

# IFFO RS V2.0



## FISHERY ASSESSMENT METHODOLOGY AND TEMPLATE REPORT

<b>Fishery Under Assessment</b>	<b>South Africa – Purse seine</b>
<b>Date</b>	<b>August 2018</b>
<b>Assessor</b>	<b>Deirdre Hoare</b>

Application details and summary of the assessment outcome				
Name:				
Address:				
Country: South Africa			Zip:	
Tel. No.			Fax. No.	
Email address:			Applicant Code	
Key Contact:			Title:	
Certification Body Details				
Name of Certification Body:			SAI Global (Ireland)	
Assessor Name	Peer Reviewer	Assessment Days	Initial/Surveillance/ Re-approval	Whole fish / By-product
Deirdre Hoare	Jim Daly	3	Surveillance	Whole fish
Assessment Period	2017			
Scope Details				
Management Authority (Country/State)			South Africa	
Main Species			Anchovy, Sardine	
Fishery Location			South Africa	
Gear Type(s)			Purse seine	
Outcome of Assessment				
Overall Outcome			Pass	
Clauses Failed			NA	
Peer Review Evaluation			Maintain approval	
Recommendation			Maintain approval	

**Assessment Determination**

The components of the South African small pelagic fishery which operate for reduction purposes meet the requirements of the raw material sourcing section of the IFFO RS Standard. There is a management, control and enforcement framework in place which has a robust legal basis. Data collection activities are sufficient to provide a scientific basis for the management of the main target species. Anchovy is the main reduction target, and the stock is currently estimated to be substantially larger than the informal target and limit reference points. Round herring, also known as redeye herring, makes up around 10-20% of the reduction catch but is poorly understood; however it is currently estimated to be under-utilised and landings are consistently below the precautionary catch limit. There is no evidence of any substantial interactions between the fishery and ETP species or the physical environment.

**Peer Review Comments**

No evidence of IUU fishing, DAFF monitor vessels for compliance. Oceana have a zero tolerance to IUU and there are internal audits to ensure compliance. Biomass estimates for Anchovy (2018 data) to be included in future assessment reports. In addition a report on the new Management Plan (OMP) should be included. This plan to be published in 2018.

Peer Reviewer is in agreement with this assessment.

**Notes for On-site Auditor**

## General Results

General Clause	Outcome (Pass/Fail)
M1 - Management Framework	Pass
M2 - Surveillance, Control and Enforcement	Pass
F1 - Impacts on ETP Species	Pass
F2 - Impacts on Habitats	Pass
F3 - Ecosystem Impacts	Pass

Note: This table should be completed for whole fish assessments only.

## Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A	Anchovy, Sardine	85	A1	Pass
			A2	Pass
			A3	Pass
			A4	Pass
Category B	Red-eye herring	13	Pass	
Category C	Horse mackerel, Lanternfish	0.44	Pass	
Category D	Chub mackerel	1	Pass	

[List all Category A and B species. List approximate total %age of landings which are Category C and D species; these do not need to be individually named here]

## HOW TO COMPLETE THIS ASSESSMENT REPORT

This assessment template uses a modular approach to assessing fisheries against the IFFO RS standard.

### Whole Fish

The process for completing the template for a **whole fish** assessment is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table, to determine which categories of species are present in the fishery.
2. ALL ASSESSMENTS: Complete clauses M1, M2, M3: Management.
3. IF THERE ARE CATEGORY A SPECIES IN THE FISHERY: Complete clauses A1, A2, A3, A4 for **each** Category A species.
4. IF THERE ARE CATEGORY B SPECIES IN THE FISHERY: Complete the Section B risk assessment for **each** Category B species.
5. IF THERE ARE CATEGORY C SPECIES IN THE FISHERY: Complete clause C1 for **each** Category C species.
6. IF THERE ARE CATEGORY D SPECIES IN THE FISHERY: Complete Section D.
7. ALL ASSESSMENTS: Complete clauses F1, F2, F3: Further Impacts.

A fishery must score a pass in **all applicable clauses** before approval may be recommended. To achieve a pass in a clause, the fishery/species must meet **all** of the minimum requirements.

### By-products

The process for completing the template for **by-product raw material** is as follows:

1. ALL ASSESSMENTS: Complete the Species Characterisation table with the names of the by-product species and stocks under assessment. The '% landings' column can be left empty; all by-products are considered as Category C and D.
2. IF THERE ARE CATEGORY C BYPRODUCTS UNDER ASSESSMENT: Complete clause C1 for **each** Category C by-product.
3. IF THERE ARE CATEGORY D BYPRODUCTS UNDER ASSESSMENT: Complete Section D.
4. ALL OTHER SECTIONS CAN BE DELETED. Clauses M1 - M3, F1 - F3, and Sections A and B do not need to be completed for a by-product assessment.

By-product approval is awarded on a species-by-species basis. Each by-product species scoring a pass under the appropriate section may be approved against the IFFO RS Standard.

## SPECIES CATEGORISATION

The following table should be completed as fully as the available information permits. All species regularly\* caught in the fishery should be listed along with an estimate of the proportion of the catch each species represents. The species should then be divided into Type 1 and Type 2. **Type 1 species must represent 95% of the total catch. Type 2 species may represent a maximum of 5% of the catch (see Appendix B).**

\*Species which make up less than 0.1% of landings do not need to be listed (NOTE: ETP species are considered separately). The table should be extended if more space is needed. Discarded species should be included when known.

The 'stock' column should be used to differentiate when there are multiple biological or management stocks of one species captured by the fishery. The 'management' column should be used to indicate whether there is an adequate management regime specifically aimed at the individual species/stock. In some cases it will be immediately clear whether there is a species-specific management regime in place (for example, if there is an annual TAC). In less clear circumstances, the rule of thumb should be that if the species meets the minimum requirements of clauses A1-A4, an adequate species-specific management regime is in place.

NOTE: If any species is categorised as Endangered or Critically Endangered on the IUCN Red List, or if it appears in the CITES appendices, it **cannot** be approved for use as an IFFO RS raw material. This applied to whole fish as well as by-products.

### TYPE 1 SPECIES (Representing 95% of the catch or more)

**Category A:** Species-specific management regime in place.

**Category B:** No species-specific management regime in place.

### TYPE 2 SPECIES (Representing 5% OF THE CATCH OR LESS)

**Category C:** Species-specific management regime in place.

**Category D:** No species-specific management regime in place.

Common name	Latin name	Stock	% of landings	Management	Category
Anchovy	<i>Engraulis encrasicolus</i> , <i>Engraulis capensis</i>	South African Stock	65	DAFF	A
Sardine	<i>Sardinops sagax</i>	South and west coast stocks	20	DAFF	A
Horse Mackerel	<i>Trachurus capensis</i>		0.4	DAFF	C
Lanternfish	<i>Lampanyctodes hectoris</i>	South African	0.04	DAFF	C
Redeye herring	<i>Etrumeus whiteheadi</i>	South African	13	DAFF	B
Chub mackerel	<i>Scomber japonicus</i>	South African Stock	1	DAFF	D

Category A species are assessed through an examination of the data collection, stock assessment, management measures, and stock status relating to the species. Category B species are assessed using a risk-based assessment covering similar areas. Category C species are assessed on stock status only. Category D species are assessed using a PSA analysis as described in the relevant section of this document.

## MANAGEMENT

The two clauses in this section relate to the general management regime applied to the fishery under assessment. A fishery must meet all the minimum requirements in every clause before it can be recommended for approval.

<b>M1</b>	<b>Management Framework – Minimum Requirements</b>		
	M1.1	There is an organisation responsible for managing the fishery	Yes
	M1.2	There is an organisation responsible for collecting data and assessing the fishery	Yes
	M1.3	Fishery management organisations are publicly committed to sustainability	Yes
	M1.4	Fishery management organisations are legally empowered to take management actions	Yes
	M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making	Yes
	M1.6	The decision-making process is transparent, with processes and results publicly available	Yes
<b>Clause outcome:</b>			Pass
<p><b>Evidence</b></p> <p>Fisheries management in South Africa falls under the jurisdiction of the Department of Agriculture, Forestry and Fisheries (DAFF). Within this Ministry, several Directorates play key roles, including the Chief Directorate of Marine Resources Management (encompassing the Directorates of Offshore &amp; High Seas Fisheries, Small-Scale Fisheries, and Inshore Fisheries Management); the Chief Directorate of Fisheries Research and Development (encompassing the Directorates of Research Support, Aquaculture Research, and Resources Research); the Chief Directorate of Monitoring, Control and Surveillance (encompassing the Directorates of Compliance, Fisheries Protection Vessels, and Monitoring and Surveillance); the Chief Directorate of Fisheries Partnerships Management (encompassing both internal stakeholder engagement and international and intergovernmental relations); and a number of Directorates which provide general support, monitoring and evaluation functions to the entire Department.</p> <p>The stated roles of the Directorate of Resources Research include the undertaking of research to promote the sustainable and optimal management of fisheries resources, and to provide scientific advice to support resources research. Additional analytical and advisory support is provided by the Marine Resource Assessment and Management Group (MARAM) at the University of Cape Town. The MARAM group is primarily funded by DAFF, and aims to provide a scientific basis for the assessment and management of renewable marine resources. The MARAM group produces the Operational Management Procedures (OMPs) used as the basis for many management decisions in the small pelagic fishery.</p> <p>The operation of DAFF follows six Strategic Goals, each further broken down into Strategic Objectives. Strategic Goal 2 is “Sustained Management of Natural Resources”, the Strategic Objectives for which include “Ensure the sustainable management and efficient use of natural resources” and “Ensure protection of indigenous genetic resources”.</p> <p>The primary legal basis for fisheries management in South Africa is the Marine Living Resources Act, 1998, as amended in 2000, 2014 and 2016. The Act states that the Minister and any other component of government exercising the power within the Act should bear in mind a series of over-arching objectives. These include the need to achieve optimum utilisation and ecologically sustainable development of marine living resources; the need to conserve marine living resources; the need to apply precautionary approaches to fisheries management; the need to protect the ecosystem as a whole, the need to preserve marine biodiversity; and the need to engage stakeholders in the decision-making process.</p>			



Decision-making processes respond to important issues identified in relevant research, monitoring, evaluation and consultation, in a transparent and adaptive manner. A formal Scientific Working Group, constituted by DAFF and comprising scientists from DAFF, MARAM and members of industry associations, decide on a TAC level for the fishery after interpreting the outcome of an OMP.

The TAC recommendation is considered by the DAFF Chief Directorate: Marine Resource Management, taking into account factors such as legislation, socio-economics, the ecosystem approach to fisheries management (EAF), and stock advice. It is then submitted to the decision maker (normally the Minister) in line with Departmental protocols. After signature by the Minister, the TAC is allocated to rights holders, proportionally, according to their share of the rights allocated. A DAFF fisheries manager dedicated to the small pelagic fishery then meets with industry to prepare annual fishing plans, and prepare permit conditions.

## References

DAFF organisational structure: <http://www.daff.gov.za/daffweb3/About-Us/Structure-and-Functions>

MARAM overview: <http://www.mth.uct.ac.za/maram/>

DAFF vision and mission: <http://www.daff.gov.za/daffweb3/About-Us/Vision-and-Mission>

South Africa Marine Living Resources Act, 1998: [http://www.saflii.org/za/legis/consol\\_act/mlra1998256/](http://www.saflii.org/za/legis/consol_act/mlra1998256/)

*Standard clauses 1.3.1.1, 1.3.1.2*

M2	Surveillance, Control and Enforcement - Minimum Requirements		
	M2.1	There is an organisation responsible for monitoring compliance with fishery laws and regulations	Yes
	M2.2	There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken	Yes
	M2.3	There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing	Yes
	M2.4	Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.	Yes
<b>Clause outcome:</b>			Pass
<b>Evidence</b> <p>Monitoring, control and surveillance is the responsibility of DAFF, supplemented by the police, navy and customs offices. All catches are inspected and weighed at off-loading points by monitors and/or fisheries inspectors, to ensure that rights-holders remain within their quotas, that bycatch species do not exceed PUCs, and that no gear or other restrictions had been exceeded. All fishing vessels are tracked in real time through a VMS system, operated from an operations room at the DAFF offices. Four ocean-going patrol vessels do inspections of vessels at sea – these patrols are logged, together with records of inspections, infractions and boarding data. As well as remote surveillance (VMS) and monitoring at sea by patrol vessels, DAFF inspects landings when catches are discharged, and audits the catch, landings and processing records for the fishery to ensure compliance with effort (TAC) controls. Mobile scanners are used to inspect the contents of containers. Fisheries observers accompany fishing vessels to sea at request (permit condition), although the task of observers is data collection (catch of target</p>			

and non-target species, and interactions with ETP species) instead of compliance monitoring. Skippers return logbooks of each trip, detailing fishing effort and catches. They also report the numbers of sea-bird fatalities.

Section 28 (Chapter 6) of the Marine Living Resources Act (1998) sets out the law enforcement legislation. This includes empowering fishery control officers to enter and search any vessel or premises, and seize any property considered to be used in or related to an offence. The chapter also empowers the Director-General to designate observers to monitor vessel activity during fishing operations. Chapter 7 of the Act sets out the judicial components of fisheries management, including penalties for non-compliance. Breaches of the regulations set out in the Act, of the conditions of right of access, or of any authorisation to fish, are punishable by a fine of up to 2 million rand or imprisonment of up to five years. Contravention of international conservation or management measures or the conditions imposed by a high seas fishing permit or licence is punishable by a fine of up to 3 million rand. Punishments for other transgressions include fines and/or imprisonment. About 70% of cases brought by DAFF are successful; as part of its work, DAFF officials provide training to the judiciary and prosecuting counsel about fisheries legislation and regulation.

There is no evidence of IUU fishing, as described above DAFF monitors vessels for compliance. Also, Oceana states in their Sustainability Report 2016 that they have a zero tolerance to IUU and there are internal audits to ensure compliance.

#### References

South Africa Marine Living Resources Act, 1998: [http://www.saflii.org/za/legis/consol\\_act/mlra1998256/](http://www.saflii.org/za/legis/consol_act/mlra1998256/)

Oceana Sustainability Report 2016 [http://oceana.co.za/pdf/JOB010973\\_Oceana\\_SDR.PDF](http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF)

Oceana Sustainability Report 2017

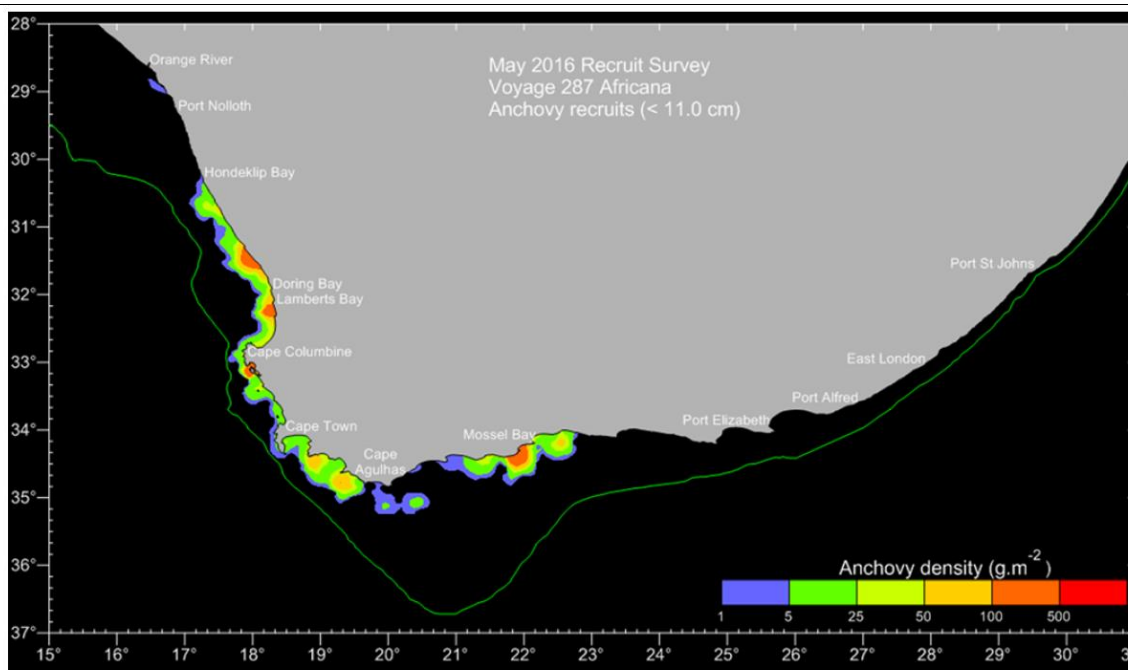
<http://oceana.co.za/pdf/Oceana%20Group%20Sustainability%20Report%202017.pdf>

*Standard clause 1.3.1.3*

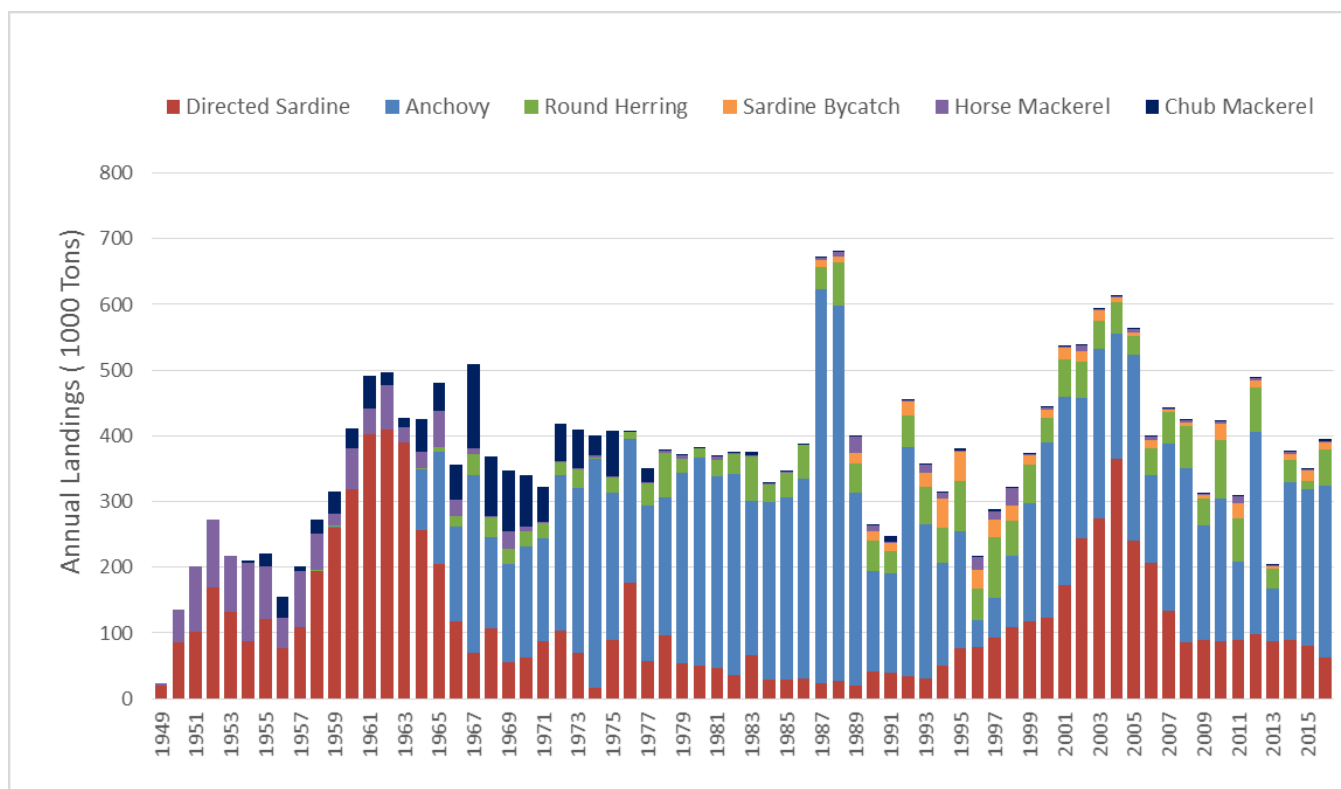
## CATEGORY A SPECIES

The four clauses in this section apply to Category A species. Clauses A1 - A4 should be completed for **each** Category A species. If there are no Category A species in the fishery under assessment, this section can be deleted. A Category A species must meet the minimum requirements of all four clauses before it can be recommended for approval. If the species fails any of these clauses it should be re-assessed as a Category B species.

Species Name		Anchovy ( <i>Engraulis encrasicolus</i> , <i>Engraulis capensis</i> )	
A1	Data Collection - Minimum Requirements		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	Yes
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	Yes
Clause outcome:			Pass
Evidence			
<p><i>E. capensis</i> hardly differs from the European anchovy (<i>Engraulis encrasicolus</i>) and can be identified from that description. It is not certain that they are distinct species. Therefore, they are considered as inseparable.</p> <p>Fishery dependent data collected for the South Africa small pelagic fishery include landed weight, species composition, catch location and date. Additionally, sampling is used to obtain length frequency data, age estimates, sex, maturity stage, and fish condition. Landings data for anchovy are collected in the directed fishery, but also in the components of the small pelagic fishery which target sardine and redeye herring.</p> <p>In addition to landings records, the biomass and distribution of anchovy is assessed biannually via hydro-acoustic surveys, which have been conducted uninterrupted for the past 30 years. These surveys also collect a range of other data required for the Operational Management Procedure (OMP). The biological characteristics of anchovy mean that stock size can fluctuate rapidly, and that environmental factors often influence the stock more substantially than fishery removals. For these reasons, conducting fishery-independent surveys twice per year is seen as an essential mechanism for generating stock status estimates with sufficient frequency and accuracy to enable informed management of the fishery. Additional surveys and analyses are conducted as deemed necessary, such as to determine aggregation rates, proportions of shoals made up of recruits, to measure the impacts of the fishery on penguin abundance, and to determine the reasons for the substantial under-utilisation of the anchovy TAC in recent years.</p> <p>The November 2016 survey estimate of anchovy biomass was 1,733,040 t and the June 2017 survey estimate of anchovy recruitment was 830.201 billion. This resulted in the final anchovy TAC was 450,000 t which is subject to the maximum TAC constraint of 450,000t and exceptional circumstances did not apply. The Final Anchovy TAC for 2018 was 295,911t and TAB of 500t. The biomass estimates for 2018 were not available.</p> <p>Observers have been deployed on vessels in the fishery since 1999, although observer coverage is estimated to be around 8% by number of trips covered. Observer data is used to validate other data sources, in particular catch location, date and gear type. Observer data has also been used to compare the results of data collection at landing from vessels which are observed and those which are not.</p>			



**Figure 1:** Spatial distribution of anchovy from the May2016 recruitment survey (Coetzee et al. 2016).



**Figure 2.** Annual landings of Anchovy and other small pelagic fish by the South African purse-seine fishery since 1949. (Source MARAM/IWS/2017/Sardine/BG1)

## References

Coetzee, Janet C., Dagmar Merkle, Mzwamadoda Philips, Yonela Geja, Kanakana Mushanganyisi and Fannie Shabangu. 2016. Results of the 2016 pelagic recruitment survey. FISHERIES/2016/JUL/SWG-PEL/25.

Final Anchovy and Sardine TACs and TABs for 2017, Using OMP-14. Carryn L. de Moor. FISHERIES/2017/JUL/SWG-PEL/22

[https://drupalupload.uct.ac.za/maram/Documents/pub/2017/FISHERIES\\_2017\\_JUL\\_SWG-PEL\\_22%202017TACs.pdf](https://drupalupload.uct.ac.za/maram/Documents/pub/2017/FISHERIES_2017_JUL_SWG-PEL_22%202017TACs.pdf)

Status of the South African Marine Fishery Resources, 2014. DAFF, Cape Town, SA.

[http://www.nda.agric.za/doaDev/sideMenu/fisheries/03\\_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf](http://www.nda.agric.za/doaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf)

Oceana Sustainability Report 2016 [http://oceana.co.za/pdf/JOB010973\\_Oceana\\_SDR.PDF](http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF)

*Standard clause 1.3.2.1*

A2 Stock Assessment - Minimum Requirements			
A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock), and considers all fishery removals and the biological characteristics of the species.		Yes
A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.		Yes
A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.		Yes
A2.4	The assessment is subject to internal or external peer review.		Yes
A2.5	The assessment is freely available to the assessment team.		Yes
Clause outcome:			Pass
Evidence			
<p>Management advice and the associated TAC's for South African small pelagics have been developed through OMPs, which are designed to develop robust management based upon projections of management alternatives under the range of uncertainties in the assessment. Various management objectives, risks and constraints are agreed upon, tested in the simulations, and then form the basis of management actions. An OMP is built on the premise that major changes are unlikely to occur in an assessment from one year to the next; that full assessments conducted annually, accompanied by debates and management negotiations, may be counter-productive to long-term management strategies; and that human resources (government managers, scientists and industry) are limited. The most recent OMP was developed in 2014 and a new one is currently being tested for 2018.</p> <p>The South African small pelagic OMP specifies a set of data to be used in the OMP, the formulae and models that use those data to determine the TAC, and the associated process of selection. This includes extensive simulation testing of the consequences of alternative assumptions about population dynamics and how management quantities react to those alternatives. The simplified formulae are updated annually in order to determine the TAC. By so doing, the need for a full assessment every year is avoided, but there is a requirement that the formulae do not deviate greatly from the assessment projections.</p> <p>The OMP contains harvest control rules for anchovy and sardine species based on the results of the November hydro-acoustic surveys. The anchovy TAC is based on the relationship between the November biomass estimate and the historical average biomass between 1984 and 1999. Initially this TAC assumes average recruitment, but this factor (and therefore the TAC) is updated to reflect the results of the May acoustic cruise. The model used to generate the initial TAC takes this uncertainty into account and scales down the recommendation. OMP-14 also includes a fixed anchovy TAB (Total Allowable Bycatch) for anchovy caught in the directed sardine fishery.</p>			

There is an annual International Stock Assessment Workshop funded by the NRF and DAFF in 2017 it took place in University of Cape Town. In 2017 the four scientists invited to comprise the Review Panel were: Sean Cox (Canada), Malcolm Haddon (Australia), Daniel Howell (Norway) and Andre Punt (USA). All stock assessments and paper are publicly available <http://www.maram.uct.ac.za/maram/publications/research-papers>

#### References

Status of the South African Marine Fishery Resources, 2014. DAFF, Cape Town, SA.

[http://www.nda.agric.za/daaDev/sideMenu/fisheries/03\\_areasofwork/Resources%20Research/STATUS%20OF%20THE%20OUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf](http://www.nda.agric.za/daaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20OUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf)

de Moor, CL & Butterworth, DS (2014). OMP-14. [http://www.mth.uct.ac.za/maram/pub/2014/FISHERIES\\_2014\\_NOV\\_SWG-PEL\\_60.pdf](http://www.mth.uct.ac.za/maram/pub/2014/FISHERIES_2014_NOV_SWG-PEL_60.pdf)

INTERNATIONAL REVIEW PANEL REPORT FOR THE 2017 INTERNATIONAL FISHERIES STOCK ASSESSMENT WORKSHOP 27 November – 1 December 2017, UCT

<https://drupalupload.uct.ac.za/maram/Documents/pub/2017/IWS%202017/IWS%202017%20Final%20report%20of%20the%20Panel.pdf>

Draft simulation testing framework to be used during the development of OMP-17 C.L. de Moor

[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/workshop/2016/MARAM\\_IWS\\_DEC16\\_Sardine\\_P14.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/2016/MARAM_IWS_DEC16_Sardine_P14.pdf)

Initial Directed Sardine and Anchovy TACs and TABs for 2017, Using OMP-14 C.L. de Moor

[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/pub/2016/FISHERIES\\_2016\\_DEC\\_SWG-PEL\\_80.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/pub/2016/FISHERIES_2016_DEC_SWG-PEL_80.pdf)

*Standard clause 1.3.2.2*

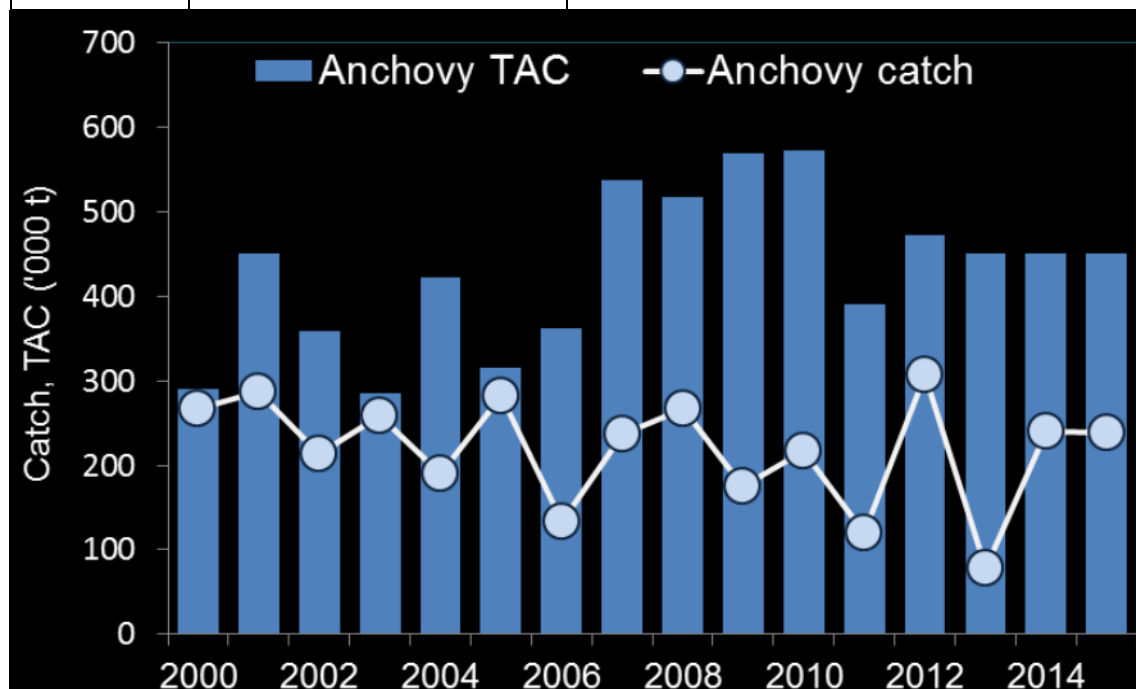
<b>A3 Harvest Strategy - Minimum Requirements</b>		
A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted (which may include economic mechanisms).	Yes
A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	Yes
A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	Yes
<b>Clause outcome:</b>		Pass
<b>Evidence</b>		
Total removals are limited through the use of a quota system, with the Total Allowable Catch (TAC) and Total Allowable Bycatch (TAB) of anchovy defined according to the rules in the OMP. The Marine Living Resources Act (1998) empowers the Minister to apportion the TAC between rights holders, regions, components of the fishery, and however else is deemed necessary. In practice, TACs are apportioned between holders of commercial fishing		

permits for anchovy and/or sardine. The TAC is set at the level defined by the OMP and as calculated by subsequent initial and mid-season MARAM recommendation papers.

In recent years there has been a substantial under-catch of anchovy, with total landings considerably below the TAC (see graph in section A1). Pelagic rights holders appear to be finding it difficult to catch their annual allocations, an issue which has had some examination by government researchers. A number of explanations are believed to contribute to the under-utilisation of the resource, including reduced processing capacity arising from strict environmental regulation applied to factories, severe weather conditions, and industry efforts to minimise juvenile horse mackerel and sardine bycatch by localised voluntary fishery closure.

The OMP does not include an explicit limit reference point, although where anchovy biomass is estimated to be below 600,000t 'Exceptional Circumstances' are invoked and the TAC is substantially reduced. OMP-14 includes a list of constraints to the TAC calculation process, one of which states that "Minimum anchovy TAC" is 120,000t. However, the details of the mathematical model indicate that where the November biomass estimate is below 25% of the Exceptional Circumstances threshold (i.e. 25% of 600,000t: 150,000t), the anchovy TAC will be set at 0t. Thus an SSB of 150,000t is used as an informal limit reference point.

	INITIAL Anchovy TAC	Juvenile Sardine by-catch allowance (associated with anchovy directed catches)
<b>2016</b>	254,483 t	25,866 t
<b>2017</b>	247,500 t	25,064 t
<b>2017 (final)</b>	450,000t	7,000t
<b>2018 (final)</b>	295,911t	25,129t



**Figure 3.** Anchovy TAC and Anchovy catch from 2000 to 2015.

#### References

Small pelagic initial TAC – 2016, 2017 Department: Agriculture, Forestry and Fisheries Republic of South Africa

Assessment and management of the South African Purse-Seine Fishery for Small Pelagics (Sardine, Anchovy and Round – Herring) presentation to NOAA Southwest Fisheries Science Centre & PFMC Workshop on Coastal Pelagic Species Assessments, La Jolla 3rd May 2016 by Carryn de Moor, Doug Butterworth, Janet Coetzee  
<http://www.maram.uct.ac.za/maram/publications/2016>

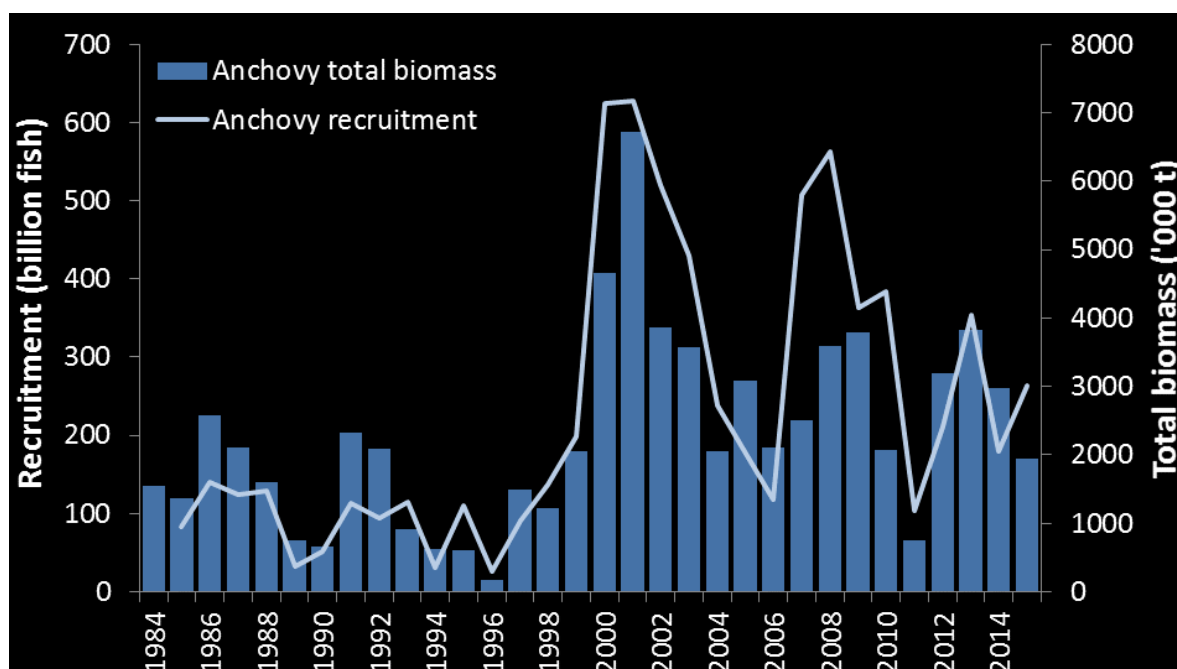
*Standard clause 1.3.2.3*

A4	Stock Status - Minimum Requirements		
	A4.1	The stock is currently estimated to be below the limit reference point or proxy, but fishery removals are prohibited OR the stock is currently above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR the stock is at or above the target reference point.	Yes
	Clause outcome:		Pass

**Evidence**

The OMP does not include an explicit limit reference point, although where anchovy biomass is estimated to be below 600,000t 'Exceptional Circumstances' are invoked and the TAC is substantially reduced. OMP-14 includes a list of constraints to the TAC calculation process, one of which states that "Minimum anchovy TAC" is 120,000t. However, the details of the mathematical model indicate that where the November biomass estimate is below 25% of the Exceptional Circumstances threshold (i.e. 25% of 600,000t: 150,000t), the anchovy TAC will be set at 0t. Thus an SSB of 150,000t is used as an informal limit reference point.

According to the November 2015 pelagic biomass survey the anchovy biomass had been estimated at approximately 1.9 million tonnes, in November 2016 it was estimated at 1.7 million tonnes which was lower than in the preceding years and less than the estimated average anchovy biomass of 2.28 million tonnes.



**Figure 4.** Anchovy total biomass and recruitment

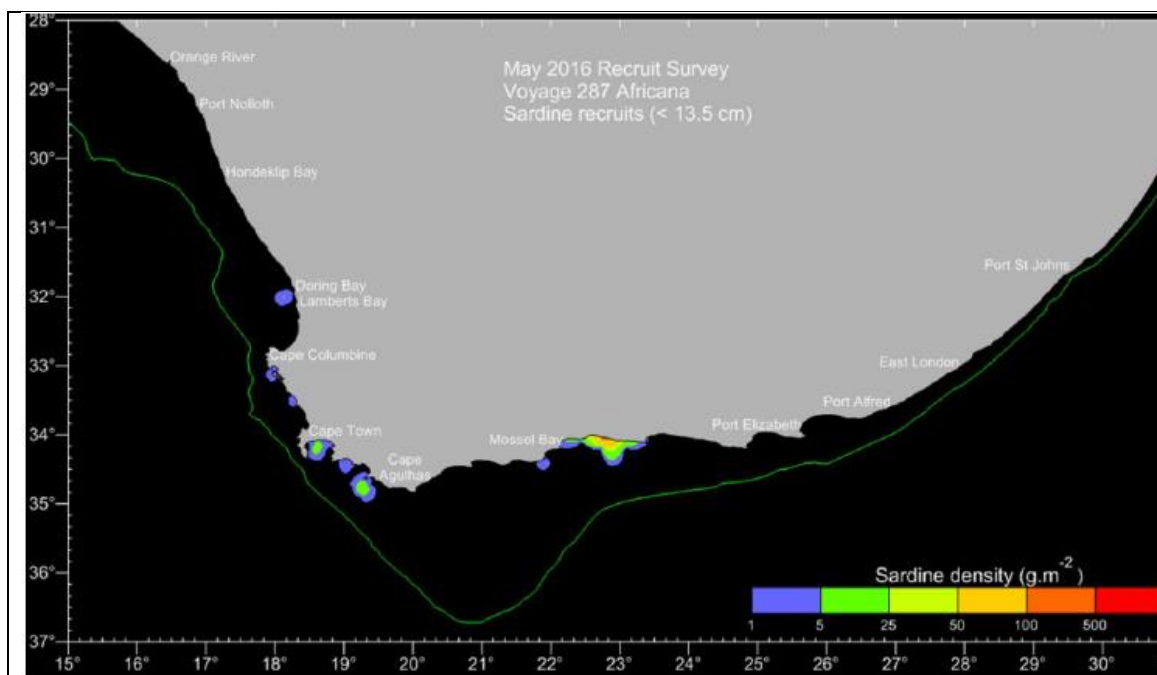


**References**

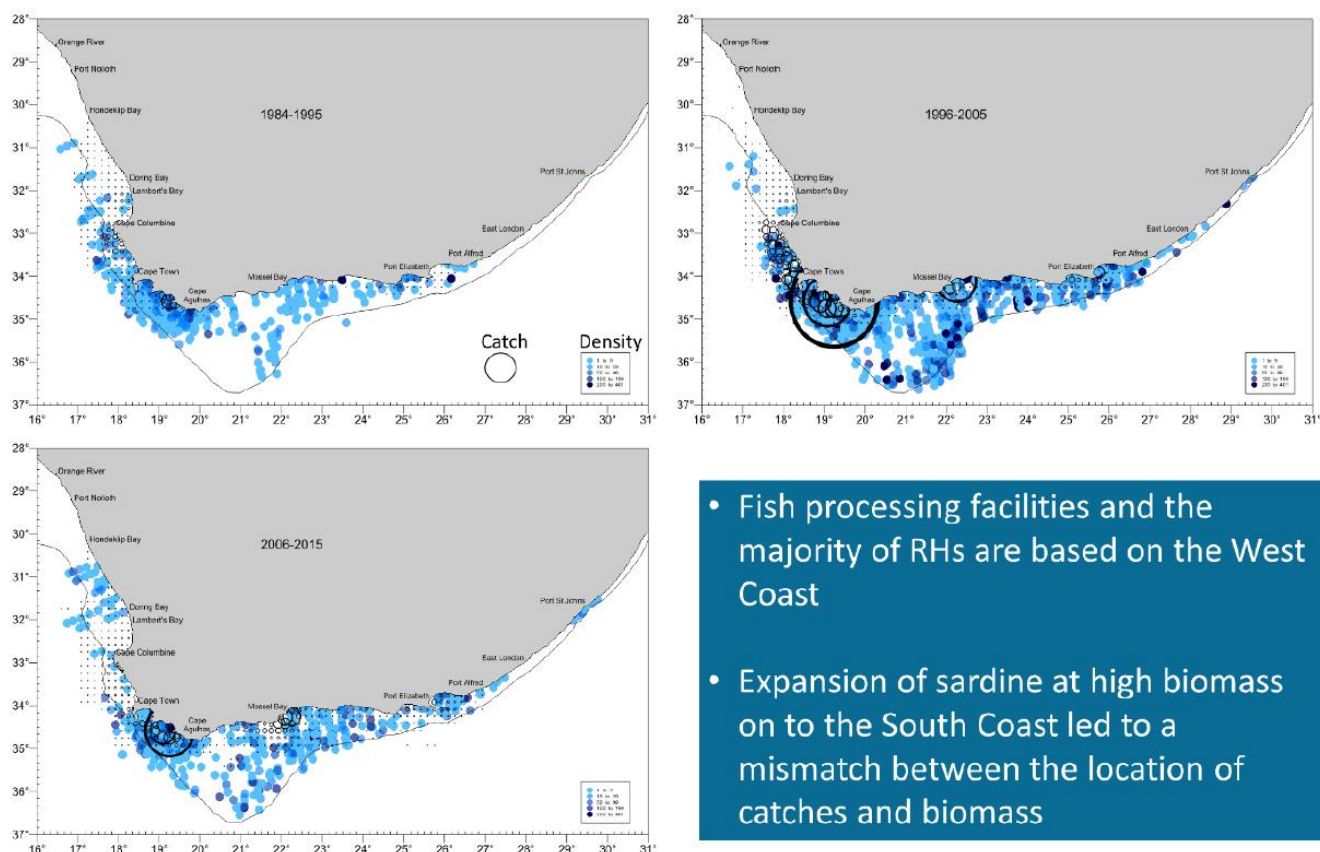
Assessment and management of the South African Purse-Seine Fishery for Small Pelagics (Sardine, Anchovy and Round – Herring) presentation to NOAA Southwest Fisheries Science Centre & PFMC Workshop on Coastal Pelagic Species Assessments, La Jolla 3rd May 2016 by Carryn de Moor, Doug Butterworth, Janet Coetzee  
<http://www.maram.uct.ac.za/maram/publications/2016>

*Standard clause 1.3.2.4*

Species Name		Sardine <i>Sardinops sagax</i>	
A1	Data Collection - Minimum Requirements		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	Yes
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	Yes
Clause outcome:			Pass
<b>Evidence</b> <p>Fishery dependent data collected for the South Africa small pelagic fishery include landed weight, species composition, catch location and date. Additionally, sampling is used to obtain length frequency data, age estimates, sex, maturity stage, and fish condition. Landings data for sardine are collected in the directed fishery, but also in the components of the small pelagic fishery which target anchovy and redeye herring. In addition to landings records, the biomass and distribution of sardine is assessed biannually via hydro-acoustic surveys, which have been conducted uninterrupted for the past 33 years. These surveys also collect a range of other data required for the Operational Management Procedure (OMP). Fishery-independent surveys are conducted twice per year as an essential mechanism for generating stock status estimates with sufficient frequency and accuracy to enable informed management of the fishery. Additional surveys and analyses are conducted as deemed necessary, such as to determine aggregation rates, proportions of shoals made up of recruits and to measure the impacts of the fishery on penguin abundance.</p> <p>Observers have been deployed on vessels in the fishery since 1999, although observer coverage is estimated to be around 8% by number of trips covered. Observer data is used to validate other data sources, in particular catch location, date and gear type. Observer data has also been used to compare the results of data collection at landing from vessels which are observed and those which are not.</p>			



**Figure 1:** Spatial distribution of sardine from the May2016 recruitment survey (Coetzee et al. 2016).



**Figure 2.** Composite maps of sardine catches (open circles, proportional size) and sardine density from hydro-acoustic surveys (dots) for three 10 year periods. (Source MARAM/IWS/2017/Sardine/BG1)

#### References

Coetzee, Janet C., Dagmar Merkle, Mzwamadoda Philips, Yonela Geja, Kanakana Mushanganyisi and Fannie Shabangu. 2016. Results of the 2016 pelagic recruitment survey. FISHERIES/2016/JUL/SWG-PEL/25.

Status of the South African Marine Fishery Resources, 2014. DAFF, Cape Town, SA. <a href="http://www.nda.agric.za/doaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf">http://www.nda.agric.za/doaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf</a> Oceana Sustainability Report 2016 <a href="http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF">http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF</a>
<i>Standard clause 1.3.2.1</i>

<b>A2 Stock Assessment - Minimum Requirements</b>			
A2.1	A stock assessment is conducted at least once every 3 years (or every 5 years if there is substantial supporting information that this is sufficient for the long-term sustainable management of the stock), and considers all fishery removals and the biological characteristics of the species.		Yes
A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.		Yes
A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.		Yes
A2.4	The assessment is subject to internal or external peer review.		Yes
A2.5	The assessment is freely available to the assessment team.		Yes
<b>Clause outcome:</b>			Pass
<p><b>Evidence</b></p> <p>The South African small pelagic OMP specifies a set of data to be used in the OMP, the formulae and models that use those data to determine the TAC, and the associated process of selection. This includes extensive simulation testing of the consequences of alternative assumptions about population dynamics and how management quantities react to those alternatives. The simplified formulae are updated annually in order to determine the TAC. By so doing, the need for a full assessment every year is avoided, but there is a requirement that the formulae do not deviate greatly from the assessment projections.</p> <p>The OMP contains harvest control rules for both species (anchovy and sardine) based on the results of the November hydro-acoustic surveys. The sardine TAC is based on the relationship between the November biomass estimate and the historical average biomass between 1984 and 1999. Initially this TAC assumes average recruitment, but this factor (and therefore the TAC) is updated to reflect the results of the May acoustic cruise. The model used to generate the initial TAC takes this uncertainty into account and scales down the recommendation. OMP-14 also includes a fixed sardine TAB for sardine caught in the directed anchovy fishery.</p> <p>There is an annual International Stock Assessment Workshop funded by the NRF and DAFF in 2017 it took place in University of Cape Town. In 2017 the four scientists invited to comprise the Review Panel were: Sean Cox (Canada), Malcolm Haddon (Australia), Daniel Howell (Norway) and Andre Punt (USA). All stock assessments and paper are publicly available <a href="http://www.maram.uct.ac.za/maram/publications/research-papers">http://www.maram.uct.ac.za/maram/publications/research-papers</a></p>			
<p><b>References</b></p> <p>Status of the South African Marine Fishery Resources, 2016. DAFF, Cape Town, SA. <a href="http://www.nda.agric.za/doaDev/sideMenu/fisheries/fisheriesresearch%20and%20development/docs/STATUS%20REPORT%202016.pdf">http://www.nda.agric.za/doaDev/sideMenu/fisheries/fisheriesresearch%20and%20development/docs/STATUS%20REPORT%202016.pdf</a> de Moor, CL &amp; Butterworth, DS (2014). OMP-14. <a href="http://www.mth.uct.ac.za/maram/pub/2014/FISHERIES_2014_NOV_SWG-PEL_60.pdf">http://www.mth.uct.ac.za/maram/pub/2014/FISHERIES_2014_NOV_SWG-PEL_60.pdf</a> INTERNATIONAL REVIEW PANEL REPORT FOR THE 2017 INTERNATIONAL FISHERIES STOCK ASSESSMENT WORKSHOP 27 November – 1 December 2017, UCT</p>			

<https://drupalupload.uct.ac.za/maram/Documents/pub/2017/IWS%202017/IWS%202017%20Final%20report%20of%20the%20Panel.pdf>

Draft simulation testing framework to be used during the development of OMP-17 C.L. de Moor

[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/workshop/2016/MARAM\\_IWS\\_DEC16\\_Sardine\\_P14.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/2016/MARAM_IWS_DEC16_Sardine_P14.pdf)

Initial Directed Sardine and Anchovy TACs and TABs for 2017, Using OMP-14 C.L. de Moor

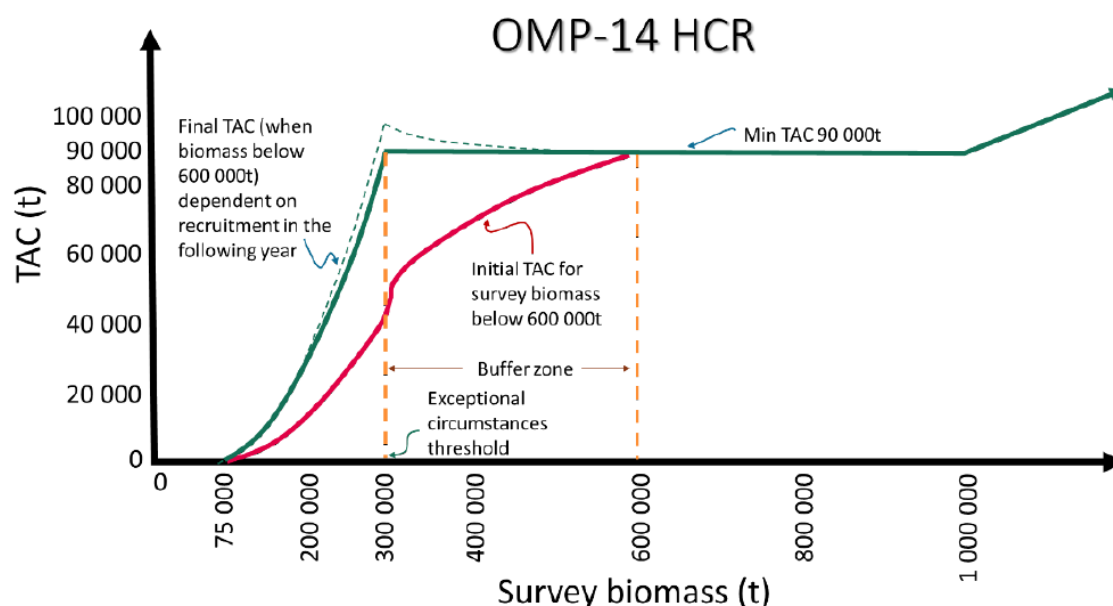
[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/pub/2016/FISHERIES\\_2016\\_DEC\\_SWG-PEL\\_80.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/pub/2016/FISHERIES_2016_DEC_SWG-PEL_80.pdf)

Standard clause 1.3.2.2

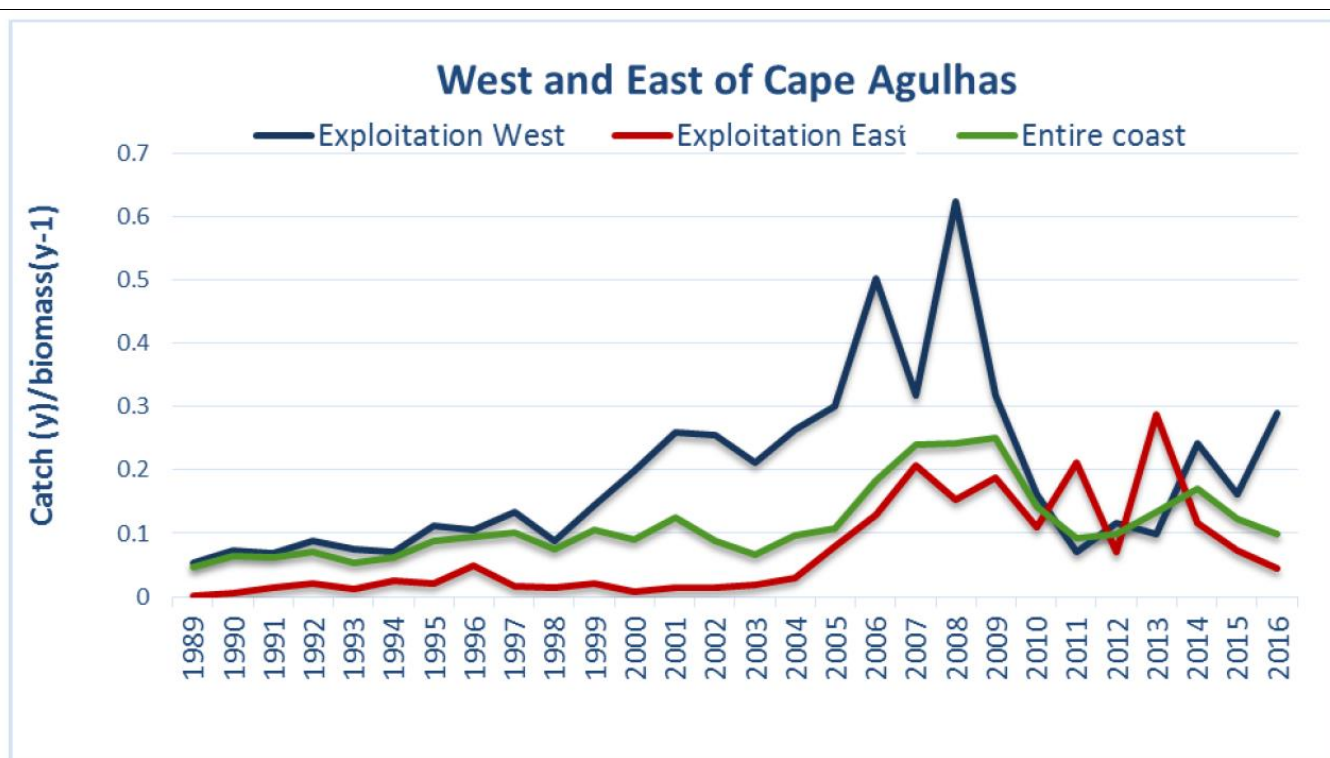
A3 Harvest Strategy - Minimum Requirements		
A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted (which may include economic mechanisms).	Yes
A3.2	Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment. Where a specific quantity of removals is recommended, the actual removals may exceed this by up to 10% ONLY if the stock status is above the limit reference point or proxy.	Yes
A3.3	Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy (small quotas for research or non-target catch of the species in other fisheries are permissible).	Yes
Clause outcome:		Pass

#### Evidence

Total removals are limited through the use of a quota system, with the Total Allowable Catch (TAC) and Total Allowable Bycatch (TAB) of sardine defined according to the rules in the OMP and do not regularly exceed the level indicated in the stock assessment.



**Figure 3.** A schematic of the OMP-14 HCR for calculating initial (when survey biomass is less than 600,000t) and final TACs. Note that the final TAC (dotted green line) could be higher than the original calculated TAC (solid green line) if above average recruitment is measured during the subsequent recruit survey.



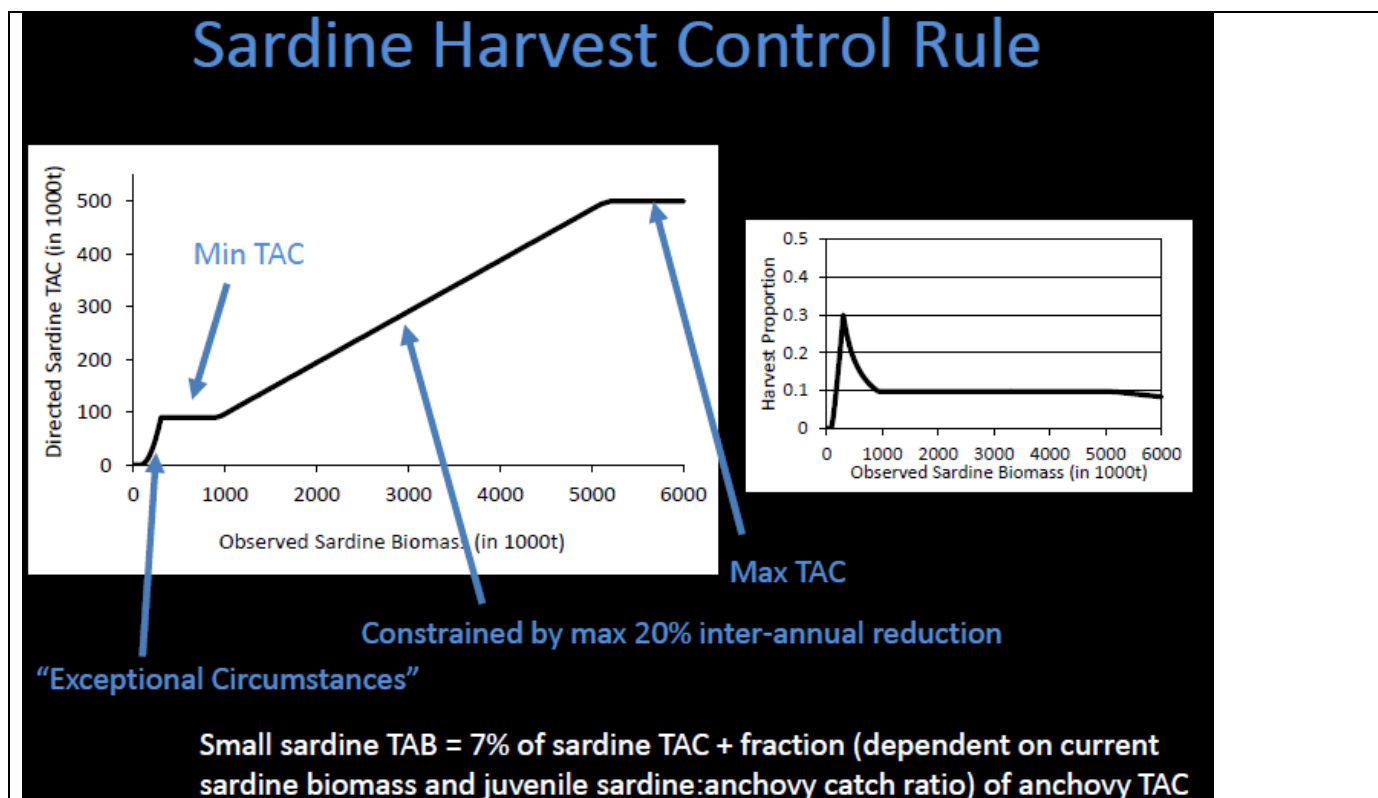
**Figure 4.** Harvest proportion (catch in current year/model predicted biomass in previous year) for the area to the west of Cape Agulhas, East of Cape Agulhas and for the entire coast. (Source: MARAM 2017)

The Marine Living Resources Act (1998) empowers the Minister to apportion the TAC between rights holders, regions, components of the fishery, and however else is deemed necessary. In practice, TACs are apportioned between holders of commercial fishing permits for sardine and/or anchovy. The TAC is set at the level defined by the OMP and as calculated by subsequent initial and mid-season MARAM recommendation papers.

The sardine recruitment estimate June 2017 was 7.156 billion recruits. The average annual recruitment since surveys began in 1985 is 13 billion fish. The low 2016 and 2017 estimates are cause for considerable concern. As a result and again in accordance with the OMP results, the directed adult sardine TAC was decreased by a few hundred tonnes from the initial TAC to a final allowable catch of 45,560 tonnes. The final juvenile sardine TAB for directed adult sardine fishing was also reduced to 3,189 t.

The OMP does not include an explicit limit reference point, although where sardine biomass is estimated to be below 300,000t 'Exceptional Circumstances' are invoked and the TAC is substantially reduced. Where the November survey estimate is between 300,000 – 600,000 t a conservative initial sardine TAC is recommended at the beginning of the year, with a mid-season increase dependent on the survey estimate of sardine recruitment. OMP-14 includes a list of constraints to the TAC calculation process, one of which states that "Minimum directed sardine TAC" is 90,000t. However, the details of the mathematical model indicate that where the November biomass estimate is below 25% of the Exceptional Circumstances threshold (i.e. 25% of 300,000t: 75,000t), the sardine TAC will be set at 0t. Thus, an SSB of 75,000t is used as an informal limit reference point.

	Final Sardine TAC	Juvenile Sardine by-catch allowance (associated with anchovy directed catches)
<b>2016</b>	64,927.93 t	25,866 t
<b>2017</b>	45,560 t	29,969 t
<b>2018 (initial)</b>	59,214 t	25,129 t



**Figure 5.** Sardine harvest control rule OMP-14.

#### References

de Moor, CL & Butterworth, DS (2014). OMP-14.

[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/workshop/2016/MARAM\\_IWS\\_DEC16\\_Sardine\\_BG10.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/2016/MARAM_IWS_DEC16_Sardine_BG10.pdf)

Small pelagic initial TAC – 2016, 2017 Department: Agriculture, Forestry and Fisheries Republic of South Africa

Assessment and management of the South African Purse-Seine Fishery for Small Pelagics (Sardine, Anchovy and Round – Herring) presentation to NOAA Southwest Fisheries Science Centre & PFMC Workshop on Coastal Pelagic Species Assessments, La Jolla 3rdMay 2016 by Carryn de Moor, Doug Butterworth, Janet Coetzee  
<http://www.maram.uct.ac.za/maram/publications/2016>

Final Anchovy and Sardine TACs and TABs for 2017, Using OMP-14. Carryn L. de Moor.  
 FISHERIES/2017/JUL/SWG-PEL/22

[https://drupalupload.uct.ac.za/maram/Documents/pub/2017/FISHERIES\\_2017\\_JUL\\_SWG-PEL\\_22%202017TACs.pdf](https://drupalupload.uct.ac.za/maram/Documents/pub/2017/FISHERIES_2017_JUL_SWG-PEL_22%202017TACs.pdf)

2018 Initial TACs and TABs for Small Pelagics – received from client

Standard clause 1.3.2.3

A4	Stock Status - Minimum Requirements		
	A4.1	The stock is currently estimated to be below the limit reference point or proxy, but fishery removals are prohibited OR the stock is currently above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure OR the stock is at or above the target reference point.	Yes
Clause outcome:			Pass

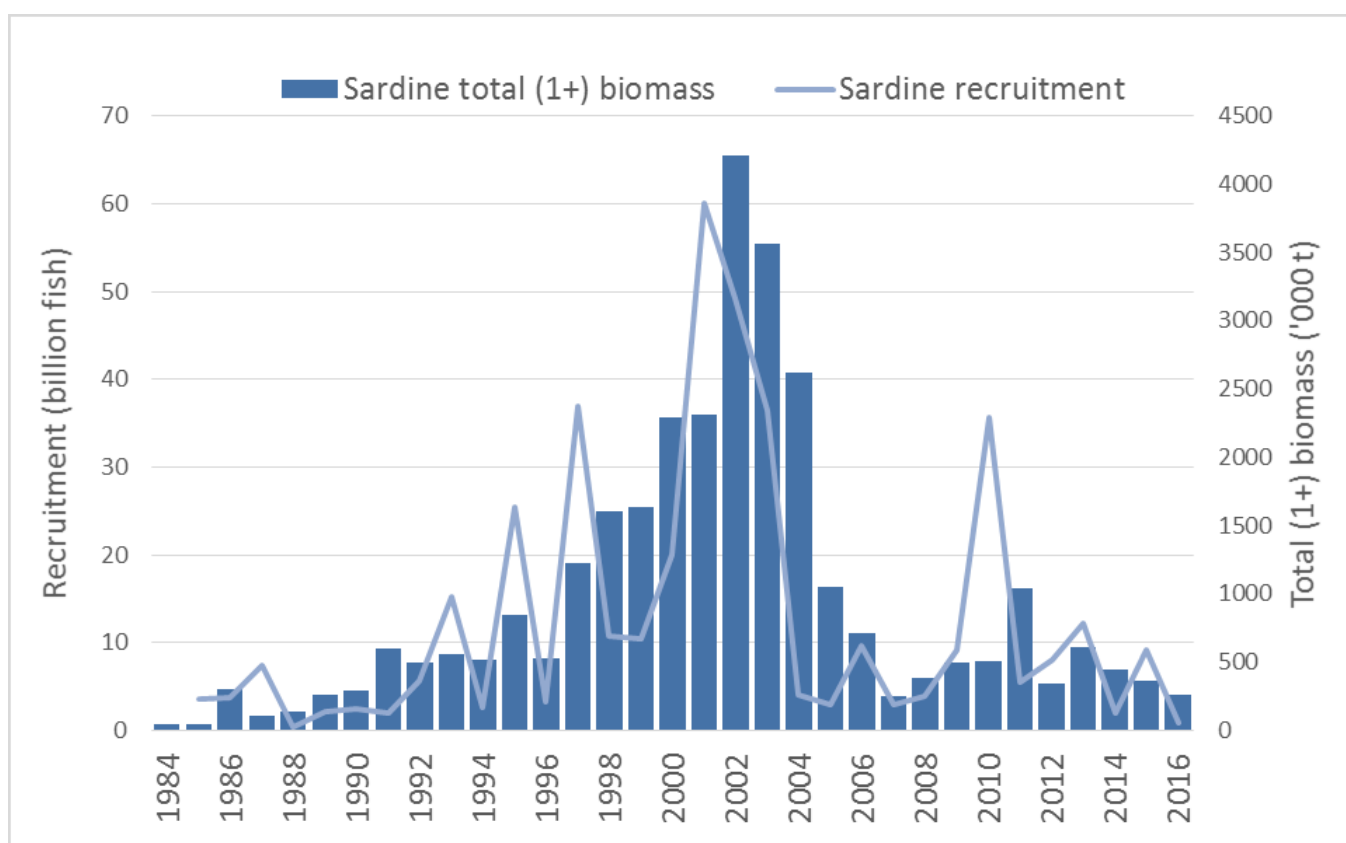


## Evidence

The stock is currently above the limit reference point or proxy and there is evidence that a fall below the limit reference point would result in fishery closure. As detailed in A3 the OMP does not include an explicit limit reference point, although where sardine biomass is estimated to be below 300,000t 'Exceptional Circumstances' are invoked and the TAC is substantially reduced. Where the November survey estimate is between 300,000 – 600,000 t a conservative initial sardine TAC is recommended at the beginning of the year, with a mid-season increase dependent on the survey estimate of sardine recruitment, as was the case in 2017.

OMP-14 includes a list of constraints to the TAC calculation process, one of which states that "Minimum directed sardine TAC" is 90,000t. However, the details of the mathematical model indicate that where the November biomass estimate is below 25% of the Exceptional Circumstances threshold (i.e. 25% of 300,000t: 75,000t), the sardine TAC will be set at 0t. Thus, an SSB of 75,000t is used as an informal limit reference point.

The sardine biomass in November 2016 was estimated at approximately 258,575 tonnes, which was about 100,000 tonnes less than the biomass estimate in November of the previous year and well below half of the estimated long-term average biomass of nearly 970,000 tonnes. The sardine recruitment estimate was 7.156 billion recruits, which is lower than the 9 billion recruits estimated for 2015. The average annual recruitment since surveys began in 1985 is 13 billion fish. The low 2016 and 2017 estimates are cause for considerable concern. As a result and again in accordance with the OMP results, the directed adult sardine TAC was reduced from the initial TAC to a final allowable catch of 45,560 tonnes. The final juvenile sardine TAB for directed adult sardine fishing was also reduced to 3,189 t. When issuing the final recommendations in July, DAFF reported concern at the current status of the sardine population following several years of poor recruitment, and advised the pelagic industry to try to keep the bycatch of juvenile sardine as low as possible. Industry was also requested to spread their fishing effort for sardine over both south and west coasts.



**Figure 6.** Time-series of acoustic survey estimates of total sardine biomass in October/November (bars) and recruitment in May/June (lines) since the start of the acoustic survey program. (Source: MARAM 2017)

## References

de Moor, CL & Butterworth, DS (2014). OMP-14.

[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/workshop/2016/MARAM\\_IWS\\_DEC16\\_Sardine\\_BG10.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/2016/MARAM_IWS_DEC16_Sardine_BG10.pdf)

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<http://www.maram.uct.ac.za/maram/publications/2016>

Oceana Sustainability Report 2016 [http://oceana.co.za/pdf/JOB010973\\_Oceana\\_SDR.PDF](http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF)

Coetzee, J.C, de Moor, C.L and Butterworth, D.S 2017. A summary of the South African sardine (and anchovy) fishery MARAM/IWS/2017/Sardine/BG1

[https://drupalupload.uct.ac.za/maram/Documents/pub/2017/IWS%202017/MARAM\\_IWS\\_2017\\_Sardine\\_BG1.pdf](https://drupalupload.uct.ac.za/maram/Documents/pub/2017/IWS%202017/MARAM_IWS_2017_Sardine_BG1.pdf)

*Standard clause 1.3.2.4*



## CATEGORY B SPECIES

Category B species are those which make up greater than 5% of landings in the applicant raw material, but which are not subject to a species-specific research and management regime sufficient to pass all Category A clauses. If there are no Category B species in the fishery under assessment, this section can be deleted.

Category B species are assessed using a risk-based approach. The following process should be completed once for each Category B species.

### If there are estimates of biomass (B), fishing mortality (F), and reference points

It is possible for a Category B species to have some biomass and fishing mortality data available. When sufficient information is present, the assessment team should use the following risk matrix to determine whether the species should be recommended for approval.

Table B(a) - F, B and reference points are available

<b>Biomass is above MSY / target reference point</b>	Pass	Pass	Pass	Fail	Fail
<b>Biomass is below MSY / target reference point, but above limit reference point</b>	Pass, but re-assess when fishery removals resume	Pass	Fail	Fail	Fail
<b>Biomass is below limit reference point (stock is overfished)</b>	Pass, but re-assess when fishery removals resume	Fail	Fail	Fail	Fail
<b>Biomass is significantly below limit reference point (Recruitment impaired)</b>	Fail	Fail	Fail	Fail	Fail

	<b>Fishery removals are prohibited</b>	<b>Fishing mortality is below MSY or target reference point</b>	<b>Fishing mortality is around MSY or target reference point, or below the long-term average</b>	<b>Fishing mortality is above the MSY or target reference point, or around the long-term average</b>	<b>Fishing mortality is above the limit reference point or above the long-term average (Stock is subject to overfishing)</b>
--	----------------------------------------	-----------------------------------------------------------------	--------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------

### If the biomass / fishing pressure risk assessment is not possible

Initially, the resilience of each Category B species to fishing pressure should be estimated using the American Fisheries Society procedure described in Musick, J.A. (1999). This approach is used as the resilience values for many species and stocks have been estimated by FishBase, and are already available online. For details of the approach, please refer to Appendix A. Determining the resilience provides a basis for estimating the risk that fishing may pose to the long-term sustainability of the stock. Table B(b) should be used to determine whether the species should be recommended for approval.

**Table B(b) - No reference points available. B = current biomass; B<sub>av</sub> = long-term average biomass; F = current fishing mortality; F<sub>av</sub> = long-term average fishing mortality.**

<b>B &gt; B<sub>av</sub> and F &lt; F<sub>av</sub></b>	Pass	Pass	Pass	Fail
<b>B &gt; B<sub>av</sub> and F or F<sub>av</sub> unknown</b>	Pass	Pass	Fail	Fail
<b>B = B<sub>av</sub> and F &lt; F<sub>av</sub></b>	Pass	Pass	Fail	Fail
<b>B = B<sub>av</sub> and F or F<sub>av</sub> unknown</b>	Pass	Fail	Fail	Fail
<b>B &gt; B<sub>av</sub> and F &gt; F<sub>av</sub></b>	Pass	Fail	Fail	Fail
<b>B &lt; B<sub>av</sub></b>	Fail	Fail	Fail	Fail
<b>B unknown</b>	Fail	Fail	Fail	Fail
<b>Resilience</b>	<b>High</b>	<b>Medium</b>	<b>Low</b>	<b>Very Low</b>

### Assessment Results

<b>Species Name</b>		Red-eye herring
<b>B1</b>	Species Name	Red-eye herring
	Table used (Ba, Bb)	Ba
	Outcome	Pass
<b>Evidence</b>		

As the targeted redeye fishery is still considered underdeveloped, and information on the species is comparatively limited, fishery removals are not currently factored in to its management. However, landings data is recorded, and total catch is monitored and used to ensure fishing does not exceed the precautionary upper catch limit. The round herring resource in South African waters is currently believed to be under-utilised at present, and attempts at greater exploitation have been encouraged. Since June 2008, South Africa has been a member of the South East Atlantic Fisheries Organisation (SEAFO). The objective of the organisation is to ensure the long-term conservation and sustainable use of the fishery resources in the Convention Area through the effective implementation of the Convention.

The PUCL is set at around 10% of estimated biomass, and so as long as landings remain below the PUCL (which they have to date), the exploitation rate will remain fairly low. Landings vary between 30,000 to 55,000 tonnes annually (FishStat 2009). Landings for 2013 were 32,000t.

The 2015 November biomass survey results for red-eye herring was 1.3 million tonnes, which was approximately the same as in 2014 and considerably higher than the estimated long-term average of about 967 000 tonnes.

Red-eye herring is not considered an immediate assessment priority as it is currently under- utilised. The OMP – 14 focuses mainly on sardine and anchovy but a Precautionary Upper Catch Limit (PUCL) is set for red-eye herring. The PUCL is set at 100,000t per annum, which is 8% of the conservative estimate of stock size for 2016. The PUCL decreases linearly if the November survey biomass is less than 750 000t.

Although the quantity of information available for redeye appears to be limited, what information is available is utilised in management decisions, and scientific understanding appears to be fully utilised in the management of the primary target species of the small pelagic fishery.

## References

Assessment and management of the South African Purse-Seine Fishery for Small Pelagics (Sardine, Anchovy and Round – Herring) presentation to NOAA Southwest Fisheries Science Centre & PFMC Workshop on Coastal Pelagic Species Assessments, La Jolla 3rdMay 2016 by Carryn de Moor, Doug Butterworth, Janet Coetzee

<http://www.maram.uct.ac.za/maram/publications/2016>

Oceana Sustainability Report 2016 [http://oceana.co.za/pdf/JOB010973\\_Oceana\\_SDR.PDF](http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF)

*Standard clauses 1.3.2.1 - 1.3.2.4*

## CATEGORY C SPECIES

In a whole fish assessment, Category C species are those which make up less than 5% of landings, but which are subject to a species-specific management regime. In most cases this will be because they are a commercial target in a fishery other than the one under assessment. In a by-product assessment, Category C species are those which are subject to a species-specific management regime, and are usually targeted species in fisheries for human consumption.

Clause C1 should be completed for **each** Category C species. If there are no Category C species in the fishery under assessment, this section can be deleted. A Category C species does not meet the minimum requirements of clause C1 should be re-assessed as a Category D species.

Species Name		Lanternfish ( <i>Lampanyctodes hectoris</i> )						
C1	Category C Stock Status - Minimum Requirements							
	C1.1	Fishery removals of the species in the fishery under assessment are included in the stock assessment process, OR are considered by scientific authorities to be negligible.	Yes					
	C1.2	The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy), OR removals by the fishery under assessment are considered by scientific authorities to be negligible.	Yes					
Clause outcome:			Pass					
Evidence								
The biomass and distribution of anchovy and sardine, but also of other schooling pelagic and meso-pelagic fish species such as red-eye herring, juvenile horse mackerel and lantern and light fish ( <i>Lampanyctodes hectoris</i> and <i>Maurolicus walvisensis</i> , respectively) are assessed biannually using hydroacoustic surveys. These surveys, which have been conducted without interruption for the past 30 years, comprise a summer adult biomass survey and a winter recruit survey. These biomass estimates suggest a minimum combined biomass for Lantern and Light fish ranging from 550,000 t to 2,000,000 t, with an average of 1,300,000 t over the past 10 years. An annual PUCL for mesopelagic fish of 50 000 t was introduced in 2012, following increased catches of lantern- and light fish by the experimental pelagic trawl fishery in 2011, when just over 7 000 t of these species were landed. Since then, however, catches have not exceeded 1 000 t.								
Table 1. Information on mesopelagic fish biomass, catch and level of exploitation (Source DAFF).								
Year	Lantern fish		Light fish		Combined biomass (t)	Exploitation level at 50 000t PUCL	Catch (t)	Actual exploitation level
	Biomass (t)	CV	Biomass (t)	CV				
2006	471319.78	0.28	1231669.26	0.15	1702989.04	0.03	0.0	0.0000
2007	601631.20	0.14	260162.14	0.24	861793.34	0.06	2.0	0.0000
2008	739757.34	0.30	775539.34	0.31	1515296.68	0.03	0.0	0.0000
2009	1658221.37	0.32	335309.87	0.19	1993531.24	0.03	0.0	0.0000
2010	188554.37	0.47	524587.96	0.24	713142.33	0.07	321.0	0.0005
2011	213223.35	0.31	809601.67	0.26	1022825.02	0.05	7288.0	0.0071
2012	20935.97	0.81	523894.64	0.11	544830.60	0.09	22.0	0.0000
2013	282877.73	0.55	1709819.48	0.15	1992697.21	0.03	0.0	0.0000
2014	295460.90	0.42	431166.30	0.20	726627.20	0.07	1.0	0.0000
2015	878538.81	0.40	1166319.88	0.17	2044858.68	0.02	0.0	0.0000
2016	299175.06	0.44	1121356.52	0.18	1420531.58	0.04	166.0	0.0001
2017	411763.67	0.45	309084.21	0.25	720847.88	0.07	325.0	0.0005

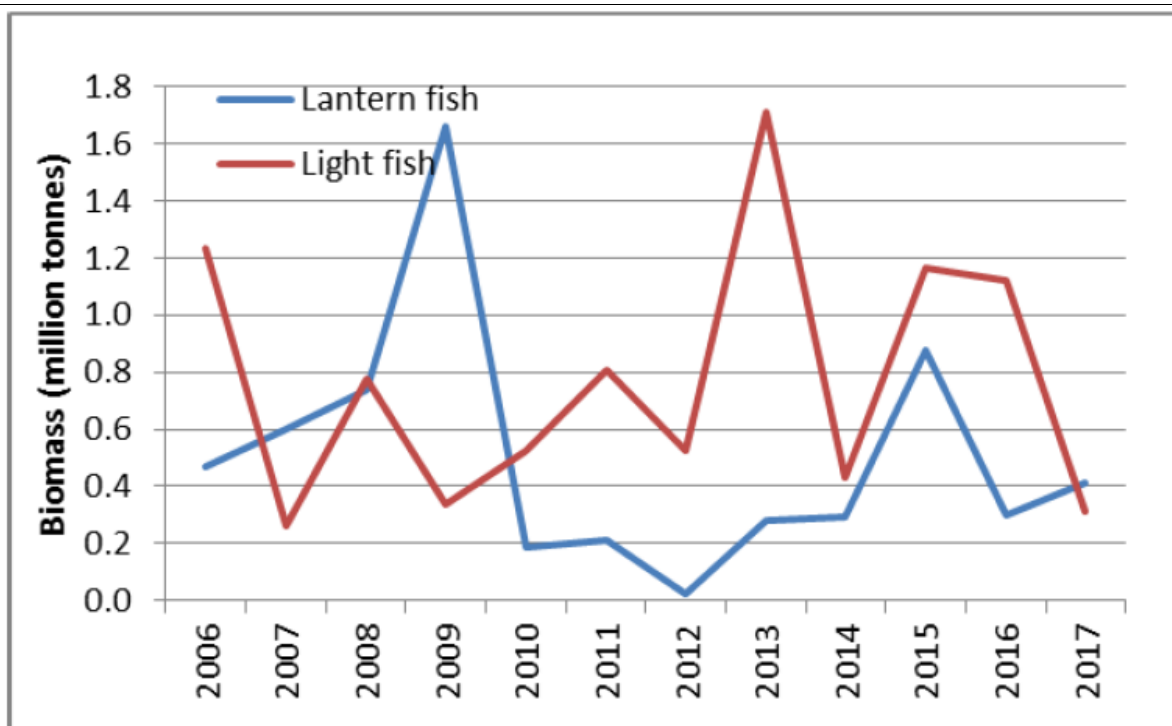


Figure 7. Acoustic biomass estimates of Lantern fish and light fish since 1996. Source DAFF

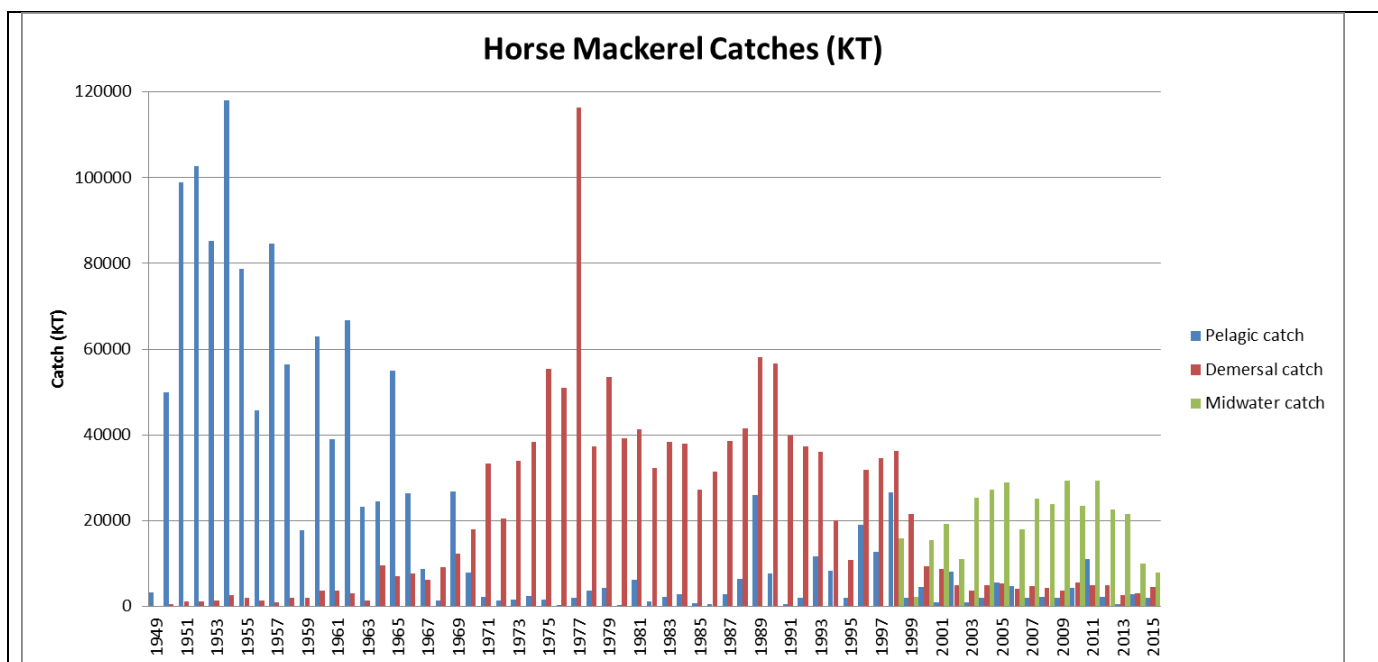
#### References

Status of the South Africa Marine Fishery Resources 2014:

[http://www.nda.agric.za/daaDev/sideMenu/fisheries/03\\_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf](http://www.nda.agric.za/daaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf)

Standard clauses 1.3.2.1 - 1.3.2.4

Species Name		Horse mackerel ( <i>Trachurus capensis</i> )	
C1	Category C Stock Status - Minimum Requirements		
	C1.1	Fishery removals of the species in the fishery under assessment are included in the stock assessment process, OR are considered by scientific authorities to be negligible.	Yes
	C1.2	The species is considered, in its most recent stock assessment, to have a biomass above the limit reference point (or proxy), OR removals by the fishery under assessment are considered by scientific authorities to be negligible.	yes
Clause outcome:			Pass
Evidence			
FISHERIES/2016/SEP/SWG-DM/51 provides a full description of the current stock assessment model for the South African Horse Mackerel, which was updated in FISHERIES/2017/SEP/SWG-DM/31. An age-structured production model (ASPM) is used as the underlying assessment model for the Horse Mackerel. Fishery removals of Horse mackerel are included in the stock assessment process.			
Horse mackerel had a TAC of 8,372t for 2017 and 8,947t for 2018. Recent increases in abundance of Cape horse mackerel have been attributed to strong recruitment over the past few years. Further horse mackerel-directed surveys are required to validate the modelling results. 5,000 t Precautionary Upper Catch Limit (PUCL) for the purse-seine fishery in 2000, following which the average annual purse-seine catch has been 3 400 t.			



**Figure 10.** Horse mackerel catches 1949- 2015

#### References

S.J. Johnston and D.S. Butterworth The 2016 Horse Mackerel Updated Assessment FISHERIES/2016/SEP/SWG-DEM/51  
[https://open.uct.ac.za/bitstream/handle/11427/24033/FISHERIES\\_2016\\_SEP\\_SWG-DEM\\_51.pdf?sequence=1](https://open.uct.ac.za/bitstream/handle/11427/24033/FISHERIES_2016_SEP_SWG-DEM_51.pdf?sequence=1)

S.J. Johnston and D.S. Butterworth The 2017 Horse Mackerel Updated Assessment FISHERIES/2017/SEP/SWG-DM/31

Status of the South Africa Marine Fishery Resources 2014:

[http://www.nda.agric.za/doaDev/sideMenu/fisheries/03\\_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf](http://www.nda.agric.za/doaDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf)

Initial Directed Sardine and Anchovy TACs and TABs for 2017, Using OMP-14 C.L. de Moor  
[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/pub/2016/FISHERIES\\_2016\\_DEC\\_SWG-PEL\\_80.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/pub/2016/FISHERIES_2016_DEC_SWG-PEL_80.pdf)

Standard clauses 1.3.2.1 - 1.3.2.4

## CATEGORY D SPECIES

In a whole fish assessment, Category D species are those which make up less than 5% of landings and are not subject to a species-specific management regime. In the case of mixed trawl fisheries, Category D species may make up the majority of landings. In a by-product assessment, Category D species are those which are not subject to a species-specific management regime. In both cases, the comparative lack of scientific information on the status of the population of the species means that a risk-assessment style approach must be taken.

The process for assessing Category D species involves the use of a Productivity-Susceptibility Analysis (PSA) to further subdivide the species into 'Critical Risk', 'Major Risk' and 'Minor Risk' groups. If there are no Category D species in the fishery under assessment, this section can be deleted.

Productivity and susceptibility ratings are calculated using a process derived from the APFIC document "Regional Guidelines for the Management of Tropical Trawl Fisheries, which in turn was derived from papers by Patrick *et al* (2009) and Hobday *et al* (2007). Table D1 should be completed for each Category D species as follows:

- Firstly, the best available information should be used to fill in values for each productivity and susceptibility attribute.
- Table D2 should be used to convert each attribute value into a score between 1 and 3.
- The average score for productivity attributes and the average for susceptibility attributes should be calculated.
- Table D3 should be used to determine whether the species is required to meet the requirements of Table D4. A species which does not need to meet the requirements of D4 is automatically awarded a pass.
- Table D4 should be used to assess those species indicated by Table D3 to determine a pass/fail rating.
- Any Category D species which has been categorised by the IUCN Red List as Endangered or Critically Endangered, or which appears in the CITES appendices, automatically results in a fail.

D1	Species Name	Chub Mackerel ( <i>Scomber japonicus</i> )	
	Productivity Attribute	Value	Score
	Average age at maturity (years)	2-4	2
	Average maximum age (years)	7	1
	Fecundity (eggs/spawning)	10,000	1
	Average maximum size (cm)	30	1
	Average size at maturity (cm)	26	1
	Reproductive strategy	Broadcast spawner	1
	Mean trophic level	3.59	3
	Average Productivity Score		1.43
	Susceptibility Attribute	Value	Score
	Overlap of adult species range with fishery	< 25% of the stock occurs in area fished	1
	Distribution	Not scored if overlap scored (see Table D2)	Not scored
	Habitat	pelagic-neritic	1
	Depth range	50-200	1
	Selectivity	Species 1 to 2 times mesh size	2
	Post-capture mortality	Most dead, retained	3
	Average Susceptibility Score		1.75
	PSA Risk Rating (From Table D3)		Pass
	Compliance rating		Pass
References			
Fish base <a href="http://fishbase.org/Summary/SpeciesSummary.php?ID=117&amp;AT=chub+mackerel">http://fishbase.org/Summary/SpeciesSummary.php?ID=117&amp;AT=chub+mackerel</a>			
IUCN Redlist <a href="http://www.iucnredlist.org/details/170306/0">http://www.iucnredlist.org/details/170306/0</a>			
Standard clauses 1.3.2.1 - 1.3.2.4			



Table D2 - Productivity / Susceptibility attributes and scores.

Productivity attributes	Low productivity/ High risk	Medium productivity/ Medium risk	High productivity/ Low risk
	Score 3	Score 2	Score 1
Average age at maturity (years)	>4	2 to 4	<2
Average maximum age (years)	>30	10 to 30	<10
Fecundity (eggs/spawning)	<1 000	1 000 to 10 000	>10 000
Average maximum size (cm)	>150	60 to 150	<60
Average size at maturity (cm)	>150	30 to 150	<30
Reproductive strategy	Live bearer, mouth brooder or significant parental investment	Demersal spawner "berried"	Broadcast spawner
Mean trophic level	>3.25	2.5–3.25	<2.5

Susceptibility attributes		High susceptibility/ High risk	Medium susceptibility/ Medium risk	Low susceptibility/ Low risk
		Score 3	Score 2	Score 1
Availability	1) Overlap of adult species range with fishery	>50% of stock occurs in the area fished	Between 25% and 50% of the stock occurs in the area fished	<25% of stock occurs in the area fished
	2) Distribution	Only in the country/ fishery	Limited range in the region	Throughout region/ global distribution
Encounterability	1) Habitat	Habitat preference of species make it highly likely to encounter trawl gear (e.g. demersal, muddy/sandy bottom)	Habitat preference of species make it moderately likely to encounter trawl gear (e.g. rocky bottom/reefs)	Depth or distribution of species make it unlikely to encounter trawl gear (e.g. epi-pelagic or meso-pelagic)
	2) Depth range	High overlap with trawl fishing gear (20 to 60 m depth)	Medium overlap with trawl fishing gear (10 to 20 m depth)	Low overlap with trawl fishing gear (0 to 10 m, >70 m depth)
Selectivity		Species >2 times mesh size or up to 4 m length	Species 1 to 2 times mesh size or 4 to 5 m length	Species <mesh size or >5 m length
Post capture mortality		Most dead or retained Trawl tow >3 hours	Alive after net hauled Trawl tow 0.5 to 3 hours	Released alive Trawl tow <0.5 hours

**Note:** Availability 2 is only used when there is no information for Availability 1; the most conservative score between Encounterability 1 and 2 is used.

<b>D3</b>		<b>Average Susceptibility Score</b>		
		<b>1 - 1.75</b>	<b>1.76 - 2.24</b>	<b>2.25 - 3</b>
<b>Average Productivity Score</b>	<b>1 - 1.75</b>	PASS	PASS	PASS
	<b>1.76 - 2.24</b>	PASS	PASS	TABLE D4
	<b>2.25 - 3</b>	PASS	TABLE D4	TABLE D4

## FURTHER IMPACTS

The three clauses in this section relate to impacts the fishery may have in other areas. A fishery must meet the minimum requirements of all three clauses before it can be recommended for approval.

F1	Impacts on ETP Species - Minimum Requirements		
	F1.1	Interactions with ETP species are recorded.	Yes
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	Yes
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	Yes
Clause outcome:			Pass
<p><b>Evidence</b></p> <p>Government officials report that there is no ETP species bycatch in the fishery – the reliability of this statement is improved by the admission in the DAFF annual report that, for example, longline and demersal trawl fisheries catch significant numbers of vulnerable sharks. Landings are observed by government officials and so any landings of ETP species would be recorded; however due to low rates of observer coverage (around 8%), there is a possibility of ETP capture and disposal at sea. The main potential ETP impact of the fishery is indirect, via the removal of prey species for the African Penguin (<i>Spheniscus demersus</i>). St Croix Island near Port Elizabeth is home to the world's largest colony of African Penguins, which are categorised as Endangered by the IUCN Red List, and has been used as the basis for several studies into the potential impacts of the fishery on the species. A recent analysis by MARAM concluded that the current reference points may be appropriate in this regard.</p> <p>The status of the African penguin <i>Spheniscus demersus</i> remains an urgent concern and the population numbers are continuing to decline. The total size of the Cape penguin population was estimated to be just over 19 000 breeding pairs in 2015, approximately 37% of the number estimated in 2004 (DEA, unpublished data) and a small fraction of the number thought to exist at the start of the 20th century (DEA, 2013). There are a number of factors considered to be contributing to the decline in penguin abundance, one of which is that pelagic fishing in the vicinity of islands used by penguins for breeding could be having a negative impact on the breeding success of penguins. This possible impact is being examined through an experiment, initiated in 2008, that involves alternately opening and closing the areas around two pairs of islands, Robben and Dassen Islands on the West Coast and Bird and St Croix Islands on the south coast and testing to see whether there is a measureable difference in breeding success between those periods when an island is closed to fishing compared to when fishing is allowed in the vicinity.</p>			
<p><b>References</b></p> <p>DEA. 2013. Biodiversity management plan for the African penguin <i>Spheniscus demersus</i>. Government Gazette, 31 October 2013. <a href="http://www.gov.za/sites/www.gov.za/files/36966_gon824_0.pdf">http://www.gov.za/sites/www.gov.za/files/36966_gon824_0.pdf</a></p> <p>Oceana Sustainability Report 2016 <a href="http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF">http://oceana.co.za/pdf/JOB010973_Oceana_SDR.PDF</a></p>			
Standard clause 1.3.3.1			

F2	Impacts on Habitats - Minimum Requirements		
	F2.1	Potential habitat interactions are considered in the management decision-making process.	Yes

	F2.2	There is no substantial evidence that the fishery has a significant negative impact on seabed habitats.	Yes
	F2.3	If the fishery is known to interact with the seabed, there are measures in place to minimise and mitigate negative impacts.	NA
<b>Clause outcome:</b>			Pass
<b>Evidence</b> <p>Purse – seine gears are known to rarely interact with physical habitats. Pelagic trawls are fished in the water column and do not impact benthic habitats. As a result, it is not necessary that management decision making process consider potential interactions between the fishery and habitats.</p> <p>In addition, there is no substantial evidence that the fishery has a significant negative impact on seabed habitats meaning measures to mitigate such impacts are not required.</p>			
<b>References</b>			
<i>Standard clause 1.3.3.2</i>			

<b>F3</b>	<b>Ecosystem Impacts - Minimum Requirements</b>		
	F3.1	The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	Yes
	F3.2	There is no substantial evidence that the fishery has a significant negative impact on the ecosystem.	Yes
	F3.3	If one or more of the species identified during species categorisation plays a key role in the ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	Yes
<b>Clause outcome:</b>			Pass
<b>Evidence</b> <p>Pelagic fish occupy a key position in the marine food web where they are the link that transfers energy produced by plankton to large-bodied predatory fish, seabirds, and marine mammals. Because many animals and humans depend on forage fish, it is important to manage the fishery that targets them in a manner that accounts for their high degree of variability and importance to the ecosystem. This is so because of the potentially severe risks of local depletion of forage fish for dependent species such as seabirds, particularly in years of low fish abundance in certain areas.</p> <p>The Marine Living Resources Act, 1998 includes as one of its recognised principals “the need to apply precautionary approaches in respect of the management and development of marine living resources”. OMPs are aimed at quantifying risks and benefits of alternative short- and long-term management options, in terms that resource managers and decision-makers can understand and relate to. OMPs perform a risk analysis, which allows results to be expressed as the probability that a defined event will occur (e.g. the biomass falling below a specified threshold level or the fishery collapsing) within a fixed period. Commonly used risk statistics include the probability of depleting the (spawning-stock) biomass below some threshold or the median biomass expected at the end of the simulation period (compared with the biomass at the onset of this period. Incorporation of ecosystem considerations and the development of ecosystem-based management was first undertaken through the revised Operational Management Procedure (OMP-13). Currently OMP – 18 is under development. In revising the OMP,</p>			

additional performance statistics related to several ecosystem objectives under different harvest strategies will be evaluated, over and above those related to resource risk and average catch.

**References**

South Africa Marine Living Resources Act, 1998: [http://www.saflii.org/za/legis/consol\\_act/mlra1998256/](http://www.saflii.org/za/legis/consol_act/mlra1998256/)

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[http://webcms.uct.ac.za/sites/default/files/image\\_tool/images/302/pub/2016/FISHERIES\\_2016\\_DEC\\_SWG-PEL\\_80.pdf](http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/pub/2016/FISHERIES_2016_DEC_SWG-PEL_80.pdf)

*Standard clause 1.3.3.3*

## SOCIAL CRITERION

In addition to the scored criteria listed above, applicants must commit to ensuring that vessels operating in the fishery adhere to internationally recognised guidance on human rights. They must also commit to ensuring there is no use of enforced or unpaid labour in the fleet(s) operating upon the resource.

## Appendix A - Determining Resilience Ratings

The assessment of Category B species described in this assessment report template utilises a resilience rating system suggested by the American Fisheries Society. This approach was chosen because it is also used by FishBase, and so the resilience ratings for many thousands of species are freely available online. As described by FishBase, the following is the process used to arrive at the resilience ratings:

*“The American Fisheries Society (AFS) has suggested values for several biological parameters that allow classification of a fish population or species into categories of high, medium, low and very low resilience or productivity (Musick 1999). If no reliable estimate of  $r_m$  (see below) is available, the assignment is to the lowest category for which any of the available parameters fits. For each of these categories, AFS has suggested thresholds for decline over the longer of 10 years or three generations. If an observed decline measured in biomass or numbers of mature individuals exceeds the indicated threshold value, the population or species is considered vulnerable to extinction unless explicitly shown otherwise. If one sex strongly limits the reproductive capacity of the species or population, then only the decline in the limiting sex should be considered. We decided to restrict the automatic assignment of resilience categories in the Key Facts page to values of  $K$ ,  $t_m$  and  $t_{max}$  and those records of fecundity estimates that referred to minimum number of eggs or pups per female per year, assuming that these were equivalent to average fecundity at first maturity (Musick 1999). Note that many small fishes may spawn several times per year (we exclude these for the time being) and large live bearers such as the coelacanth may have gestation periods of more than one year (we corrected fecundity estimates for those cases reported in the literature). Also, we excluded resilience estimates based on  $r_m$  (see below) as we are not yet confident with the reliability of the current method for estimating  $r_m$ . If users have independent  $r_m$  or fecundity estimates, they can refer to Table 1 for using this information.”*

Parameter	High	Medium	Low	Very low
Threshold	0.99	0.95	0.85	0.70
$r_{max}$ (1/year)	> 0.5	0.16 - 0.50	0.05 - 0.15	< 0.05
$K$ (1/year)	> 0.3	0.16 - 0.30	0.05 - 0.15	< 0.05
Fecundity (1/year)	> 10,000	100 - 1000	10 - 100	< 10
$t_m$ (years)	< 1	2 - 4	5 - 10	> 10
$t_{max}$ (years)	1 - 3	4 - 10	11 - 30	> 30

[Taken from the FishBase manual, “Estimation of Life-History Key Facts”,  
<http://www.fishbase.us/manual/English/key%20facts.htm#resilience>]

## Appendix B – Background on the 5% catch rule

The proposed fishery assessment methodology uses a species categorisation approach to divide the catch in the assessment fishery into groups. These groups are:

- **Category A:** “Target” species with a species-specific management regime in place.
- **Category B:** “Target” species with no species-specific management regime in place.
- **Category C:** “Non-target” species with a species-specific management regime in place.
- **Category D:** “Non-target” species with no species-specific management regime in place

The distinction between 'target' and 'non-target' species is made to enable the assessment to consider the impact of the fishery on all the species caught regularly, without requiring a full assessment be conducted for each. Thus 'target' species are subjected to a more detailed assessment, while 'non-target' species are considered more briefly. For the purposes of the IFFO RS fishery assessment, 'target' and 'non-target' species are defined by their prevalence in the catch, by weight. Applicants must declare which species are considered 'target' species in the fishery, and the combined weight of these must be at least 95% of the annual catch. The remaining 5% can be made up of 'non-target' species. Note also that ETP species are considered separately, irrespective of their frequency of occurrence in the catch.

The proposed use of 5% as a limit for 'non-target' species is one area in which feedback is being sought via the public consultation. The decision to propose a value of 5% ensures consistency with other fishery assessment programmes, such as the MSC which uses 5% to distinguish between 'main' and 'minor' species (see MSC Standard, SA3.4 and GSA3.4.2); and Seafood Watch, which uses 5% when defining the 'main' species for the assessment (see Seafood Watch Standard, Criterion 2). The value is also consistent with the approach used in Version 1 of the IFFO RS Standard, in which up to 5% of the raw material could be comprised of 'unassessed' species.

**Comments on this proposition are welcomed along with any other feedback on the proposed approach.**