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Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0



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Fishery Under Assessment	South Africa EEZ Multi-Species Pelagic Purse Seine
Date	February 2020
Assessor	Jim Daly

Application details and summary of the assessment outcome				
Name: (Oceana) Lucky Star; Pioneer; West Point				
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 Ltd		
Assessor Name	Pier Reviewer	Assessment Days	Initial/Surveillance /Re-approval	Whole fish/ By-product
Jim Daly	Vito Romito	3	Re-approval	Whole fish
Assessment Period	2018-2019			

Scope Details	
Management Authority (Country/State)	South Africa: Department of Agriculture, Forestry and Fisheries (DAFF).
Main Species	Anchovy, Sardine, Round Herring, Horse Mackerel, Lanternfish, Chub Mackerel
Fishery Location	South Africa EEZ
Gear Type(s)	Purse seine
Outcome of Assessment	
Overall Outcome	PASS
Clauses Failed	NONE
Peer Review Evaluation	APPROVE
Recommendation	PASS

Assessment Determination

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 (MRM). The South African small pelagic fishery is managed using Operational Management Procedures (OMP's). Precautionary Upper Catch Limits (PUCL), TAC and TAB (by-catch) recommendations are considered by MRM on receipt of scientific advice. OMP-14 (finalised in Dec 2014) has been used to recommend TACs and TABs (by-catch) for the small pelagic fishery since 2015. A new OMP (OMP-18) was planned for adoption in December 2018.

Underpinning management is a core group of DAFF Scientists in the Small Pelagic Scientific Working Group (SPSWG). The principle objectives of the SPSWG are to coordinate annual stock assessments, provide recommendations on Total Allowable Catch (TAC) and revise the current OMP-14 to OMP-18. Future assessments should note how fishing mortality for the sardine fishery is the assessment area will be managed under the new OMP-18.

Three main species falling under the management regime are Anchovy (*Engraulis encrasicolus*), Sardine (*Sardinops sagax*) and Round herring (*Etrumeus whiteheadi*). These Low Trophic Level (LTL) species provide food for hake, snoek and migratory tuna in the assessment area. Anchovy and sardine generally account for most of the catch, the remainder being made up largely by round herring and juvenile horse mackerel *Trachurus Capensis*.

A joint anchovy-sardine OMP is needed because sardine and anchovy school together as juveniles, resulting in an unavoidable by-catch of juvenile sardine with the (mainly juvenile) anchovy catch during the first half of the year. Because the anchovy fishery is largely a recruit fishery, TAC's of anchovy and juvenile sardine bycatch allowance in the directed anchovy fishery are revised mid-year following completion of the recruitment survey in May/June.

Fishery dependent data collected for anchovy and mackerel include landed weight, species composition, catch location and date. Additionally, sampling is used to obtain length frequency data (1984-2015), age estimates, sex, maturity stage, and fish condition. Landings data for both are collected in the directed fisheries and in the components of the small pelagic fishery, targeting other pelagic species that capture anchovy and mackerel.

The agreed TAC for anchovy (2018) was 315, 242t for all rights holders. The final agreed TAC (directed fishery) for anchovy in 2019 was 347,860t with a final juvenile sardine by-catch allowance (TAB) of 9,400t. In accordance with OMP results, the directed adult sardine TAC in 2017 was 45,560t. The final juvenile sardine TAB for directed adult sardine fishing was 3,189t. In 2018 the respective TAC and TAB were 59,214t and 4,145t; in 2019 the respective quotas (TAC and TAB) were 12, 250t and 250t.

The main potential ETP impact of the pelagic fishery is indirect, via the removal of prey species for the African Penguin (*Spheniscus demersus*). St Croix Island near Port Elizabeth is home to the world's largest colony of African Penguins, 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. Government officials report no evidence of ETP species bycatch in the small pelagic fishery. TAC announcements for the pelagic fleet (2019) include a note to rights holders that Bird Island and Robben Island offshore waters are closed for fishing.

The pelagic industry (2019 fishery) should continue to take appropriate steps to attempt to keep the sardine by-catch as low as possible by avoiding areas where a relatively high proportion of sardine is found mixed with anchovy schools.

Anchovy, sardine, round herring (and other components of the small pelagic fishery listed in this report) within South Africa's EEZ have been identified as species of least concern (IUCN website accessed 11.09.19). No species is listed on the current CITES list of endangered or threatened fish species.

The assessment team recommends maintaining the approval of anchovy, sardine, round herring and other components of the small pelagic fishery listed in this report as whole fish material for the production of fishmeal and fish oil under the current IFO RS Standard v 2.0.

Peer Review Comments

The South African small pelagic fishery is managed using Operational Management Procedures (OMP's). Precautionary Upper Catch Limits (PUCL), TAC and TAB (by-catch) recommendations based on routine scientific advice.

The species have biomasses above limit reference points or are subject to very conservative removals.

ETP interactions are recorded, subject to an 8% rate of observer coverage to verify catch and bycatch recording. Habitat effects of the fishery are assumed to be negligible.

The Peer Reviewer agrees with the recommendation to maintain the approval of Anchovy, sardine and other components of the small pelagic fishery listed in this report as whole fish material for the production of fishmeal and fish oil under the current IFO RS Standard v 2.0.

Notes for On-site Auditor

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

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

Species-Specific Results

Category	Species	% landings	Outcome (Pass/Fail)	
Category A	Anchovy <i>Engraulis encrasicolus</i>	70	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS
Category A	Sardine <i>Sardinops sagax</i>	13	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS
Category B	Round herring <i>Etrumeus whiteheadi</i>	13	PASS	
Category C	Horse mackerel <i>Trachurus capensis</i>	2	PASS	
Category C	Lanternfish <i>Lampanyctudes hectoris</i>	1	PASS	
Category D	Chub mackerel <i>Scomber japonicus</i>	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** 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. Any species representing more than 0.1% of the annual catch 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 as follows:

- **Type 1 Species** can be considered the 'target' or 'main' species in the fishery. They make up the bulk of annual landings and are subjected to a detailed assessment.
- **Type 2 Species** can be considered the 'bycatch' or 'minor' species in the fishery. They make up a small proportion of the annual landings and are subjected to relatively high-level assessment.

Type 1 Species must represent 95% of the total annual catch. Type 2 Species may represent a maximum of 5% of the annual 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>	South Africa	70	DAFF	A
Sardine	<i>Sardinops sagax</i>	South Africa	13	DAFF	A
Round herring	<i>Etrumeus whiteheadi</i>	South Africa	13	DAFF	B
Horse mackerel	<i>Trachurus capensis</i>	South Africa	2	DAFF	C
Lanternfish	<i>Lampanyctodes hectoris</i>	South Africa	1	DAFF	C
Chub mackerel	<i>Scomber japonicus</i>	South Africa	1	No management regime	D

Ref on landings data (2017): Summary of the South African sardine resource and fishery: International Stock Assessment Workshop Cape Town (Nov 2018) MARAM/IWS/2018 pdf 22pp

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.

M1 Management Framework – Minimum Requirements			
M1	M1.1	There is an organisation responsible for managing the fishery	PASS
	M1.2	There is an organisation responsible for collecting data and assessing the fishery	PASS
	M1.3	Fishery management organisations are publically committed to sustainability	PASS
	M1.4	Fishery management organisations are legally empowered to take management actions	PASS
	M1.5	There is a consultation process through which fishery stakeholders are engaged in decision-making	PASS
	M1.6	The decision-making process is transparent, with processes and results publically available	PASS
Clause outcome:			PASS
Evidence:			
M1.1:			
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 Directorates of Offshore & 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) and the Chief Directorate of Monitoring, Control and Surveillance (encompassing the Directorates of Compliance, Fisheries Protection Vessels, and Monitoring and Surveillance).			

The South African small pelagic fishery is managed using an Operational Management Procedure (OMP-14). Underpinning the management is a core group of DAFF Scientists in the Small Pelagic Scientific Working Group (SPSWG). The principle objectives of the SPSWG are to coordinate annual stock assessments, provide recommendations on Total Allowable Catch (TAC) and revise the current OMP-14 to OMP-18. OMPs are typically updated every 4-5 years.

Three main species falling under the management regime are Anchovy (*Engraulis encrasicolus*), Sardine (*Sardinops sagax*) and Round herring (*Etrumeus whiteheadi*). These Low Trophic Level (LTL) species provide food for hake, snoek and migratory tuna. Meso-Pelagic Lantern (*Lampanyctodes hectoris*) and Light (*Maurolicus walvisensis*) fishes also provide feed for many demersal and pelagic feeding fish.

Precautionary Upper Catch Limits (PUCL), TAC and TAB (by-catch) recommendations are considered by the DAFF Chief Directorate: Marine Resource Management, considering factors such as legislation, socio-economics, the ecosystem approach to fisheries management (EAFM), and stock advice. Recommendations are then submitted to the decision maker (normally the Minister) in line with Departmental protocols. After signature by the Minister, quotas are allocated to the South African Rights Holders, proportionally, according to their share of the rights allocated. A DAFF fisheries manager dedicated to the small pelagic fishery meets with the industry frequently to prepare annual fishing plans and clarify fishing permit conditions.

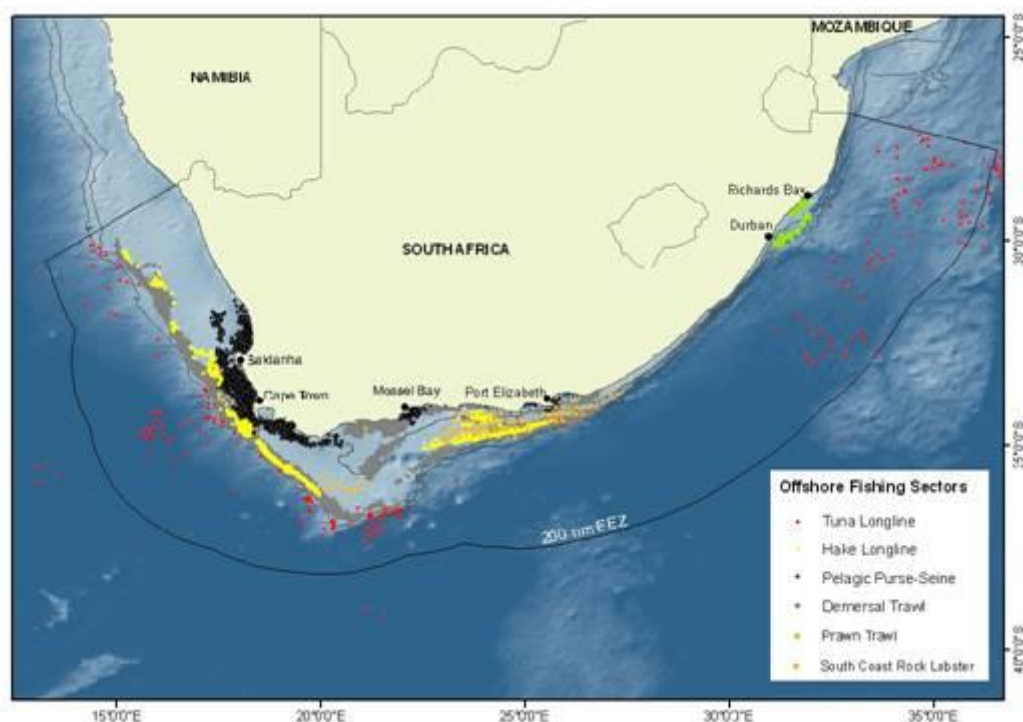


Figure 1: South Africa Offshore Fishing Sectors:

Pelagic fisheries (dark circles) are concentrated off the West and South Coasts **R1**

There is an organisation (s) responsible for managing the fishery .

R1-R5

M1.2:

DAFF Directorate of Resources Research undertakes work to promote the sustainable and optimal management of fisheries resources, and to provide scientific advice. Additional analytical and advisory support is provided by the Marine Resource Assessment and Management Group (MARAM) at the University of Cape Town. MARAM is primarily funded by DAFF and aims to provide a scientific basis for assessment and management of renewable marine resources. The MARAM group drafts OMP's (Operational Management Procedures) used as the basis for many management decisions in the small pelagic fishery. Underpinning management is a core group of DAFF Scientists in the Small Pelagic Scientific Working Group (SPSWG).

South Africa's National Research Foundation (NRF) is the intermediary agency between policies and strategies of the Government of South Africa and South Africa's research institutions.

There is an organisation (s) responsible for collecting data and assessing the fishery

R2; R4; R6

M1.3:

DAFF operations follow six Strategic Goals, each further broken down into Strategic Objectives (SO).

Strategic Goal 4: Sustainable use of natural resources in the sector is further defined as follows:

- *SO, 4.1 Ensure the conservation, protection, rehabilitation and recovery of depleted and degraded natural resources*
- *SO, 4.2 Ensure adaptation and mitigation to climate change through effective implementation of prescribed frameworks*

Fishery management organisations are publically committed to sustainability .

R7

M1.4:

The primary legal basis for fisheries management in South Africa is the Marine Living Resources Act (MLRA) 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 overarching objectives, including 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.

R8

M1.5:

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 quotas for the fishery after interpreting the outcome of an OMP.

Integral to the management process is the participation of the fishing industry, primarily through the small pelagic industrial body, the South African Pelagic Fishing Industry Association (SAPFIA).

Fishery management organisations are legally empowered to take management actions. There is a consultation process through which fishery stakeholders are engaged in decision-making.

R9-R10; R17

M1.6:

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 (Small Pelagic Scientific Working Group) 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 then considered by the DAFF Chief Directorate: Marine Resource Management, considering factors such as legislation, socio-economics, the ecosystem approach to fisheries management (EAF), and stock advice. Recommendations are 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 in advance of the fishing season.

Fishing Permit conditions, TAC's and TAB's, closed areas and other information are provided by the Government to industry and directly to rights holders and posted on the industry's website

The decision-making process is transparent, with processes and results publically available.

R6, R9-R10; R17

References p 47

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	PASS
	M2.2 There is a framework of sanctions which are applied when laws and regulations are discovered to have been broken	PASS
	M2.3 There is no substantial evidence of widespread non-compliance in the fishery, and no substantial evidence of IUU fishing	PASS
	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.	PASS
Clause outcome:		PASS
<p>Evidence:</p> <p>M2.1:</p> <p>Monitoring, control and surveillance is the responsibility of DAFF Chief Directorate Monitoring, Control & Surveillance (MCS) supplemented by Police, Navy and Customs. The area of responsibility (South Africa EEZ) stretches from Port Nolloth on the West Coast to Punto D'Oro on the East Coast approximately 3200km (Figure 1).</p> <p>All catches are inspected and weighed at off-loading points (designated ports) by monitors and/or fisheries inspectors, to ensure that Rights Holders remain within their quotas, that bycatch species do not exceed conservation limits and that no other gear restrictions have been exceeded. Scientific Fisheries observers accompany fishing vessels to sea on request (small pelagic permit condition), although the task of observers is data collection (catch of target and non-target species, and interactions with ETP species) instead of compliance monitoring. Skippers return logbooks of each trip, detailing fishing effort and catches and are obliged to report on the numbers of sea-bird fatalities and interactions with other ETP species.</p> <p>There is an organisation responsible for monitoring compliance with fishery laws and regulations.</p> <p>R11</p> <p>M2.2:</p> <p>A valid fishing license and safety registration certificate issued by the South African Maritime Safety Authority (SAMSA) is required before a fishing permit is issued. The permit holder is further obliged always to have available true certified copies of these documents on board the vessel. In-port-transhipments are allowed only under a strict set of conditions including the application for and issuance of a valid transhipment permit.</p> <p>Chapter 6 of the MLRA (1998) sets out law enforcement legislation. This includes empowering fishery control officers (FCO's) to enter and search any vessel or premises, and seize any property considered to be used in or related to an offence. Section 28 of the MLRA makes provision for sanctions if the holder of a right, licence or permit:</p> <ul style="list-style-type: none"> • Has furnished information in the application for that right, licence or permit, or has submitted any other information required in terms of this Act, which is not true or complete. • Contravenes or fails to comply with a condition imposed in the right, licence or permit. 		

- Contravenes or fails to comply with a provision of the Act.
- Is convicted of an offence in terms of the Act.
- Fails to effectively utilise that right, licence or permit.

Chapter 7 of the MLRA sets out the judicial components of fisheries management, including penalties for non-compliance. Breaches of Regulations are punishable by a fine of up to 2, 000, 000 Rand or imprisonment of up to five years. Contravention of international conservation or management measures or conditions imposed by a high seas fishing permit or licence is punishable by a fine of up to 3, 000, 000 Rand. 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 a framework of sanctions which are applied when laws and regulations are discovered to have been broken.

R10

M2.3:

South Africa ratified the FAO Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing in 2014. Transshipment-at-sea is prohibited for all authorised vessels in the South African fleet. In-port-transhipments are allowed for this fleet subject to a strict set of conditions, including the issuance of a valid transshipment permit; 72 hours pre-notification (foreign flagged vessels only) and the nomination of a designated port for transshipment.

The numbers of infringements and penalties issued (South African and Foreign flagged vessels) in each fishery may be available on written request from DAFF's MCS Chief Directorate. Non-compliances detected range from entering South Africa EEZ with gear on board without a valid EEZ permit, to failure to have a valid EEZ permit available for inspection.

During the 2017-2018 fishing season foreign flagged vessels were prosecuted for exceeding declared species weight (Blue shark *Prionace glauca*) and for illegal possession of shark fins (various sp.). Fines were levied where convictions were successful. An observer programme is in place for the large pelagic fishery.

There is no substantial evidence of widespread non-compliance in the mesopelagic fishery, and no substantial evidence of IUU fishing. DAFF have a zero tolerance to IUU; internal audits are undertaken to ensure compliance.

R11-R12

M2.4:

South Africa is in the process of improving its Vessel Monitoring Systems (VMS), which should bring about a more stringent monitoring and surveillance regime by applying the most advanced VMS technologies. VMS operated by DAFF is mandatory for all South African flagged vessels and has been in operation since 1998. Currently 22 commercial fisheries, Marine Protected Areas (MPA's) and MSC Certified Fisheries are managed by the VMS Department, in addition to its RFMO Obligations.

The VMS system tracks these vessels within South Africa's EEZ, ensuring no South African flagged vessel undertakes fishing operations within Marine Protected Areas (MPA) or undertakes illegal transshipments at sea. Fishing permit conditions outline requirements for the installation and operation of a VMS unit and actions to be undertaken by the Rights Holder in the event of a systems failure of the VMS unit at sea.

Inspections of vessels at sea are logged, together with records of infractions and boarding data. As well as remote surveillance (VMS) and monitoring at sea by patrol vessels, DAFF inspectors (Fisheries Control Officers) inspect landings when catches are discharged, and audit catch, landings and processing records for the fishery to ensure compliance with effort (quota) controls.

Compliance with laws and regulations is actively monitored, through a regime which may include at-sea and portside inspections, observer programmes, and VMS.

R11

References p47

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>
A1	Data Collection - Minimum Requirements		
	A1.1	Landings data are collected such that the fishery-wide removals of this species are known.	PASS
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	PASS
Clause outcome:			PASS

Evidence

A1.1:

The latest stock assessment (anchovy and sardine) was undertaken in 2016. Fishery dependent data collected includes landed weight, species composition, catch location and date. Additionally, sampling is used to obtain length frequency data (1984-2015), 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 (Figure 2):

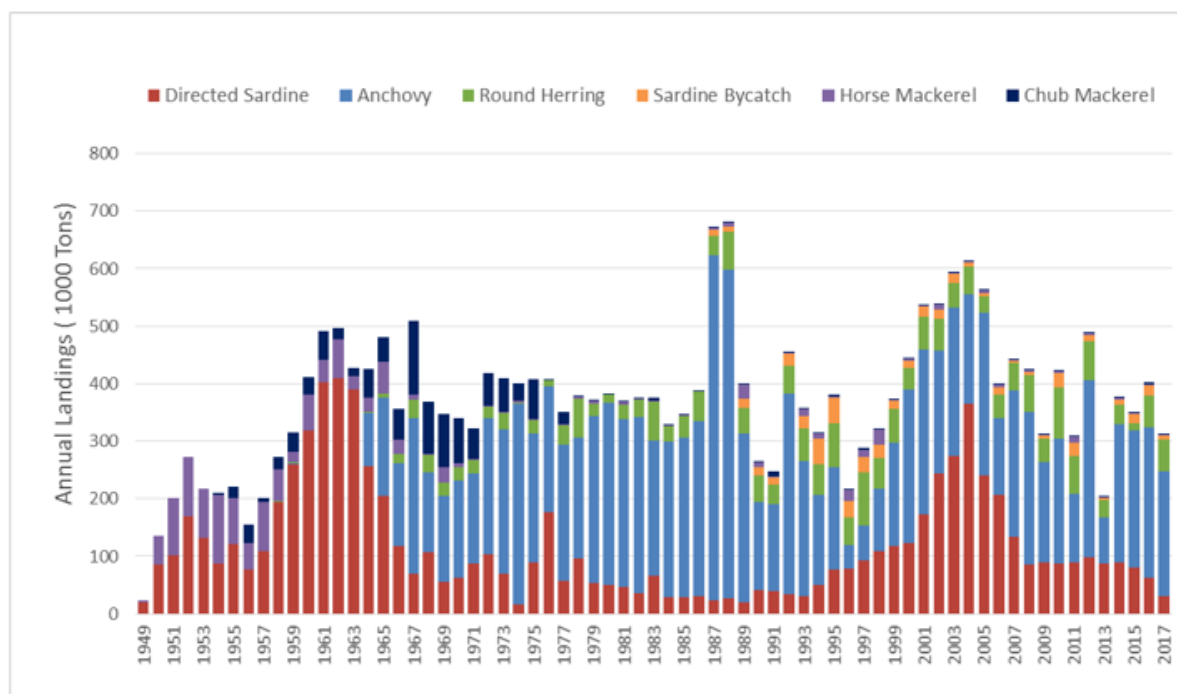


Figure 2: Annual landings of sardine and other small pelagic fish by the South African purse-seine fishery since 1949. **R19**

Landings data are collected such that the fishery-wide removals of this species are known.

R13

A1.2:

Biomass and distribution of anchovy and other schooling pelagic and meso-pelagic fish are assessed biannually using hydro-acoustic surveys based on a random stratified sampling design. These

surveys, conducted without interruption (apart from the recruit survey of 2018) since 1984, comprise a summer biomass survey and a winter recruit survey. Biomass estimates obtained from these surveys form the basis for recommendations of annual total allowable catches of anchovy and sardine. Surveys cover the entire area of the South African continental shelf (Figure 1). Sampling effort during recruit surveys is concentrated mainly on the inshore areas of the shelf, biomass surveys extend westward and northward to the Namibian Border.

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 enough frequency and accuracy to enable informed management of the fishery.

The full set of data available as inputs into the sardine (and anchovy) assessments are described in detail:

- Commercial Catch Data: Monthly catch length frequencies are constructed for landings. From 1987 onwards, these are available by area (east and west of Cape Agulhas). The sardine bycatch with anchovy (or 'small' <14cm sardine bycatch) is used separately in the assessment to the directed sardine catch and sardine bycatch with round herring.
- Survey biomass estimates and weighted length frequencies: Time series of total biomass estimates and associated CVs from acoustic surveys (1984 - 2016) in November each year. Length frequencies (scaled to total biomass) are also available. Time series of recruit biomass and associated CVs from the May/June recruit surveys (1985-2017).

Additional surveys and analyses are conducted as deemed necessary, such as to determine aggregation rates, to measure the impacts of the fishery on penguin abundance, and to determine reasons for the substantial under-utilisation of the anchovy TAC in recent years.

Sufficient additional information is collected to enable an indication of stock status to be estimated.

R13-R15

References p47

Standard clause 1.3.2.1.1

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.	PASS
A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	PASS
A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	PASS
A2.4	The assessment is subject to internal or external peer review.	PASS
A2.5	The assessment is made publically available.	PASS
Clause outcome:		PASS
<p>Evidence</p> <p>A2.1:</p> <p>In addition to landings records, biomass and distribution of anchovy has been assessed biannually via hydro-acoustic surveys, conducted uninterrupted (apart from the recruit survey of 2018) since 1984. These surveys also collect a range of other data required for the Operational Management Procedure (OMP). Biomass estimates obtained from these surveys form the basis for recommendations of annual total allowable catches of anchovy and sardine. Surveys cover the entire area of the South African continental shelf (Figure 1). The latest stock assessment (anchovy and sardine) was undertaken in 2016. Sampling effort during recruit surveys is concentrated mainly on the inshore areas of the shelf, biomass surveys extend westward and northward to the Namibian Border. Annual Fisheries Stock Assessment Review Workshops have been published on MARAM's website since 2004 (website accessed 09.09.19). A stock assessment is conducted at least once every 3 years. The 2019 assessment has not yet been published on MARAM's website (accessed 25.10.19).</p> <p>R16</p> <p>A2.2:</p> <p>OMP-14 does not include explicit limit reference points, although where anchovy biomass is estimated to be below 600,000t 'Exceptional Circumstances' are invoked and the TAC substantially reduced. OMP-14 includes a list of constraints to the TAC calculation process, one of which states that the 'Minimum anchovy annual TAC' is 120,000t.</p> <p>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. An SSB of 150,000t is therefore used as an informal limit reference point.</p> <p>A joint anchovy-sardine OMP is needed because sardine and anchovy school together as juveniles, resulting in an unavoidable by-catch of juvenile sardine with the (mainly juvenile) anchovy catch during the first half of the year. Because the anchovy fishery is largely a recruit fishery, TAC's of anchovy and juvenile sardine bycatch allowance are revised in mid-year following completion of the recruitment survey in May/June.</p>		

Constraints to the directed fishery for anchovy (OMP-14) include an annual maximum directed fishery TAC of 450,000t and a two-tier threshold for the directed fishery of 330,000t. If the previous year's TAC is

below this 'two-tier' threshold, then the TAC is subject to a maximum percentage decrease from the previous year's TAC. The maximum proportion by which the directed fishery for anchovy can be reduced annually is 25%. OMP's are reviewed every 4 or 5 years. The current OMP was valid up to the 2018 fishery.

The implications of the sardine resource consisting of two components with differential exploitation levels, rather than a single 'fully mixed' stock, has been investigated in the development of a new OMP (OMP-18) planned for adoption in December 2018. OMP-14 was used to establish TAC's for the 2018 fishery. OMP-18 is now in the process of implementation.

Assessments provide an estimate of the status of the biological stock relative to a reference point or proxy.

R3

A2.3:

The anchovy TAC is based on the relationship between November biomass estimates 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 results of the May acoustic cruises. 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.

The November 2016 survey biomass estimate was 1,733,040 t; the June 2017 recruitment estimate 830.201 billion individuals. This resulted in a final anchovy TAC (2017) of 450,000t. Exceptional circumstances did not apply. Anchovy biomass (Dec 2018 survey) was estimated at around 1.56 million tonnes, virtually the same as that estimated in 2017 and below the long term (1984-2017) average of 2.24 million tonnes.

The TAC for anchovy (2018) was set at 315,242t for all rights holders. The final agreed TAC (directed fishery) in 2019 was 347,860t with a final juvenile sardine by-catch allowance (TAB) of 9,400t.

The assessment provides an indication of the volume of fishery removals appropriate for the current stock status.

R3, R5

A.2.4:

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 (e.g. South African Pelagic Fishing Industry Association) decide on a TAC level for the fishery after interpreting the outcome of an OMP.

Annual Stock Assessment Workshops (funded by the NRF and DAFF) include invited overseas scientists.

The assessment is subject to internal or external peer review.

R4-R5; R9; R17

A2.5:

All stock assessments and paper are publicly available on MARAM's website. Agreed quotas and rules on Total Allowable Bycatch are available on South African Pelagic Fishing Industry Association's (SAPFIA) website.

The assessment is made publically available

R4-R5; R9

References p47

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

A3	Harvest Strategy - Minimum Requirements		
	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	PASS
	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.	PASS
	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).	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>A 3.1:</p> <p>Total removals are limited using a quota system, with Total Allowable Catch (TAC) and Total Allowable Bycatch (TAB) of anchovy defined according to the OMP in force. The MLRA empowers the Minister to apportion the TAC between rights holders, regions, components of the fishery, and however else is deemed necessary.</p> <p>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 (for the 2018 quota OMP-14 is used) and calculated by subsequent initial and mid-season MARAM recommendation papers.</p> <p>There is a mechanism in place by which total fishing mortality of this species is restricted.</p> <p>R2; R5; R10; R15</p> <p>A3.2:</p> <p>In recent years there has been a substantial under-catch of anchovy, with total landings considerably below the TAC (Figure 3):</p>			

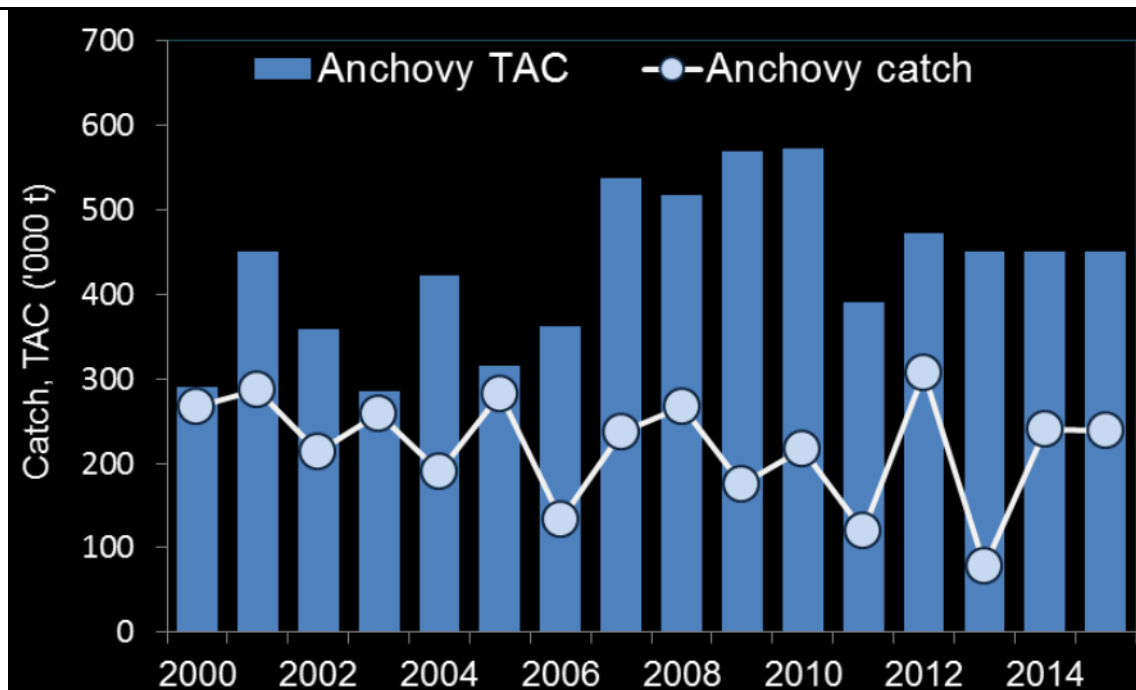


Figure 3: Anchovy TAC and Anchovy catch 2000-2015. **R18**

Pelagic rights holders appear to be finding it difficult to catch their annual allocations, an issue which has had some examination by government researchers. Several 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.

Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment.

R18

A3.3:

All catches are inspected and weighed at off-loading points (designated ports) by monitors and/or fisheries inspectors, to ensure that Rights Holders remain within their quotas, that bycatch species do not exceed conservation limits and that no other gear restrictions have been exceeded. Scientific Fisheries observers accompany fishing vessels to sea on request (small pelagic permit condition), although the task of observers is data collection (catch of target and non-target species, and interactions with ETP species) instead of compliance monitoring.

Skippers return logbooks of each trip, detailing fishing effort and catches and are obliged to report on the numbers of sea-bird fatalities and gear interactions with other ETP species.

Constraints to the directed fishery for anchovy (OMP-14) include an annual maximum directed fishery TAC of 450,000t and a two-tier threshold for the directed fishery of 330,000t. If the previous year's TAC is below this 'two-tier' threshold, then the TAC is subject to a maximum percentage decrease from the previous year's TAC. The maximum proportion by which the directed fishery for anchovy

can be reduced annually is 25%. OMP' s are reviewed every 4 or 5 years. The current OMP expires after the 2018 fishery.

Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy.

R3, R11, R16, R18

References p47

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements		
	A4.1	<p>The stock is at or above the target reference point, OR IF NOT:</p> <p>The stock is 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 IF NOT:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p>	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>A 4.1:</p> <p>The November 2016 survey biomass estimate was 1,733,040 t; the June 2017 recruitment estimate 830.201 billion individuals. This resulted in a final anchovy TAC (2017) of 450,000t. Exceptional circumstances did not apply. Anchovy biomass (Dec 2018 survey) was estimated at around 1.56 million tonnes, virtually the same as that estimated in 2017 and below the long term (1984-2017) average of 2.24 million tonnes. The TAC for anchovy (2018) was set at 315, 242t for all rights holders. The final agreed TAC (directed fishery) in 2019 was 347,860t with a final juvenile sardine by-catch allowance (TAB) of 9,400t.</p> <p>The stock is at or above the target reference point.</p> <p>R3, R5</p>			
References p47			
<i>Standard clause 1.3.2.1.4</i>			

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.	PASS
	A1.2	Sufficient additional information is collected to enable an indication of stock status to be estimated.	PASS
Clause outcome:			PASS
<p>Evidence</p> <p>A1.1-A1.2:</p> <p>Fishery dependent data collected includes 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. Monthly catch length frequencies are constructed for the sardine landings. From 1987 onwards, monthly catch length frequencies are available by area (east and west of Cape Agulhas, Figure 1).</p> <p>The sardine bycatch with anchovy (or 'small' <14cm sardine bycatch) is used separately in the assessment to directed sardine catch and sardine bycatch with round herring.</p> <p>Biomass and distribution of sardine is assessed biannually via hydro-acoustic surveys, conducted without interruption (apart from the recruit survey of 2018) since 1984. These surveys also collect a range of other data required for the OMP (Figures 4,5).</p> <p>Observers have been deployed on vessels in the fishery since 1999. Observer coverage is estimated to be around 8% by number of trips covered. Observer data is used to validate other data sources, 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>			

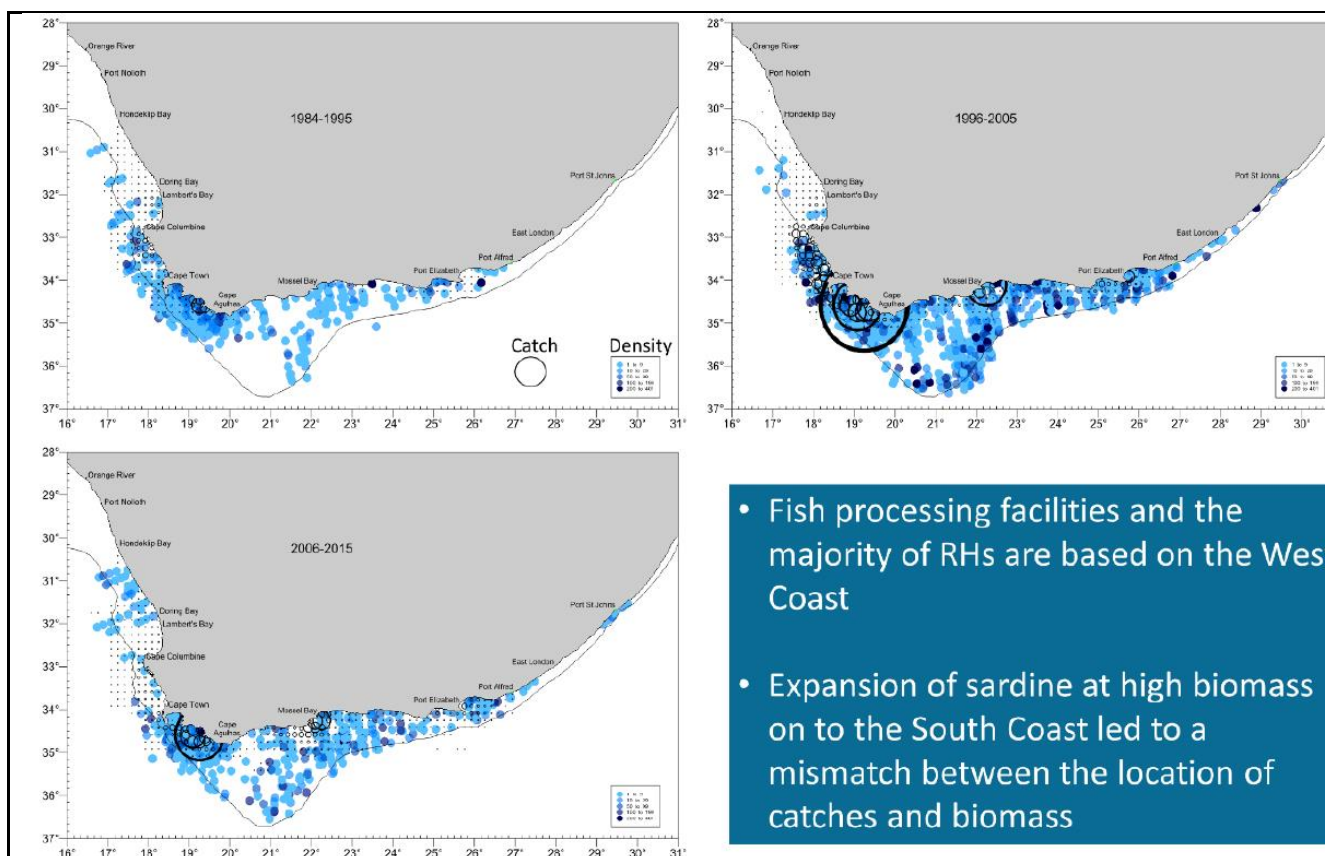


Figure 4 Composite maps of sardine catches (open circles, proportional size) and sardine density from hydro-acoustic surveys (dots) for three 10-year periods. **R13**

The single stock hypothesis uses abundance indices and proportion-at-length data for the whole west-south coast combined and excludes the parasite data used to inform mixing between the components in the two mixing-components hypotheses.

Spawner biomass is calculated assuming a maturity-at-length ogive which changes over time, using weight-at-length. The trawl survey selectivity-at-length is assumed to be logistic (hence allowing for some escapement of small fish). The estimated component-specific commercial selectivity-at-length curve is described by a logistic distribution at greater lengths. Time-varying commercial selectivity is assumed, with selectivity varying by quarter and between four pre-specified periods (1984-1986, 1987-1997, 1998-2001, 2002-2015).

During the November 2018 acoustic assessment 1,500t of sardine was found in a low-density patch off Saldanha. A higher density concentration of sardine was detected in False Bay. A smaller patch of sardine, though small in average size (12 cm caudal length) was found off Quoin Point. A further high-density patch of sardine was found inshore off Cape Agulhas.

Very few sardines were detected offshore except off Port Elizabeth. The relatively high densities of sardine found in Algoa Bay during the 2017 biomass survey were absent in that area during 2018. A small patch of sardine was found off Port St Johns, but this only amounted to some 12, 000 tonnes:

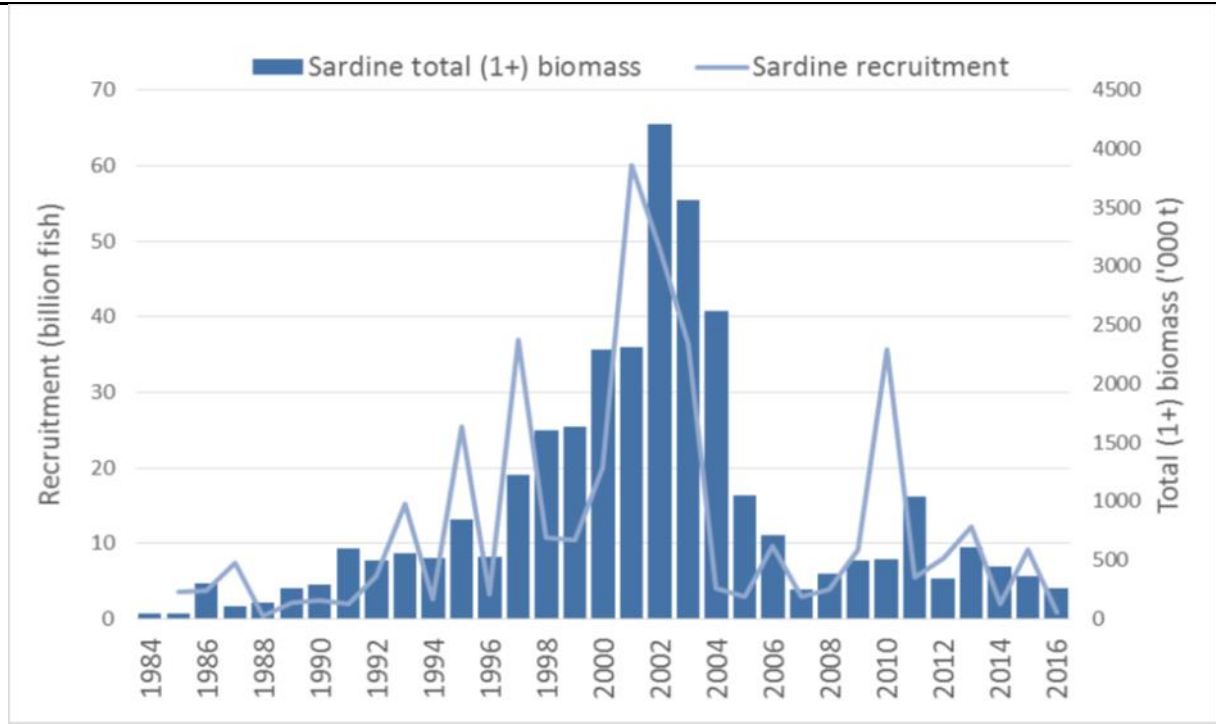


Figure 5: Sardine biomass and recruitment time-series (1984-2016) **R20**

Landings data are collected such that the fishery-wide removals of this species are known. Sufficient additional information is collected to enable an indication of stock status to be estimated.

R13, R15

References p47

Standard clause 1.3.2.1.1

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.	PASS
	A2.2	The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.	PASS
	A2.3	The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status.	PASS
	A2.4	The assessment is subject to internal or external peer review.	PASS
	A2.5	The assessment is made publically available.	PASS
Clause outcome:			PASS
Evidence			
A2.1:			
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. Monthly catch length frequencies are constructed for the sardine landings. From 1987 onwards, monthly catch length frequencies are available by area (east and west of Cape Agulhas). The sardine bycatch with anchovy ('small' <14cm sardine bycatch) is used separately in the assessment to the directed sardine catch and sardine bycatch with round herring.			
Biomass and distribution of sardine is assessed biannually via hydro-acoustic surveys, which have been conducted without interruption (apart from the recruit survey of 2018) since 1984. These surveys also collect a range of other data required for the Operational Management Procedure (OMP).			
A stock assessment is conducted at least once every 3 years.			
R13			
A2.2:			
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 was published by MARAM during their latest assessment (Figure 6):			

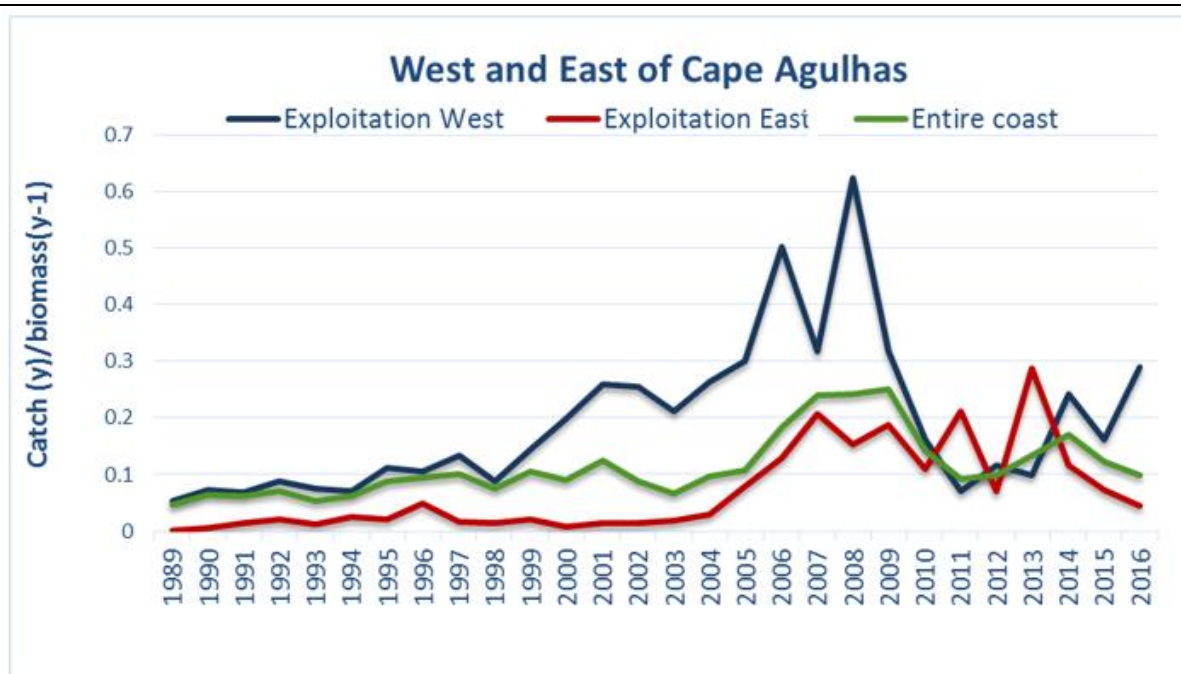


Figure 6: Harvest proportion (catch in current year/model predicted biomass in previous year) for the area to the west of Cape Agulhas, East of Cape Agulhas and for the entire coast. **R13**

Since the start of the acoustic survey program estimates of total biomass and recruitment are available (Figures 5,7):

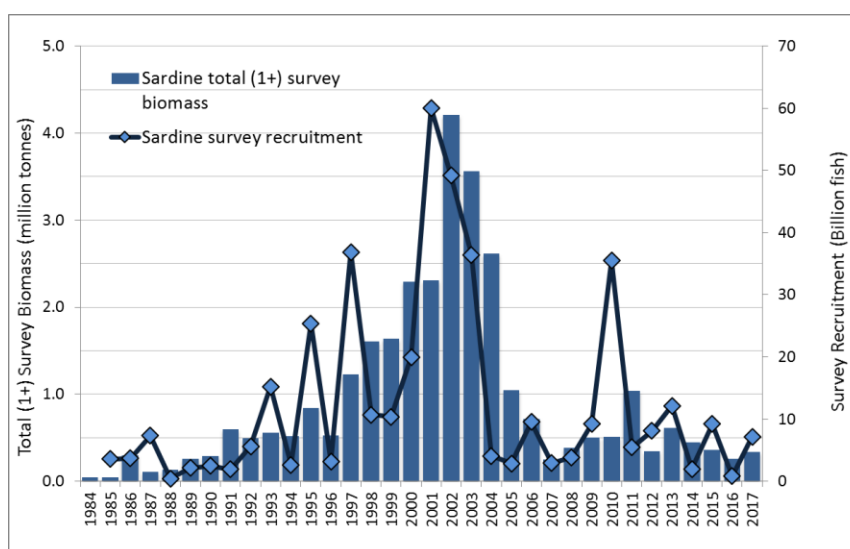


Figure 7: Time-series of acoustic survey estimates of total sardine biomass in October/November (bars) and recruitment in May/June (lines) since the start of the acoustic survey program. **R13, R20**

OMP-14 does not include explicit limit reference points. Should sardine biomass (November survey biomass threshold) at which Exceptional Circumstances are invoked for sardine fall below 300,000t the TAC is substantially reduced.

A period of prolonged poor (or below average) recruitment since 2004 has led to a decline in the adult sardine biomass to below 500,000t in most years since 2007, and to recent lows of 258,000 t in 2016, 334, 800 in 2017 and 90,768t total biomass in 2018 (Figure 7).

The assessment provides an estimate of the status of the biological stock relative to a reference point or proxy.

R13, R15

A2.3:

The directed sardine TAC is set at a proportion of the previous year's November 1+ biomass index of abundance, but subject to the constraints of a minimum and a maximum value. If the previous year's TAC is below the 'two-tier' threshold, then the TAC is subject to a maximum percentage decrease from the previous year's TAC. If it is above this threshold, any reduction in TAC is limited only by a lower bound of the corresponding threshold less the maximum percentage decrease. If the previous year's November 1+ biomass index of abundance is below a "buffer" threshold, only a portion of the TAC is given as an initial TAC.

Sardine recruitment estimate (June 2017) was 7.156 billion recruits (Figure 7). The average annual recruitment since surveys began in 1985 is 13 billion fish. Low 2016 and 2017 estimates are cause for considerable concern. In accordance with OMP results, the directed adult sardine TAC was decreased by a few hundred tonnes from the initial TAC to a final allowable catch (2017) of 45,560t. The final juvenile sardine TAB for directed adult sardine fishing was also reduced to 3,189t. In 2018 the respective TAC and TAB were 59,214t and 4,145t and in 2019 12, 250t and 250t.

The current low sardine TACs are insufficient for profitable operation of the major canning facilities and the bulk of canned sardine products currently produced in South Africa contain sardine that are sourced from Morocco and elsewhere.

Assessments provide an indication of the volume of fishery removals appropriate for current stock status.

R13, R15, R18, R20

A.2.4:

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 (e.g. South African Pelagic Fishing Industry Association) decide on a TAC level for the fishery after interpreting the outcome of an OMP. OMP-14 is used to recommend catch and bycatch limits for 2015 to 2018, unless refined in the interim. Annual Stock Assessment Workshops (funded by the NRF and DAFF) include invited overseas scientists.

R4-R5; R9; R17

A2.5:

All stock assessments and papers are publicly available on MARAM's website. Agreed quotas and rules on Total Allowable Catch and Bycatch are available on South African Pelagic Fishing Industry Association's (SAPFIA) website.

R4-R5; R9; R17

References p48

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

A3 Harvest Strategy - Minimum Requirements			
A3	A3.1	There is a mechanism in place by which total fishing mortality of this species is restricted.	PASS
	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.	PASS
	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).	PASS
Clause outcome:			PASS

Evidence

A 3.1 – A3.2

The final directed Sardine TAC (2019) was agreed at 12, 250t; the final juvenile sardine by-catch allowance (associated with anchovy directed catches, 2019 fishery) was agreed at 250t.

The directed sardine catches, and associated TAC have been recorded from 2001-2018 (Figure 8):

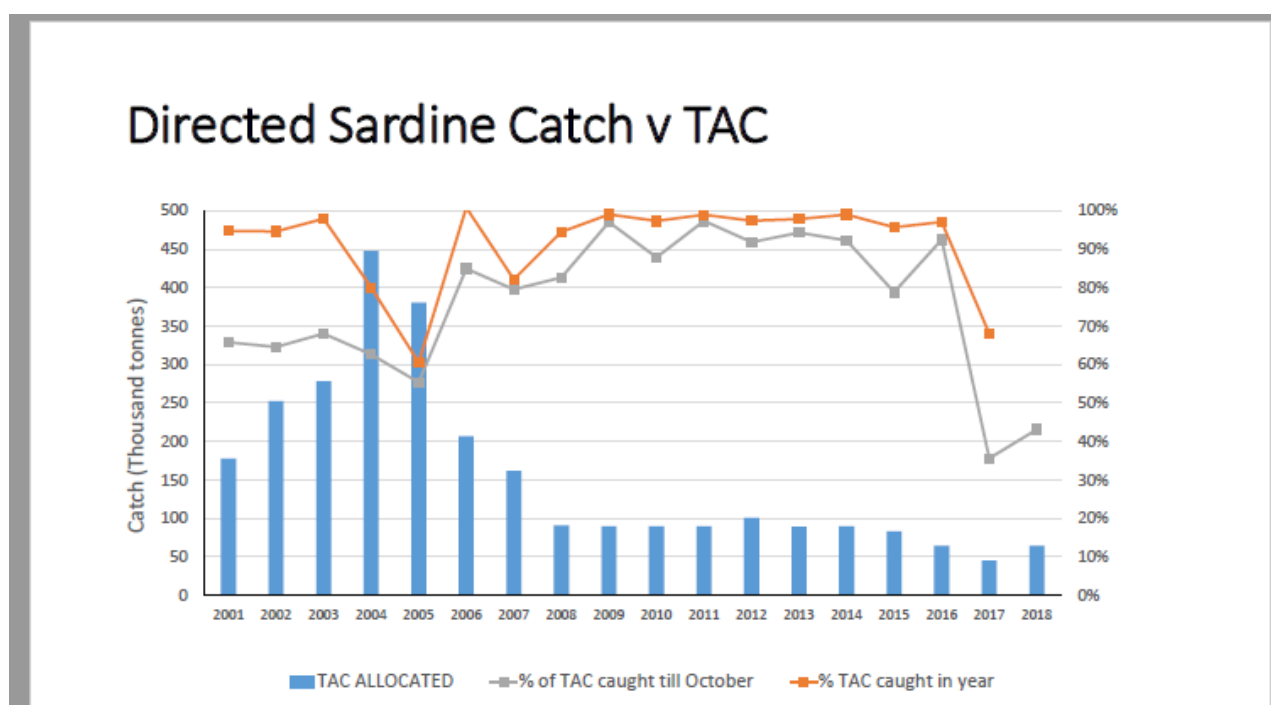


Figure 8: Directed sardine catch v TAC (2001-2018) **R19**

Slightly less than 70% of the annual sardine quota was taken up in 2017; 2018 data (up to October 2018) showed that approximately 45% of the quota was caught.

An example of a future harvest control rule for sardine was presented during a MARAM workshop (Nov 2018):

Example Directed Sardine HCR

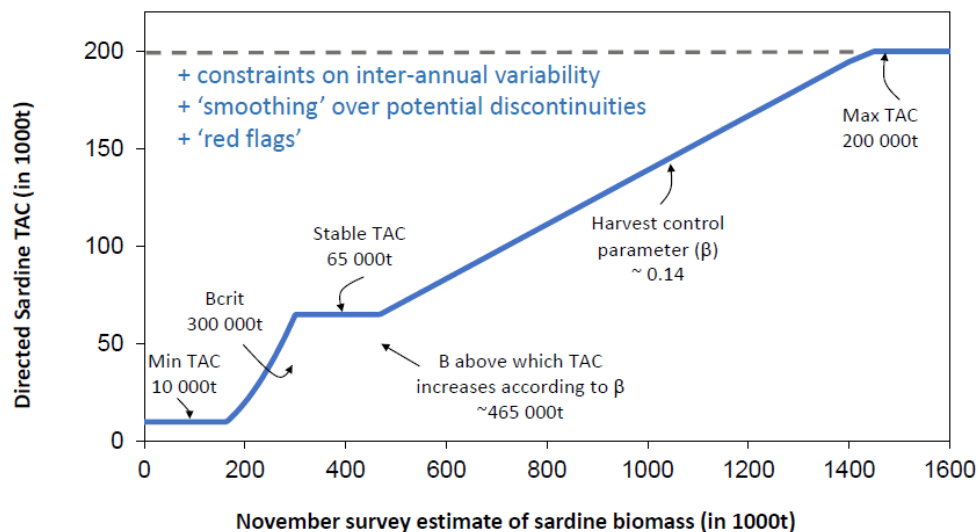


Figure 9: Examples of a directed HCR for sardine **R19**

A new OMP is being developed. Future assessments should note how fishing mortality for the sardine fishery is the assessment area will be managed.

There is a mechanism in place by which total fishing mortality of this species is restricted. Total fishery removals of this species do not regularly exceed the level indicated or stated in the stock assessment

R3; R19

A3.3:

OMP-14 includes a list of constraints to the TAC calculation process, one of which states that the 'Minimum directed sardine TAC' is 90,000t. However, details of the mathematical model indicate that where the November biomass estimate is below 25% of the ExceptionalCircumstances 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.

Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy.

R3, R19

References p48

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements		
	A4.1	<p>The stock is at or above the target reference point, OR IF NOT:</p> <p>The stock is 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 IF NOT:</p> <p>The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.</p>	PASS
Clause outcome:			PASS
<p>Evidence:</p> <p>A4.1:</p> <p>Sardine biomass (November 2016) was estimated at approximately 258,575 tonnes (about 100,000 tonnes less than the biomass estimate in November 2015. Low 2016 and 2017 estimates are cause for considerable concern. The average annual recruitment since surveys began in 1985 is 13 billion fish. Exceptional circumstances are invoked for when sardine biomass falls below 300,000t.</p> <p>Sardine recruitment estimate (June 2017) was 7.156 billion recruits (Figure 7). The average annual recruitment since surveys began in 1985 is 13 billion fish. Low 2016 and 2017 estimates are cause for considerable concern. In accordance with OMP results, the directed adult sardine TAC was decreased by a few hundred tonnes from the initial TAC to a final allowable catch (2017) of 45,560t. The final juvenile sardine TAB for directed adult sardine fishing was also reduced to 3,189t. In 2018 the respective TAC and TAB were 59,214t and 4,145t and in 2019 12, 250t and 250t.</p> <p>When issuing the final recommendations DAFF reported concern at the 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 were also requested to spread their fishing effort for sardine over both south and west coasts.</p> <p>The sardine stock is estimated to be below limit reference point or proxy, but fishery removals are prohibited.</p> <p>R3, R16, R19</p>			
References p48			
<i>Standard clause 1.3.2.1.4</i>			

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

Biomass is above MSY/target reference point	Pass	Pass	Pass	Fail	Fail
Biomass is below MSY/target reference point, but above limit reference point	Pass, but re-assess when fishery removals resume	Pass	Fail	Fail	Fail
Biomass is below limit reference point (stock is overfished)	Pass, but re-assess when fishery removals resume	Fail	Fail	Fail	Fail
Biomass is significantly below limit reference point (Recruitment impaired)	Fail	Fail	Fail	Fail	Fail
	Fishery removals are prohibited	Fishing mortality is below MSY or target reference point	Fishing mortality is around MSY or target reference point, or below the long-term average	Fishing mortality is above the MSY or target reference point, or around the long-term average	Fishing mortality is above the limit reference point or above the long-term average (Stock is subject to overfishing)

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_{av} = long-term average biomass; F = current fishing mortality; F_{av} = long-term average fishing mortality.

B > B_{av} and F < F_{av}	Pass	Pass	Pass	Fail
B > B_{av} and F or F_{av} unknown	Pass	Pass	Fail	Fail
B = B_{av} and F < F_{av}	Pass	Pass	Fail	Fail
B = B_{av} and F or F_{av} unknown	Pass	Fail	Fail	Fail
B > B_{av} and F > F_{av}	Pass	Fail	Fail	Fail
B < B_{av}	Fail	Fail	Fail	Fail
B unknown	Fail	Fail	Fail	Fail
Resilience	High	Medium	Low	Very Low

Assessment Results

Species Name		Round herring <i>Etrumeus whiteheadi</i>
B1	Species Name	<i>Etrumeus whiteheadi</i>
	Table used (Ba, Bb)	Bb
	Outcome	PASS
<p>Evidence:</p> <p>The targeted redeye fishery is still considered underdeveloped, information on the species is comparatively limited. However, landings data are recorded, and total catch monitored and used to ensure targeted fishing does not exceed the precautionary upper catch limit (PUCL, currently 100,000t.).</p> <p>Biomass and distribution of round herring are assessed biannually using hydro-acoustic surveys based on a random stratified sampling design (Table 6 Column 6 Redeye 1984-2018):</p>		

Table 1: November acoustic estimates of biomass (000 tonnes) and associated CV measured since 1984 up to Port Alfred. **R15**

Year	Anchovy	CV	Sardine	CV	Redeye	CV
1984	1 554	0.254	48	0.972	82	0.336
1985	1 366	0.183	45	0.449	257	0.224
1986	2 569	0.148	300	0.696	344	0.297
1987	2 109	0.132	111	0.402	545	0.197
1988	1 607	0.204	134	0.715	377	0.318
1989	752	0.143	257	0.225	836	0.254
1990	652	0.167	290	0.276	441	0.171
1991	2 328	0.140	598	0.308	625	0.242
1992	2 088	0.140	494	0.488	715	0.160
1993	916	0.190	560	0.316	521	0.216
1994	617	0.136	518	0.280	283	0.208
1995	601	0.192	844	0.515	571	0.132
1996	162	0.391	529	0.359	576	0.145
1997	1 483	0.267	1 225	0.244	591	0.280
1998	1 229	0.217	1 607	0.251	1 248	0.149
1999	2 052	0.156	1 635	0.212	1 398	0.171
2000	4 654	0.125	2 292	0.500	1 420	0.169
2001	6 720	0.107	2 310	0.142	1 046	0.131
2002	3 868	0.154	4 206	0.227	918	0.189
2003	3 563	0.236	3 564	0.197	1 762	0.108
2004	2 045	0.131	2 616	0.334	1 475	0.100
2005	3 077	0.144	1 049	0.300	1 616	0.130
2006	2 106	0.136	713	0.346	1 228	0.106
2007	2 508	0.157	257	0.345	1 721	0.153
2008	3 706	0.120	384	0.422	1 260	0.118
2009	3 793	0.136	502	0.271	1 991	0.108
2010	2 077	0.144	508	0.235	1 115	0.134
2011	754	0.204	1 037	0.235	1 961	0.101
2012	3 187	0.116	345	0.344	795	0.145
2013	3 820	0.102	612	0.346	959	0.129
2014	2 971	0.137	445	0.291	1 429	0.178
2015	1 944	0.157	363	0.297	1 315	0.136
2016	1 733	0.227	259	0.352	1 419	0.191
2017	1 568	0.196	334	0.449	1 101	0.169
2018	1 560	0.235	91	0.502	1 407	0.147

The round herring resource in South African waters is currently believed to be under-utilised at present, attempts at greater exploitation have been encouraged. The PUCL is set at around 10% of estimated biomass, if landings remain below the PUCL (which they have to date Table 1), the exploitation rate remains low. The PUCL decreases linearly if the November survey biomass is less than 750, 000t.

The 2018 November biomass survey results for red-eye herring was 1,406,888t considerably higher than the estimated long-term average of about 967,000t. The 2019 TAC (targeted fishery when rights holder in possession of anchovy or sardine permits) was agreed at 100,000t.:

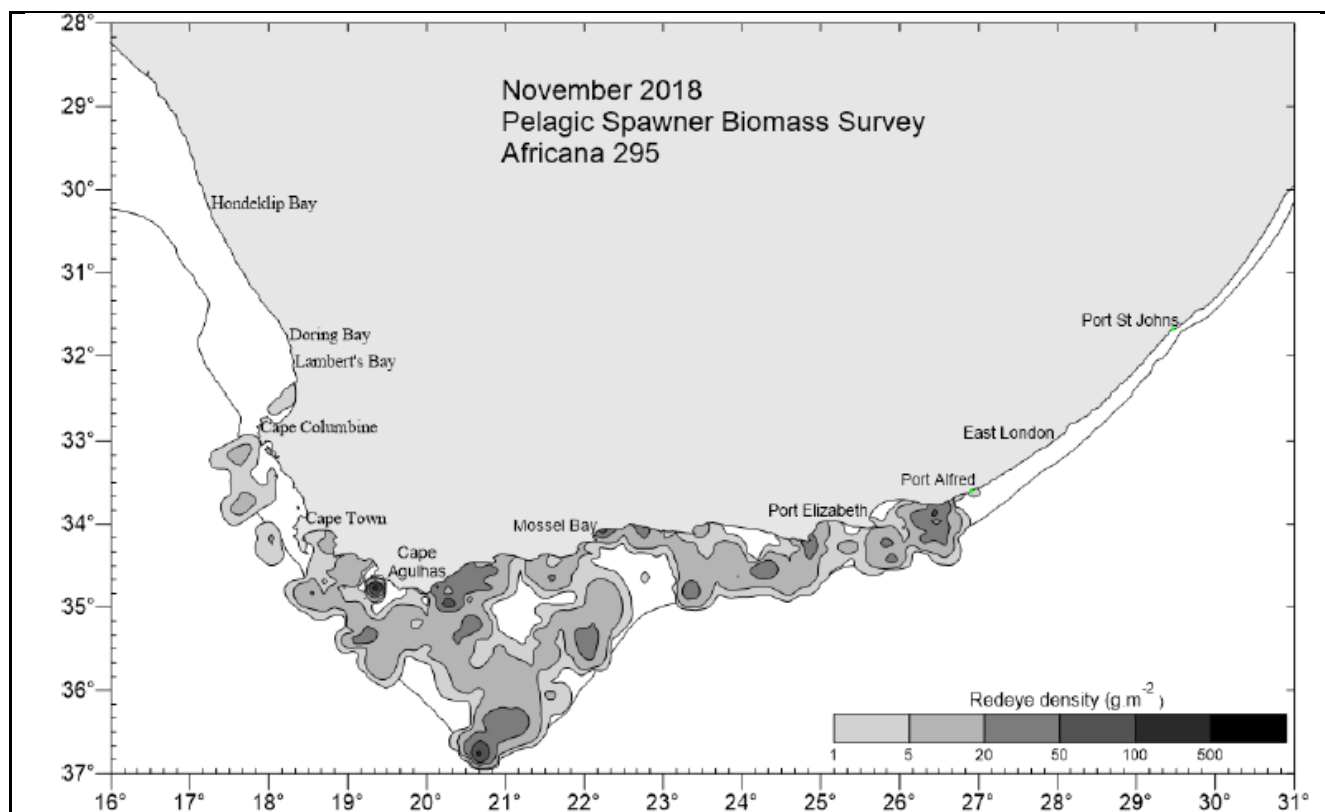


Figure 10: Distribution and relative density of redeye round herring observed during the 2018 pelagic biomass survey **R15**

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.

Current biomass is greater than Bav. F or Fav unknown. The species passes Category B assessment.

References p48

Standard clauses 1.3.2.1

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		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. PASS
	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. PASS
Clause outcome:		PASS
Evidence: C1.1: Annual landings of horse mackerel have been recorded since 1984 (Figure 11). Biomass and distribution of horse mackerel are assessed biannually using hydro-acoustic surveys based on a random stratified sampling design. These surveys, conducted without interruption (apart from the recruit survey of 2018) since 1984, comprise a summer biomass survey and a winter recruit survey. Biomass estimates obtained from these surveys form the basis for recommendations of annual total allowable catches of horse mackerel. The current stock assessment model is an age-structured production model (ASPM). Results of the November 2018 survey showed low densities of horse mackerel on the west coast. A few low-density patches of recruit horse mackerel were detected towards the shelf edge, between Cape Point and Cape Agulhas but the bulk of the horse mackerel was found on the shelf edge between Cape Agulhas and Mossel Bay:		

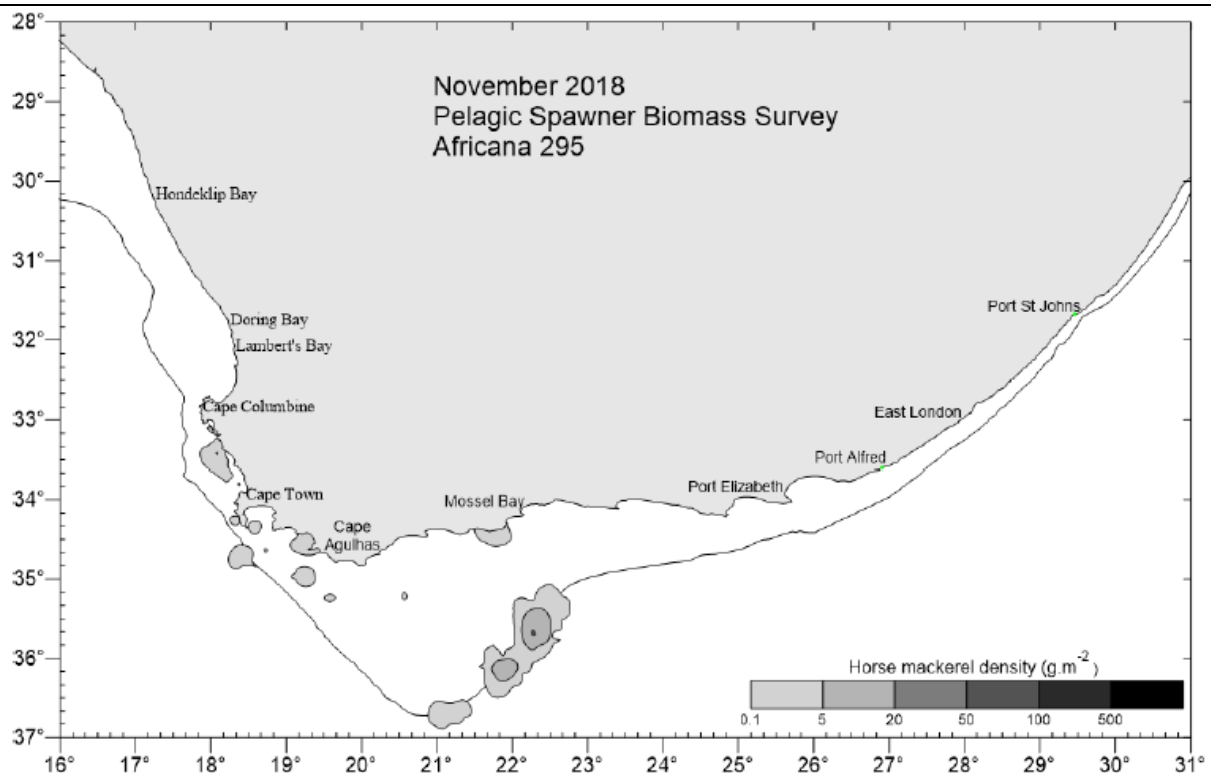


Figure 11: Distribution and relative density of horse mackerel note the minimum density is 0.1 g.m⁻². **R15**

Overall horse mackerel caught incidentally with pelagic fish over the entire survey area were small with only a few larger fish found over the shelf edge south of Mossel Bay. Biomass estimates from the 2018 survey was 44,122t.

Fishery removals of the species in the fishery under assessment are included in the stock assessment process.

C1.2:

The 2019 TAC for horse mackerel (by-catch only) was agreed at 9,572t; in 2018 the TAC was 8,947t; in 2017 8,372t. Recent increases in abundance have been attributed to strong recruitment over the past few years. Further horse mackerel-directed surveys are required to validate modelling results.

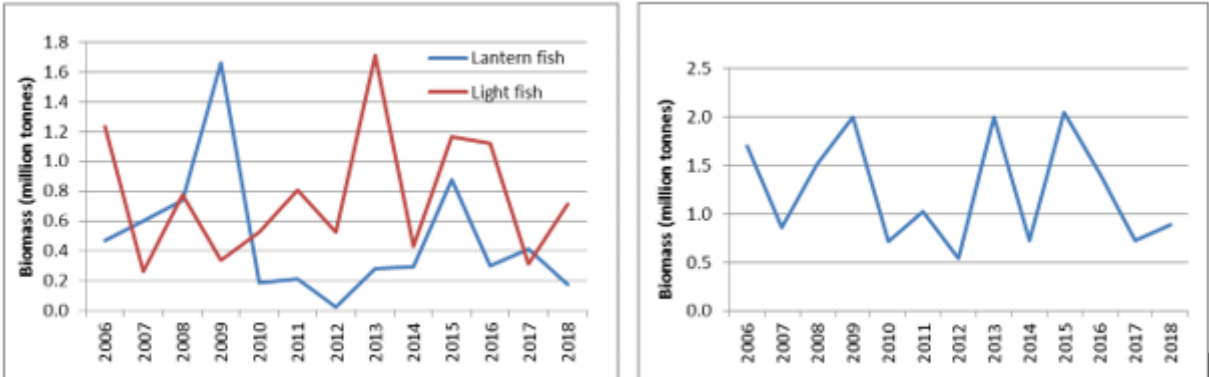
Horse mackerel had a TAC of 8,372t for 2017 and 8,947t for 2018. Recent increases in abundance of Cape horse mackerel have been attributed to strong recruitment over the past few years. Further horse mackerel-directed surveys are required to validate the modelling results.

Removals by the fishery under assessment are considered by scientific authorities to be negligible.

R5, R13, R15-R16

References p48

Standard clauses 1.3.2.2

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. PASS
	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. PASS
Clause outcome:		PASS
C1.1 Evidence: Biomass and distribution of schooling pelagic and meso-pelagic fish are assessed biannually using hydroacoustic surveys. These surveys, been conducted without interruption for the past 30 years, comprise a summer adult biomass survey and a winter recruit survey (Figure 12). An annual Precautionary Upper Catch Limit (PUCL) for mesopelagic fish in the directed pelagic trawl fishery (50,000t) was first introduced in 2012. Catches of Lanternfish in the pelagic trawl fishery have not exceeded 1,000t until 2018 (5,830t, source DAFF). OMP-14, the management procedure used to recommend total allowable catches (TACs) and bycatches (TABs) for sardine and anchovy (in force until 2018, OMP-17 is yet to be published) makes no reference to lanternfish TAC's. In a DAFF document (Nov 2018) summarising landings from the directed fishery for sardine (purse seine) there are no records of landings of lanternfish. Removals from the purse seine fishery are considered by scientific authorities to be negligible.		
C1.2 Evidence Acoustic estimates including the 2018 series were provided by DAFF (Nov 2019 Janet Coetzee, pers. comm, Figure 12):		
 <p>Figure 12: Acoustic biomass estimates of Lantern fish (<i>Lampanyctodes hectoris</i>) and light fish (<i>Maurollicus walvisensis</i>) (Separate and Combined) 2006-2018 R25</p> <p>Biomass estimates suggest a minimum combined biomass (Lantern and Light fish) ranging from 550,000t to 2,000,000t, with an average of 1,300,000t over the past 12 years. Target strength (TS) estimates were conducted in 2006. These estimates are necessary to scale acoustic estimates to</p>		

fish density. No further verification of these TS estimates has been done since 2006 hence acoustic estimates of abundance are treated as relative. No reference points are available.

An annual Precautionary Upper Catch Limit (PUCL) for mesopelagic fish in the directed pelagic trawl fishery of 50,000t was first introduced in 2012. Since then catches have not exceeded 1,000t until 2018 (5,830t, source DAFF). The 2018 figure for catch (Lantern Fish) represented 0.66% of available combined biomass.

A DAFF presentation (Nov 2018) summarised annual landings of sardine and other small pelagic fish by the purse-seine fishery (1949-2017). There are no records of any landings of lanternfish in this fishery during this time. Removals by the fishery under assessment are considered by scientific authorities to be negligible.

There is strong evidence (provided by DAFF) that the commercial fishery is not putting the species at risk of over-exploitation.

References p48

R19, R26

Standard clauses 1.3.2.2

D1	Species Name:	Chub Mackerel (<i>Scomber japonicus</i>)	
	Productivity Attribute	Value	Score
	Average age at maturity (years)*	2	2
	Average maximum age (years)*	7.9	1
	Fecundity (eggs/spawning) *	86,616-213,422	1
	Average maximum size (cm)	30	1
	Average size at maturity (cm)*	22	1
	Reproductive strategy	Open water / substratum egg scatterers	1
	Mean trophic level	3.4	3
	Average Productivity Score		1.43
	Susceptibility Attribute	Value	Score
	Overlap of adult species range with fishery	<25% of stock occurs in area fished	1
	Distribution	Not scored	Not scored
	Habitat	Not scored	Not scored
	Depth range: Low overlap trawl gear	0-300m	1
	Selectivity	Up to 4m in length	3
	Post-capture mortality	Short tows	2
	Average Susceptibility Score		1.75
	PSA Risk Rating (From Table D3)		PASS
	Evidence:		
	* Life history tool (Figure 13)		

The species is not subject to a species-specific research and management regime sufficient to pass a Category C assessment. In South Africa there is no information on stock status.

The comparative lack of scientific information on the status of the population in the assessment area means that a risk-assessment style approach must be taken. The fishery was assessed using the risk-based Productivity, Susceptibility Analysis (PSA) as per IFFO RS v 2.0 procedures for Category D species. The species has passed this risk-based assessment (**Table D3**).

Life History Data on *Scomber japonicus* Chub mackerel

Family:	Scombridae Mackerels, tunas, bonitos		
Max. length (Lmax):	64.0	cm TL	
L infinity (Linf):	= 38.1	cm TL	Recalculate
K:	0.36 /year	$\emptyset' = 2.72$	Recalculate Growth & mortality data
to:	-0.43	years	Estimated from Linf and K.
Natural mortality (M):	0.60	s.e. 0.40 - 0.91 /year	Recalculate
	Estimated from Linf., K and annual mean temp. = 16.6 °C		
Life span (approx.):	7.9	years	Estimated from Linf., K and to. Max. age & size data
Generation time:	2.4	years	Estimated from Lopt, Linf., K and to.
Age at first maturity (tm):	2.0	years	Estimated from Lm, Linf., K and to.
L maturity (Lm):	22.0	s.e. 16.4 - 28.4	cm TL Maturity data
L max. yield (Lopt):	24.5	s.e. n.a. - n.a.	cm TL
	Estimated from Linf., K and M.		
Length-weight:	38.1	cm TL	=> 645.8 g (wet weight)
	W = 0.0047	* L ^ 3.25000	Recalculate Length-weight data
Nitrogen & protein:	Weight 646 (g)	=> whole-body nitrogen (N) 17.6 (g)	Recalculate
		=> whole-body crude protein 109.7 (g)	
Reproductive guild:	nonguarders: open water/substratum egg scatterers Reproduction		
Fecundity:	135,962	[86,616-213,422]	Estimated as geometric mean. Fecundity
Relative Yield per Recruit (Y'/R):	0.0377	Estimate Y'/R from M/K, Lc/Linf and E. Lc= 15.2 cm TL E= 0.50 /year Emsy 0.61 /year Eopt 0.55 /year Fmsy 0.94 /year Fopt 0.73 /year	Recalculate
Exploitation:	Z= F= E=	Estimate Z, F, E from Lc, Lmean, Linf, K, M Lc = 15.2 cm TL Lmean = cm TL	Recalculate
Resilience / productivity:	High; decline threshold 0.99 Vulnerable to extinction if decline in biomass or numbers exceeds threshold over the longer of 10 years or 3 generations.		
Intrinsic rate of increase (rm):	1.88 /year	Lr = 15.2 cm TL Estimated from Fmsy at Lc = length of recruitment (Lr).	Recalculate
Main food:	mainly animals (troph. 2.8 and up)		
Trophic level:	3.4 +/- s.e. 0.10	Estimated from diet data. Diet	
Food consumption (Q/B):	10.9 times the body weight per year	Enter Winf, temperature, aspect ratio (A), and food type to estimate Q/B Winf = 645.8 g Temp. = 16.6 °C A = 5.16	Recalculate
		<input type="checkbox"/> Detrivore <input type="checkbox"/> Herbivore <input type="checkbox"/> Omnivore <input type="checkbox"/> Carnivore	

Figure 13: Chub Mackerel Life History R25

Chub mackerel Global Distribution:

Add your observation in [Fish Watcher](#)

[Native range](#)



Reviewed map

[Scomber japonicus](#) [AquaMaps](#) Data sources: [GBIF](#) [OBIS](#)

Figure 14: Chub mackerel Global Distribution R25

R25

References p 48

Standard clauses 1.3.2.2

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.

D3		Average Susceptibility Score		
		1.00 – 1.75	1.76 – 2.24	2.25 – 3.00
Average Productivity Score	1.00 – 1.75	PASS	PASS	PASS
	1.76 – 2.24	PASS	PASS	TABLE D4
	2.25 – 3.00	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.	PASS
	F1.2	There is no substantial evidence that the fishery has a significant negative effect on ETP species.	PASS
	F1.3	If the fishery is known to interact with ETP species, measures are in place to minimise mortality.	PASS
Clause outcome:			PASS
Evidence			
<p>F1.1:</p> <p>DAFF Annual Reports include examples of longline and demersal trawl fisheries catching significant numbers of vulnerable sharks. Landings in the pelagic sector are observed by DAFF inspectors; however due to low rates of Scientific Observer coverage (around 8%), there is a possibility of ETP capture and disposal at sea from this sector.</p> <p>The main potential ETP impact of the pelagic 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, 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.</p> <p>Fishing near 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.</p> <p>Interactions with ETP species are recorded.</p> <p>R21-R23</p> <p>F1.2:</p> <p>Government officials report no evidence of ETP species bycatch in the small pelagic fishery. A paper published in 2014 summarised results of the island closure feasibility study for both pairs of islands. Scientists found predominantly positive effects of closures; however, traits and islands differed in</p>			

their responses. Clear benefits to chick condition or foraging behaviour were apparent at three of four islands; fledging success improved at one colony. Results thus far suggest that by enhancing breeding conditions for penguins, closures will likely benefit both juvenile and adult penguin survival in the long run, leading to improved population trajectories.

There is no substantial evidence that the fishery has a significant negative effect on ETP species.

R21-R2

F1.3:

TAC announcements for the pelagic fleet (2019) include a note to rights holders that Bird Island and Robben Island offshore are closed for fishing in 2019. The fisheries off St. Croix, Riy Banks and Dassen Island remain open for the 2019 campaign.

Oceana's horse mackerel mid-water trawler, Desert Diamond, has successfully piloted a new device designed to optimise the chances of large fish swimming out of the trawl unharmed while mitigating the loss of targeted species through the escape hatch. To guide the path of the fish, the device uses netting, with a long taper forming a tunnel to the top of the cod end where unwanted catch is liberated. The success, which has also been independently verified, follows several years of trials by the trawler of various excluders aimed at mitigating the risk of the by-catch of larger pelagic species.

If the fishery is known to interact with ETP species, measures are in place to minimise mortality.

R5, R24

References p48

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.	PASS
	F2.2	There is no substantial evidence that the fishery has a significant negative impact on physical habitats.	PASS
	F2.3	If the fishery is known to interact with physical habitats, there are measures in place to minimise and mitigate negative impacts.	PASS
Clause outcome:			PASS
Evidence			
F2.1-F2.2:			
Purse-seine and pelagic trawls are known to rarely interact with physical habitats. Pelagic trawls are fished in the water column and do not impact benthic habitats. Most studies in the assessment area focus on the effects of bottom trawl fisheries on vulnerable marine habitats and ecosystems (VME's).			
VMS operated by DAFF is mandatory for all South African flagged vessels and has been in operation since 1998. Currently 22 commercial fisheries, Marine Protected Areas (MPA's) and MSC Certified Fisheries offshore are managed by DAFF's VMS Department, in addition to RFMO Obligations. Breaches of Regulations are punishable by a fine of up to 2,000,000 Rand or imprisonment of up to			

five years. Contravention of international conservation or management measures or conditions imposed by a high seas fishing permit or licence are also punishable by fines up to 3,000,000 Rand.

As the Competent Authority in the assessment area one of DAFF's Strategic Goal is further broken down into a Strategic Objectives (SO)\;

Strategic Goal 4: Sustainable use of natural resources in the sector is further defined as follows:

- *SO 4.1 Ensure the conservation, protection, rehabilitation and recovery of depleted and degraded natural resources*

Potential habitat interactions are considered in the management decision-making process. There is no substantial evidence that the fishery has a significant negative impact on physical habitats.

R4, R7, R11

F2.3:

Oceana (South Africa) partners with DAFF and the fishing industry to trial an electronic data reporting system with the aim of providing decision-makers in DAFF with timely access to accurate fisheries data in real time. Oceana also support efforts to establish an observer protocol to monitor catches of endangered, threatened and protected species in the fisheries for small pelagics.

NGO's like the Centre for Environmental Rights (CER) and the Safeguard Our Seabed Coalition (SOSC) work with Oceana to better understand potential impacts that large scale mining and other activities have on the environment.

R24

References p48

Standard clause 1.3.3.2

F3	Ecosystem Impacts - Minimum Requirements	
	F3.1 The broader ecosystem within which the fishery occurs is considered during the management decision-making process.	PASS
	F3.2 There is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.	PASS
	F3.3 If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.	PASS
Clause outcome:		PASS
<p>Evidence</p> <p>F3.1:</p> <p>The operation of DAFF follows six Strategic Goals, each further broken down into Strategic Objectives (SO).</p> <p>Strategic Goal 4: Sustainable use of natural resources in the sector is further defined as follows:</p> <ul style="list-style-type: none"> • <i>SO 4.1 Ensure the conservation, protection, rehabilitation and recovery of depleted and degraded natural resources</i> • <i>SO 4.2 Ensure adaptation and mitigation to climate change through effective implementation of prescribed frameworks</i> <p>Scientific Observers accompany fishing vessels to sea on request (small pelagic permit condition), the task of observers is data collection (catch of target and non-target species, and logging of interactions with ETP species). Integral to the management process is the participation of the fishing industry, primarily through the small pelagic industrial body, the South African Pelagic Fishing Industry Association (SAPFIA).</p> <p>The Marine Living Resources Act (MLRA) 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.</p> <p>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).</p> <p>Incorporation of ecosystem considerations and the development of ecosystem-based management was first undertaken through the revised Operational Management Procedure (OMP-14) and has been included in OMP-18.</p> <p>The broader ecosystem within which the fishery occurs is considered during the management decision-making process</p> <p>R3, R5, R8-R9</p>		

F3.2:

Purse-seine and pelagic trawls are known to rarely interact with physical habitats. Pelagic trawls are fished in the water column and do not impact benthic habitats. Most studies in the assessment area focus on the effects of bottom trawl fisheries on vulnerable marine habitats and ecosystems.

VMS operated by DAFF is mandatory for all South African flagged vessels and has been in operation since 1998. Currently 22 commercial fisheries, Marine Protected Areas (MPA's) and MSC Certified Fisheries offshore are managed by the VMS Department, in addition to its RFMO Obligations. Breaches of Regulations are punishable by a fine of up to 2,000,000 Rand or imprisonment of up to five years.

Oceana's horse mackerel mid-water trawler, Desert Diamond, has successfully piloted a new device designed to optimise the chances of large fish swimming out of the trawl unharmed while mitigating the loss of targeted species through the escape hatch. To guide the path of the fish, the device uses netting, with a long taper forming a tunnel to the top of the cod end where unwanted catch is liberated. The success, which has also been independently verified, follows several years of trials by the trawler of various excluders aimed at mitigating the risk of the by-catch of larger pelagic species.

R11, R24

F3.3:

Total removals are limited using a quota system, with the Total Allowable Catch (TAC) and Total Allowable Bycatch (TAB) of anchovy defined according to the rules in the OMP. 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 (for the 2018 quota OMP-14 is used) and calculated by subsequent initial and mid-season MARAM recommendation papers.

The TAC and TAB system considers both targeted (anchovy, round herring) and bycatch (sardine, horse-mackerel) fisheries and the effects of fishing activities on all species in the ecosystem. Sardine and Anchovy play an important role in regulating ecosystem functioning. Shifts in sardine distribution and fluctuations in sardine abundance have been hypothesised to have had substantial ramifications for top predators, distribution and relative abundance of seabird species for which sardine are an important dietary component such as Cape gannets *Morus capensis* and African penguins *Spheniscus demersus*. These Low Trophic Level (LTL) species also provide food for hake, snoek and migratory tuna in the assessment area.

If one or more of the species identified during species categorisation plays a key role in the marine ecosystem, additional precaution is included in recommendations relating to the total permissible fishery removals.

R3, R5

References p48

References

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- R4:** DAFF Functions (SPSWG): <https://www.daff.gov.za/About-Us/Structure-and-Functions>
- R5:** 2019 TAC's and TAB's: <https://sapfia.org.za/tac/>
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- R17:** International Review Panel report for the 2018 international fisheries stock assessment workshop 20pp:
MARAM/IWS/2018 <http://www.maram.uct.ac.za/maram/workshops/2018>
- R18:** DAFF: 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 (May 2016): Carryn de Moor, Doug Butterworth, Janet Coetzee 46pp
<http://www.maram.uct.ac.za/maram/publications/2016>
- R19** A summary of the South African sardine resource and fishery: International Stock Assessment Workshop Cape Town (Nov 2018) MARAM/IWS/2018 pdf 22pp: Slides and presentations:
<http://www.maram.uct.ac.za/maram/workshops/2018>

- R20** A summary of the South African sardine resource and fishery : International Stock Assessment Workshop Cape Town (Nov 2017) MARAM/IWS/2017 pdf 20pp: Slides and presentations
<http://www.maram.uct.ac.za/maram/workshops/2017>
- R21** DAFF Annual Report 2017-2018 pdf 303pp
https://www.daff.gov.za/Daffweb3/Portals/0/Annual%20Report/AR_Final_28%20September.pdf
- R22** DEA. 2013. Biodiversity management plan for the African penguin *Spheniscus demersus*. Government Gazette, 31 October 2013.
http://www.gov.za/sites/www.gov.za/files/36966_gon824_0.pdf
- R23** W. M. L. Robinson, D. S. Butterworth and L. B. Furman MARAM/IWS/DEC14/Peng/B4 Analyses of the Results from the Island Closure Feasibility Study for the Dassen/Robben and St Croix/Bird Island Pairs pdf 29pp MARAM/IWS/DEC14/Peng/B4
<http://www.maram.uct.ac.za/maram/workshops/2014>
- R24** Oceana Sustainability Report 2018: <http://oceana.co.za/sustainability/sustainable-development-reports/>
- R25** Fishbase Chub mackerel:
<https://www.fishbase.in/Summary/SpeciesSummary.php?ID=117&AT=chub+mackerel>
- R26** DAFF Resource Management Janet Coetzee Chair of the Small Pelagic Scientific Working Group pers. Comm: Acoustic survey estimates, exploitation rates 2006-2018 for the Lantern Fish and Light Fish Mesopelagic Fishery 1p

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.