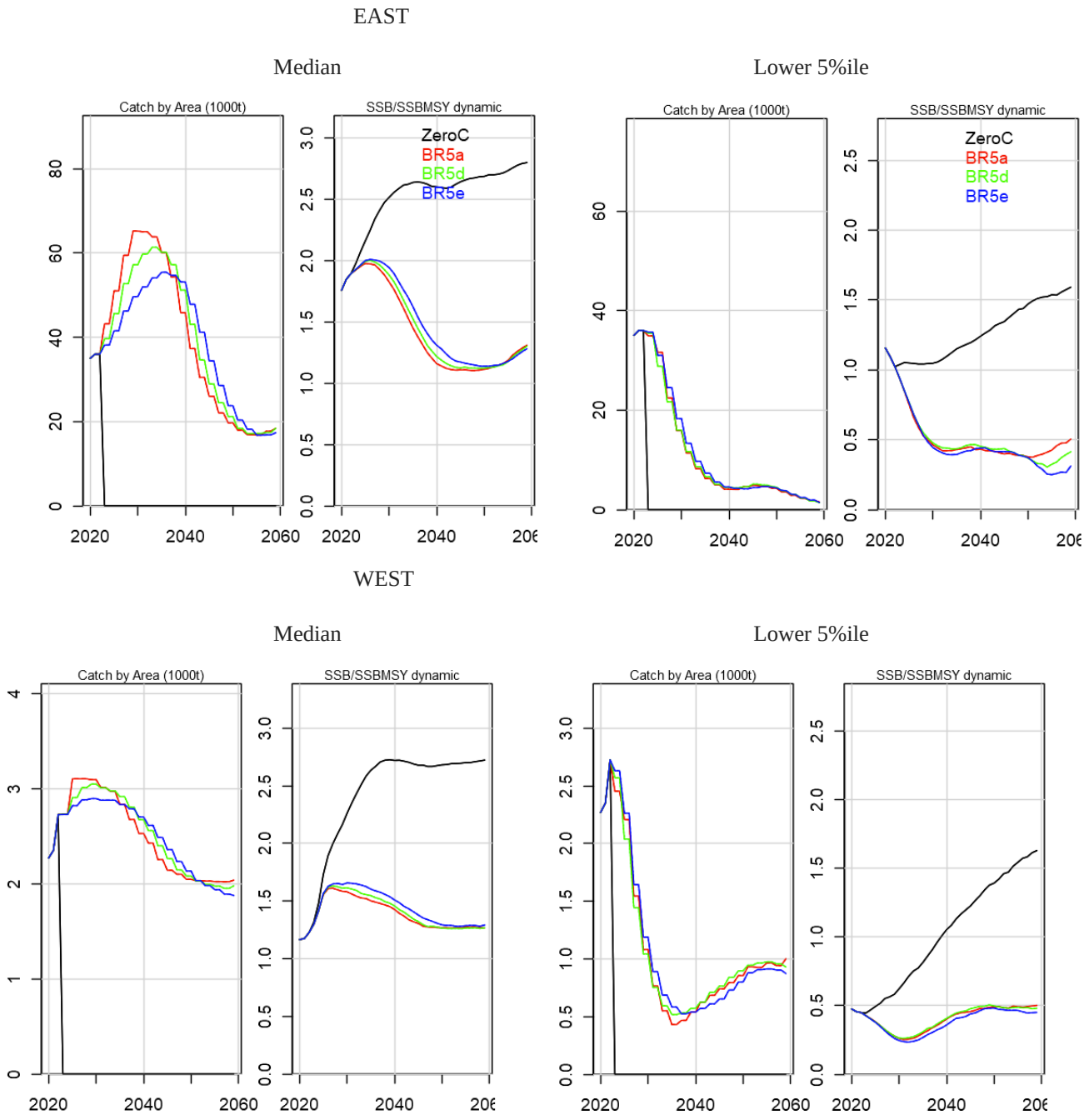
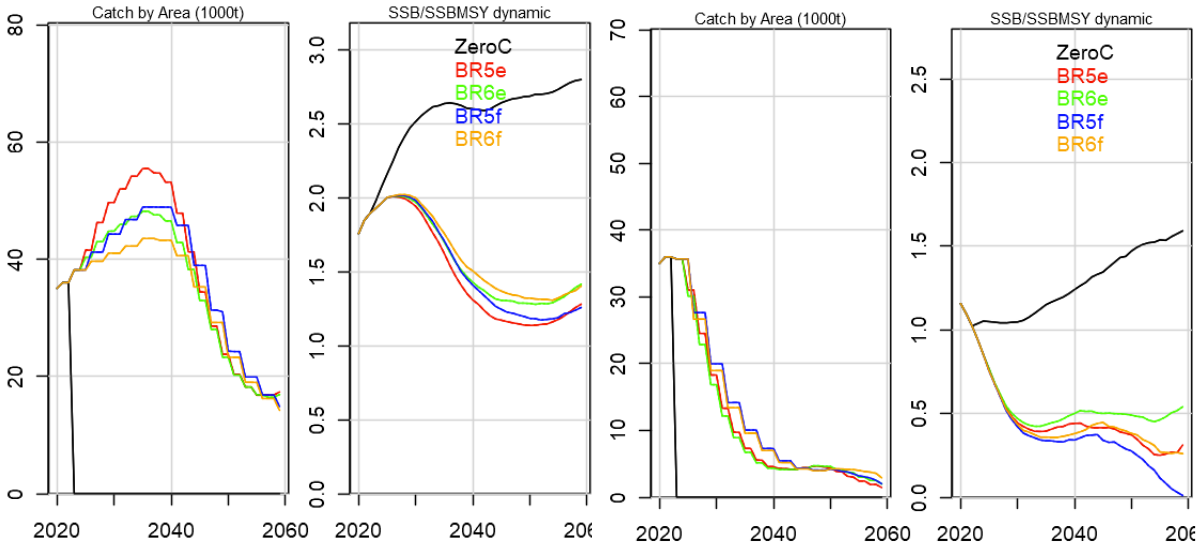


Figure 1d: Median (LHS) and lower 5%ile (RHS) catch (by area) and SSB (by stock) projections averaged over all OMs in the grid and the replicate simulations for BR5a, BR5d and BR5e (2-yr TAC interval, PGK=0.6, different TAC variances, which decrease from BR5a to 5d to 5e).

EAST

Median

Lower 5%ile



WEST

Median

Lower 5%ile

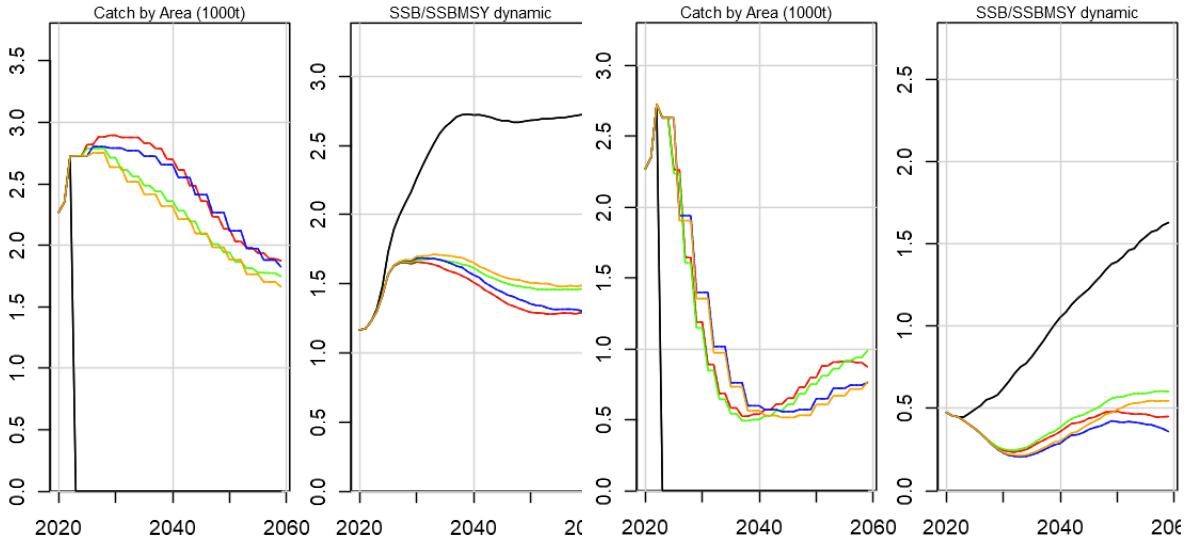


Figure 1e: Median (LHS) and lower 5%ile (RHS) catch (by area) and SSB (by stock) projections averaged over all OMs in the grid and the replicate simulations for BR5e, BR5f, BR6e and BR6f (baseline CMPs).

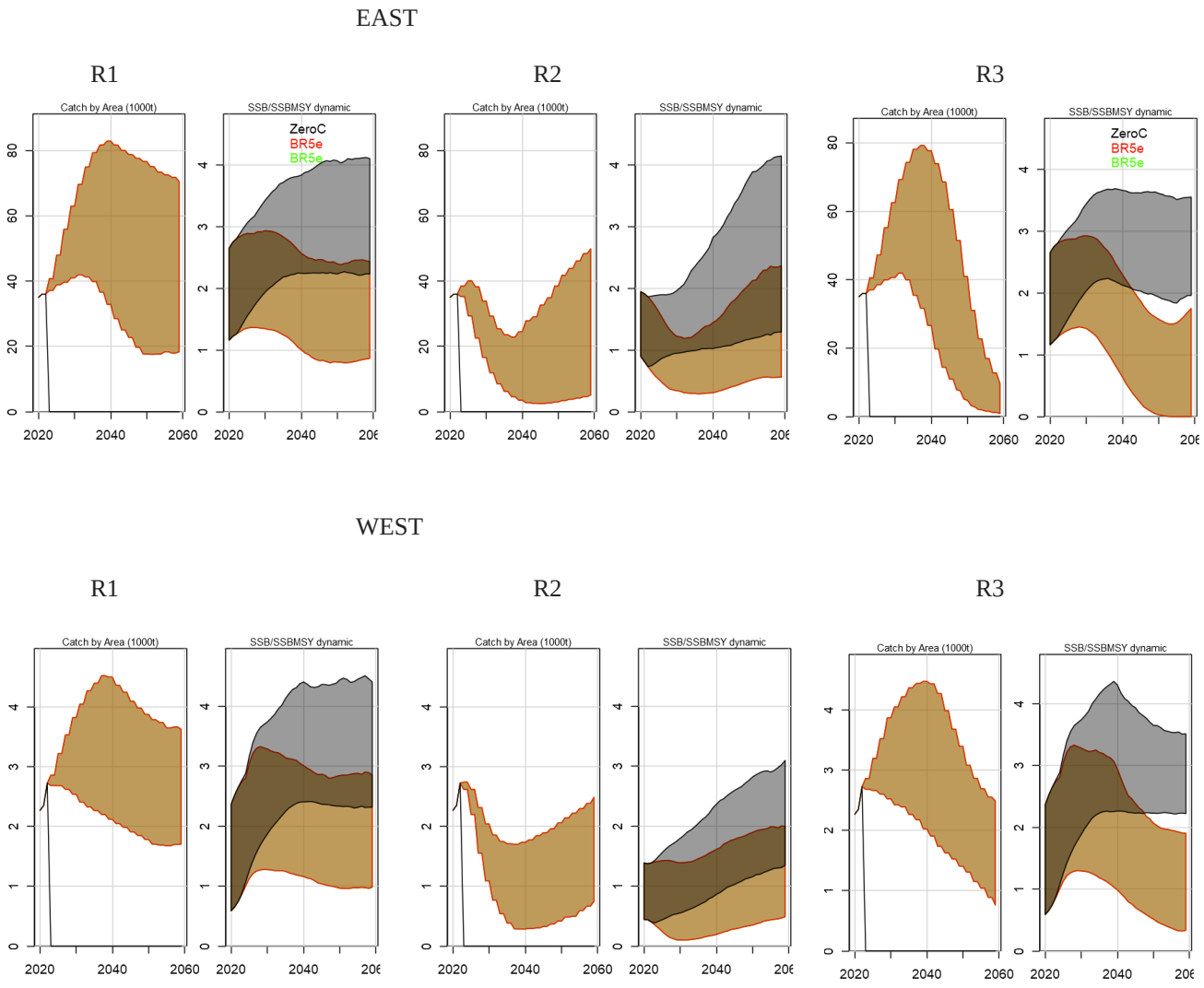


Figure 2: 90%ile range in catch (by area) and SSB (by stock) projections averaged over recruitment scenarios for BR5e (brown shading) and zero catch (grey shading).