A POSSIBLE APPROACH TO ADDRESS THE POOR PERFORMANCE OF CMPs UNDER SOME R3 OMs

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SUMMARY

Most instances of poor conservation performance of CMPs over the interim grid occur for OMs for which there is a regime shift in the future (the R3 scenario), and also a low abundance scale is assumed for the West area. To improve that performance would require a considerable sacrifice in catch for the other OMs. As a basis to avoid that, the the IWC approach of an "acceptable with research" CMP is put forward. In this case, this would involve tuning under the R1 and R2 OMs only, with implementation over a short initial period where both the an annual index of the proportion of Western origin bluefin in the West area is put in place to provide a basis able to detect a regime shift in the Eastern stock, and close-kin genetics is developed further to provide an improved estimate of the abundance of the Western stock in absolute terms.

KEYWORDS

Management Strategy Evaluation, Candidate Management Procedure, Operating Model grid, Atlantic bluefin tuna, stock of origin proportion index

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Introduction

Figure 1 shows deterministic results for Br30 for the 96 OMs of the interim grid under the BR_1 CMP (Butterworth and Rademeyer, 2020). What is immediately obvious is that most cases of poor conservation performance in terms of this Br30 statistic are related to R3 OMs – ones with a regime shift in the future. Also evident is that the more serious of these problematic instances occur within the first and third "quartiles" of these OMs, i.e. the ones with the lower abundance scale parameter for the West area.

For a CMP that shows conservation performance which is robust to these problematic cases, it is evident that a more conservative choice of control parameter values (especially β for the West area) will be needed, with a negative impact on the catches that could otherwise occur (again especially for the West area).

The ideas presented here to provide a way of addressing this have their origins in an IWC RMP concept – a CMP that is "acceptable with research". The intention was that although a CMP might have unsatisfactory conservation performance under certain scenarios, that CMP could nevertheless be accepted for implementation in the short term, but **only provided** it could be shown that research was to be conducted over that period which would either:

1) show the scenarios concerned did not apply; or
2) if the result was to show instead that they did apply, a more conservative MP would be implemented after that initial period to compensate for the impact of the larger catches that had been taken over that period.

A possible application to Atlantic bluefin

The base idea here is that the CMP initially selected would be based on the R1 and R2 OMs only of the interim grid, without considering the R3 OMs. Tables 1 and 2 and Figure 2 show the impact of tuning some BR CMPs of Butterworth and Rademeyer (2020) to the R1 and R2 OMs only for Br30 (West) = 1.0. These are the CMPs denoted BR_nx. Unsurprisingly, these BR_nx CMPs can show better conservation performance without possibly depleting the stocks as low, and especially can make a higher catch possible particularly in the West area.

The two suggested associated "acceptable with research" options would involve the following.

1) Attempting to eliminate the lower abundance scale option for the Western stock (or at least set it higher)

Close-kin genetics work has already been initiated to attempt to estimate the abundance of the Western stock in absolute terms (i.e. in tons). Though time will be needed to detect a sufficient number of parent-offspring pairs to provide an estimate with reasonable precision, that estimate has the potential to be a "game-changer" as far as providing a greatly improved understanding of the scale of the abundance of the Western stock, and hence has the potential to be considered as the basis to develop an "acceptable with research" CMP.

2) Distinguishing R3 scenarios, i.e. if a regime shift is taking place

The poor conservation performance for R3 OMs arise primarily because of the Eastern stock changing to a less productive regime. That this has a negative impact on the future size (specifically Br30) for the Eastern stock is not too surprising (TACs are not reduced sufficiently and sufficiently fast), but the reason that this occurs also for the Western stock (and indeed there the deterioration of performance is the more severe) requires explanation.

The reason is that if the abundance of the Eastern stock declines, this impacts the overall abundance in the West area because there are then fewer Eastern origin bluefin there. Although many abundance indices in the West area therefore drop too, and hence the TAC for that area falls, the more important consequence is that a bigger fraction of the TAC then becomes comprised of Western origin bluefin, leading to a catch that would have made a "sustainable impact" on the Western stock abundance becoming unsustainable and leading to the depletion of that stock . Figure 3 gives an example of how the proportion of Western origin fish in catches in the pertinent West strata changes over time for two OMs. For OM1 without the regime shift this proportion is relatively steady, but with the regime shift (OM9) it increases dramatically.

Figure 4 shows that this difference is not confined to these two OMs. Even when changing from deterministic to stochastic results, there is a clear differentiation between the R3 and the other OMs: the proportion shows a large increase for the R3 OMs only. This suggests that if regular monitoring of the proportion of Western origin fish in the annual catch in, say, the WATL stratum could be put in place, that could provide a further index to be used in determining the TAC for the West area in a CMP. Basically, improved CMP conservation performance (and better catches in the absence of a regime shift) could be achieved by reducing TACs more heavily ONLY if this index reflected an increase in the proportion of the Western origin bluefin in (say) the WATL stratum.

This is no more that an idea at this stage, but in qualitative terms it would seem to have promise. If it were to be pursued further however, it would first need some extension of the trial software to generate a realistic annual index for this Western origin proportion of the catch in a West area stratum.

Reference

Butterworth D.S., and Rademeyer R.A. 2020. Further refinement of the MFXP (Modified Fixed Proportion) CMP. SCRS/2020/160.

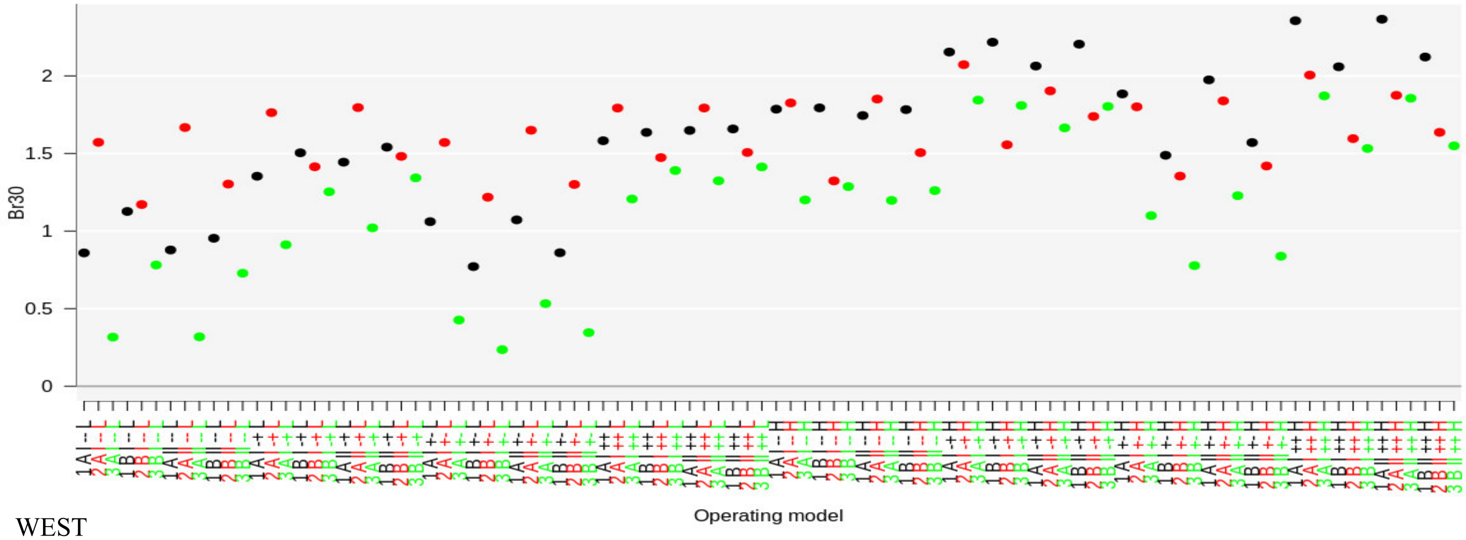
Table 1: Control parameter values for each of the BR CMPs presented here. The tunings apply to deterministic results.

CMP name	Eastern CMP	Western CMP	α	β	Note
BR_1	BR_E1	BR_W100	1.500	0.600	Tuned to Br30 (west)=1.00
BR_1x	BR_E1	BR_W100noR3	1.500	0.625	As BR_1 but excluding the R3 OMs
BR_6	BR_E1	BR_W100lw	1.500	0.690	No extra weight on US_RR
BR_6x	BR_E1	BR_W100lwnoR3	1.500	0.740	As BR_6 but excluding the R3 OMs
BR_7	BR_E3	BR_W100E3	2.500	0.400	Lower median East Br30
BR_7x	BR_E3	BR_W100E3noR3	2.500	0.580	As BR_7 but excluding the R3 OMs

Table 2: Deterministic Br30 results for various BR CMPs.

EAST	All 96 OMs			Only R1 and R2 OMs		
	Median	5%ile	min	Median	5%ile	min
ZeroC	3.41	2.10	1.96	2.90	2.05	1.96
BR_1	1.52	0.48	0.24	1.64	0.88	0.77
BR_1x	1.52	0.48	0.24	1.64	0.88	0.77
BR_6	1.53	0.49	0.24	1.64	0.88	0.77
BR_6x	1.52	0.48	0.24	1.64	0.88	0.77
BR_7	1.18	0.00	0.00	1.44	0.22	0.04
BR_7x	1.18	0.00	0.00	1.46	0.22	0.04
WEST	**All 96 OMs**			**Only R1 and R2 OMs**		
	Median	5%ile	min	Median	5%ile	min
ZeroC	2.78	1.49	1.14	2.55	1.23	1.14
BR_1	1.00	0.35	0.01	1.03	0.47	0.43
BR_1x	0.97	0.34	0.01	1.00	0.45	0.42
BR_6	1.00	0.23	0.01	1.04	0.57	0.53
BR_6x	0.97	0.19	0.00	1.00	0.55	0.49
BR_7	1.00	0.08	0.00	1.23	0.62	0.04
BR_7x	0.82	0.02	0.00	1.00	0.45	0.02

EAST



WEST

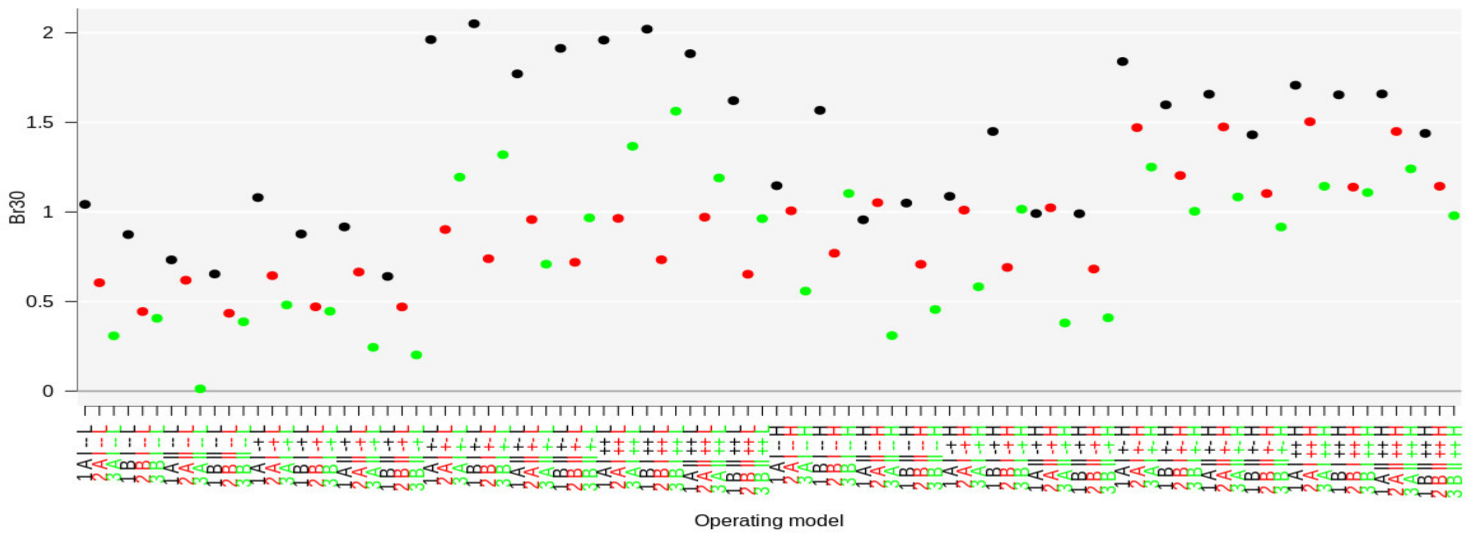


Figure 1: Deterministic Br30 results for the BR_1 CMP. The colours are identifying the different recruitment scenarios (black=R1, red=R2 and green=R3).

EAST

All 96 OMS

Only R1 and R2 OMs (no R3)

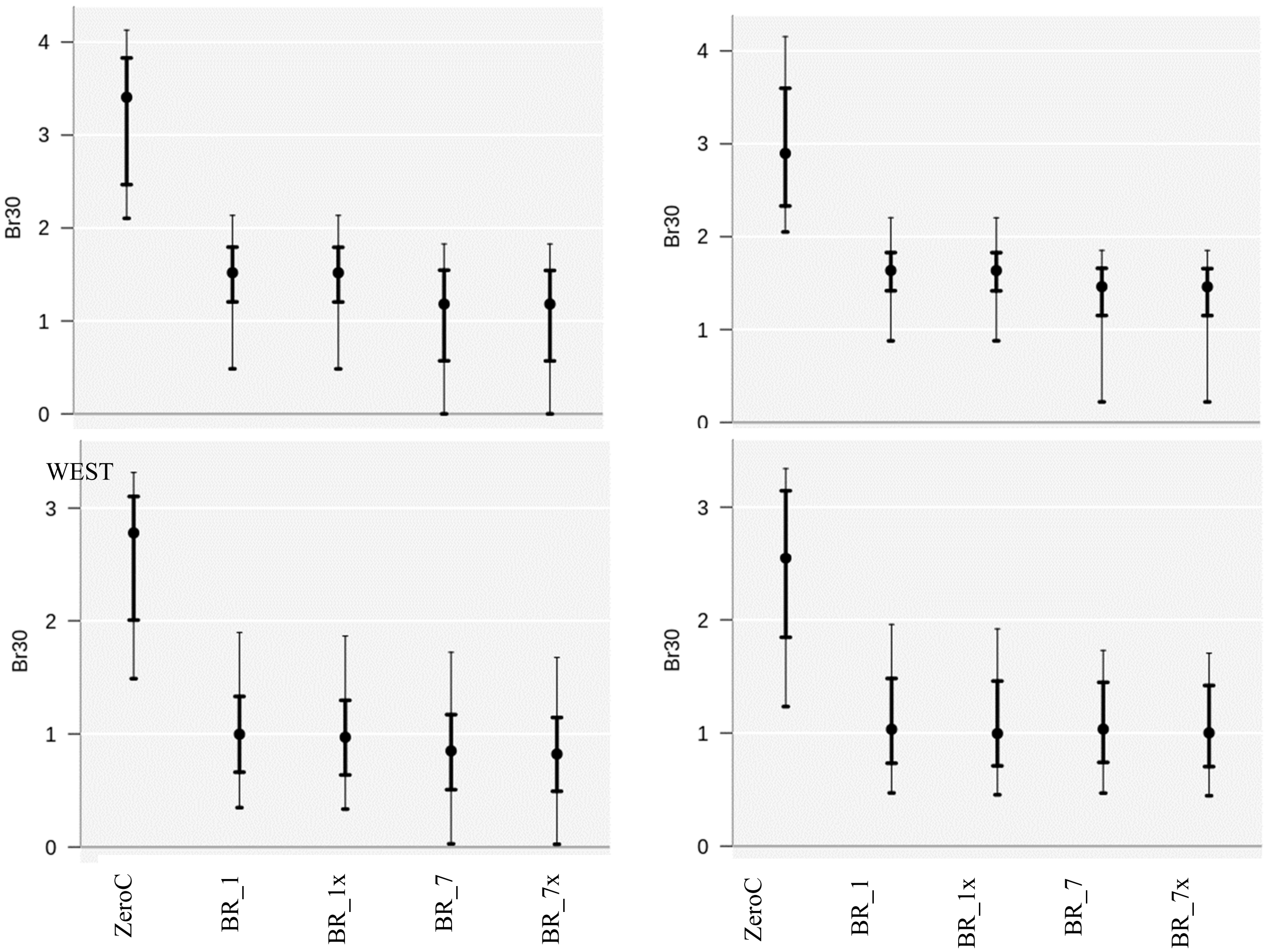
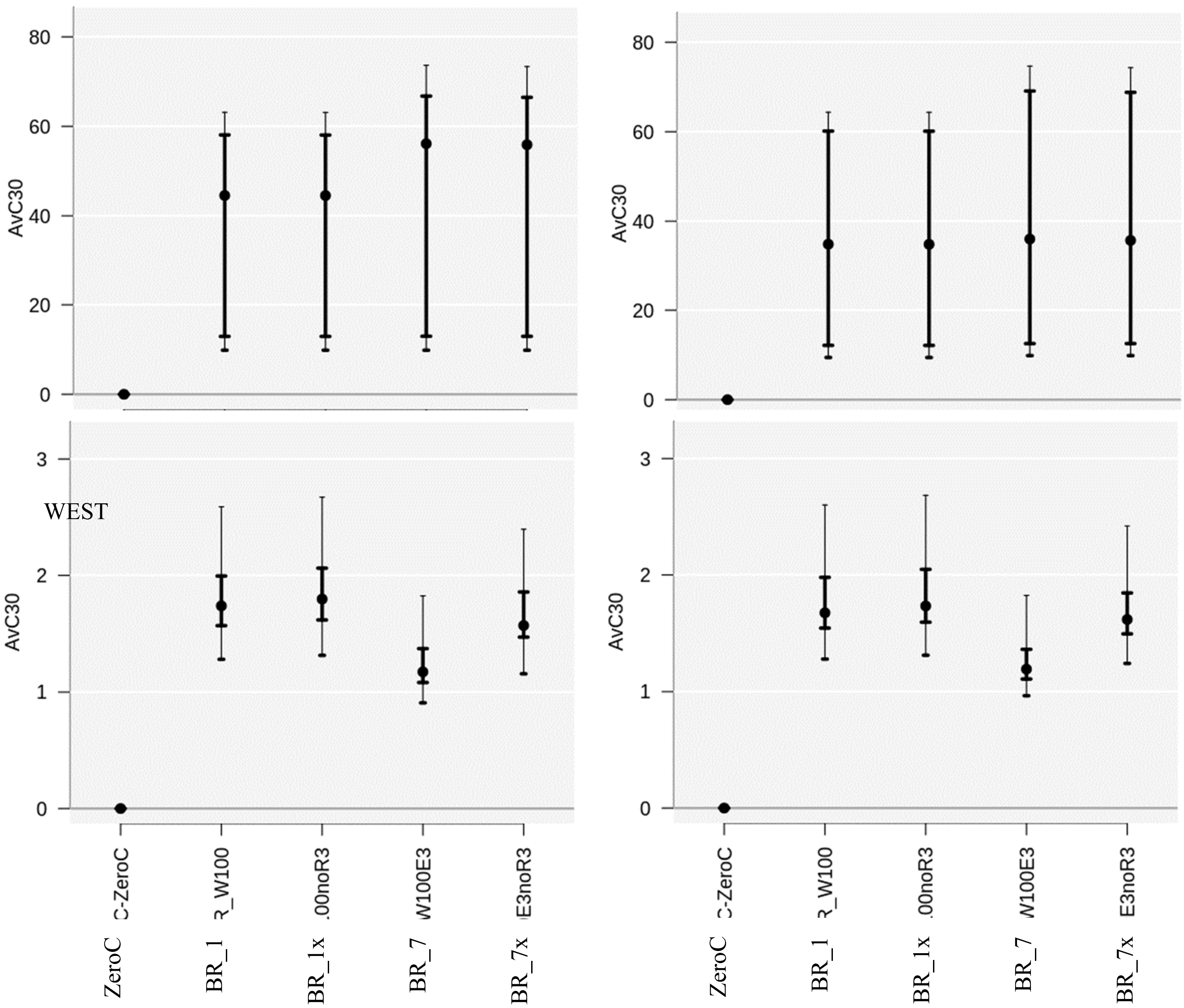


Figure 2a: Deterministic Br30 values for all BR CMPs considered over the interim grid of OMs (LHS), and omitting the R3 recruitment scenarios (RHS). The plots show median, interquartile and 90%-ile range.

EAST

All 96 OMS

Only R1 and R2 OMs (no R3)



WEST

Figure 2b: Deterministic AvC30 values for all BR CMPs considered over the interim grid of OMs (LHS,) and omitting the R3 recruitment scenarios (RHS). The plots show median, interquartile and 90%-ile range.

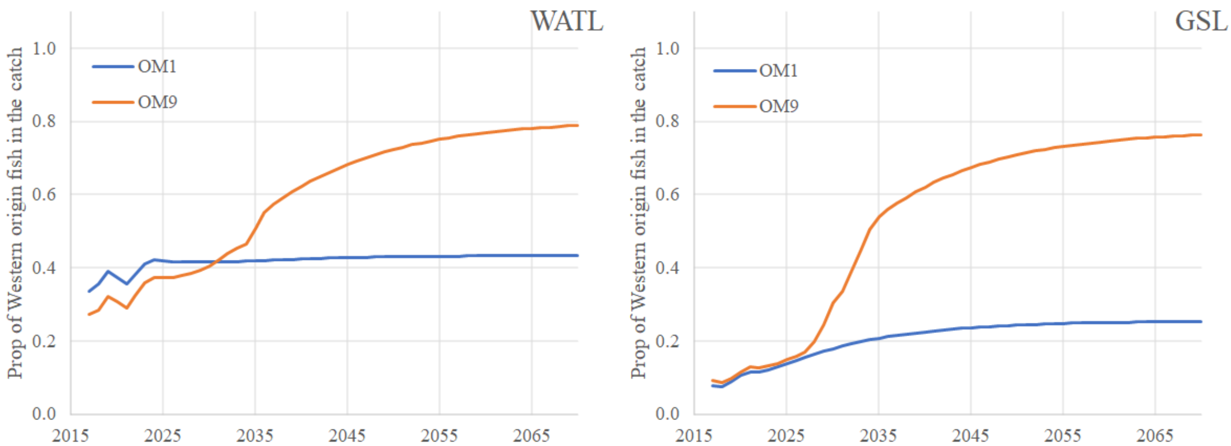


Figure 3: Deterministic projected proportion of Western origin fish in the catch (numbers) in the Western Atlantic (WATL) and Gulf of Saint Laurence (GSL) strata, for OM1 (R1, A, I, --, L) and OM9 (R3, A, II, --, L), under the BR_1 CMP.

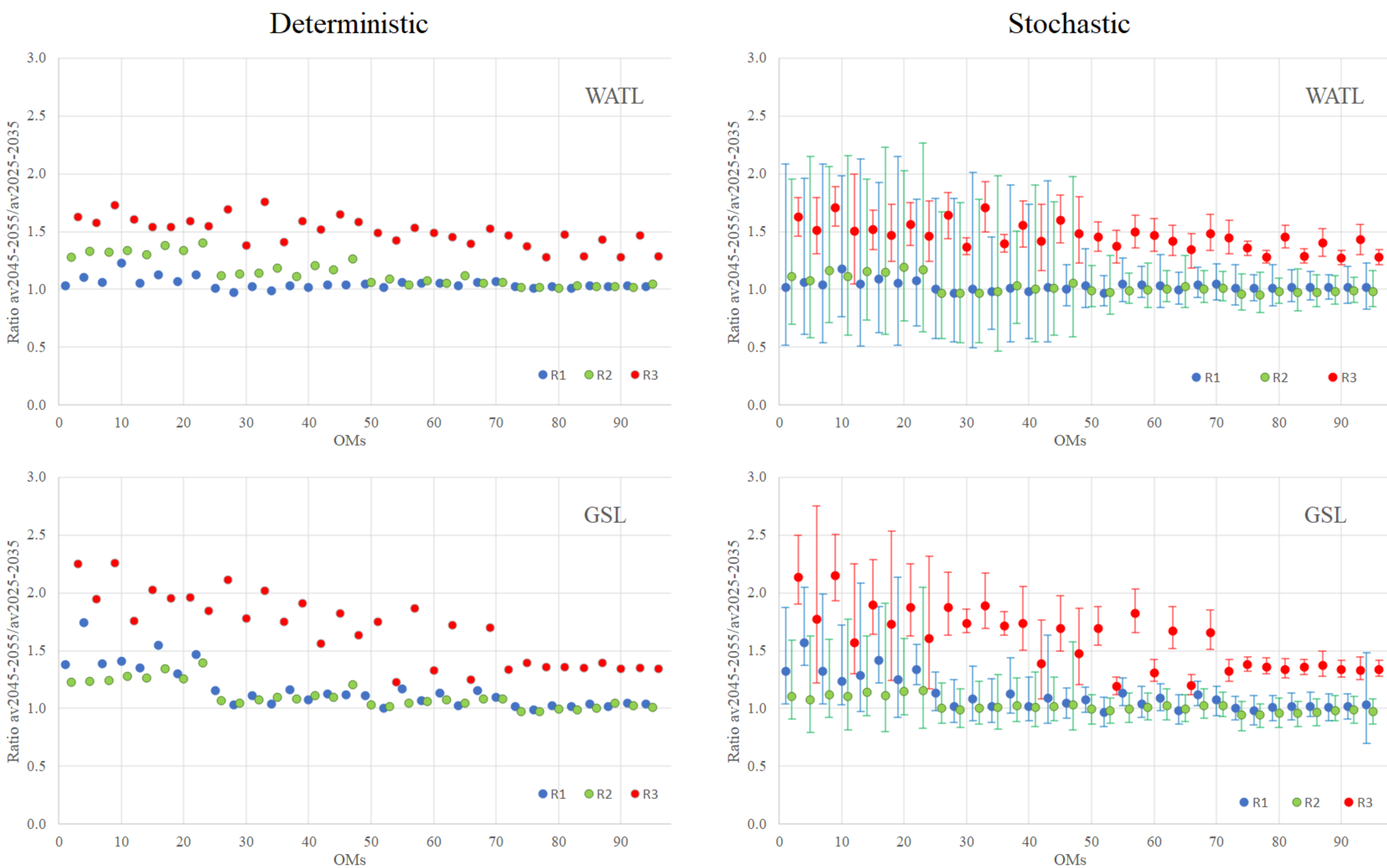


Figure 4: The evolution (ratio of av2045-2055 over av2025-2035) of the proportion of western origin fish (in numbers) in the catch in the WATL and GSL strata for the 96 OMs in the interim grid, under the BR_1 CMP.