

A List of the TACs and TABs required as output from OMP-12

C.L. de Moor*

Correspondence email: carryn.demoor@uct.ac.za

Introduction

A revision of the TACs and TABs output from the joint sardine and anchovy OMP is required. This is firstly to account for a change in the specification of bycatch in the landings from 2011 (de Goede 2011) and secondly to make allowance for some landings which have historically been ignored as they have not been landed under a permit. This document lists the TACs and TABs that were recommended by OMP-08 and those to be recommended by OMP-12 and makes some suggestions for how the new TAC/Bs to be recommended by OMP-12 will be calculated.

OMP-08

The TACs and TABs recommended by OMP-08 are as follows:

- 1) Directed sardine TAC (Jan – Dec). Applies to all sardine caught when sardine tonnage in the landing is >50% of landed mass. In 2011 only sardine > 14cm have counted against this allocation.
- 2) Directed anchovy TAC (Jan – Aug), revised in June. Applies to all anchovy caught except a small amount landed by sardine only RHs which is ignored.
- 3) Directed anchovy TAC (Sep-Dec). Applies to all anchovy caught except a small amount landed by sardine only RHs which is ignored.
- 4) Sardine TAB with anchovy (Jan-Aug), revised in June, proportional to 2 above. Calculated on the assumption that these are mostly juveniles. Should apply to all sardine landed when the anchovy mass is >50% of total landed mass. In practice sometimes if bigger sardine from a separate trawl have been stored in a separate hold, these sardine are marked against the directed sardine TAC (1 above). The expectation is that these sardine should be mostly juveniles. In 2011 all sardine <14cm have counted against this allocation, regardless of what the directed catch was.
- 5) Sardine TAB with anchovy (Sep-Dec), constant amount almost every year. The expectation is that these sardine should be mostly juveniles. However, larger sardine are occasionally caught and then allocated the sardine TAB with red-eye (see below).
- 6) Sardine TAB with redeye (Jan-Dec), constant amount almost every year. The expectation is that these sardine should be mostly adults. Applies to all sardine landed with redeye when redeye mass is >50% of total landed mass.

* MARAM (Marine Resource Assessment and Management Group), Department of Mathematics and Applied Mathematics, University of Cape Town, Rondebosch, 7701, South Africa.

OMP-12

The TACs and TABs recommended by OMP-12 are to be as follows:

ANCHOVY

- A) Directed anchovy TAC (Jan-Aug), revised in June. (Allocated to anchovy RHs.) Equations for TAC will initially remain unchanged, though consideration needs to be given to min/max constraints. If the maximum is decreased, do we still need to take into account implementation uncertainty? See Table 1 for historic undercatch of the anchovy TAC.
- B) Directed anchovy TAC (Sep-Dec). (Allocated to anchovy RHs.) Equations for TAC will initially remain unchanged, though consideration needs to be given to min/max constraints.

Alternatives to A) and B) which have been requested for testing:

- 1) Directed anchovy TAC (Jan-Sep, Oct-Dec).
- 2) Directed anchovy TAC (Jan-Dec)
- C) Anchovy bycatch by sardine only RHs. (Pool for sardine-only RHs.) Primarily from bycatch with anchovy, but also from bycatch with eg redeye. Historically this previously unaccounted for bycatch has ranged from 0t to 239t, with an average of 66t over 2001 – 2010. We will allow an annual fixed tonnage of 250t. An alternative of 500t is possible and will be tested if time allows

BIG SARDINE (sardine \geq 14cm TL)

- D) Directed sardine TAC (Jan-Dec). (Allocated to sardine RHs.) This is where sardine > 50% of the total landed mass. Equations used for directed sardine TAC will initially remain unchanged. Ratio of big sardine : total directed sardine landings ranges from an average of 0.96 to 1.00 over 1987-2011, and 0.94-1.00 over 2001-2010. Thus the change to the categorization does not necessarily require an adjustment to the constraints.
- E) Big sardine TAB (Jan-Dec), revised mid-year. (Pool for all RHs.) This is where sardine < 50% of the total landed mass. Comprises i) sardine bycaught with redeye (and others) + ii) sardine bycaught with anchovy. For i) we will initially assume a constant 7000t per year. For ii) this will be set proportional to the anchovy TAC (starting with a similar style equation to that used for small sardine TAB).

SMALL SARDINE (sardine <14cm TL)

- F) Small sardine TAB (Jan-Dec). (Pool for all RHs, used for all sardine bycatch from fisheries other than anchovy). Calculated primarily to account for i) small sardine bycaught in directed sardine fishery and ii) small sardine bycaught in redeye fishery. For i), the historic ratios of small sardine bycaught in the directed sardine fishery (where sardine > 50% of landed mass) is given in Table 2. This TAB should be a proportion of the directed sardine TAC. Historically the proportion of small sardine in the directed sardine fishery has been \leq 4% except for 1992, 1993, 1995 and 2011. An initial suggestion would be to set this TAB at 7% of directed sardine TAC. 7% has only been exceeded in 1992 and 1995. When simulation testing, the proportion of this TAB which is actually assumed to be caught will be drawn from a distribution based on the historic proportions in Table 2.

For ii) the historic max of small sardine bycatch with redeye is 756t (in 1994) compared to a historic max of 7719t (in 1997) for big sardine bycatch with redeye. In 2008 the landing was 0t, in 2009 it was 43t, in 2010 it was 15t, and in 2011 it is currently 669t. The proportion of sardine bycatch with redeye has been $\leq 1\%$ of the redeye landings, but since redeye is given a PUCL rather than a TAC, a fixed tonnage rather than a proportion of the redeye PUCL should be allocated. Proposed 1000t. The fixed tonnage should not be too large as to give a higher TAB than what is practically caught, because simulation testing will assume this bycatch is taken and reduce the sardine directed TAC accordingly. However, the fixed tonnage should not be too small to result in closure of fisheries. Proposed to be 1000t. An alternative of 1200t will be tested if time allows.

- G) Small sardine TAB (Jan-Aug), revised in June. (Allocated to all RHs). Comprises small sardine bycaught in anchovy directed fishery. Equations for TAB will initially remain unchanged, though I hope to modify this by including some allowance for drop-off in this allocation and not only in the simulation testing.
- H) Small sardine TAB (Sep-Dec). (Allocated to all RHs). Equations for TAB will initially remain unchanged. Note that in the past 10 years the small sardine bycatch with anchovy during the additional season has averaged 810t, increasing beyond 2000t in 2002 (Table 3).

Alternatives to G) and H), corresponding to alternatives to A) and B) above, which have been requested for testing:

- 1) Small sardine TAB (Jan-Sep, Oct-Dec). Equations for normal season TAB will initially remain unchanged (as this will now depend on the anchovy TAC for a longer period), though as per G) I hope to modify this by including some allowance for drop-off in this allocation and not only in the simulation testing. See Table 3 for historic sardine bycatch during the additional season.
- 2) Small sardine TAB (Jan-Dec). See Table 3 for historic sardine bycatch with anchovy during the additional season. Figure 1 shows the regression of the commercial sardine bycatch: anchovy ratio against that observed in the May survey. This shows a drop-off of about 50% from May to August, as assumed during previous simulations. However, there is an increase in this ratio in October and November. Thus an alternative method, than the framework currently used for June-August, will likely need to be developed to simulate the implementation of this TAB.

References

- De Goede, J. 2011. Requirement for various by-catch pools and observer coverage changes as a result of new categorization of pelagic landings. Department of Agriculture Forestry and Fisheries document FISHERIES/2011/SWG-PEL/20. 8pp.

Table 1. Historic total anchovy catch (in thousands of tons), and the corresponding initial normal season, $TAC_y^{1,A}$, revised normal season, $TAC_y^{2,A}$, and final less revised, $TAC_y^{3,A} - TAC_y^{2,A}$, anchovy TACs. Although not always accurate, the difference between the revised and initial normal season TAC is compared to the catch taken in July and August, as the permits have often only been available in late July. A negative number implies the catch was more than the TAC for a particular period.

	Catches			TACs			Difference		
	January-June	July-August	September-December	$TAC_y^{1,A}$	$TAC_y^{2,A}$	$TAC_y^{3,A} - TAC_y^{2,A}$	$TAC_y^{1,A}$ - (Jan-Jun)	$TAC_y^{2,A} - TAC_y^{1,A}$ - (Jul-Aug)	$TAC_y^{3,A} - TAC_y^{2,A}$ - (Sep-Dec)
1987	429.506	146.517	24.357		600.000				
1988	328.392	131.326	113.027		600.000				
1989	280.674	13.747	0.000		300.000				
1990	150.750	0.775	0.035		150.000				
1991	143.813	7.197	0.034		150.000				
1992	216.329	101.509	31.206		350.000				
1993	115.787	78.060	42.021		360.000				
1994	122.719	30.388	2.833		150.000				
1995	92.777	71.767	13.886		210.000				
1996	40.596	0.243	0.042		70.000				
1997	2.017	31.362	27.008		60.000				
1998	86.038	16.039	5.791		175.000				
1999	60.282	53.592	66.018	108.000	146.000	85.000	47.718	15.592	18.982
2000	120.745	106.171	40.376	123.000	191.000	100.000	2.255	-38.171	59.624
2001	131.942	41.109	114.461	228.000	371.000	80.000	96.058	101.891	-34.461
2002	85.342	83.423	44.682	259.726	259.726	100.003	174.384	-83.423	55.318
2003	122.455	64.951	71.471	182.000	182.000	100.000	59.545	-64.951	28.529
2004	82.456	89.169	18.467	182.000	273.000	150.000	99.544	1.831	131.533
2005	158.890	69.285	54.553	215.049	215.049	81.951	56.159	-69.285	27.398
2006	52.328	56.237	25.619	212.251	212.251	150.000	159.923	-56.237	124.381
2007	109.563	72.313	71.216	186.942	386.942	150.000	77.379	127.687	78.784
2008	92.438	85.646	87.739	247.500	397.500	120.000	155.062	64.354	32.261
2009	63.707	74.090	36.668	299.437	449.437	120.000	235.73	75.91	83.332
2010	106.008	105.906	5.151	303.183	453.183	120.000	197.175	44.094	114.849
2011	64.218	55.259		247.500	270.291		183.282	-32.468	

Table 2. Ratio of small (<14cm) : big (≥14cm) sardine in the directed sardine fishery.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	annual small sardine in tons	annual big sardine in tons	annual small sardine in tons : big sardine in tons	annual small sardine : total directed sardine
1987	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.00	0.00				211	24620	0.01	0.01
1988	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.02	0.00	0.00	0.29	0.05	456	27725	0.02	0.02
1989	0.00	0.00	0.01	0.04	0.06	0.01	0.00	0.00	0.00	0.01	0.01	0.01	365	22265	0.02	0.02
1990	0.04	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.02	0.00	219	48609	0.00	0.00
1991	0.02	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	415	43170	0.01	0.01
1992	0.00	0.00	0.00	0.00	0.00	0.40	0.10	0.33	0.01	0.00	0.00	0.00	3755	36711	0.10	0.09
1993	0.00	0.00	0.00	0.07	0.24	0.19	0.23	0.01	0.00	0.00	0.00	0.00	2568	38881	0.07	0.06
1994	0.06	0.07	0.01	0.01	0.12	0.05	0.00	0.02	0.00	0.00	0.00	0.00	2701	72765	0.04	0.04
1995	0.00	0.00	0.01	0.00	0.08	0.17	0.36	0.52	0.09	0.00	0.18	0.00	10302	82880	0.12	0.11
1996	0.08	0.03	0.00	0.11	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	1572	93325	0.02	0.02
1997	0.06	0.00	0.00	0.00	0.00	0.00	0.02	0.01	0.08	0.01	0.00	0.00	1859	102261	0.02	0.02
1998	0.00	0.00	0.00	0.00	0.01	0.06	0.00	0.01	0.00	0.00	0.00	0.00	1274	113601	0.01	0.01
1999	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	108	119276	0.00	0.00
2000		0.00	0.00	0.00	0.02	0.02	0.00	0.00	0.00	0.00	0.00	0.00	620	124505	0.00	0.00
2001	0.00	0.00	0.00	0.00	0.01	0.00	0.03	0.05	0.01	0.01	0.00	0.00	1288	173874	0.01	0.01
2002	0.00	0.01	0.01	0.02	0.02	0.01	0.04	0.13	0.00	0.00	0.00	0.00	3870	242523	0.02	0.02
2003	0.00	0.00	0.03	0.01	0.02	0.00	0.00	0.01	0.01	0.01	0.00	0.00	2131	273182	0.01	0.01
2004	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	740	364131	0.00	0.00
2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	96	239060	0.00	0.00
2006	0.00	0.00	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	621	205848	0.00	0.00
2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12	133860	0.00	0.00
2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	25	84140	0.00	0.00
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	107	88928	0.00	0.00
2010	1.36	0.01	0.02	0.00	0.02	0.01	0.00	0.17	0.03	0.01	0.00	0.00	2717	85293	0.03	0.03
2011	0.00	0.00	0.01	0.04	0.07	0.03	0.35	0.00	0.00				5329	80881	0.07	0.06
average all years	0.07	0.01	0.01	0.01	0.03	0.04	0.05	0.05	0.01	0.00	0.02	0.00	1734.46		0.02	0.02
average 87-96	0.02	0.01	0.01	0.02	0.06	0.09	0.08	0.09	0.01	0.00	0.06	0.01	2256.46		0.04	0.04
average 2001-10	0.14	0.00	0.01	0.00	0.01	0.00	0.01	0.04	0.01	0.00	0.00	0.00	1160.69		0.01	0.01

Table 3. The sardine bycatch with anchovy (where anchovy is the largest species by mass in the landing) during the last four months of the year which has over the past decade been the “additional season”. Empty cells are those for which no anchovy catch occurred.

	Small sardine bycatch with anchovy					Big sardine bycatch with anchovy					All Bycatch	
	Sep	Oct	Nov	Dec	Total Additional Season	Sep	Oct	Nov	Dec	Total Additional Season		
1987	198.6				198.6	7.5				7.5	206.1	
1988	125.7	288.0	36.5		450.1	28.8	411.1	198.2		638.1	1088.2	
1989					0.0					0.0	0.0	
1990	0.0				0.0	0.0				0.0	0.0	
1991	0.0				0.0	0.0				0.0	0.0	
1992	255.9	6.7	0.0		262.6	21.0	1.5	0.0		22.5	285.1	
1993	554.7	146.5	0.0	0.2	701.4	3.6	16.6	0.0	0.1	20.3	721.7	
1994	31.8				31.8	0.0				0.0	31.9	
1995	130.7	1483.5	220.2		1834.3	362.2	486.8	314.7		1163.7	2998.1	
1996		1.9	0.0		1.9		1.9	0.0		1.9	3.8	
1997	2934.6	759.3			3693.9	291.5	159.1			450.6	4144.5	
1998	544.3	55.2			599.6	133.6	195.9			329.5	929.1	
1999	734.7	98.5	54.2		887.4	831.1	503.6	34.9		1369.5	2257.0	
2000	29.0	17.7	0.0		46.7	113.9	3.0	0.0		116.9	163.6	
2001	1020.1	771.3	0.1	0.0	1791.5	358.4	1071.5	100.6	27.7	1558.2	3349.7	
2002	2337.9		0.0	9.4	2347.2	371.0		64.2	54.6	489.8	2837.0	
2003	204.9	412.3	129.1	0.0	746.3	200.4	450.5	0.8	0.0	651.8	1398.1	
2004	150.3	0.0	2.4		152.7	148.6	0.0	169.3		317.9	470.6	
2005	457.1	175.3	12.6	0.0	645.1	62.5	158.8	362.8	0.0	584.1	1229.2	
2006	1609.3	65.2	5.9		1680.5	452.8	47.4	0.0		500.2	2180.7	
2007	94.8	189.1	0.0	4.5	288.3	62.6	31.8	0.0	23.1	117.6	405.9	
2008	136.6	85.8	0.2	0.1	222.7	0.0	59.6	290.2	50.7	400.5	623.2	
2009	59.1	61.2	8.7		129.1	3.6	36.0	1.1		40.7	169.8	
2010	34.9	46.5	15.1		96.5	0.7	0.0	0.0		0.7	97.2	
Average 1987-2010					700.3	Average 1987-2010					365.9	1066.3
Average 2001-2010					810.0	Average 2001-2010					466.1	1276.1

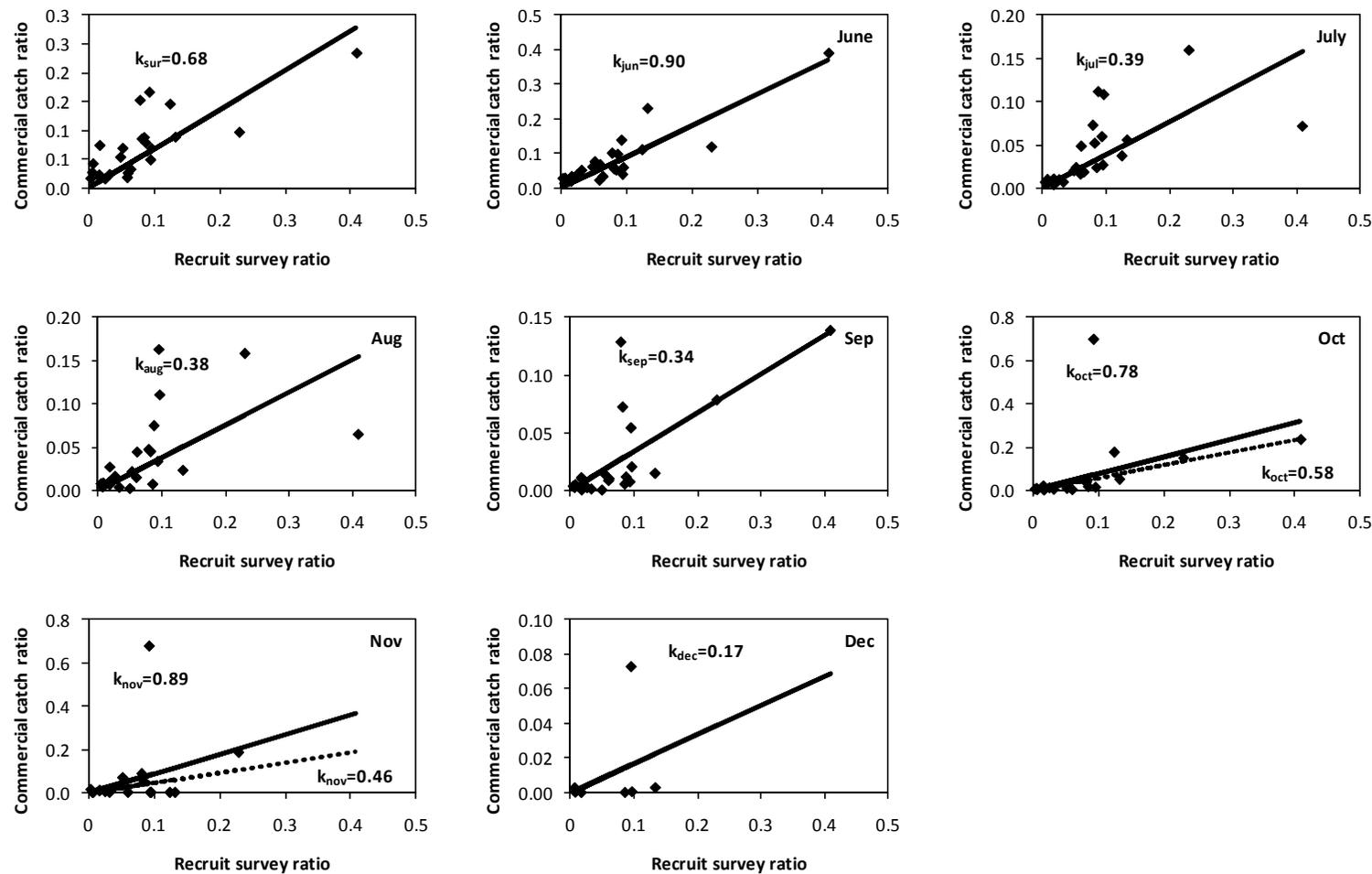


Figure 1. The regressions of the ratio of small sardine bycatch : anchovy¹ in the monthly commercial catch against that observed in the recruit survey, i.e. minimising

$$\sum_{y=1987}^{2010} \left[\left(C_{y,m}^{S,byc} / C_{y,m}^A \right) - k_m \left(N_{y,r}^{S,obs} / N_{y,r}^{A,obs} \right) \right]^2 \text{ w.r.t. } k_m .$$

The outliers of commercial ratios of 0.69 and 0.68 in October and November 2010 are removed, as these could be biased by the mid-water trawl experiments which occurred at this time. The regressions excluding these outliers are given by the dotted lines.

¹ For cases where anchovy is the maximum species by mass in the landing