agriculture,
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Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

INITIAL RECOMMENDATION OF THE SMALL PELAGIC SCIENTIFIC WORKING GROUP FOR THE SUSTAINABLE MANAGEMENT OF SMALL PELAGIC RESOURCES FOR THE 2014 PELAGIC FISHING SEASON

December 2013

SUMMARY

Following results from the recent November 2013 Pelagic Biomass Survey, the initial small pelagic TACs/TABs for the 2014 pelagic fishing season are recommended in terms of Interim OMP-13 v3 as follows:

Directed (>14cm) sardine TAC:	90 000 t
≤14cm sardine TAB for directed >14cm sardine fishing:	6 300 t
Initial anchovy TAC:	404 251 t
Initial ≤14cm sardine TAB with directed anchovy fishing:	42 592 t
>14cm sardine TAB with directed round herring and anchovy fishing:	7 000 t
≤14cm sardine TAB with directed round herring fishing:	1 000 t
Anchovy TAB for sardine-only right holders:	500 t

BACKGROUND

1. TACs, TABs and catches for 2013 - The document entitled “Final recommendation of the scientific working group for the sustainable management of small pelagic resources for the season 2013, July 2013” (FISHERIES/2013/JUL/SWG-PEL/18) provides a description of the process followed to set the final pelagic TACs and TABs for 2013. The TACs, TABs, PUCLs, and total landed catches (up to 12/12/2013 and subject to verification) for 2013 are shown below (Table 1). Catches are close to the

TAC for directed (> 14 cm) sardine, whereas the various sardine by-catches are substantially lower than the TABs set for these allowances as is to be expected under the OMP. Anchovy catches are the lowest since 1997 and well below the TAC despite the good recruitment measured in May 2013. Information available suggests that anchovy recruits were available on the west coast for only a very limited time. Redeye round herring, horse mackerel and mesopelagic catches were all far below their respective PUCLs, and achieved catches for 2013 total to around 203 837 t.

Table 1. Pelagic TAC/TAB/PUCLs and landed catches for 2013. All figures are in tonnes.

	Initial TAC / TAB	Final TAC / TAB / PUCL[1]	Total landed catch[2]
Directed >14 cm sardine TAC		90 000	88 608
≤14cm sardine TAB with directed >14cm sardine fishing		6 300	78
Directed anchovy TAC	247 500	450 000	79 350
≤14cm sardine TAB with directed anchovy fishing	25 139	44 571	3 332
>14cm sardine TAB with directed round herring and anchovy fishing		7 000	25
≤14cm sardine TAB with directed round herring fishing		1 000	21
Anchovy TAB for sardine only right holders		500	39
Round herring PUCL		100 000	31 804
Juvenile horse mackerel PUCL		12 469	609
Mesopelagic PUCL		50 000	0.71

1. TAB and PUCL pools have intentionally been set quite generously so that the chance of them being reached, which would be followed by (premature) closure of the fishery is small
2. As at 12/12/2013 and subject to verification

2. The Operational Management Procedure used to recommend total allowable catches (TACs) and bycatches (TABs) for sardine and anchovy in South African waters is currently being revised. Given the extensive testing required for this new management procedure, which among other factors includes taking account of the possibility of multiple sardine stocks and of the impact of the recommended catches on penguins (used as a proxy for ecosystem health), a final version of OMP-13 is not yet available. However, the Small Pelagic Scientific Working Group has agreed a revised version of “Interim OMP-13 v2”, called “Interim OMP-13 v3” (see Annex A) for use in December 2013 for calculating recommended initial TAC/Bs for 2014. The revised management

procedure is expected to be finalised and agreed to during 2014. Interim OMP-13 v3 has been applied to the results of the November 2013 pelagic biomass survey (see Table 2), to calculate the initial TAC/TAB recommendations (see FISHERIES/2013/DEC/SWG-PEL/44) for 2014. The single difference between Interim OMP-13 v2 and the new Interim OMP-13 v3 is the provision for a conservative lower initial directed (>14cm) sardine TAC for the range of November hydro-acoustic survey estimates of sardine biomass from 300 000t (below which Exceptional Circumstances would be declared) to 600 000t.

3. TACs/TABs output from Interim OMP-13 v3 are as follows:

Directed (>14 cm) sardine TAC[1]	90 000 t
≤14cm sardine TAB with directed >14cm sardine fishing[1]	6 300 t
Initial directed anchovy TAC[2]	404 251 t
Initial ≤14 cm sardine TAB with directed anchovy fishing[2]	42 592 t
>14 cm sardine TAB with directed round herring fishing[3]	7 000 t
≤14 cm sardine TAB with directed round herring fishing[3]	1 000 t
Anchovy TAB for sardine only right holders[4]	500 t

1. For the fishing season (15/01/2014 to 31st December 2014) and are allocated individually to sardine right holders.
2. This TAC and TAB may be revised upwards following the May 2014 recruitment survey and is allocated individually to anchovy right holders.
3. These TABs are final for the fishing season and are not allocated on an individual basis to right holders but kept in a pool for all right holders.
4. Final for the fishing season and not allocated on an individual basis to right holders but kept in a pool for sardine only right holders

The directed (>14cm) sardine TAC for 2014 remains unchanged from 2013. This amount of 90 000 t is the minimum sardine TAC allowed under Interim OMP-13 v3. Note that because Exceptional Circumstances do not apply, and because the survey estimate was above the newly agreed threshold of 600 000t, below which only a part of the TAC would be recommended as an initial TAC, this directed (>14cm) sardine TAC and associated ≤14cm TAB recommendation is final and for the whole season. The initial anchovy normal season TAC is substantially higher than that recommended in 2013 as a result of the high anchovy spawning biomass estimated from the November 2013 survey, and is not subject to any OMP constraints.The estimate of redeye round

herring abundance from the November 2013 pelagic biomass survey does not indicate any need for modifying the present precautionary upper catch limit (PUCL) of 100 000 t for this species.

MANAGEMENT OBJECTIVES

OMPs used to provide TAC recommendations for the sardine-anchovy fishery comprise formulae which calculate these recommendations from resource monitoring data, primarily the estimates of abundance provided by the May pelagic recruitment and November pelagic biomass hydro-acoustic surveys. The results from the November 2013 pelagic biomass survey constitute the primary inputs into Interim OMP-13 v3 leading to the TAC and TAB recommendations for 2014. The Interim OMP-13 v3 formulae have been selected with the objectives of maximising average directed sardine and anchovy catches in the medium term, subject to constraints on the extent to which TACs can vary from year to year in order to enhance industrial stability. The Interim OMP-13 v3 formulae are also conditioned on low probabilities that the abundances of these resources fall beneath agreed threshold levels, below which successful future recruitment might be compromised (see Annex A for further details).

SMALL SCALE FISHERY ALLOWANCE

Sardine that migrate to KwaZulu-Natal (KZN) waters during the annual, winter sardine run (but not sardine from elsewhere off the SA coast) have been included in Basket E (Eastern region) of species potentially available for exploitation by small-scale fishers using beach-seine nets under the new small-scale fisheries policy. The Small Pelagic Scientific Working Group (SWG-PEL) currently has no scientifically established framework for setting catch limits for this component, but based on limited survey data and leaning on existing knowledge gained from scientific analyses and projections performed on the sardine stocks occurring off the south and west coasts, recommends that an annual PUCL of 300t be set for sardine on the KZN coast (see FISHERIES/2013/DEC/SWG-PEL/47). This 300t, which is to include any catch of sardine taken by existing KZN beach-seine right holders and is more than double the average annual amount taken by this beach-seine sector since 1970, could potentially support an additional small scale fishery.

RESOURCE ASSESSMENT

The biomass of small pelagic fish species off the coast of South Africa has been monitored since 1984. These time-series of November biomass and May recruitment estimates derived from hydro-acoustic surveys form the basis for sustainable management of both the South African sardine and anchovy resources and are central to the setting of annual total allowable catch and by-catch levels.

The November 2013 pelagic biomass survey is the most recent in this series and results from this survey are fully described in FISHERIES/2013/DEC/SWG-PEL/45. Anchovy biomass was estimated at around 5.15 million tonnes (see Table 2), substantially higher than that estimated in recent years and the highest estimate since 2001. The 2013 anchovy estimate is more than double the long-term (1984-2012) average of 2.2 million tonnes. The sardine biomass of 851 553 tonnes is considerably higher than the 345 000 t estimated in 2012 but still slightly below the long-term (1984-2012) average of 999 000 tonnes for this stock. The estimate of redeye round herring biomass has also increased considerably since 2012 to around 1.29 million tonnes. This biomass estimate is slightly higher than the long-term (1984-2012) average of 952 000 t. Time-series of annual November survey estimates of anchovy, sardine and redeye round herring biomass are given in Table 2.

ECOSYSTEM CONSIDERATIONS

OMP-08 and Interim OMP-13 v2 was simulation tested to ensure an acceptable level of risk regarding the probability that sardine and anchovy abundances would drop below specified thresholds over a variety of harvest strategies. That OMP was also tested using parameters denoting risk to the African penguin population *Spheniscus demersus*. Penguins were chosen as a key predator species for consideration because they feed predominantly on anchovy and sardine and because of their conservation status which has been of recent concern due to appreciable reductions in numbers at the major breeding colonies on Robben and Dassen Islands over the last few years. Additionally, penguins may be potentially sensitive to changes in pelagic fish abundance and distribution as a consequence of their land-based breeding sites and their limited foraging range (<20 km) during breeding. As part of the implementation of an ecosystems approach to fisheries (EAF) in South Africa's fishery for small pelagic fish, a model of penguin dynamics has been developed for use in conjunction with the small pelagic fish OMP so that the impact on penguins of predicted future pelagic fish trajectories under alternative harvest strategies could be evaluated. These studies have indicated that even with large reductions in pelagic catches under an alternative OMP, there would be little benefit for penguins. These initial findings have recently been corroborated with the inclusion of new

data and further refinement of the models. Further evaluation of these results under a sardine 2-stock operating model will be completed in 2014. Additional measures to possibly restrict fishing in close proximity to penguin breeding colonies are also being investigated.

ASSOCIATED ADVICE

I. The SWG-PEL remains concerned about the sardine population size observed over the past few years as a consequence of a prolonged period of poor recruitment. Given that a population recovery depends on survival of as many recruits as possible, and because sardine recruits are caught in anchovy-directed fishing operations, the pelagic industry should take appropriate steps to attempt to keep the sardine bycatch as low as possible by avoiding areas where a relatively high proportion of sardine is found mixed with anchovy schools.

II. In development of the new OMP, the Small Pelagic Scientific Working Group (SWG-PEL) has undertaken substantial analyses during the course of the past year related to the implications of the sardine resource consisting of two stocks rather than a single stock. The International Scientific Review Panel that met and considered this matter over 2-6 December 2013 reconfirmed that the two stock hypothesis is more plausible than that of a single sardine stock. This in turn leads to the conclusion that spatial management measures, possibly in the form of separate directed sardine TACs for west and east of Cape Agulhas, may be necessary to safeguard the sardine resource. Such an innovation would clearly have operational implications for the industry, so that it is important that the requisite formal consultation procedures, which the Resource Management Chief Directorate is required to conduct in such circumstances, are initiated without delay to enable such consultations to progress in parallel with the on-going further scientific analyses that would underpin possible future proposals by the SWG-PEL in this regard.

III. In the interim, until the new OMP is finalised, industry associations have agreed that they would encourage their members to shift their fishing pressure relative to the distribution of the survey biomass.

Table 2. Estimated anchovy, sardine and redeye round herring biomass (in thousands of tonnes) and their coefficients of survey sampling variation (CV) from the November acoustic surveys.

Year	Anchovy Biomass	CV (%)	Sardine Biomass	CV (%)	Round Herring	CV (%)
2013	5 153	0.102	851	0.350	1 286	0.128
2012	3 188	0.116	345	0.345	796	0.145
2011	754	0.204	1 037	0.235	1 962	0.100
2010	2 077	0.144	508	0.235	1 115	0.134
2009	3 793	0.136	502	0.271	1 991	0.108
2008	3 599	0.120	384	0.422	1 260	0.118
2007	2 508	0.157	257	0.345	1 721	0.153
2006	2 106	0.136	713	0.346	1 228	0.106
2005	3 077	0.144	1 049	0.300	1 616	0.130
2004	2 045	0.131	2 616	0.334	1 475	0.100
2003	3 563	0.236	3 564	0.197	1 762	0.108
2002	3 868	0.154	4 206	0.227	918	0.189
2001	6 720	0.107	2 310	0.142	1 046	0.131
2000	4 654	0.125	2 292	0.500	1 420	0.169
1999	2 052	0.156	1 635	0.212	1 398	0.171
1998	1 229	0.217	1 607	0.251	1 248	0.149
1997	1 483	0.267	1 225	0.329	591	0.280
1996	162	0.410	529	0.471	576	0.145
1995	601	0.217	844	0.713	571	0.132
1994	617	0.159	518	0.370	283	0.208
1993	916	0.209	560	0.427	521	0.216
1992	2 088	0.161	494	0.658	715	0.160
1991	2 328	0.159	598	0.395	625	0.242
1990	652	0.183	290	0.352	441	0.171
1989	752	0.167	257	0.274	836	0.254
1988	1 607	0.222	134	0.957	377	0.318
1987	2 109	0.157	111	0.630	545	0.197
1986	2 569	0.172	300	0.848	344	0.297
1985	1 366	0.211	45	0.509	257	0.224
1984	1 554	0.282	48	1.118	82	0.336

RECOMMENDATIONS

1. It is recommended that the TAC/Bs for 2014 be set as follows:

Directed >14 cm sardine TAC	90 000 t
≤14cm sardine TAB with directed >14cm sardine fishing	6 300 t
Initial directed anchovy TAC	404 251 t
Initial ≤14 cm sardine TAB with directed anchovy fishing	42 592 t
>14 cm sardine TAB with directed round herring fishing	7 000 t
≤14 cm sardine TAB with directed round herring fishing	1 000 t
Anchovy TAB for sardine only right holders	500 t

2. No exchange between directed sardine TACs and bycatch allowances should be permitted. Note that the evaluations underlying Interim OMP-13 v3 assume that ≤14cm sardine bycatch allowances, set for fishing directed at anchovy and >14 cm sardine, may be reached on occasion, but are anticipated to be under-caught on average through time, which is one reason that such exchange is not allowed.

3. Industry associations request their members to spread their combined fishing effort such that the overall directed sardine catch distribution is in proportion to the observed biomass distribution in November 2013. For 2014 we would encourage industry not to exceed catching 70% of the directed sardine TAC west of Cape Agulhas (i.e., west of 20° E).

4. Provision should be made for a separate pool of sardine for use by small scale fishers fishing for sardine on the KwaZulu-Natal coast during the annual winter sardine run. The catch taken by such a small scale fishery, in addition to that taken by existing beach-seine right holders in KZN should not exceed a Precautionary Upper Catch Limit of 300 tonnes.

5. An area around the Bird Island penguin breeding colony in the Eastern Cape should be closed to purse-seine fishing until the 31st December 2014. The extent of the closed area should be a circle of 20 km radius seaward from the light house on Bird Island. Additionally, a circle of 20 km radius seaward from the mid-point of Dassen Island on the West Coast should be closed to purse-seine fishing until the 31st December 2014. These closures are components of an extended feasibility study that may lead to subsequent experimental closures around islands with penguin breeding

colonies to ascertain whether or not restriction of pelagic fishing in the vicinity of these colonies enhances penguin reproductive success.

6. The by-catch of juvenile horse mackerel in the purse-seine fishery should not exceed 15 194 t. Adaptive management measures by the industry such as those implemented previously (i.e. local area closures) should be put in place if necessary to avoid areas of high bycatch but care should be taken not to unduly compromise catches of anchovy. It should also be borne in mind that under the new PUCL rule, by-catches of horse mackerel in 2014 will impact the PUCL available for 2015 and 2016.

7. A precautionary upper catch limit (PUCL) of 100 000 t should apply to round herring, as in immediately previous years.

8. A precautionary upper catch limit (PUCL) of 50 000 t should apply to catches of mesopelagic fish (lanternfish and lightfish combined).

9. The by-catch of sardine resulting from directed round herring fishing should be closely monitored. The difficulty experienced by the fishery in targeting “clean” round herring shoals results in unavoidable catches of sardine. Adaptive management measures should, however, be put in place by the industry to try to avoid areas of high sardine bycatch. Both the juvenile and adult pools (7000t and 1000t respectively) should not be exceeded.

10. A small Task Team with representation from the DAFF Small Pelagic Scientific Working Group, DAFF Resource Management, and industry members be appointed to hold initial discussions regarding the possible implementation of spatial management measures in the sardine fishery. This Task Team should be appointed early in 2014, before the formal consultation process begins, so that issues emanating from discussions, and which could potentially benefit further development of the new Small Pelagic Operational Management Procedure due for completion in 2014 can be taken into account in this exercise.

Janet Coetzee

Chair of the Small Pelagic Scientific Working Group

Annex A

Interim OMP-13 v3

Introduction

The management procedure used to recommend total allowable catches (TACs) and bycatches (TABs) for sardine and anchovy in South African waters is currently being revised. Given the extensive testing desired for this new management procedure, which among other factors includes taking account of the possibility of multiple sardine stocks and of the impact of the recommended catches on penguins, a final version of OMP-13 is not yet available. However, the Small Pelagic Scientific Working Group has agreed a revised version of "Interim OMP-13v2" (de Moor and Butterworth 2013), called "Interim OMP-13v3" for use in December 2013 for calculating recommended initial TAC/Bs for 2014. The revised management procedure is expected to be finalised and agreed during 2014. This document provides details of "Interim OMP-13v3" only in respect of differences from "Interim OMP-13v2".

Important Changes from Interim OMP-13 v2

The single difference between Interim OMP-13 v2 and the new Interim OMP-13 v3 is the provision for a conservative lower initial directed >14cm sardine TAC for the range of November hydroacoustic survey estimates of sardine biomass from 300 000t (below which Exceptional Circumstances would be declared) and 600 000t.

If Exceptional Circumstances are declared, the Harvest Control Rule is such that given the calculated directed >14cm sardine TAC ($TAC^{\#}$), only half of this is recommended as an initial TAC ($TAC_{init}= 0.5TAC^{\#}$). The increase in TAC_{init} recommended after the recruit survey can range from 0-120% of TAC_{init}, dependent on the survey estimate of sardine recruitment, so that the final TAC can range from 50-110% of the $TAC^{\#}$ value calculated originally.

The new provision in Interim OMP-13 v3 moves linearly from this recommendation of 50% of the $TAC^{\#}$ as an initial TAC (TAC_{init}) at a survey estimate of 300 000t (with a potential increase during the year), to the recommendation of 100% $TAC^{\#}$ as an initial TAC (TAC_{init}) at a survey estimate of 600 000t (Figure 1). Thus for a November survey biomass estimate of 600 000t and above, $TAC^{\#}$ as recommended by Interim OMP-13 v3 at the start of the year is final and for the full calendar year, with no mid-season increase.

The Small Pelagic Scientific Working Group has not yet agreed a rule upon which to base the potential increase in the directed >14cm sardine TAC in 2014, under the circumstances that the survey estimate of biomass is within the range of 300 – 600 000t. It is hoped that a final OMP will be agreed prior to such a rule being necessary.

The remainder of the OMP is unchanged from Interim OMP-13 v2 (see Tables 1 and 2), which is fully described in de Moor and Butterworth (2013). Interim OMP-13v3 cannot be simulation tested without the definition of the "top-up" rule; however, it is currently more conservative than Interim OMP-13 v2 (Figure 2). Key summary statistics for the less conservative Interim OMP-13 v2 and simulated distributions of sardine and anchovy at the end of the projection period are given in de Moor and Butterworth (2013), where they are also compared to a no-catch scenario.

References

de Moor, C.L., and Butterworth, D.S. 2013. Interim OMP-13 v2. DAFF Branch Fisheries document: FISHERIES/2013/JUL/SWG-PEL/15. 18pp.

de Moor, C.L., Coetzee, J., Durholtz, D., Merkle, D., van der Westhuizen, J.J. and Butterworth, D.S. 2012. A record of the generation of data used in the 2012 sardine and anchovy assessments. DAFF Branch Fisheries document: FISHERIES/2012/AUG/SWG-PEL/41. 29pp.

Table 1. Definitions of control parameters and constraints used in OMP-02, OMP-04, OMP-08, Interim OMP-13 and Interim OMP-13v2 together with their values. **The control parameters and constraints for Interim OMP-13v3 are unchanged from those of Interim OMP-13 v2.** All mass-related quantities are given in thousands of tons. Values for Interim OMP-13v2 which differ from OMP-08 are given in bold face.

	Key Control Parameters	**OMP-02**	**OMP-04**	**OMP-08**	**Interim OMP-13**	**Interim OMP13v2**
β	Directed sardine catch control parameter	0.1865	0.14657	0.097	**0.090**	**0.090**
α_{ns}	Directed anchovy catch control parameter for normal season	0.16655	0.73752	0.78	**0.321**	**0.871**
α_{ads}	Directed anchovy catch control parameter for additional season	0.99956	1.47504	1.17	**0.4815**	**N/A**
	Fixed TABs	**OMP-02**	**OMP-04**	**OMP-08**	**Interim OMP-13**	**Interim OMP13v2**
TAB^S_{big}	Fixed >14cm sardine bycatch	10[1]	10[1]	3.5[1]	**7**	**7**
TAB^A	Fixed anchovy bycatch for sardine only right holders	N/A	N/A	N/A	**0.5**	**0.5**
$TAB^S_{y,small,rh}$	Fixed ≤14cm sardine bycatch with round herring	N/A	N/A	N/A	**1.0**	**1.0**
	Fixed Control Parameters	**OMP-02**	**OMP-04**	**OMP-08**	**Interim OMP-13**	**Interim OMP13v2**
δ	Scale-down factor applied to initial anchovy TAC	0.85[2]	0.85	0.85	0.85	0.85
p	Weighting given to recruitment survey in anchovy TAC	0.7[3]	0.7	0.7	0.7	0.7
q	Relates to average TAC under OMP-99 if $\alpha_{ns}=1$	300[4]	300	300	300	300
$\overline{B}^A_{Nov}$	**Historic average 1984 to 1999 index of anchovy abundance from the November spawner biomass surveys**		2 149	1 380	1 380	1380
$\overline{N}^A_{rec0}$	**Average 1985 to 1999 observed anchovy recruitment in May, back-calculated to November of the previous year**	N/A	N/A	198 billion	**180 billion**	**217 billion**
ϖ	Estimate of the percentage of ≤14cm sardine bycatch in the >14cm sardine catch	N/A	N/A	N/A	**0.07**	**0.07**
γ_y	Range within which initial estimate of juvenile sardine : anchovy ratio is set, dependent upon observed sardine biomass	0.1	0.1-0.2	0.1-0.2	0.1-0.2	0.1-0.2
$\gamma_{\max}$	Maximum of the logistic curve for γ_y	N/A	0.1	0.1	0.1	0.1
B_{50}	Biomass of sardine where the logistic curve for γ_y reaches 50%	N/A	2 000	2 000	2 000	2000

[1] TAB (assumed adult) with round herring only, initially set at 10 000t calculated as 12.5% of the predicted average round herring catch of 80 000t; subsequently decreased to 3 500t when considering historic bycatch had not been greater than 3 500t.

[2] A value of $\delta = 0.85$, used since OMP-02, reflects the industry's desire for greater 'up-front' TAC allocation for planning purposes, even if this means some sacrifice in expected average TAC to meet the same risk criterion.

[3] A value of $p = 0.7$ reflects the greater importance of the incoming recruits in the year's catch relative to the previous year's biomass survey.

[4] Leaving $q = 300$ unchanged facilitated easy comparison between the outputs from OMP-02 and subsequent revised OMP candidates

Table 1 (continued).

Constraints		OMP-02	OMP-04	OMP-08	Interim OMP-13	Interim OMP13v2
B_{95}	Biomass of sardine where the logistic curve for γ_y reaches 95%	N/A	3 178	3 178	3 178	3178
c^{S}_{mntac}	Minimum directed sardine TAC	90	90	90	90	90
c^{A}_{mntac}	Minimum normal season anchovy TAC	150	150	120	120	120
c^{S}_{mxtac}	Maximum directed sardine TAC	250	500	500	500	500
c^{A}_{mxtac}	Maximum total anchovy TAC	600	600	600	**450**	**450**
c^{S}_{tier}	Two-tier threshold for directed sardine TAC	N/A	240	255	255	255
c^{A}_{tier}	Two-tier threshold for normal season anchovy TAC	N/A	330	330	330	330
c^{S}_{mxdn}	Maximum proportion by which directed sardine TAC can be reduced annually	0.20	0.15	0.20	0.20	0.20
c^{A}_{mxdn}	Maximum proportion by which normal season anchovy TAC can be reduced annually	0.30	0.25	0.25	0.25	0.25
$c^{ns,A}_{mxinc}$	Maximum increase in normal season anchovy TAC	150	200	150	150	**N/A**
$c^{ads,A}_{mxinc}$	Maximum additional season anchovy TAC	100	150	120	120	**N/A**
TAB^{S}_{ads}	Maximum sardine bycatch during the additional season	2	2	2	**1.5**[5]	**N/A**
B^{S}_{ec}	Threshold at which Exceptional Circumstances are invoked for sardine	150	250	300	300	300
B^{A}_{ec}	Threshold at which Exceptional Circumstances are invoked for anchovy	400	400	400	400	**600**
Δ^{S}	threshold above B^{S}_{ec} at which linear smoothing is introduced before sardine exceptional circumstances are declared (to ensure continuity)	N/A	500	500	**400**	**400**
Δ^{A}	threshold above B^{A}_{ec} at which linear smoothing is introduced before anchovy exceptional circumstances are declared (to ensure continuity)	N/A	N/A	100	100	100
B_1	threshold above which the anchovy additional sub-season TAC can increase more rapidly	N/A	N/A	1 000	1 000	**N/A**
B_2	threshold above which the anchovy additional sub-season TAC reaches a maximum	N/A	N/A	1 500	1 500	**N/A**
x^{S}	the proportion of B^{S}_{ec} below which sardine TAC is zero.	0	0	0.25	0.25	0.25
x^{A}	the proportion of B^{A}_{ec} below which anchovy TAC is zero.	0	0.25	0.25	0.25	0.25
R_{crit}	sardine recruitment threshold above which the maximum possible mid-year increase in sardine TAC under exceptional circumstances is achieved	N/A	N/A	17.38	**16.48**	**16.48**

[5] Interim OMP-13 assumed the additional season runs from October to December, rather than September to December as assumed for earlier OMPs.

Table 2. The data required as input to the Interim OMP-13v3 formulae to provide the directed sardine TAC and initial anchovy TAC and sardine TAB recommendations for year y in December of year $y-1$, and to set the revised and final anchovy TAC and sardine TAB recommendations in June of year y.

	Input	Definition
December *y*-1	$B^{S}_{y-1,N}$	November survey estimate of sardine 1+ biomass in year $y-1$ (in thousands of tons)
	$B^{A}_{y-1,N}$	November survey estimate of anchovy 1+ biomass in year $y-1$ (in thousands of tons)
June *y*	$N^{A}_{y,r}$	May survey estimate of anchovy recruitment in year y (in billions)
	$N^{S}_{y,r}$ [6]	May survey estimate of sardine recruitment in year y (in billions)
	t^{A}_{y}	Day of commencement of recruitment survey (time in months after 1 May)
	$C^{A}_{y,1}$	Anchovy catch at age 1[7] from 1 November of year $y-1$ to the day before the commencement of the recruitment survey (in billions)
	$C^{A}_{y,0bs}$	Anchovy catch at age 0[9] from 1 November of year $y-1$ to the day before the commencement of the recruitment survey (in billions)
	$r_{y,sur}$	Ratio of juvenile sardine to anchovy (by mass) indicated by the recruitment survey
	$r_{y,com}$	Ratio of juvenile sardine to anchovy (by mass) in the commercial catches during May, using only the commercial catches comprising at least 50% anchovy
	$\overline{w}^{A}_{1}=10.689$	Average historic anchovy weight-at-age 1 in November
	$\overline{w}^{A}_{2}=13.671$	Average historic anchovy weight-at-age 2 in November
	$\overline{w}^{A}_{0c}=4.847$	Average historic catch weight-at-age 0
	$\overline{w}^{A}_{1c}=10.983$	Average historic catch weight-at-age 1

[6] Only needed if sardine Exceptional Circumstances are declared in December $y-1$.

[7] Monthly cut-off lengths are used to split the anchovy catch into juveniles and adults. The monthly cut-off lengths for November to March are given in de Moor *et al.* (2012), while the monthly cut-off lengths for April, May and June (if necessary) are dependent on the recruit cut-off length used for the recruit survey in year y.

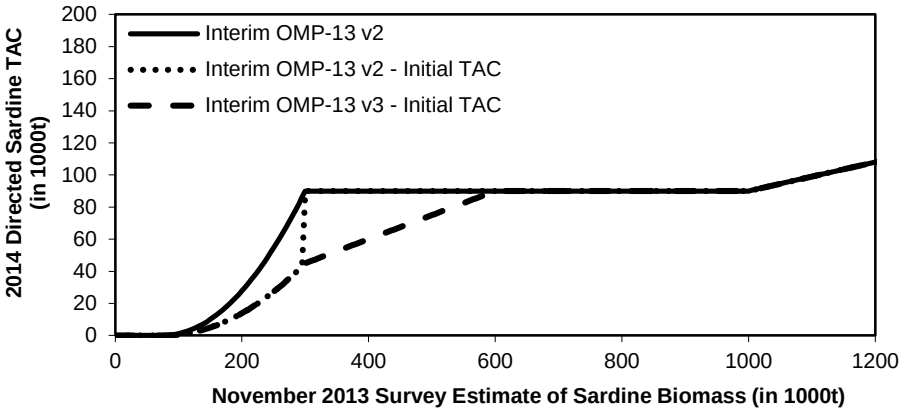

Figure 1. The Harvest Control Rule for directed ≥14cm sardine TAC in 2014 under Interim OMP-13 v2 and Interim OMP-13 v3. The initial sardine TAC awarded at the beginning of the year under Interim OMP-13 v2 and Interim OMP-13 v3 are also plotted.

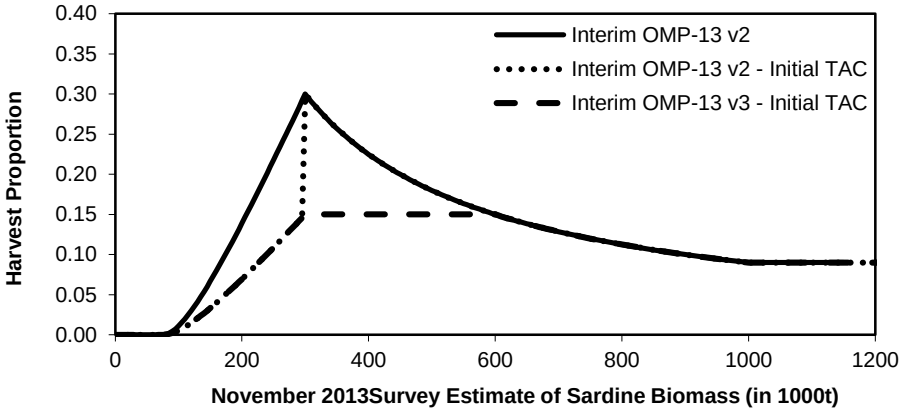

Figure 2. The harvest rate (TAC/survey estimate of sardine 1+ biomass) for the alternative Harvest Control Rules shown in Figure 1.