Final OMP simulation results for OMP 2015 for west coast rock lobster

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Summary

The results for OMP variants requested at the previous SWG meeting are reported. Adjusting the amount transferred from A8 to A56 results in satisfactory performance for a maximum TAC increase constraint in the 10-12% range. Tolerance allowances of 10% for the offshore fishing gives acceptable results, but not for the nearshore and IR sectors because the projected frequency of transfers into A8 in that case leads to A8 being heavily depleted.

Introduction

Following results presented in FISHERIES/2015/JUN/SWG/WCRL/15, the SWG recommended that the OMP variant that allowed for a 10% A8+ offshore TAC to be shifted into A56 only (VAR1c) was preferred. This variant with a 10%, 11% and 12% (VAR2 from FISHERIES/2015/JUN/SWG/WCRL/15) maximum TAC increase constraint should be explored further allowing for tolerance in the offshore sector (only), as well as tolerance that would be extended to the nearshore and IR sectors. The "VARTOL2" method described in FISHERIES/2015/JUN/SWG/WCRL/15 was recommended to be used to scale the CPUE values in the model to "absolute/real" values when determining the "best" and "worst" super-areas.

A further variant on the10% and 12% maximum TAC increase constraint variants (no tolerance), but where a lesser amount of offshore TAC is shifted into A56 (5% as opposed to 10%) was also to be explored, in order to improve recovery performance in A56.

<u>VARTOL2: Method 2 (scales the CPUE to absolute/real values to determine the best and worst super-areas)</u>

Offshore TACs

For super-areas A34, A56, A7 and A8 generate future trap CPUE values (as normal):

$$CPUE_{Y,A}^{model}$$

where *Y* is from 2014 onwards (actual data are available up to 2013), and *A* is the super-area.

Scale these values such that the average standardised trap CPUE values over the 2011-2013 period produced by Glazer multiplied by the "scaling" results in the average nominal 2011-2013 trap CPUE values reported by van Zyl in FISHERIES/2014/JUL/SWG/WCRL/12. Note that the averages over the A3

and A4 values were used for A34, and A8 is used for A8+. The scaling values for each super-area are as follows:

A34 = 5.396

A56 = 3.532

A7 = 9.736

A8 = 8.900

Nearshore and Interim Relief TACs

For super-areas A12, A34, A56 and A8 generate future hoop CPUE values (as normal):

$$CPUE_{Y,A}^{model}$$

where *Y* is from 2014 onwards (actual data are available up to 2013), and *A* is the super-area.

Scale these values such that the average standardised hoop CPUE values over the 2011-2013 period produced by Glazer multiplied by the "scaling" results in the average nominal 2011-2013 hoop (bakkies) CPUE values reported by van Zyl in FISHERIES/2014/JUL/SWG/WCRL/12. Note that the averages over the A3 and A4 values were used for A34, and A8 is used for A8+. The scaling values for each super-area are as follows:

A12 = 24.81

A34 = 52.53

A56 = 43.72

A8 = 140.26

[Note although the OMP now allows nearshore and IR catches in A7, the tolerance rule does not yet involve A7 as there are insufficient hoop CPUE data to calculate the "best" or "worst" areas with A7 included.]

Results

Results for the five following OMP variants are reported in Table 1:

OMP_10% - 10% maximum TAC increase constraint (10% A8 offshore shifted into A56)

OMP_12% - 12% maximum TAC increase constraint (10% A8 offshore shifted into A56)

OMP_10%* - 10% maximum TAC increase constraint (**5%** A8 offshore shifted into A56)

OMP_12%* - 12% maximum TAC increase constraint (**5%** A8 offshore shifted into A56)

OMP_10% TOL - 10% maximum TAC increase constraint with Offshore TAC tolerance allowed (10% A8 offshore shifted into A56)

OMP_11% TOL - 11% maximum TAC increase constraint with Offshore TAC tolerance allowed (10% A8 offshore shifted into A56)

OMP_12% TOL - 12% maximum TAC increase constraint with Offshore TAC tolerance allowed (10% A8 offshore shifted into A56)

OMP_10% TOLB - 12% maximum TAC increase constraint with Offshore, Nearshore and IR TAC tolerance allowed (10% A8 offshore shifted into A56)

Tables 2a and b report the probability (expressed as a %) that the EC rule is invoked at least once in any one super-area over the six year period 2015-2020 (Table 2a), or the four year period 2015-2018 (Table 2b).

Figures 1a and b show in their upper plots the annual probability (reported as percentage) of offshore TAC transfers taking place between different super-areas in the simulation study for **OMP_10% TOL** (Figure 1a, i.e. offshore tolerance only) and **OMP_10% TOLB** (offshore and nearshore+IR tolerance allowed). Note A34_A56 refers to offshore TAC transfer FROM A34 into A56. The two lower plots show the probability (reported as percentage) of offshore TAC transfer into and from each super-area.

Discussion

Improving performance in A56

OMP_12%* which allows for only a 5% shift of offshore TAC from A8 into A56 (in contrast to 10% in OMP_12%) produces a substantial improvement in the performance in A56 recovery. The lower 5%ile improves from 0.57 (OMP_12%) to 1.03 (OMP_12%*). There is subsequently a small reduction in the A8 recovery performance, but not one of too great a concern (the lower 5%ile is reduced from 0.70 (OMP_12%) to 0.65 (OMP_12%*)).

For OMP_10%* the lower 5%ile improves from 0.70 (OMP_10%) to 1.13 (OMP_10%*). There is subsequently a small reduction in the A8 recovery performance, but also not one of too great a concern (the lower 5%ile is reduced from 0.74 (OMP_11%) to 0.68 (OMP_10%*)).

Comparing 10%, 11% and 12% maximum TAC increase constraints

As expected, allowing for an 11% maximum TAC increase constraint produces performance results intermediate between those for a 10% or 12% maximum TAC increase constraint (Table 1). Note that here these OMP variants being compared allow for offshore tolerance. Similar results would be expected for the variants which do not allow for tolerance.

Extending tolerance for Nearshore and IR TAcs

The average CPUEs for bakkies (hoopnets) for each super-area over the 2011-2013 period were:

A12: 23

A34: 63

A56: 63

A8: 127

i.e. hoopnet performance in A8 is five times better than A12 and twice as good for A34 and A56. When the OMP is extended to allow for tolerance in the Nearshore and IR sectors (based on hoopnet performance) what results is that in many years the shift is into A8 – this in turn depletes A8 and results in the EC rule being triggered relatively frequently for A8, with the end result being all catches (including those offshore) being set equal to zero for A8 for these simulations. For A12, although TAC is seldom transferred INTO this area, when it does it is usually a relatively large amount (compared to the pre-tolerance TAC value) with the result that depletion occurs and ECs are then triggered in A12 with the catches being set equal to zero.

So the net result is that for with the extension of the tolerance to nearshore+IR, the “best” area can have its TAC increased too much, which results in triggering the EC rule in that “best” area, which in turn results in the setting of zero TACS for that area.

Hence, as shown in Table 1, the overall result is that the global TAC from the six years drops from an average of some 2200 MT to 660 MT, with a consequent much greater resource recovery.

Conclusions

The results presented here show that by allowing for only a 5% TAC shift from A8 to A56 improves the A56 recovery such that both a 10% and 12% maximum TAC increase constraint OMP variants produce satisfactory resource recovery for A56. Allowance for tolerance in the offshore sector does not alter the biological impact on the resource. Extending the tolerance to both the nearshore and IR sectors does however result in large overall TAC reductions due to exceptional circumstances rules being triggered far more frequently.

Table 1: OMP 2015 simulation results of offshore TAC and B75m(21/06) Medians with 5th and 95th percentile values shown in parentheses. Note the offshore TAC values reported here are those set by the OMP prior to any tolerances allowed.

		OMP_10% **Max TAC incr. constraint 10% (No tolerance)**	**OMP_12%** **Max TAC incr. constraint 12% (No tolerance)**	**OMP_10%*** **Max TAC incr. constraint 10% (only 5% offshore TAC shifted from A8 to A56)**	**OMP_12%*** **Max TAC incr. constraint 12% (only 5% offshore TAC shifted from A8 to A56)**	**OMP_10%_TOL** **Max TAC incr. constraint 10% (Tolerance allowed for Offshore only)**	**OMP_11%_TOL** **Max TAC incr. constraint 11% (Tolerance allowed for Offshore only)**	**OMP_12%_TOL** **Max TAC incr. constraint 12% (Tolerance allowed for Offshore only)**	**OMP_10%_TOLB** **Max TAC incr. constraint 10% (Tolerance allowed for Offshore, Nearshore and IR)**
6-yr (2015-2020) Ave Global TAC	A1-2	48 [39; 48]	52 [44; 53]	47 [39; 48]	52 [43; 52]	47 [36; 48]	50 [40; 51]	52 [43; 53]	2 [1; 33]
	A3-4	319 [121; 372]	343 [128; 404]	316 [121; 368]	340 [128; 397]	318 [113; 383]	332 [118; 401]	344 [128; 404]	143 [87; 357]
	A5-6	546 [486; 616]	587 [519; 667]	411 [363; 470]	441 [389; 507]	528 [431; 612]	548 [451; 638]	587 [519; 667]	213 [1651; 573]
	A7	260 [229; 282]	279 [242; 303]	276 [246; 297]	296 [258; 320]	266 [210; 302]	277 [222; 314]	279 [242; 304]	89 [66; 290]
	A8	1093 [968; 1146]	1173 [1022; 1240]	1189 [1056; 1255]	1283 [1116; 1347]	1096 [943; 1189]	1141 [980; 1237]	1173 [1022; 1240]	201 [189; 1169]
	T	2229 [1915; 2236]	2390 [2055; 2399]	2212 [1900; 2220]	2372 [2035; 2380]	2229 [1847; 2236]	2327 [1925; 2335]	2390 [2055; 2399]	656 [570; 2233]
6-yr (2015-2020) Ave offshore TAC	A1-2	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]	0 [0; 0]
	A3-4	178 [61; 229]	191 [63; 246]	176 [62; 226]	189 [63; 243]	177 [51; 240]	183 [51; 250]	191 [63; 246]	83 [37; 220]
	A5-6	446 [393; 515]	478 [419; 556]	313 [270; 370]	334 [287; 399]	428 [346; 510]	443 [358; 532]	478 [420; 556]	170 [127; 478]
	A7	223 [202; 256]	250 [215; 275]	250 [220; 270]	268 [232; 291]	240 [186; 275]	249 [195; 286]	250 [215; 274]	76 [53; 260]
	A8	581 [528; 635]	616 [543; 674]	687 [626; 746]	730 [642; 794]	584 [518; 673]	602 [523; 695]	616 [543; 674]	131 [127; 665]
	T	1453 [1270; 1463]	1555 [1355; 1562]	1440 [1257; 1447]	1539 [1337; 1547]	1453 [1214; 1463]	1508 [1270; 1515]	1555 [1355; 1562]	456 [393; 1460]
6-yr (2015-2020) Ave nearshore TAC	A1-2	30 [24; 30]	33 [28; 33]	29 [24; 30]	32 [27; 33]	30 [23; 30]	32 [25; 32]	33 [38; 33]	0 [0; 00]
	A3-4	81 [35; 82]	89 [36; 89]	79 [33; 81]	89 [36; 89]	82 [31; 82]	87 [34; 89]	89 [36; 89]	35 [26; 81]
	A5-6	36 [30; 36]	39 [33; 39]	35 [29; 36]	39 [33; 39]	36 [28; 36]	38 [30; 38]	39 [33; 39]	15 [14; 34]
	A7	15 [13; 15]	25 [19; 25]	15 [13; 15]	16 [14; 16]	15 [13; 15]	16 [13; 16]	16 [14; 16]	8 [7; 17]
	A8	304 [255; 306]	332 [287; 334]	294 [246; 304]	331 [286; 332]	305 [241; 306]	324 [261; 324]	332 [288; 334]	44 [40; 305]
	T	430 [361; 430]	469 [387; 469]	428 [360; 429]	467 [385; 468]	430 [360; 430]	459 [369; 460]	469 [387; 470]	109 [93; 430]
6-yr (2015-2020) Ave IR TAC	A1-2	16 [13; 16]	17 [15; 18]	16 [13; 16]	17 [13; 17]	16 [12; 16]	17 [13; 17]	17 [14; 18]	1 [0; 10]
	A3-4	50 [20; 50]	53 [22; 56]	50 [21; 50]	53 [21; 54]	49 [20; 50]	52 [20; 52]	53 [22; 56]	21 [16; 51]
	A5-6	54 [45; 54]	57 [47; 61]	54 [45; 54]	57 [46; 58]	54 [44; 54]	56 [45; 57]	57 [47; 61]	24 [21; 53]
	A7	9 [8; 9]	13 [11; 13]	9 [8; 9]	10 [8; 10]	9 [8; 9]	10 [8; 10]	10 [8; 10]	5 [4; 11]
	A8	152 [125; 153]	162 [133; 172]	152 [127; 152]	161 [129; 164]	152 [124; 153]	158 [126; 159]	162 [133; 172]	23 [21; 156]
	T	266 [221; 266]	283 [231; 283]	265 [221; 265]	282 [231; 282]	266 [220; 266]	278 [230; 278]	283 [231; 283]	76 [66; 266]
6 yr (2015-2020) Ave Total Rec. Take	T	77 [67; 81]	83 [68; 83]	78 [66; 78]	83 [70; 83]	76 [67; 81]	82 [68; 82]	83 [70; 83]	20 [18; 81]
***B75*$_m$(21/06)**	A1-2	0.77 [0.40; 1.98]	0.75 [0.38; 1.96]	0.78 [0.40; 1.99]	0.75 [0.39; 1.96]	0.77 [0.40; 2.01]	0.76 [0.39; 2.00]	0.75 [0.40; 1.96]	0.97 [0.63; 2.24]
	A3-4	1.72 [0.91; 2.93]	1.68 [0.88; 2.88]	1.73 [0.91; 2.93]	1.69 [0.88; 2.88]	1.73 [0.91; 2.95]	1.71 [0.90; 2.92]	1.68 [0.88; 2.88]	1.96 [1.13; 3.06]
	A5-6	1.80 [0.70; 4.15]	1.67 [0.57; 3.96]	2.24 [1.13; 4.76]	2.15 [1.03; 4.62]	1.88 [0.72; 4.33]	1.81 [0.65; 4.28]	1.67 [0.57; 3.96]	2.50 [1.50; 4.91]
	A7	1.86 [1.21; 2.85]	1.83 [1.17; 2.81]	1.83 [1.18; 2.82]	1.80 [1.14; 2.79]	1.83 [1.21; 2.85]	1.82 [1.19; 2.83]	1.83 [1.17; 2.81]	1.96 [1.44; 3.09]
	A8	1.29 [0.74; 2.60]	1.25 [0.70; 2.55]	1.23 [0.68; 1.96]	1.19 [0.65; 2.48]	1.29 [0.76; 2.58]	1.27 [0.74; 2.55]	1.25 [0.72; 2.51]	1.56 [1.11; 2.82]
	T	1.57 [1.00; 2.56]	1.53 [0.97; 2.51]	1.57 [1.01; 2.56]	1.53 [0.97; 2.51]	1.57 [1.01; 2.56]	1.54 [0.99; 2.53]	1.53 [0.97; 2.51]	1.72 [1.40; 2.61]

Table 2a: The probability (expressed as a %) that the EC rule is invoked at least once in any one super-area **over the six year period** 2015-2020. Results shown for the six final OMP variants.

	OMP_10%	**OMP_12%**	**OMP_10% TOL**	**OMP_12% TOL**	**OMP_10% TOLB**
A1+2	1.00%	1.17%	1.00%	1.00%	0.17%
A3+4	2.50%	2.50%	2.50%	2.67%	2.33%
A5+6	1.00%	1.33%	1.00%	1.00%	0.33%
A7	0.00%	0.00%	0.00%	0.00%	0.00%
A8+	2.17%	3.00%	0.00%	0.00%	10.00%
T	6.67%	8.00%	4.50%	4.67%	12.83%

Table 2b: The probability (expressed as a %) that the EC rule is invoked at least once in any one super-area **in the first four years.** Results shown for the six final OMP variants.

	OMP_10%	**OMP_12%**	**OMP_10% TOL**	**OMP_12% TOL**	**OMP_10% TOLB**
A1+2	0.00%	0.00%	0.00%	0.00%	0.00%
A3+4	1.50%	1.50%	1.50%	1.50%	1.50%
A5+6	0.25%	0.25%	0.25%	0.25%	0.25%
A7	0.00%	0.00%	0.00%	0.00%	0.00%
A8+	0.00%	0.00%	0.00%	0.00%	14.75%
T	1.75%	1.75%	1.75%	1.75%	15.60%

Figure 1a: The top plot shows the annual probability (reported as percentage chance) of offshore TAC transfers taking place between different super-areas in the simulation study for **OMP_10% TOL** (i.e. offshore tolerance only). Note e.g. A34_A56 refers to offshore TAC transfer FROM A34 into A56. The two lower plots show the probability (reported as percentage change) of offshore TAC transfer into and from each super-area.

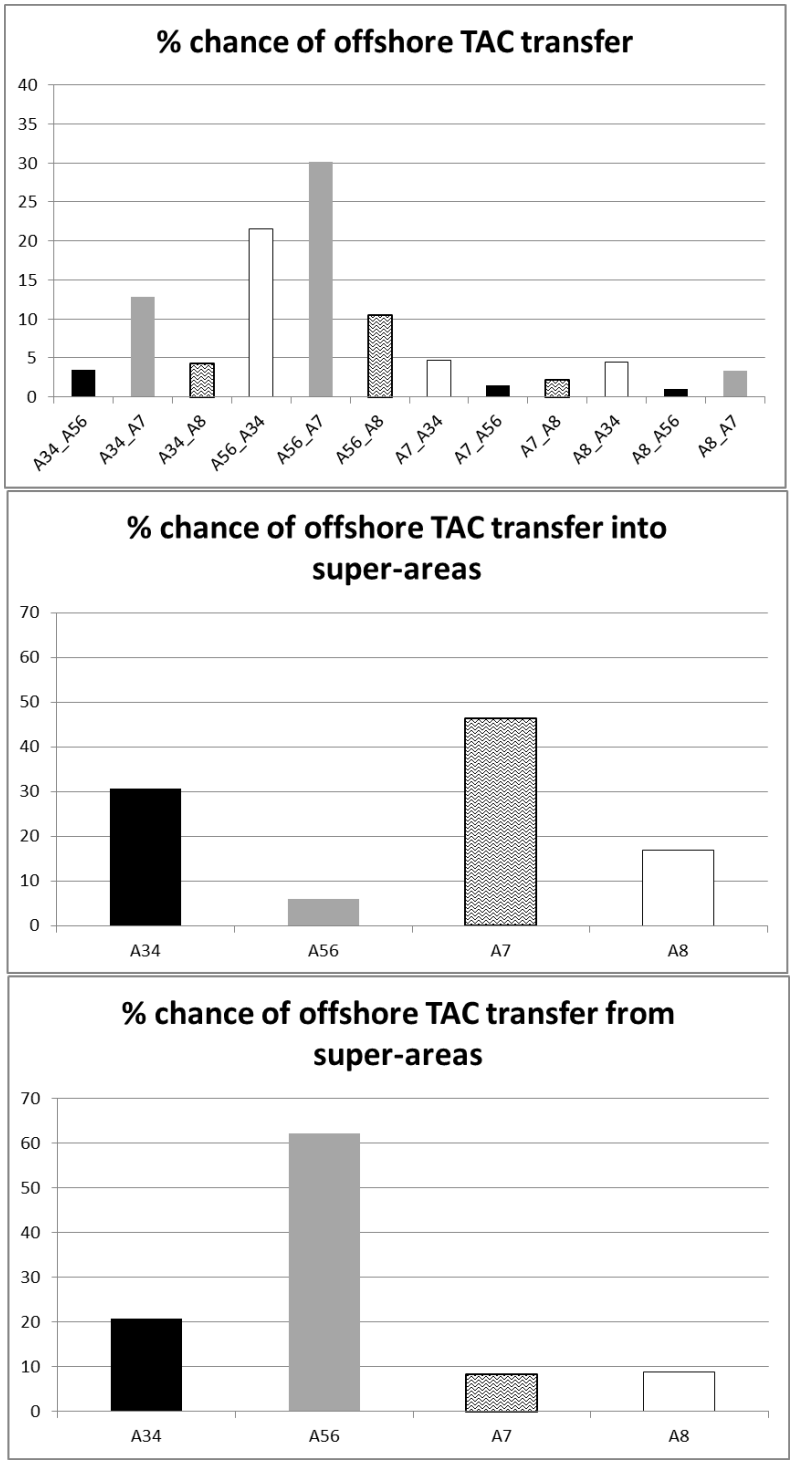

Figure 1b: The top plots show the annual probability (reported as percentage chance) of offshore (LHS) and nearshore+IR (RHS) TAC transfers taking place between different super-areas in the simulation study for **OMP_10% TOLB** (i.e. offshore, nearshore and IR tolerance allowed). Note e.g. A34_A56 refers to TAC transfer FROM A34 into A56. The two lower plots show the probability (reported as percentage change) of offshore TAC transfer into and from each super-area.