IFFO RS Limited

T: +44 (0) 2030 539 195
E: Standards@iffors.com
W: www.iffors.com

Unit C, Printworks | 22 Amelia Street
London, SE17 3BZ | United Kingdom

Global Standard for Responsible Supply of Marine Ingredients

Fishery Assessment Methodology and Template Report V2.0

Fishery Under Assessment	**South Africa EEZ Multi-Species Pelagic Purse Seine**
Date	**September 2020**
Report Code	**2020 - 159**
Assessor	**Vito Romito**
Stock (s) Pass	**Pass**
Stock (s) Fail	

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:				
Assessor Name	**Peer Reviewer**	**Assessment Days**	**Assessment type**	**Whole fish / by-product**
Vito Romito	Virginia Polonio	3	**Surveillance 1**	**Whole fish**
Assessment Period	2019-2020			

Scope Details	
Management Authority (Country/State)	South Africa: Department of Agriculture,
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	Agree with determination

Recommendation	PASS

Assessment Determination

Fisheries management in South Africa fell until recently under the jurisdiction of the Department of Agriculture, Forestry and Fisheries (DAFF). Subsequently, in May 2019, the Fisheries Management Branch was transferred to what was previously the Department of Environmental Affairs, which was renamed the Department of Environment, Forestry and Fisheries (DEFF)[1]. Within this Ministry, several divisions play key roles in fisheries management. 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 the Ministry 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) is currently in force.

Underpinning management is a core group of DEFF 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 OMPs.

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.*

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, age estimates, sex, maturity stage, and fish condition. Landings data 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 sardine stock is quite depressed, while the anchovy and round herring stocks are in a much healthier status. Harvest control rules and TAC decision take into account the status of the various small pelagic species. The pelagic industry (2020 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.

The main potential ETP impact of the pelagic fishery is indirect, via the removal of prey species for the IUCN Red list Endangered African Penguin, Cape Gannet and Cape Cormorant. St Croix Island near Port Elizabeth is home to the world's largest colony of African Penguins, and has been used as the basis for several studies into the potential impacts of the fishery on the species. Bird Island is an important habitat for the three seabird species. Permit conditions for the pelagic fleet (2020) include a note to rights holders that Bird Island and Dassen Island offshore waters are prohibited from purse seine fishing.

Habitat effects of the purse seine fishery are considered negligible since the gear does not come into contact with the seabed.

[1] https://www.sciencedirect.com/science/article/abs/pii/S0308597X19307006

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 25.09.20). 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 MarinTrust Standard v 2.0.
Peer Review Comments
The new Operational Management Procedure (OMP) that replaced the old OMP-14 referred to as OMP-18 determines the sardine and anchovy catch limits, is dependent upon sardine biomass estimates obtained from the annual October/November hydro-acoustic survey. It includes a new Harvest Control Rule (HCR) for calculating the directed >14cm sardine Total Allowable Catch (TAC) and associated ≤14cm sardine Total Allowable Bycatch (TAB). The OMP formulae are developed to ensure low probabilities that the abundances of sardine and anchovy might drop below agreed threshold levels under which successful future recruitment might be compromised. This OMP is therefore designed in a precautionary way. Therefore, the fishery complies with the requirements established in the current MarinTrust 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 *Engraulis encrasicolus*	70	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS
Category A	Sardine *Sardinops sagax*	13	A1	PASS
			A2	PASS
			A3	PASS
			A4	PASS
Category B	Round herring *Etrumeus whiteheadi*	13	PASS	
Category C	Horse mackerel *Trachurus capensis*	2	PASS	
Category C	Lanternfish *Lampanyctudes hectoris*	1	PASS	
Category D	Chub mackerel *Scomber japonicus*	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. 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	*Engraulis encrasicolus*	South Africa	70	DEFF	A
Sardine	*Sardinops sagax*	South Africa	13	DEFF	A
Round herring	*Etrumeus whiteheadi*	South Africa	13	DEFF	B
Horse mackerel	*Trachurus capensis*	South Africa	2	DEFF	C
Lanternfish	*Lampanyctudes hectoris*	South Africa	1	DEFF	C
Chub mackerel	*Scomber japonicus*	South Africa	1	No management regime	D

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		
	M1.1	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:

The South Africa purse seine fishery for small pelagic species fishes anchovy *Engraulis encrasicolus*, sardine *Sardinops sagax* and redeye round herring *Etrumeus whiteheadi* as the primary target species, which collectively make up about 90% of the catches.

Responsibility for management of South Africa's fisheries has recently resided with the Fisheries Management Branch of the Department of Agriculture, Forestry and Fisheries (DAFF). Subsequently, in May 2019, the Fisheries Management Branch was transferred to what was previously the Department of Environmental Affairs, which was renamed the Department of Environment, Forestry

and Fisheries (DEFF)[2]. Within this Ministry, there are six sub-programmes driven within the branch, namely Aquaculture and Economic Development, Fisheries Research and Development; Marine Resource Management and Monitoring, Control and Surveillance, Fisheries Operations Support and Financial Management[3].

South African sardine and anchovy Total Allowable Catches (TACs) and Total Allowable Bycatches (TABs) are typically recommended based on a joint Operational Management Procedure (OMP, e.g. de Moor et al. 2011). Underpinning the management is a core group of DEFF Scientists in the Small Pelagic Scientific Working Group (SPSWG). Exceptional Circumstances were declared in 2019 for sardine as a result of (among other things) the very low survey estimate of sardine abundance in October-November 2018. This survey estimate was outside the range simulated during the development of OMP-18 (Coetzee 2018, de Moor 2018). As a consequence, any TAC/TABs (by-catch) for sardine needed to be determined by alternative short-term calculations, rather than the OMP Harvest Control Rules (Rademeyer et al. 2008, de Moor 2018)[4].

Precautionary Upper Catch Limits (PUCL), TAC and TAB recommendations are considered by the DEFF 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 DEFF fisheries manager dedicated to the small pelagic fishery meets with the industry frequently to prepare annual fishing plans and clarify fishing permit conditions.

[2] https://www.sciencedirect.com/science/article/abs/pii/S0308597X19307006
[3] https://www.environment.gov.za/branches/fisheriesmanagement#objetives
[4] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P2%20Method%20Used%20to%20set%20Sardine%20quotas%20in%202019.pdf

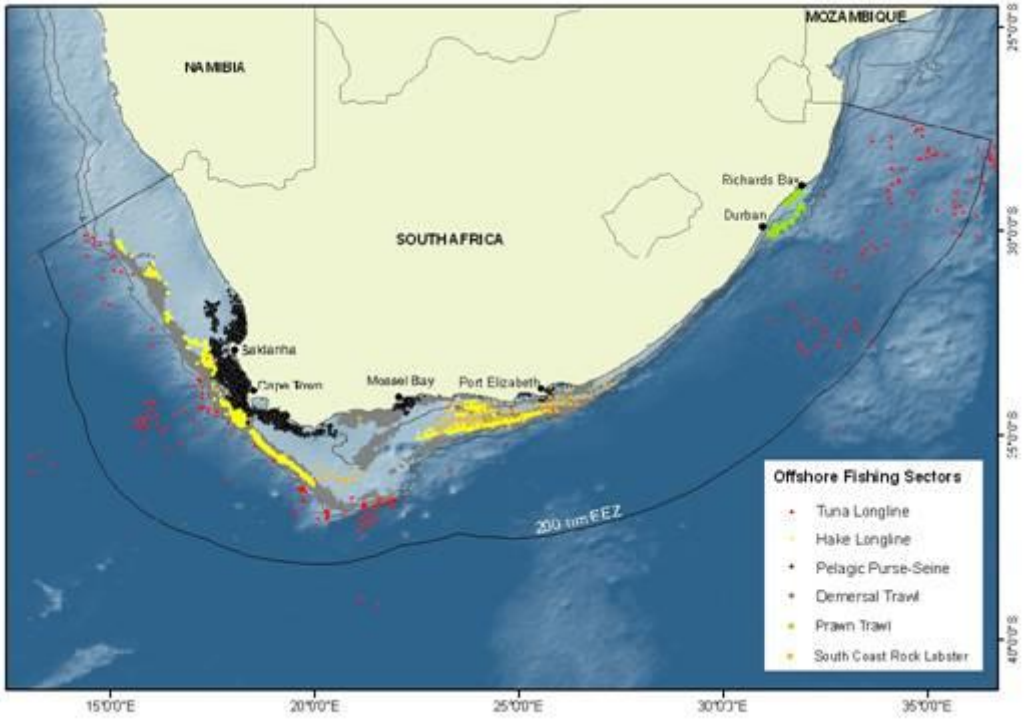


Figure 1: South Africa Offshore Fishing Sectors: Pelagic fisheries (dark circles) are concentrated off the West and South Coasts. Source FAO.

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

M1.2:

DEFF Fisheries Research and Development 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 DEFF and aims to provide a scientific basis for assessment and management of renewable marine resources[5]. The MARAM group drafts OMP's (Operational Management Procedures) used as the basis for many management decisions in the small pelagic fishery. The most recent small pelagics OMP is the interim OMP-18 (de Moor 2018)[6]. Underpinning management is a core group of DEFF Scientists in the Small Pelagic Scientific Working Group (SPSWG). The Small Pelagic Management Working group meets bi-annually to discuss any management and day to day operational issues with DEFF[7].

South Africa's National Research Foundation (NRF)[8] 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

[5] http://www.maram.uct.ac.za/
[6] https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1
[7] https://sapfia.org.za/working-with-deff/
[8] https://www.nrf.ac.za/about-nrf

M1.3:
Within this Ministry, there are six sub-programmes driven within the branch, namely Aquaculture and Economic Development, Fisheries Research and Development; Marine Resource Management and Monitoring, Control and Surveillance, Fisheries Operations Support and Financial Management. The objectives of these divisions[9] are:

- Fisheries Research and Development: To ensure the promotion of the sustainable development of fisheries resources and ecosystems by conducting and supporting appropriate research.
- Marine Resource Management: Ensures the sustainable utilisation and equitable and orderly access to the marine living resources through improved management and regulation.
- Monitoring, Control and Surveillance: Ensures the protection and promotion of sustainable use of marine living resources by intensifying enforcement and compliance.
- Fisheries Operations Support: The provision of support services in order to ensure the effective and efficient management and administration of the Branch: Fisheries Management and the Marine Living Resources Fund.
- Chief Financial Officer: The provision of financial management for the Branch: Fisheries Management and the Marine Living Resources Fund.

Fishery management organisations are publicly committed to sustainability.

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[10]. 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, 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.

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 DEFF 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). SAPFIA has a long history of working closely with DEFF. The Scientific Committee members meet regularly with the Scientific Working Group at DEFF, although they are only observers, their input is taken into consideration when scientific decisions are taken for the Industry. SAPFIA also provides research

[9] https://www.environment.gov.za/branches/fisheriesmanagement#objetives
[10] http://extwprlegs1.fao.org/docs/pdf/saf155134.pdf

funding when they are able to. If there are decisions made there for the Industry, SAPFIA together with its Members puts them in place[11].

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

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 DEFF (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 (OMP 18 for small pelagics).

The TAC recommendation is then considered by the DEFF 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 DEFF 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[12].

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

References

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

DAFF. 2016. Marine Living Resources Act of 1998, Marine Living Resources Act: Regulations relating to small-scale fishing 2016. Department of Agriculture, Forestry and Fisheries. http://extwprlegs1.fao.org/docs/pdf/saf155134.pdf

DEFF. 2020. Fisheries Management Objectives. Department of Environment, Forestry and Fisheries. https://www.environment.gov.za/branches/fisheriesmanagement#objetives

de Moor, C.L. and Butterworth D.S. 2014. OMP 14 (MARAM Dec 2014). 27pp pdf https://sapfia.org.za/tac/ (in downloads tab).

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

[11] https://sapfia.org.za/working-with-deff/
[12] https://sapfia.org.za/tac/

de Moor, C.L. and Coetzee, J.C. 2019. A summary of the method used to provide 2019 catch limit advice for South African sardine. MARAM/IWS/2019/Sardine/P2 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P2%20Method%20Used%20to%20set%20Sardine%20quotas%20in%202019.pdf

FAO Country Profile: South Africa Offshore Fishing Sectors. http://www.fao.org/fishery/facp/ZAF/en

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

MARAM. 2020. Homepage. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/

NRF. 2020. About. National Research Foundation. https://www.nrf.ac.za/about-nrf

SAPFIA. 2020. Working with DEFF. South African Pelagic Fishing Industry Association https://sapfia.org.za/working-with-deff/

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

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**

Evidence:

M2.1:

Monitoring, control and surveillance is the responsibility of DEFF (Fisheries) Monitoring, Control and Surveillance division tasked with ensures the protection and promotion of sustainable use of marine living resources by intensifying enforcement and compliance. Monitoring, Control & Surveillance (MCS) is supplemented by Police, Navy[13] 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).

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 (see 2020 sardine and anchovy permit conditions[14]), 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.

There is an organisation responsible for monitoring compliance with fishery laws and regulations.

M2.2:

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.

Chapter 6 of the MLRA (1998) sets out law enforcement legislation[15]. 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:

[13] https://www.gov.za/about-sa/fisheries
[14] https://sapfia.org.za/tac/
[15] https://www.unodc.org/res/cld/document/marine-living-resources-act-18-of-1998_html/MLRA.pdf

- 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. In the 2019 re-assessment for this fishery, 70% of cases brought by DAFF (now DEFF) were reported to be successful. As part of its work, DEFF 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.

M2.3:
South Africa ratified the FAO Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing in 2014. Transhipment-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 transhipment permit; 72 hours pre-notification (foreign flagged vessels only) and the nomination of a designated port for transhipment.

The numbers of infringements and penalties issued (South African and Foreign flagged vessels) in each fishery may be available on written request from DEFF's MCS division. 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. An observer programme is in place for the large pelagic fishery. Three new navy ships are currently been built and expected to come into service starting from 2021[16]. The vessels will aid in protecting the South African Coast from threats such as trafficking, illegal fishing and piracy.

There is no substantial evidence of widespread non-compliance in the pelagic fishery, and no substantial evidence of IUU fishing. DAFF have a zero tolerance to IUU[17]; internal audits are undertaken to ensure compliance**.**

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 DEFF is mandatory for all South African flagged vessels. The VMS

[16] https://www.businessinsider.co.za/3-new-military-patrol-vessels-are-being-built-in-cape-town-2019-2
[17] https://www.defenceweb.co.za/security/maritime-security/daff-working-on-illegal-unregulated-and-unreported-fishing-as-part-of-phakisa/

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 transhipments 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. The VMS system has been in operation since March 2000. There are currently in excess of 1000 fishing vessels active on the database. The diversity of fisheries in SA has led to the approval of two different types of VMS units which provide coverage ranging from global coverage (Inmarsat - C) to 50 Nautical Miles (NM) offshore (Ozone VMS units). Each unit utilises different communications protocols that are routed to the central VMS database. The VMS is primarily a Monitoring, Control and Surveillance (MCS) tool, ensuring that the provisions of the Marine Living Resources Act, the Regulations promulgated in terms thereof, permit conditions and international legislation and agreements are met by utilising data obtained from the VMS, both within and outside of the exclusive economic zone (EEZ)[18].

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, DEFF 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.

References

Business Insider. 2019. Three new navy ships will protect South Africa from pirates and illegal fishing - here's what they will look like. https://www.businessinsider.co.za/3-new-military-patrol-vessels-are-being-built-in-cape-town-2019-2

DAFF. 1998. Marine Living Resources Act of 1998, Marine Living Resources Act:. Department of Agriculture, Forestry and Fisheries. https://www.unodc.org/res/cld/document/marine-living-resources-act-18-of-1998_html/MLRA.pdf

DAFF. 2016. VMS Presentation. http://mpaforum.org.za/wp-content/uploads/2016/11/VMS-Presentation-First-DAFF.ppt

DEFF. 2020. Fisheries Management Objectives. Department of Environment, Forestry and Fisheries. https://www.environment.gov.za/branches/fisheriesmanagement#objetives

DefenceWeb. 2018. DAFF working on illegal, unregulated and unreported fishing as part of Phakisa. https://www.defenceweb.co.za/security/maritime-security/daff-working-on-illegal-unregulated-and-unreported-fishing-as-part-of-phakisa/

FAO. 2015. Agreement on Port State Measures (PSMA). http://www.fao.org/port-state-measures/background/en/

[18] http://mpaforum.org.za/wp-content/uploads/2016/11/VMS-Presentation-First-DAFF.ppt

Republic of South Africa. 2020. Fisheries. https://www.gov.za/about-sa/fisheries

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

Stop Illegal Fishing. 2016. South Africa accedes to the FAO Port State Measures Agreement https://stopillegalfishing.com/news-articles/south-africa-accedes-fao-port-state-measures-agreement/

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** ***Engraulis encrasicolus***	
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 last assessment report for sardine and anchovy was published in 2019[19]. Fishery dependent data collected includes landed weight, species composition, catch location and date. Additionally, sampling is used to obtain length frequency data (1984-2018), 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[20] (Figure 2):

19 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

20 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

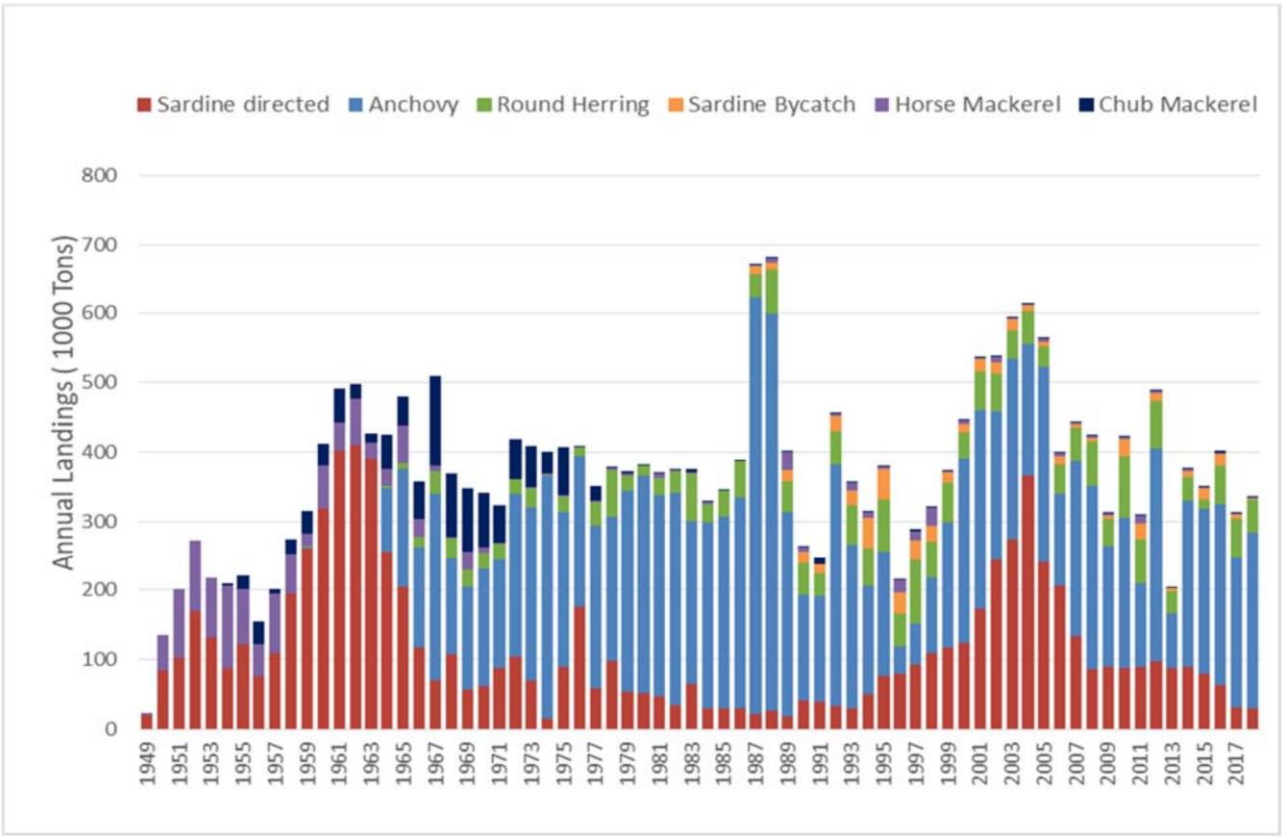


Figure 2: Annual landings of sardine and other small pelagic fish by the South African purse-seine fishery since 1949.

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

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[21] are described in detail:

21
http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

- Commercial Catch Data: Monthly catch length frequencies are constructed for the sardine landings. From 1987 onwards, these are available by area (east and west of Cape Agulhas). From 2012 onwards, the sardine landings have again been categorized as either directed >14cm (>50% sardine mass in landing) or bycatch by the scale monitor. The bycatch is now recorded as either 'small' (≤14cm) sardine with directed >14cm, or 'small' (≤14cm) bycatch with anchovy or round herring. Anchovy is seldom landed with adult sardine and/or round herring. The>14cm sardine bycatch is assumed to be primarily bycatch with round herring and the time series is assumed comparable with the 1987-2011 time series of bycatch with round herring.

- Survey biomass estimates and weighted length frequencies: Time series of total biomass estimates and associated CVs from the acoustic surveys in November are available from 1984 to 2018, corresponding to the standard survey area between Hondeklip Bay and Port Alfred. Length frequencies (scaled to the total biomass) are also available. Time series of recruit biomass and associated CVs from the May/June recruit surveys (1985-2017, 2019) are also available. The average recruit weight is calculated by applying a length-weight regression to the survey weighted length frequency. In the assessments, the recruit numbers are used together with the CVs on recruit biomass.

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.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

SCIENTIFIC WORKING GROUP – Results of the 2018 pelagic biomass survey: 15pp:
https://www.bing.com/search?q=FISHERIES%2F2018%2FDEC%2FSWG-PEL%2F38&src=IE-SearchBox&FORM=IESR4A

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:

The last assessment report for sardine and anchovy was published in 2019[22]. 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), currently OMP 18. 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. Annual Fisheries Stock Assessment Review Workshops have been published on MARAM's website since 2004 (website accessed 23.09.20). A stock assessment is conducted at least once every 3 years.

A2.2:

OMP-14 and 18[23] do 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. Some of the key differences between OMP-14 (de Moor and Butterworth 2014), which was used to recommend TACs and TABs for sardine and anchovy from 2015 to 2017, and Interim OMP-18 are as follows:

1. The maximum total anchovy TAC has been decreased from 450,000t to 350,000t, to reflect the maximum catch which the industry is expected to be able to achieve.
2. Risk to anchovy has been redefined as: the probability of the anchovy spawner biomass being below that of a quarter of the 1996 level (1996 is the lowest historical year for the baseline anchovy Operating Model) over the projection period. The comparatively lower threshold selected for anchovy (a quarter of the lowest historical spawner biomass) is primarily due to the relatively higher uncertainty surrounding anchovy projections compared to those of sardine. This is due to the higher variability about the stock-recruitment curve and the shorter

[22] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

[23] https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

life span. Anchovy future biomass is thus more dependent on the uncertain recruitment than is the case for sardine. The acceptable level of risk changes from one management procedure to the next, given changes in the perceived level of productivity of a resource resulting from the inclusion of revised and new data when conditioning the underlying operating models. Interim OMP-18 has been developed using a single baseline Operating Model for anchovy and for sardine, conditioned on data from 1984 to 2015. As was the case when developing OMP-14, a similar objective method to determine the acceptable maximum level of risk for anchovy could not be followed (de Moor 2018). The key control parameter of the anchovy HCR has been tuned so that Interim OMP-18 satisfies a maximum risk level of 0.082, where this risk level was selected as that resulting from applying OMP-14 to the updated Operating Model (de Moor 2018).

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 implicit limit reference point. The current anchovy biomass is currently estimated to be around 1.5 million tonnes (see also Figure 2 of OMP-2018 biomass projections[24]), as shown below:

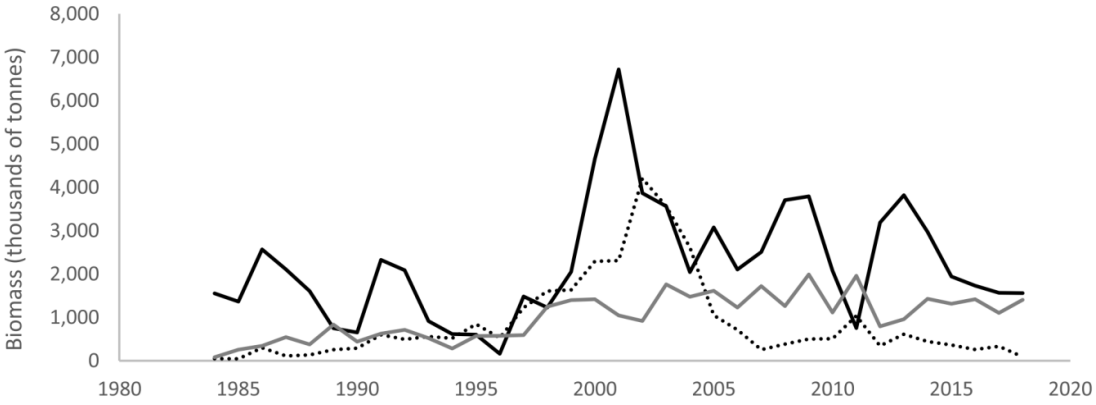


Figure 3. Estimated biomass (thousands of tonnes) of anchovy (black line), sardine (black dotted) and redeye round herring (grey line) for the years 1984–2018. Source: Cochrane *et al*. 2020[25].

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.

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

[24] https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1
[25] https://www.sciencedirect.com/science/article/abs/pii/S0308597X19307006

A2.3:

The directed >14cm sardine TAC and initial directed anchovy TAC and TAB for ≤14cm sardine bycatch with anchovy directed fishing are based on the results of the November biomass survey. These limits are announced prior to the start of the pelagic fishery at the beginning of each year. The directed anchovy initial TAC is based on how the most recent November survey estimate of biomass survey relates to the historical average between 1984 and 1999. In the absence of further information, which will become available after the May recruitment survey, this initial TAC assumes the forthcoming recruitment (which will form the bulk of the catch) will be the historical average.

The anchovy TAC and sardine TAB midyear revisions are based on the most recent November and now also recruit survey estimates of abundance. As the estimate of recruitment is now available, the 'scale-down' factor, δ, is no longer required to set the anchovy TAC. The additional constraints include ensuring that the revised anchovy TAC is not less than the initial anchovy TAC[26].

The preliminary anchovy TAC for the 2020 season was 50,000 t (but it is set to increase as the year progresses) with 1500 t of juvenile sardine by-catch allowance (only those associated with anchovy directed catches)[27].

The anchovy catch in past 5 years has average roughly 250 thousand tonnes per year, while biomass in the same period has shown some decreases from about 2 million tonnes to about 1.5 million tonnes in the last few years. The assessment provides an indication of the volume of fishery removals which is appropriate for the current stock status[28].

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 DEFF and comprising scientists from DEFF, 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. SAPFIA also provides research funding when they are able to. If there are decisions made there for the Industry, SAPFIA together with its Members puts them in place.

Annual Stock Assessment Workshops (funded by the NRF and DEFF) include invited overseas scientists and a specific review panel[29]. In 2019, 5 scientists from mainland US were invited to the International Workshop[30].

The assessment is subject to internal or external peer review.

[26] https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

[27] https://sapfia.org.za/tac/

[28] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

[29] http://www.maram.uct.ac.za/maram/publications/2019

[30] http://www.maram.uct.ac.za/maram/workshops

A2.5:
All stock assessments[31] and papers[32] 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[33].

The assessment is made publically available.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

de Moor, C.L. and Butterworth D.S. 2014. OMP 14 (MARAM Dec 2014). 27pp pdf https://sapfia.org.za/tac/ (in downloads tab).

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Publications. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/publications/2019

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

Standard clause 1.3.2.2, 1.3.2.1.2, 1.3.2.1.4

[31] http://www.maram.uct.ac.za/maram/workshops/2019
[32] http://www.maram.uct.ac.za/maram/publications/2019
[33] https://sapfia.org.za/tac/

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**

Evidence

A 3.1:

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 (OMP 18). The MLRA empowers the Minister to apportion the TAC between rights holders, regions, components of the fishery, and however else is deemed necessary[34].

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 calculated by subsequent initial and mid-season MARAM recommendation papers[35].

There is a mechanism in place by which total fishing mortality of this species is restricted.

A3.2:

In recent years there has been a substantial under-catch of anchovy, with total landings considerably below the TAC (Figure 4):

[34] https://sapfia.org.za/tac/

[35] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

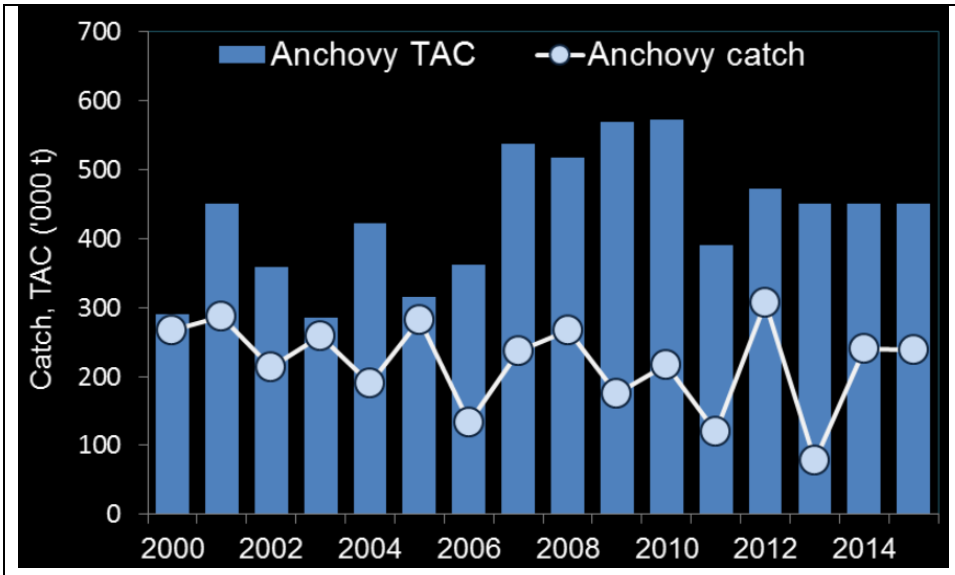


Figure 4: Anchovy TAC and Anchovy catch 2000-2015 (Source: MARAM/IWS/2018).

Anchovy catch in 2018 was 253,046[36] against a TAC of 315,242t for all rights holders. Catches continue to be well within TAC.

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.

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[37].

[36] http://oceana.co.za/pdf/Status_of_the_Small_Pelagic_Fishery_2019.pdf
[37] See 2020 Anchovy final conditions

Some of the key differences between OMP-14 (de Moor and Butterworth 2014), which was used to recommend TACs and TABs for sardine and anchovy from 2015 to 2017, and Interim OMP-18 are as follows[38]:

1. The maximum total anchovy TAC has been decreased from 450,000t to 350,000t, to reflect the maximum catch which the industry is expected to be able to achieve.
2. Risk to anchovy has been redefined as: the probability of the anchovy spawner biomass being below that of a quarter of the 1996 level (1996 is the lowest historical year for the baseline anchovy Operating Model) over the projection period.

Interim OMP-18 has been developed using a single baseline Operating Model for anchovy and for sardine, conditioned on data from 1984 to 2015. As was the case when developing OMP-14, a similar objective method to determine the acceptable maximum level of risk for anchovy could not be followed (de Moor 2018). The key control parameter of the anchovy HCR has been tuned so that Interim OMP-18 satisfies a maximum risk level of 0.082, where this risk level was selected as that resulting from applying OMP-14 to the updated Operating Model (de Moor 2018).

As explained in earlier clauses, the fishery is well above any threshold to trigger reduced catch specifications. Commercial fishery removals are prohibited when the stock has been estimated to be below the limit reference point or proxy.

References

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

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

de Moor, C.L. and Butterworth D.S. 2014. OMP 14 (MARAM Dec 2014). 27pp pdf https://sapfia.org.za/tac/ (in downloads tab).

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Publications. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/publications/2019

[38] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

Oceana. 2019. Status of the small pelagic fishery 2019. http://oceana.co.za/pdf/Status_of_the_Small_Pelagic_Fishery_2019.pdf

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

SAPFIA. 2020. 2020 Anchovy Final Conditions. 2020 Anchovy final conditions

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements		
	A4.1	The stock is at or above the target reference point, OR IF NOT: 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: The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.	PASS
Clause outcome:			**PASS**

Evidence

A 4.1:

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 implicit limit reference point. The current anchovy biomass is currently estimated to be around 1.5 million tonnes (see Figure 3 in this report as well as also Figure 2 of OMP-2018 biomass projections).

The anchovy catch in past 5 years has average roughly 250 thousand tonnes per year, while biomass in the same period has shown some decreases from about 2 million tonnes to about 1.5 million tonnes in the last few years. The preliminary anchovy TAC for the 2020 season was 50,000 t (but it is set to increase as the year progresses) with 1500 t of juvenile sardine by-catch allowance (only those associated with anchovy directed catches)[39].

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.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Publications. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/publications/2019

[39] https://sapfia.org.za/tac/

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/ SAPFIA. 2020. 2020 Anchovy Final Conditions. 2020 Anchovy final conditions
Standard clause 1.3.2.1.4

Species Name	Sardine *Sardinops sagax*	
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-A1.2:

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 (please refer to Figure 2 above). 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).

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.

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 5).

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. A composite map of sardine catches is shown below.

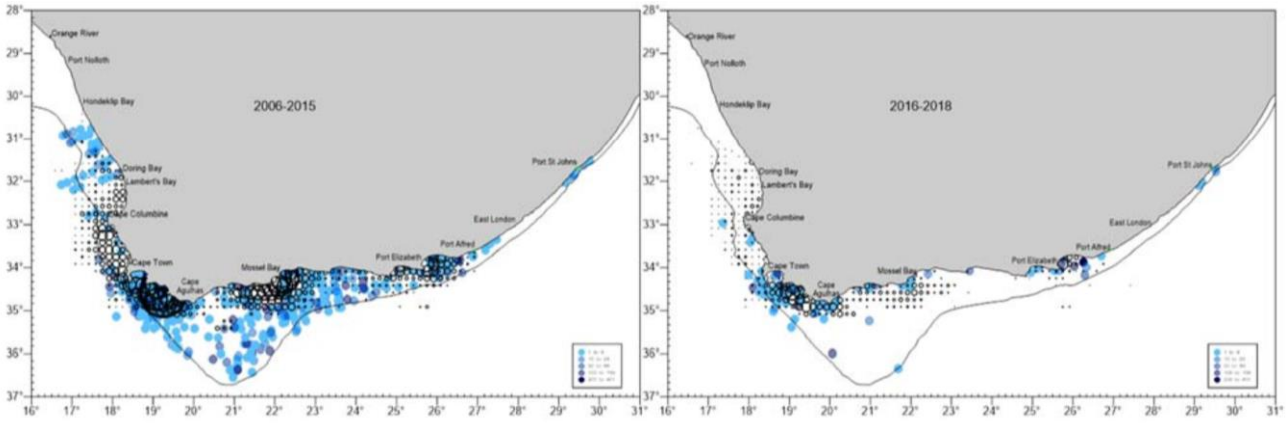


Figure 5. Composite maps of sardine catches (open circles, proportional size) and sardine density from hydroacoustic surveys (dots) for 2006-2015 and the most recent 3 years[40].

40 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Time series of total biomass estimates and associated CVs from the acoustic surveys in November are available from 1984 to 2018, corresponding to the standard survey area between Hondeklip Bay and Port Alfred. Length frequencies (scaled to the total biomass) are also available. Time series of recruit biomass and associated CVs from the May/June recruit surveys (1985-2017, 2019) are also available. The average recruit weight is calculated by applying a length-weight regression to the survey weighted length frequency. In the assessments, the recruit numbers are used together with the CVs on recruit biomass.

OMP-18[41], which was adopted in December 2018, has been developed using an operating model of the sardine resource consisting of two mixing components with differential exploitation levels. The model of two sardine components, assumed to be distributed west and east of Cape Agulhas, estimates the extent of west to south movement of fish of ages 1 and above each year. This assessment indicates that in terms of recruits-per-spawner, the western component is much more productive than the southern component by about an order of magnitude (de Moor et al. 2017). Simulations using this two-component Operating Model of population dynamics for the sardine resource assume that the proportion of future catches west of Cape Agulhas will mimic that which has been observed in the past with the proportion of directed sardine catch taken west of Cape Agulhas decreasing when the ratio (TAC : west coast biomass) increases.

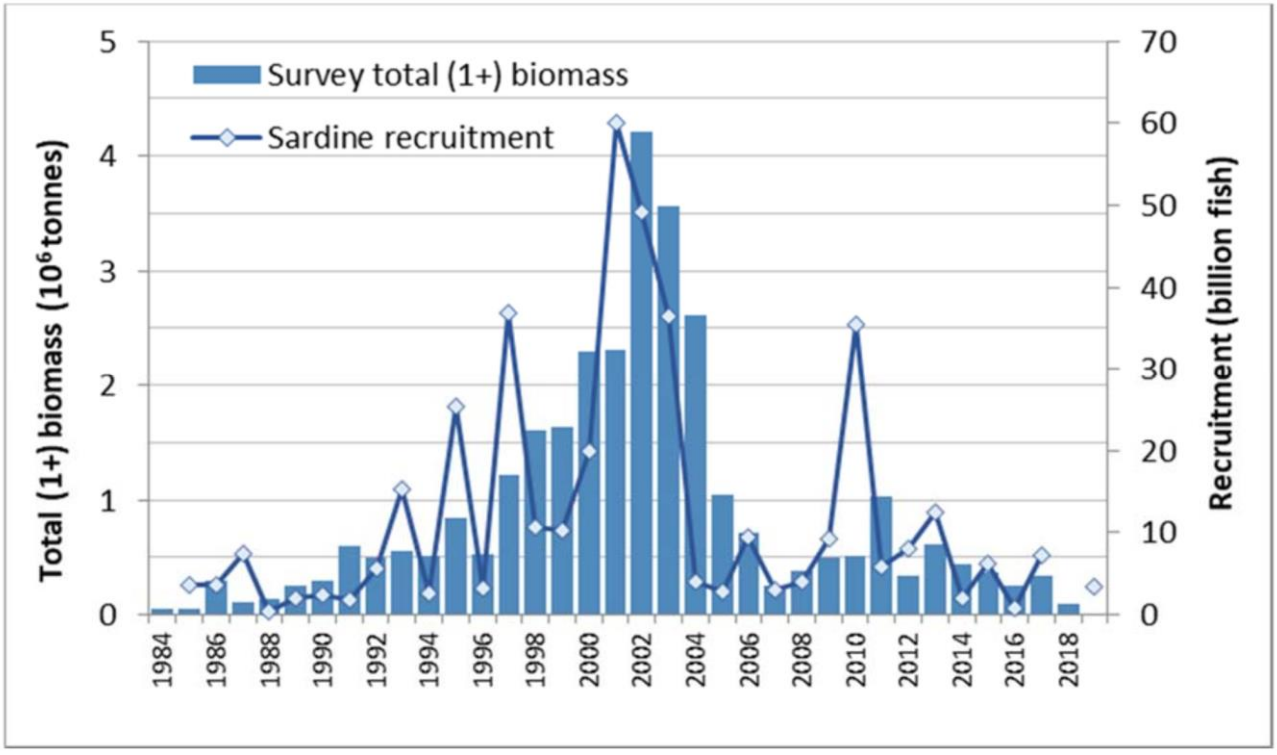


Figure 6: Time-series of acoustic survey estimates of total sardine biomass in October/November (bars) and recruitment in May/June (lines) since the start of the acoustic survey program.

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

41 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

References

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

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

de Moor, C.L. and Butterworth D.S. 2014. OMP 14 (MARAM Dec 2014). 27pp pdf https://sapfia.org.za/tac/ (in downloads tab).

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

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:

The last assessment report for sardine was published in 2019[42]. 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), currently OMP 18.

A stock assessment is conducted at least once every 3 years.

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 2019 assessment (Figure 7):

42 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

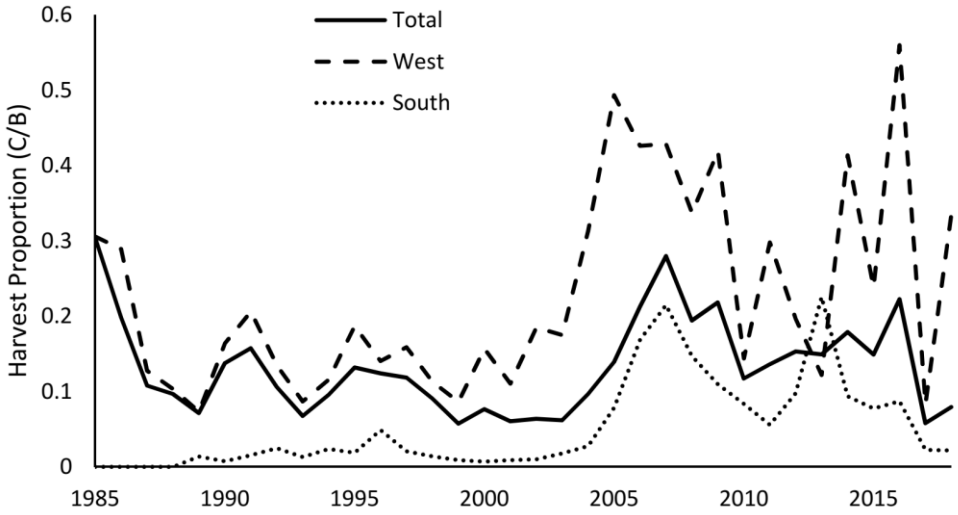


Figure 7: Harvest proportion (catch in current year/model predicted biomass in previous year) for the area to the west of Cape Agulhas, East of Cape Agulhas and for the entire coast[43].

Since the start of the acoustic survey program estimates of total biomass and recruitment are available (see figure 6). Under the Interim OMP 18, the maximum directed sardine TAC has been decreased from 500,000t to 200,000t, reflecting the low expectancy for another pulse in sardine biomass (and therefore catches) in the near future. OMP-18 does not include explicit limit reference points, instead, the HCR is worded as: "Should sardine biomass (i.e. now only based on November survey biomass threshold) at which Exceptional Circumstances are invoked for sardine fall below 300,000t the TAC is substantially reduced". This could be seen as a proxy limit reference point.

The constraints on inter-annual variability in directed sardine TACs above or below the Critical Biomass (referred to as Exceptional Circumstances in OMP-14) threshold (or limit reference proxy) have also been decreased: the maximum proportion by which directed sardine TAC can be reduced from one year to the next has been increased from 0.2 to 0.5.

Sardine biomass from the most recent stock assessment is shown below[44]:

43 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

44 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P3%20Sardine%20concerns%20and%20uncertainties.pdf

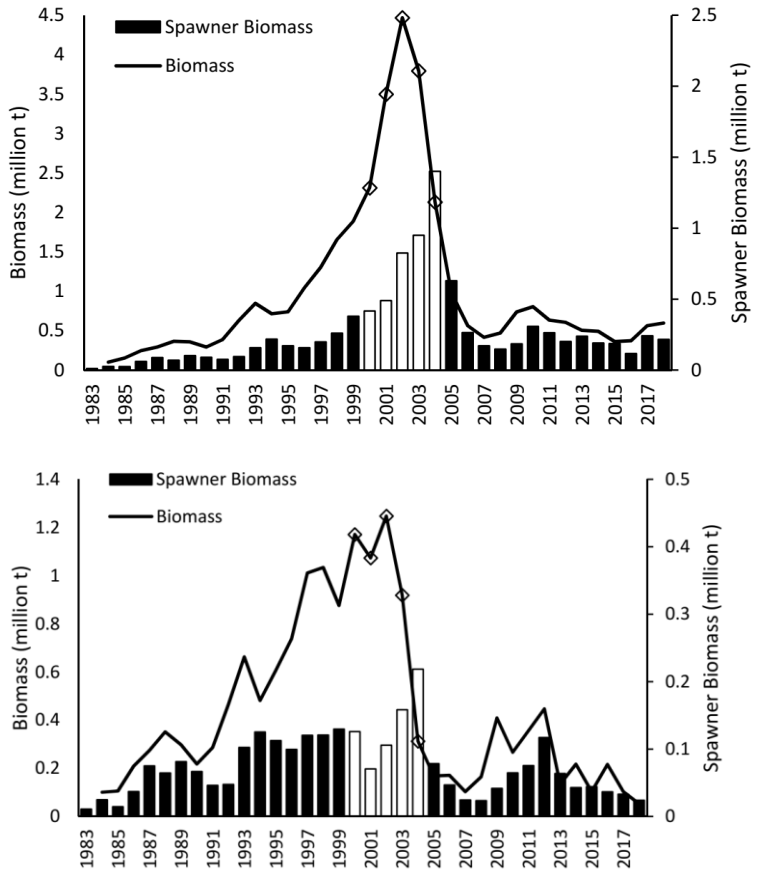


Figure 8. The total (west + south) (top) and west component (bottom) current model estimated biomass and spawning biomass, with 2000-2004 indicated by open bars/diamonds.

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

A2.3:

In 2018 the respective sardine and TAC and TAB were 59,214t and 4,145t and in 2019 12,250t and 250t. The preliminary TAC for 2020 was set to 0 tonnes[45] reflecting the recent low levels of biomass and the need to reduce harvest to the minimum.

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

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 DEFF and comprising scientists from DEFF, 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. SAPFIA also provides research funding when they are able to. If there are decisions made there for the Industry, SAPFIA together with its

[45] 2020 Sardine final conditions

Members puts them in place. Annual Stock Assessment Workshops (funded by the NRF and DEFF) include invited overseas scientists and a specific review panel[46]. In 2019, 5 scientists from mainland US were invited to the International Workshop[47].

The assessment is subject to internal or external peer review.

A2.5:
All stock assessments[48] and papers[49] 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[50].

The assessment is made publically available.

References

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

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. Uncertainties and associated concerns relating to using short-term projections to advise on the 2020 sardine TAC and TABs. MARAM/IWS/2019/Sardine/P3 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P3%20Sardine%20concerns%20and%20uncertainties.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

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

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

[46] http://www.maram.uct.ac.za/maram/publications/2019
[47] http://www.maram.uct.ac.za/maram/workshops
[48] http://www.maram.uct.ac.za/maram/workshops/2019
[49] http://www.maram.uct.ac.za/maram/publications/2019
[50] https://sapfia.org.za/tac/

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019 SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/
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**

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 preliminary TAC for 2020 was set to 0 tonnes[51] reflecting the recent low levels of biomass and the need to reduce harvest to the minimum.

The directed sardine catches, and associated TAC have been recorded from 2001-2019 as shown below. Catches tend to be at or below the actual TAC.

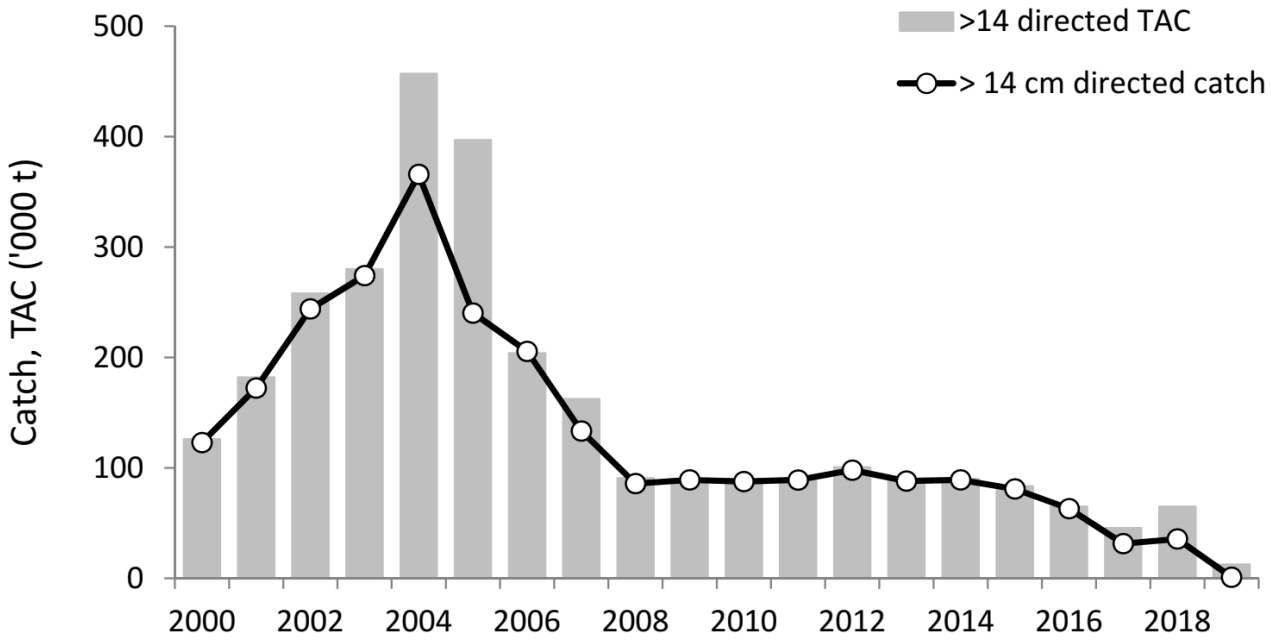


Figure 9: Directed >14cm sardine TAC and corresponding catches. 2019 catch up until 18th November 2019.

[51] 2020 Sardine final conditions

An example of the OMP 18 harvest control rule for sardine was is shown below from the MARAM 2019 stock assessment report[52]:

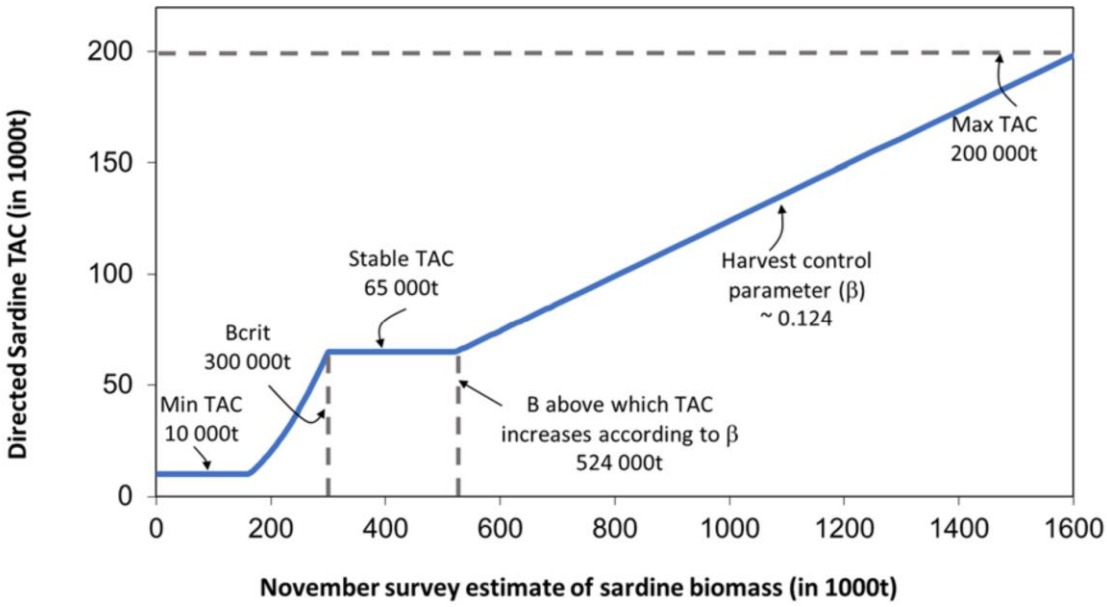


Figure 10: A schematic of OMP-18 sardine HCR. Changes from OMP-14 include a higher catch control parameter (up from 0.087 to 0.124) lower maximum TAC (down from 500 000t to 200 000t), a decreased stable TAC (65 000t down from 90 000t) and the introduction of an absolute minimum TAC at 10 000t.

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:

As shown in the HCR graphic above, TAC is decreased linearly from a maximum of 200,000 t (from 500,000 t) in OMP 2014, down to a minimum of 10 000 t if biomass decreases below the 200 000 t mark, down from the Critical biomass threshold set a 300 000 t, where TAC reduction becomes much sharper. While the final directed Sardine TAC (2019) was agreed at 12, 250t and the final juvenile sardine by-catch allowance (associated with anchovy directed catches, 2019 fishery) was agreed at 250t, the preliminary TAC for 2020 was set to 0 tonnes[53] reflecting the recent low levels of biomass and the need to reduce harvest to the minimum.

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

R3, R19

References

[52] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

[53] 2020 Sardine final conditions

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

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. A summary of the South African sardine (and anchovy) fishery.
http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. Uncertainties and associated concerns relating to using short-term projections to advise on the 2020 sardine TAC and TABs. MARAM/IWS/2019/Sardine/P3
http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P3%20Sardine%20concerns%20and%20uncertainties.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

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

de Moor, C.L. 2018. Interim OMP-18.
FISHERIES/2018/AUG/SWG-PEL/24.
https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

SAPFIA. 2020. 2020 Sardine final conditions

Standard clause 1.3.2.1.3

A4	Stock Status - Minimum Requirements		
	A4.1	The stock is at or above the target reference point, OR IF NOT: 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: The stock is estimated to be below the limit reference point or proxy, but fishery removals are prohibited.	**PASS**
Clause outcome:			**PASS**

Evidence:

A4.1:

Low 2016, 2017 and 2018 biomass estimates are cause for considerable concern. In accordance with OMP 14 and subsequently, OMP 18 results, the directed adult sardine TAC was decreased. In 2018 the respective TAC and TAB were 59,214t and 4,145t and in 2019 12, 250t and 250t. In 2020, the preliminary sardine TAC was reduced to 0 t[54].

When issuing the final recommendations DEFF 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.

The sardine stock is estimated to be below limit reference point or proxy, but fishery removals are prohibited. This has been shown from the sequential TAC reduction leading to the 2020 preliminary TAC of 0.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. Uncertainties and associated concerns relating to using short-term projections to advise on the 2020 sardine TAC and TABs. MARAM/IWS/2019/Sardine/P3 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_P3%20Sardine%20concerns%20and%20uncertainties.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774

[54] https://sapfia.org.za/tac/

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/ SAPFIA. 2020. 2020 Sardine final conditions
Standard clause 1.3.2.1.4

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

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; Bav = long-term average biomass; F = current fishing mortality; Fav = 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 *Etrumeus whiteheadi*
B1	Species Name	***Etrumeus whiteheadi***
	Table used (Ba, Bb)	Bb
	Outcome	PASS

Evidence:

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 set at 100,000t for the 2020 season[55]). Catch of round herring in 2018 was less than 48,000 tonnes.

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). A biomass graph for round herring has been shown below. The biomass has been relatively stable in the past 10 years, at a mid to high level, relative to the overall 1984–2018 time series.

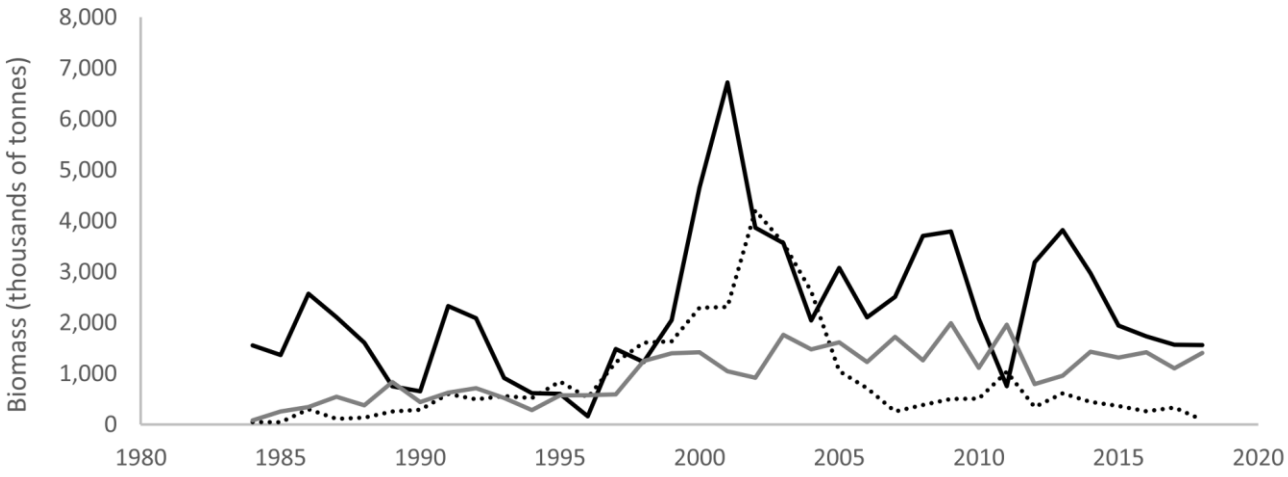


Figure 11. Estimated biomass (thousands of tonnes) of anchovy (black line), sardine (black dotted) and redeye round herring (grey line) for the years 1984–2018. Source: Cochrane *et al*. 2020[56].

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. The PUCL is set at around 10% of estimated biomass, if landings remain below the PUCL, the exploitation rate remains low. The PUCL decreases linearly if the November survey biomass is less than 750,000t.

Based on fishbase data, the resilience for this species is high, with a minimum population doubling time less than 15 months (K=0.7)[57].

[55] 2020 INTERIM INITIAL TAC and more information JdG
[56] https://www.sciencedirect.com/science/article/abs/pii/S0308597X19307006
[57] https://www.fishbase.se/summary/1456

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

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774
SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

Fishbase. 2020. Etrumeus whiteheadi Wongratana, 1983, Whitehead's round herring. https://www.fishbase.se/summary/1456

SAPFIA. 2020. 2020 INTERIM INITIAL TAC and more information JdG

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 *Trachurus capensis***		
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 the 1950s.

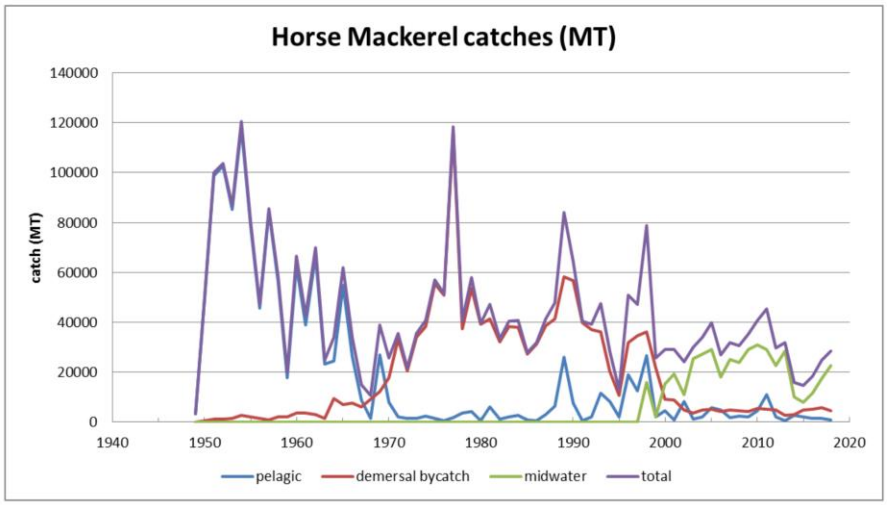


Figure 12. Historical horse mackerel catches by gear type.

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 stock has been assessed an age structure model approach using a number of different model types based on different Q (catchability values). The last horse mackerel assessment was performed in 2019[58]. Results are shown below:

[58] https://open.uct.ac.za/bitstream/handle/11427/32132/FISHERIES_2019_OCT_SWG-DEM_43%20Horse%20mackerel%20assessment%20final.pdf?sequence=1&isAllowed=y

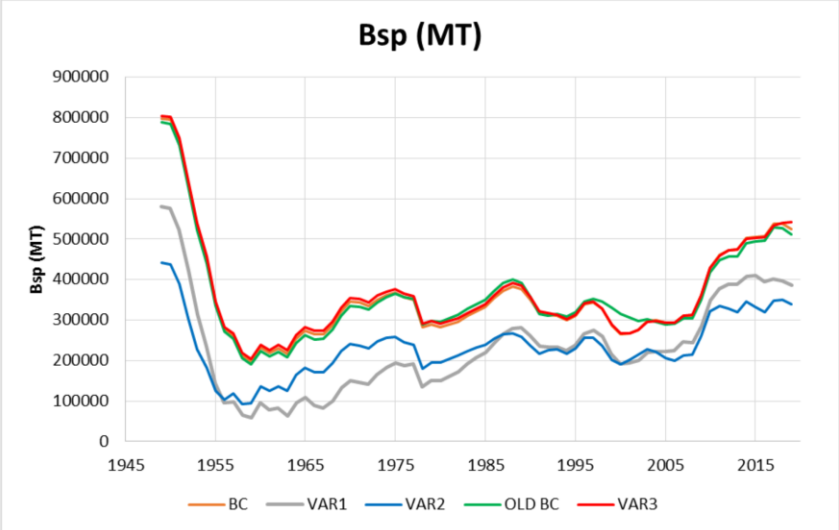


Figure 13. Spawning biomass relative to Ksp estimates for different assessment models.

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. The overall spawning biomass for the stock appears to have been increasing in the past decade.

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. The 2020 TAC for horse mackerel was set to 9 989t (not to be targeted)[59]. Recent increases in abundance have been attributed to strong recruitment over the past few years.

Given the biomass increase seen in recent years, it is likely that the species has a biomass above any potential limit reference point or proxy. Furthermore, catches associated with the pelagic fishery appear to be negligible.

References

Johnston S.J. and Butterworth D.S. 2019. Yet further 2019 horse mackerel assessments and projections. FISHERIES/2019/OCT/SWG-DEM/43. https://open.uct.ac.za/bitstream/handle/11427/32132/FISHERIES_2019_OCT_SWG-DEM_43%20Horse%20mackerel%20assessment%20final.pdf?sequence=1&isAllowed=y

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

Standard clauses 1.3.2.2

[59] https://sapfia.org.za/tac/

Species Name	Lanternfish (*Lampanyctodes hectoris*)	
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:
In June 2020, representatives of DEFF (i.e. Janet Coetzee) and Pioneer Fishing (SA fishing company) confirmed that in November 2019 the experimental fishing for lanternfish and lightfish was stopped because it was not financially sustainable.

The catches were the two most recent years as follows:
2018 – 5835 t
2019 – 3587 t

Furthermore, it was confirmed that as for 2020 no one currently has permission to target lanternfish and lightfish off South Africa. Only small amounts (typically less than 5t per annum) of incidental bycatches remain in the purse-seine fishery for anchovy and sardine.

Lanternfish fishery removals are considered by scientific authorities to be negligible.

C1.2
Evidence
As explained above, Lanternfish fishery removals are considered by scientific authorities to be negligible.

References
Personal communication with representative of DEFF (i.e. Janet Coetzee) and Pioneer Fishing (SA fishing company).

Standard clauses 1.3.2.2

D1	Species Name:	Chub Mackerel (*Scomber japonicus*)	
	Productivity Attribute	**Value**	**Score**
	Average age at maturity (years)*	2	2
	Average maximum age (years)*	7.9	1
	Fecundity (eggs/spawning) *	135,962 [86,616-213,422 Estimated as geometric mean	1
	Average maximum size (cm)	64	2
	Average size at maturity (cm)*	22	1
	Reproductive strategy	Open water / substratum egg scatterers	1
	Mean trophic level	3.4	3
	Average Productivity Score		**1.57**
	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:

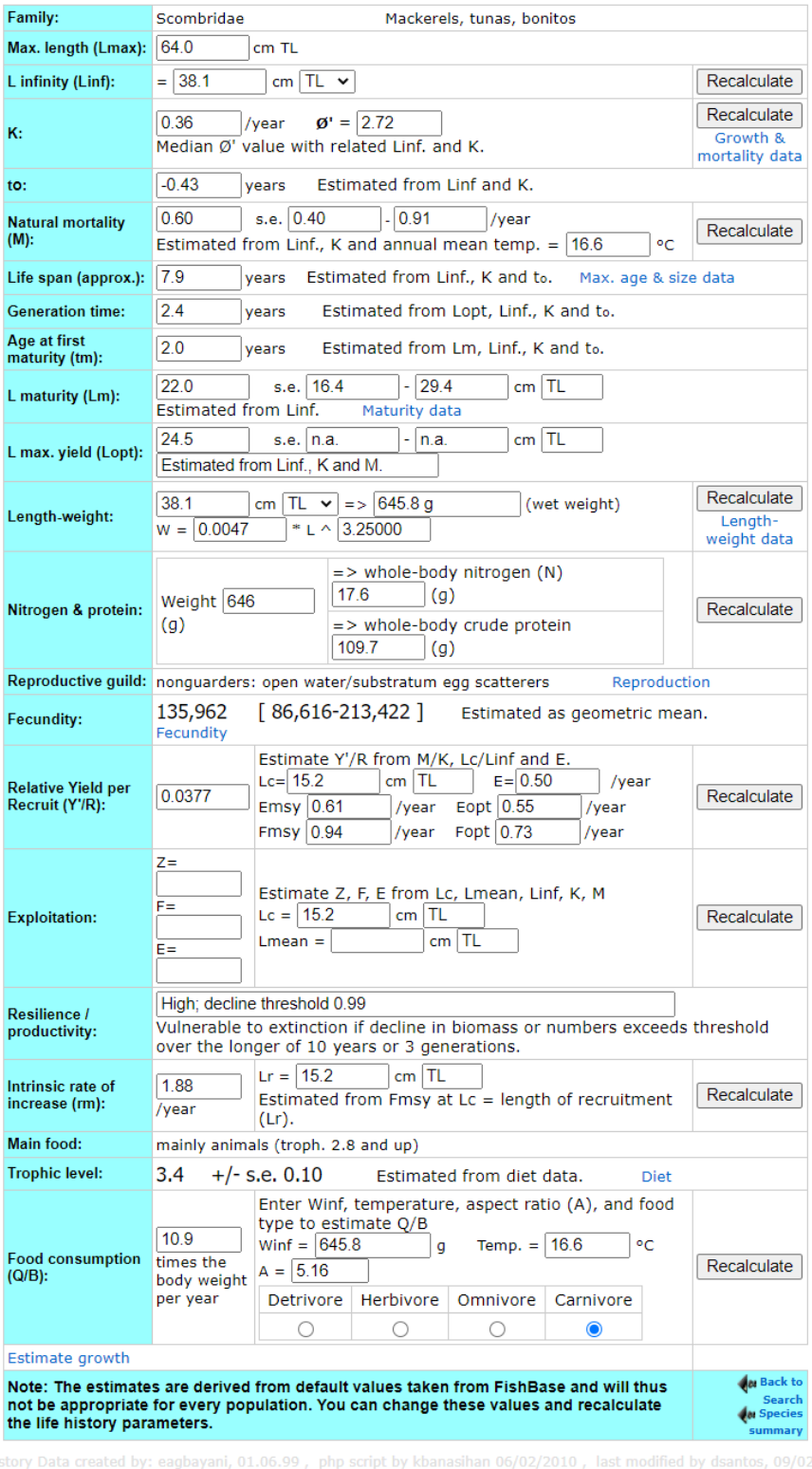
**** Life history tool [60] (Figure 14)***

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 MarinTrust v 2.0 procedures for Category D species. The species has passed this risk-based assessment using fishbase information[61] accessed on 25 September 2020 (**Table D3**).

[60] https://www.fishbase.se/popdyn/KeyfactsSummary_1.php?ID=117&GenusName=Scomber&SpeciesName=japonicus&vStockCode=131&fc=416

[61] https://www.fishbase.se/summary/Scomber-japonicus.html



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 Ø' = 2.72 Median Ø' value with related Linf. and K.	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 Estimated from Linf., K and annual mean temp. = 16.6 °C	Recalculate
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 - 29.4 cm TL Estimated from Linf. 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) => whole-body crude protein 109.7 (g)	Recalculate
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 Detrivore ○ Herbivore ○ Omnivore ○ Carnivore ◉	Recalculate
Estimate growth		
Note: The estimates are derived from default values taken from FishBase and will thus not be appropriate for every population. You can change these values and recalculate the life history parameters.		Back to Search Species summary

Life History Data created by: eagbayani, 01.06.99 , php script by kbanasihan 06/02/2010 , last modified by dsantos, 09/02/2014

Figure 14: Chub Mackerel Life History

Chub mackerel Global Distribution:

Figure 15: Chub mackerel Global Distribution.

References

Fishbase. 2020. Scomber japonicus Houttuyn, 1782, Chub mackerel. https://www.fishbase.se/summary/Scomber-japonicus.html

Fishbase. 2020. Scomber japonicus life history tool. https://www.fishbase.se/popdyn/KeyfactsSummary_1.php?ID=117&GenusName=Scomber&SpeciesName=japonicus&vStockCode=131&fc=416

Standard clauses 1.3.2.2

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.

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

F1.1:

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 DEFF inspectors as per permit conditions issued for anchovy and sardine fishing[62]. The current Scientific Observer coverage is around 8% and the program is used to record catches and any interactions with endangered species. Government officials report no evidence of ETP species bycatch in the small pelagic fishery. As explained below, there does not appear to be any significant direct bycatch (or threat) of any ETP species. Instead the main threats for the species highlighted below are prey food competition with the purse seine fishery.

Interactions with ETP species are recorded.

F1.2

The purse seine fishing method itself is considered to be fairly selective as it targets mono-specific schools. However, similar to a number of small pelagic fish, sardine and anchovy are a key food source to a number of marine species, some of which are listed as threatened, endangered, protected (ETP)[63]. A number of species affected include:

Cape cormorants (*Phalacrocorax capensis*) are classified as Endangered on the IUCN Red list. Their most recent available estimates are of c.2,600 pairs in Angola in 2005 (Dyer 2007), c.57,000 pairs in Namibia in 2005 (Crawford et al. 2007, Kemper and Simmons 2015) and c.57,000 pairs in South Africa in 2010–2014 (Crawford et al. 2016)[64]. Bird Island is an important breeding and roosting site for seabirds, particularly Cape gannets and Cape cormorants[65]. Shortage of food due to commercial overfishing is one of the primary threats to this species (Crawford et al. 1992a, 2007, 2014, 2015, 2016), a result of competition with the South African purse-seine fishery for anchovy and sardine, which are essential prey items. The positive trends in two cormorant spp. that do not compete with fisheries for prey (*Phalacrocorax lucidus, Microcarbo coronatus*), contrasted by the negative trends in species that do (*P. capensis, P. neglectus*) supports the role of fishing in causing population declines via reduced prey availability (Crawford 2015).

[62] 2020 Sardine final conditions and 2020 Anchovy final conditions
[63] https://sapfia.org.za/sustainability/
[64] https://www.iucnredlist.org/species/22696806/132594943#population
[65] https://www.capenature.co.za/reserves/bird-island-nature-reserve/

Cape gannet (*Morus capensis*) is also classified as Endangered on the IUCN Red list[66]. The most recent population estimate is made up of 10,500 pairs at Ichaboae Island, 2,200 pairs on Mercury Island and 380 pairs on Possession Island, all in 2010 (Kemper 2015). 81,000 pairs were estimated at Bird Island (Algoa Bay), 21,000 pairs at Malgas Island and 8,000 pairs at Bird Island (Lambert's Bay) in 2015 (Crawford et al. 2015 updated by R. Crawford in litt. 2016). Since the 1960s, there has been an ongoing redistribution of the species from northwest to southeast around southern Africa, and ~70% of the population now occurs on the south coast of South Africa, at Bird Island in Algoa Bay, on the eastern border of the Benguela upwelling ecosystem (BUS)[67]. Presently, major threats to Cape Gannet include: substantially decreased availability of their preferred prey in the west; heavy mortalities of eggs, chicks and fledglings at and around colonies, inflicted by Cape Fur Seals *Arctocephalus pusillus* and other seabirds; substantial disturbance at colonies caused by Cape Fur Seals attacking adult gannets ashore; oiling; and disease.

The removal of prey species for the African Penguin *Spheniscus demersus*[68] is also considered a threat. 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[69], and has been used as the basis for several studies into the potential impacts of the fishery on the species.

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.

Bird Island and Dassen Island have been closed for the 2020 season[70]. Purse seine fishing is currently prohibited within a 10.8 nm radius around Bird Island Dassen Island.

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 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.

Ecosystem considerations in the purse seine small pelagic fishery currently include the experimental closure of areas to fishing around some important seabird (e.g. African penguin and Cape gannet and Cormorant) breeding colonies (islands) in an attempt to assess the impact of localized fishing effort on the breeding success of these birds. The benefit of such closure has been demonstrated for some breeding islands but not for others. A model of penguin dynamics has also been developed for use in conjunction with the small pelagic fish OMP so that the impact on penguins of predicted

[66] https://www.iucnredlist.org/species/22696668/132587992#threats
[67] https://www.tandfonline.com/doi/abs/10.2989/00306525.2019.1684396
[68] https://www.int-res.com/articles/esr2017/34/n034p373.pdf
[69] https://www.iucnredlist.org/species/22697810/132604504#threats
[70] 2020 INTERIM INITIAL TAC and more information JdG

future pelagic fish trajectories under alternative harvest strategies can be evaluated. These studies have so far indicated that even with large reductions in the sardine TAC there would be little benefit for penguins[71].

Given that anchovy catches are well within the TAC, and that between 2006 and 2016, anchovy catches in the purse seine fishery were about half the TAC, it is probably unlikely that such level of exploitation could be considered as "substantial evidence that the fishery has a significant negative effect on ETP species". In regards to the sardine fishery, the obvious decline in productivity and the resulting low biomass level may have effects on some species preying on this resource. However, we note that the fishery has always been within TAC and the most recent 2020 preliminary TAC was set to 0 t. Such exploitation levels are unlikely to hinder recovery of ETP species preying on these resources.

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

F1.3:
Bird Island and Robben Island offshore were closed for fishing in 2019. The fisheries off St. Croix, Riy Banks and Dassen Island remained open for the 2019 campaign, while Bird Island and Dassen Island have been closed for the 2020 season[72]. Purse seine fishing is currently prohibited within a 10.8 nm radius around Bird Island Dassen Island. Bird Island is a particularly important habitat for all the seabird species highlighted above.

In addition to the above, 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.

References

BirdLife International. 2018. *Phalacrocorax capensis*. *The IUCN Red List of Threatened Species* 2018: e.T22696806A132594943. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22696806A132594943.en. Downloaded on 25 September 2020.

BirdLife International. 2018. *Morus capensis*. *The IUCN Red List of Threatened Species* 2018: e.T22696668A132587992. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22696668A132587992.en. Downloaded on 25 September 2020.

[71] http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

[72] 2020 INTERIM INITIAL TAC and more information JdG

BirdLife International. 2018. *Spheniscus demersus*. *The IUCN Red List of Threatened Species* 2018: e.T22697810A132604504. https://dx.doi.org/10.2305/IUCN.UK.2018-2.RLTS.T22697810A132604504.en. Downloaded on 25 September 2020.

Capenature. 2020. Bird Island Nature Reserve. https://www.capenature.co.za/reserves/bird-island-nature-reserve/

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. 2019. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

Cochrane, K. L., Warwick J., E., Sauer H., H. 2020. A diagnosis of the status and effectiveness of marine fisheries management in South Africa based on two representative case studies. Marine Policy Volume 112, February 2020, 103774. https://doi.org/10.1016/j.marpol.2019.103774
SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

Crawford Ret al. 2017. Tangled and drowned: a global review of penguin bycatch in fisheries. *Endanger. Spec. Res.* 34, 373–396. doi:10.3354/esr00869

Fishbase. 2020. Etrumeus whiteheadi Wongratana, 1983, Whitehead's round herring. https://www.fishbase.se/summary/1456

SAPFIA. 2020. 2020 INTERIM INITIAL TAC and more information JdG

SAPFIA. 2020. 2020 Anchovy final conditions

SAPFIA. 2020. 2020 Sardine final conditions

SAPFIA. Sustainability Assessments by WWF using the Common Wild Capture Fishery Methodology. https://sapfia.org.za/sustainability/

Sherley, R. B., Crawford, R. J. M., Byer, B. M., Kemper, J., Makhado, A. B., Masotla, M., Winker, H. 2019.The status and conservation of Cape Gannets *Morus capensis*. Journal of African Ornithology Volume 90, 2019, *Ostrich.* Pages 335-346. https://doi.org/10.2989/00306525.2019.1684396

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 DEFF's Strategic Goal are broken down by objectives and divisions[73] as:

- Fisheries Research and Development: To ensure the promotion of the sustainable development of fisheries resources and ecosystems by conducting and supporting appropriate research.
- Marine Resource Management: Ensures the sustainable utilisation and equitable and orderly access to the marine living resources through improved management and regulation.
- Monitoring, Control and Surveillance: Ensures the protection and promotion of sustainable use of marine living resources by intensifying enforcement and compliance.
- Fisheries Operations Support: The provision of support services in order to ensure the effective and efficient management and administration of the Branch: Fisheries Management and the Marine Living Resources Fund.
- Chief Financial Officer: The provision of financial management for the Branch: Fisheries Management and the Marine Living Resources Fund.

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.

F2.3:

[73] https://www.environment.gov.za/branches/fisheriesmanagement#objetives

As explained above 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.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

DAFF. 2016. Marine Living Resources Act of 1998, Marine Living Resources Act: Regulations relating to small-scale fishing 2016. Department of Agriculture, Forestry and Fisheries. http://extwprlegs1.fao.org/docs/pdf/saf155134.pdf

DAFF. 2016. VMS Presentation. http://mpaforum.org.za/wp-content/uploads/2016/11/VMS-Presentation-First-DAFF.ppt

DEFF. 2020. Fisheries Management Objectives. Department of Environment, Forestry and Fisheries. https://www.environment.gov.za/branches/fisheriesmanagement#objetives

DefenceWeb. 2018. DAFF working on illegal, unregulated and unreported fishing as part of Phakisa. https://www.defenceweb.co.za/security/maritime-security/daff-working-on-illegal-unregulated-and-unreported-fishing-as-part-of-phakisa/

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Publications. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/publications/2019

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

SAPFIA. 2020. TAC. South African Pelagic Fishing Industry Association. https://sapfia.org.za/tac/

SAPFIA. 2020. 2020 Anchovy Final Conditions. 2020 Anchovy final conditions

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**

Evidence
F3.1 and F3.2:

As the Competent Authority in the assessment area DEFF's Strategic Goal are broken down by objectives and divisions[74] as:

- Fisheries Research and Development: To ensure the promotion of the sustainable development of fisheries resources and ecosystems by conducting and supporting appropriate research.
- Marine Resource Management: Ensures the sustainable utilisation and equitable and orderly access to the marine living resources through improved management and regulation.
- Monitoring, Control and Surveillance: Ensures the protection and promotion of sustainable use of marine living resources by intensifying enforcement and compliance.
- Fisheries Operations Support: The provision of support services in order to ensure the effective and efficient management and administration of the Branch: Fisheries Management and the Marine Living Resources Fund.
- Chief Financial Officer: The provision of financial management for the Branch: Fisheries Management and the Marine Living Resources Fund.

Scientific Observers accompany fishing vessels to sea on request (refer to small pelagic permit condition)[75], 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)[76].

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.

[74] https://www.environment.gov.za/branches/fisheriesmanagement#objetives
[75] 2020 Sardine final conditions and 2020 Anchovy final conditions
[76] https://sapfia.org.za/working-with-deff/

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-14) and has been included in OMP-18. Ecosystem considerations in the purse seine small pelagic fishery currently include the experimental closure of areas to fishing around some important seabird (e.g. African penguin and Cape gannet and Cormorant) breeding colonies (islands) in an attempt to assess the impact of localized fishing effort on the breeding success of these birds. The benefit of such closure has been demonstrated for some breeding islands but not for others. A model of penguin dynamics has also been developed for use in conjunction with the small pelagic fish OMP so that the impact on penguins of predicted future pelagic fish trajectories under alternative harvest strategies can be evaluated. These studies have so far indicated that even with large reductions in the sardine TAC there would be little benefit for penguins[77].

VMS operated by DEFF 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 monitored and 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.

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.

The broader ecosystem within which the fishery occurs is considered during the management decision-making process and there is no substantial evidence that the fishery has a significant negative impact on the marine ecosystem.

F3.3:

Sardine and Anchovy play an important role in regulating ecosystem functioning. Total removals for these species 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 18 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. Shifts in sardine distribution and fluctuations in sardine abundance have been hypothesised to have had

77 http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

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.

Given that anchovy catches are well within the TAC, and that between 2006 and 2016, anchovy catches in the purse seine fishery were about half the TAC, it is probably unlikely that such level of exploitation could be considered as significantly detrimental to the wider ecosystem. In regards to the sardine fishery, the obvious decline in productivity and the resulting low biomass level may have effects on some species preying on this resource. However, we note that the fishery has always been within TAC and the most recent 2020 preliminary TAC was set to 0 t, and recent exploitation levels have very relatively small (in the region of 10-15K t per year). OMP 18 included improved ecosystem considerations such as reduced maximum directed sardine (500K to 200K t) and anchovy (450K to 350K t) TAC, as well as other consideration to more rapidly decrease sardine TAC from one year to another one.

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.

References

Coetzee, J.C., de Moor, C.L. and Butterworth, D.S. A summary of the South African sardine (and anchovy) fishery. http://webcms.uct.ac.za/sites/default/files/image_tool/images/302/workshop/IWS2019/Sardine2019_IWS/MARAM_IWS_2019_Sardine_BG1%20background%20A%20summary%20of%20the%20sardine%20fishery.pdf

DAFF. 2016. Marine Living Resources Act of 1998, Marine Living Resources Act: Regulations relating to small-scale fishing 2016. Department of Agriculture, Forestry and Fisheries. http://extwprlegs1.fao.org/docs/pdf/saf155134.pdf

DAFF. 2016. VMS Presentation. http://mpaforum.org.za/wp-content/uploads/2016/11/VMS-Presentation-First-DAFF.ppt

DEFF. 2020. Fisheries Management Objectives. Department of Environment, Forestry and Fisheries. https://www.environment.gov.za/branches/fisheriesmanagement#objetives

DefenceWeb. 2018. DAFF working on illegal, unregulated and unreported fishing as part of Phakisa. https://www.defenceweb.co.za/security/maritime-security/daff-working-on-illegal-unregulated-and-unreported-fishing-as-part-of-phakisa/

de Moor, C.L. 2018. Interim OMP-18. FISHERIES/2018/AUG/SWG-PEL/24. https://open.uct.ac.za/bitstream/handle/11427/30591/FISHERIES_2018_AUG_SWG-PEL_24%20Interim%20OMP-18.pdf?sequence=1

MARAM. 2019. Publications. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/publications/2019

MARAM. 2019. Workshop. Marine Resource Assessment and Management Group. http://www.maram.uct.ac.za/maram/workshops/2019

SAPFIA. 2020. Working with DEFF. South African Pelagic Fishing Industry Association. https://sapfia.org.za/working-with-deff/

SAPFIA. 2020. 2020 Anchovy Final Conditions. 2020 Anchovy final conditions

SAPFIA. 2020. 2020 Sardine Final Conditions. 2020 Sardine final conditions

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 rm. 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 approached 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.