MSE Mackerel

Base case SPM OM

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MSE SPM Perciformes from Thorson et al 2012, MSY/BMSY from Fmsy project, and K fitted to observation 1980-2017 including misreported catches.

Input:

Bpa =	2500		Fmsy =MSY/Bmsy=	0.2412	
Blim =	1990		K=	18556	
MSYBtrigger =	2500		n (called phi in formula)=	0.92	Autocorr.
MS type =	MS1		SP process error STD=TB*q, q=	0.012	0.00
B year 2020 =	5685		Observation CV =	0.09	0.00
SSB vs TB coefficients:		a= -0.3735	b= 0.8032		
F target (SPM currency) =	0.2412		Ratio F (SPM currency vs F (ICES currency) =	0.6236	

MSYBtrigger and F target are varied for the runs below. In appendix 1 is given the results of a run with Blim = 2.3 million t, equal to 50% Bmsy, as an alternative for the current Blim of 1.99 million t, because this value is linked to an assessment not including misreporting.

Yield 2060. Maximum values marked in green:

	$B_{trigger}$ million t						
F_{target}	2.0	2.5	3.0	3.5	4.0	4.5	5.0
0.00	0	0	0	0	0	0	0
0.04	624	616	624	619	613	625	621
0.08	1030	1043	1049	1044	1042	1042	1037
0.12	1311	1309	1307	1303	1318	1314	1319
0.16	1471	1474	1470	1470	1481	1480	1470
0.20	1555	1545	1563	1548	1544	1555	1551
0.24	1576	1575	1575	1579	1582	1571	1575
0.28	1567	1545	1557	1569	1563	1575	1579
0.32	1523	1517	1517	1539	1547	1561	1577
0.36	1455	1461	1471	1507	1537	1540	1560
0.40	1371	1415	1453	1496	1532	1540	1548

5% SSB(2060) lower confidence value. Values below Blim marked in red:

	$B_{trigger}$ million t						
F_{target}	2.0	2.5	3	3.5	4	4.5	5.0
0.00	12823	12418	12854	12984	12500	12796	12770
0.04	10562	10258	10476	10526	10136	10473	10475
0.08	8358	8713	8699	8831	8552	8621	8556
0.12	7159	7161	7135	7044	7082	7062	7061
0.16	5806	5879	5839	5871	5837	5899	5688
0.20	4773	4807	4843	4764	4824	4865	4869
0.24	4049	3960	4041	4012	3901	3991	4159
0.28	3244	3167	3362	3350	3410	3529	3718
0.32	2763	2683	2765	2868	3073	3232	3421
0.36	2289	2284	2362	2598	2814	2969	3047
0.40	1846	2019	2249	2433	2597	2802	2849

TAC (2060) variability from year to year -taken as a mean over 2060-2259 - in percentage. High values marked in color.

	$B_{trigger}$ million t						
F_{target}	2.0	2.5	3.0	3.5	4	4.5	5.0
0.00	-	-	-	-	-	-	-
0.04	14	12	12	14	13	14	14
0.08	14	14	13	13	13	13	14
0.12	13	13	13	12	15	14	15
0.16	13	14	13	13	14	13	14
0.20	15	13	14	15	14	15	15
0.24	13	15	14	14	16	17	25
0.28	15	16	14	17	21	27	32
0.32	15	15	16	25	27	31	33
0.36	14	19	29	31	34	33	33
0.40	19	24	30	34	34	33	33

SSB (2060) - SSB below Bpa marked in color:

	$B_{trigger}$ million t						
F_{target}	2.0	2.5	3	3.5	4	4.5	5.0
0.00	14932	14909	15035	14809	14982	14925	14892
0.04	12172	12199	12265	12245	12171	12299	12195
0.08	10111	10066	10087	10183	10099	10034	10156
0.12	8271	8223	8314	8274	8310	8331	8333
0.16	6824	6758	6874	6812	6892	6907	6808
0.20	5575	5595	5712	5670	5610	5656	5654
0.24	4651	4676	4719	4705	4743	4740	4827
0.28	3930	3811	3863	3914	4034	4223	4432
0.32	3266	3263	3280	3438	3636	3878	4102
0.36	2691	2723	2884	3145	3374	3561	3830
0.40	2257	2457	2662	2941	3179	3366	3527

Table 1. Results of simulations of base case with Btrigger=2.5 million t.

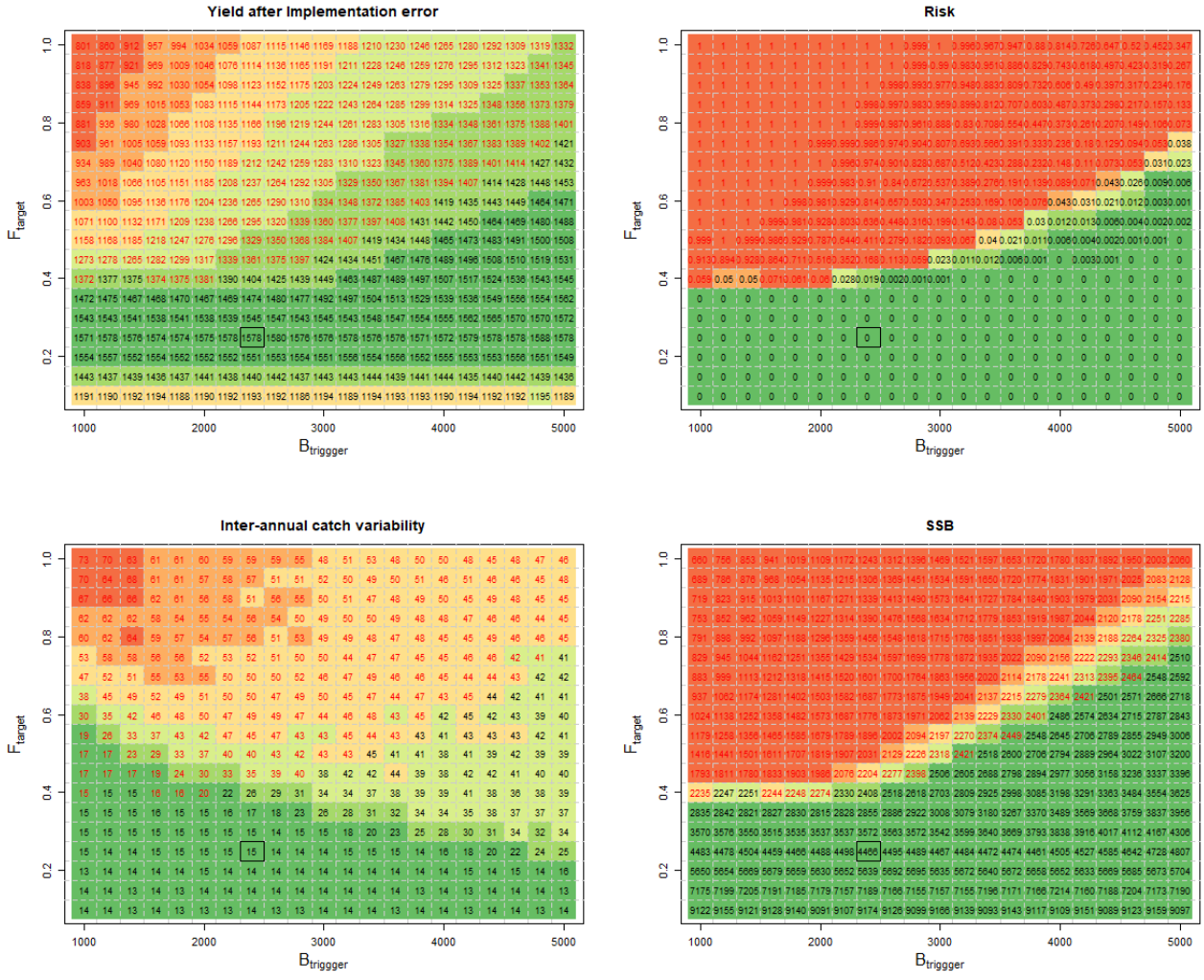
F	TB 2060	Y 2060	Y 2020-2024	Y 2025-2029	SSB 2060	TAC variation (CV) from year to year	5% per-centile of SSB 2060
0.00	18659	0	0	0	14987	-	12934
0.02	16840	335	815	1371	13400	15	11193
0.04	15396	621	1660	2582	12136	14	10499
0.06	14098	852	2215	3433	11008	13	9455
0.08	12912	1041	2921	4085	9985	13	8509
0.1	11880	1185	3507	5476	9098	13	7923
0.12	10923	1310	4446	5758	8284	12	7151
0.14	10048	1405	5044	6201	7545	14	6432
0.16	9177	1465	5610	6568	6822	14	5656
0.18	8406	1521	6050	7125	6186	14	5309
0.2	7738	1548	6071	7095	5637	14	4809
0.22	7121	1566	7081	7805	5135	15	4329
0.24	6529	1573	7862	7798	4659	14	4001
0.26	6091	1572	7770	7898	4301	15	3579
0.28	5543	1547	8049	8001	3872	15	3224
0.3	5092	1538	7983	7793	3520	15	2923
0.32	4782	1517	8649	7726	3269	15	2708
0.34	4387	1490	8406	7702	2967	15	2513
0.36	4133	1465	8873	7919	2764	18	2292
0.38	3895	1436	8832	7024	2576	23	2140
0.4	3699	1405	8933	7248	2419	27	1973
0.42	3549	1389	10025	6441	2294	27	1947
0.44	3508	1395	9275	7075	2241	34	1885
0.46	3458	1380	8765	7524	2183	35	1800
0.48	3367	1364	9565	6409	2101	33	1743
0.5	3277	1351	9606	7198	2020	41	1645
0.52	3154	1323	10394	6590	1921	43	1552
0.54	3185	1336	9083	6185	1916	37	1567
0.56	3152	1324	9345	6470	1873	40	1517
0.58	3100	1321	9636	6679	1818	40	1473
0.6	3073	1319	8962	6447	1780	42	1393

Appendix 1. More detailed results based on the R code and bioDynMSEFuncs script, available in github.

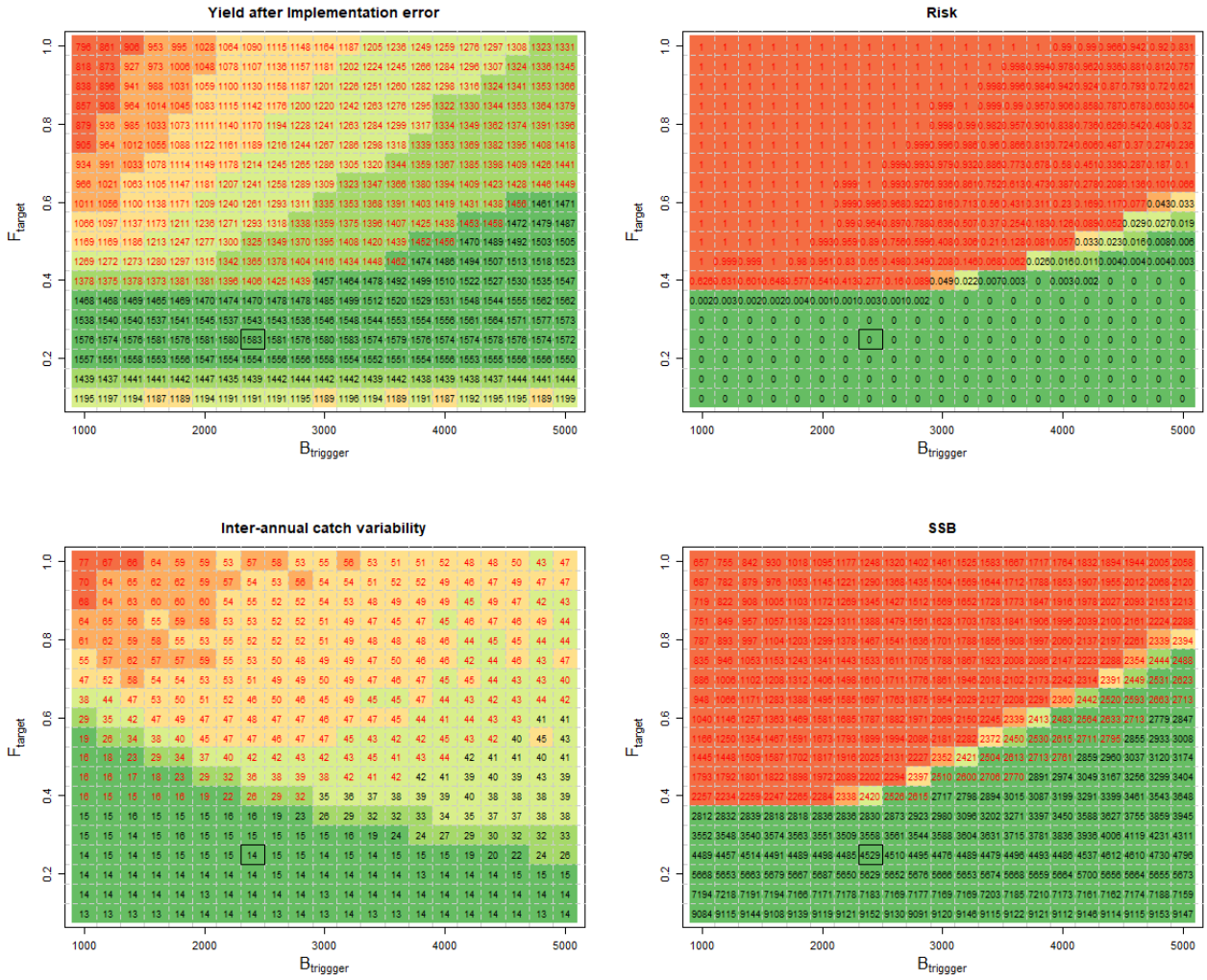
Note to WKMSEMAC 2020
29 May 2020
Tobias and Henrik

SPM OM results of F vs Btrigger for two Blim values: 1) the current one of 1.990 million t and 2) 50% of Bmsy = 2.300 million t.

<u>Blim = 1.990 million t:</u>



Blim = 2.300 million t:



Appendix 2.

The Excel code was tested agains an R-code programme “bioDynMSEFuncs” - Functions for MSE with biomass dynamic model - developed by Tobias Mildenberger, May 2020. The R-code scripts are uploaded to github and we can provide a link to the github page.

The table below shows the difference between the Excel and the R-code calculations in percentages for the base SPM MSE run (see input table at the top of the current WK doc). The differences are very low and almost certainly due to the limited number of iterations done in the Excel programme (see figure below). However, for the purpose of the WKMSEMAC the precision of the Excel programme is judged appropriate, given all the uncertainties about the biological parameters in play.

Difference between Excel and R-code programs in %					
F	TB 2060	Y 2060	SSB 2060	TAC variation (CV) from year to year	5% per-centile of SSB 2060
0.00	-0.44	NA	-0.44	NA	-0.05
0.04	-0.12	0.20	-0.12	4.19	0.37
0.08	0.16	-0.77	0.15	-12.44	0.47
0.12	-0.28	-0.05	-0.27	9.09	-1.05
0.16	0.78	0.03	0.78	10.58	0.69
0.20	0.83	-0.04	0.83	4.74	-0.33
0.24	0.24	-0.03	0.23	11.00	0.06
0.28	-0.50	-0.38	-0.53	-0.22	0.15
0.32	0.09	-0.33	0.07	-6.97	2.64
0.36	-0.64	-0.21	-0.99	-16.87	5.03
0.40	0.06	0.13	-1.23	-0.15	-2.82

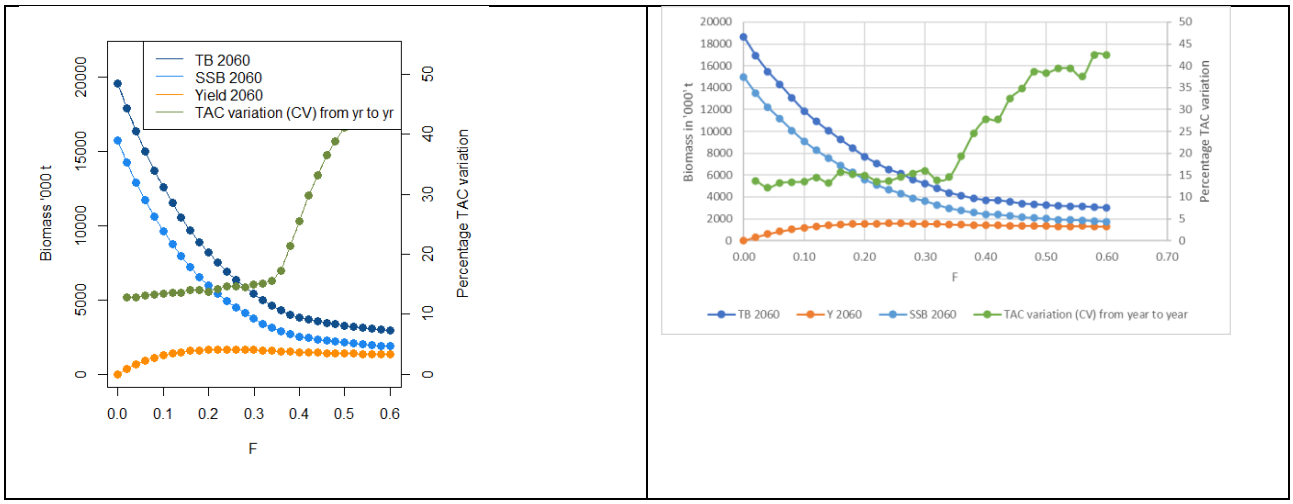


Figure A1. Left panel pot based on R-programme and right based on the Excel programme.