

FISHERY ASSESSMENT REPORT

IFFO GLOBAL STANDARD FOR RESPONSIBLE SUPPLY OF FISHMEAL AND FISH OIL



FISHERY:	Redeye Herring (<i>Etrumeus whiteheadi</i>)
LOCATION:	South Africa
DATE OF REPORT:	November 2015
ASSESSOR:	Deirdre Hoare

1. APPLICATION DETAILS AND SUMMARY OF THE ASSESSMENT OUTCOME

Name:

Address:

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Page 1 of 16

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Certification Body Details			
Name of Certification Body:		Global Trust Certification Ltd.	
Assessor Name	Peer Reviewer	Assessment Days	Initial/Surveillance/ Re-certification
Deirdre Hoare		5	Re-certification
Assessment Period	2014-2015		
Scope Details			
1. Scope of Assessment		IFFO Global Standard for Responsible Supply – Issue 1	
2. Fishery		Redeye Herring (<i>Etrumeus whiteheadi</i>)	
3. Fishery Location		South Africa	
4. Fishery Method		Purse seine	
Outcome of Assessment			
5. Overall Fishery Compliance Rating		Medium/High	
6. Sub Components of Low Compliance		None	
7. Information deficiency		None	
8. Peer Review Evaluation			
9. Recommendation		Maintain approval	

2. QUALITY OF INFORMATION

Good; primarily government reports and websites.

3. COMPLIANCE LEVEL ACHIEVED

Medium/High

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Form No: 9

Report Ref:

Page 2 of 16

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Recommendation
Approve fishery
4. GUIDANCE FOR ONSITE ASSESSMENT
Based on HIGH compliance findings
Based on MEDIUM compliance findings
Based on LOW compliance findings
5. ASSESSMENT DETERMINATION
<p>The South African redeye round herring fishery is widely considered to be underdeveloped, and exists primarily as a subsidiary of the larger anchovy and sardine fisheries. While a precautionary catch limit is set for redeye, the majority of management measures and restrictions affecting the stock are applied at the ‘small pelagic fishery’ level and focused more specifically on anchovy and sardine. In the opinion of the assessment team, the research available suggests that the current levels of fishing are sustainable, and self-limiting due to the higher commercial value of sardine and anchovy (redeye has never formed more than 30% of the total small pelagic annual catch, and landings have never exceeded the highly precautionary upper catch limit. In addition, estimated exploitation rates for redeye have not exceeded 6% since 1999). Landings continue to be substantially below TAC, which is set according to the scientifically-derived Operational Management Procedure. In 2014 a new Operational Management Procedure (OMP-14) for the small pelagic fishery, and a fisheries act amendment Bill for South African fisheries in general, were implemented and reviewed during this assessment. The management of the similar, but fully-developed, sardine and anchovy fisheries provides an indication of the management regime which could be expected to be put in place as the redeye fishery develops. For this reason, the assessment team recommends the approval of this fishery, based on the condition that future surveillance audits should ensure that any development of the targeted fishery is accompanied by a development of the species-specific stock assessment and management process.</p>
HIGH Compliance
A1, B1, B2, D2, D3, E1, E2
MEDIUM Compliance
A2, A3, C1, D1
LOW Compliance

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Form No: 9	Report Ref:	Page 3 of 16	CCM Code:

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SUMMARY OF LEVEL OF COMPLIANCE					
	The Management Framework and Procedures	Stock assessment procedures and management advice	Precautionary approach	Management measures	Implementation
legal and administrative basis	A1				
Fisheries management should be concerned with the whole stock unit	A2				
Management actions should be scientifically based	A3				
Research in support of fisheries conservation and management should exist		B1			
Best scientific evidence available should be taken into account when designing conservation and management measures		B2			
The precautionary approach is applied in the formulation of management plans			C1		
The level of fishing permitted should be set according to management advice given by research organisations				D1	
Where excess fishing capacity exist, mechanisms should be in established to reduced capacity				D2	
Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment				D3	
A framework for sanctions of violation of laws and regulations should be efficiently exists					E1
A management system for fisheries control and enforcement should be established					E2

KEY: Low Compliance: Medium Compliance: High Compliance:

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Form No: 9	Report Ref:	Page 4 of 16	CCM Code:

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6. RATIONALE OF THE ASSESSMENT OUTCOME	
A. THE MANAGEMENT FRAMEWORK AND PROCEDURE	
LEVEL OF COMPLIANCE	
<i>A1. The management of the fishery must include a legal and administrative basis for the implementation of measures and controls to support the conservation of the fishery.</i>	
LOW	An administrative framework that ensures an efficient management of the fishery for its conservation is not established.
MEDIUM	An administrative framework that ensures an efficient management of the fishery for its conservation is somehow established, but there is evidence of not being efficient to ensure the conservation of the stock.
HIGH	A legal and administrative framework that ensures an efficient management of the fishery for its conservation is established and works efficiently toward the conservation of the stock.
<p><i>Determination: South Africa has in place a robust legal and administrative framework for the determination and implementation of fishery management measures and controls. This framework is applied to the anchovy fishery.</i></p> <p>Legal Basis</p> <p>The legal foundation for the management of South African fisheries, including fisheries for sardine, anchovy and round herring, is the Marine Living Resources Act, 1998 (Act No. 18, 1998) of South Africa, which includes the following overarching goals:</p> <ul style="list-style-type: none"> • achieve optimum utilisation and ecologically sustainable development of marine living resources • conserve marine living resources for present and future generations • apply precautionary approaches in respect of the management and development of marine living resources • utilise marine living resources to achieve economic growth, human resource development, capacity building within fisheries and mariculture branches, employment creation and a sound ecological balance consistent with the development objectives of the national government • protect the ecosystem as a whole, including species which are not targeted for exploitation; • preserve marine biodiversity • minimise marine pollution • achieve to the extent practicable a broad and accountable participation in the decision-making processes provided for in the Act <p>The passing of the Marine Living Resources Amendment Bill 2013 has resulted in some changes to the basis for fisheries management since the 2013 surveillance. The Bill replaces the concept of subsistence fisheries with ‘small-scale’ fisheries, and introduces the main mechanisms by which the fisheries Minister may exert control over these; primarily, through licencing, area restrictions and quotas.</p> <p>Administrative Basis</p> <p>The South African fishing industry is managed and regulated by the Fisheries Management Branch (FMB) of the Department of Agriculture, Forestry and Fisheries (DAFF). The FMB is the primary implementer of the Marine Living Resources Act, and its aims include the maintenance and restoration of the productive capacity and biodiversity of the marine environment, ensuring the protection of human health, and promotion of the conservation and sustainable use of marine living resources. The Branch conducts research and monitoring on anchovy, amongst other stocks, including biannual research surveys, manned field stations, and creating Scientific Working Groups (SWGs) to gather state and invited outside specialist scientists to assess the status of the various pelagic stocks. The FMB uses this research to make recommendations regarding management measures, including total allowable catches (TACs) and fishery closures. The specific SWG relevant to the redeye herring stock is the Small Pelagic Scientific Working Group, which provides advice and recommendations to ensure the sustainable utilisation of South Africa's small pelagic fish resources (although does not set a TAC for redeye herring – see section D1).</p>	

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Form No: 9	Report Ref:	Page 5 of 16	CCM Code:

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R1, R2, R3		
LEVEL OF COMPLIANCE		
<i>A2. Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account fishery removals and the biology of the species.</i>		
LOW	Fisheries management is not concerned with the whole stock unit over its entire area of distribution and do not take into account any of the matters listed in 'A1'.	
MEDIUM	Fisheries management is concerned with matters listed in 'A1' but not entirely. Fisheries, in relation to 'A1' statement, should improve to ensure the long term conservation of the marine resource.	
HIGH	Fisheries management should be concerned with the whole stock unit over its entire area of distribution and take into account: <ul style="list-style-type: none"> • All fishery removals • The biology of the species 	
<p><i>Determination: Fishery management is concerned with the entire distribution of the redeye herring stock as currently understood. However, population data for the species currently appears not to be directly used in the management process, and as the fishery develops the spawning biomass estimates should be factored in more explicitly. The assessment team considers a medium compliance rating appropriate because despite fishery management not taking into account fishery removals or biomass estimates, exploitation rates have been very low for more than a decade.</i></p> <p>The redeye round herring occurring over the continental shelf region from Walvis Bay on the west coast (Namibia) to about the Thukela River on the east coast is considered to be a single stock. Lower water temperatures along the east coast in winter are thought to allow this temperate species to extend its range northwards into the more tropical waters of KwaZulu-Natal. There is a tropical co-generic species, the east coast round herring (<i>Etrumeus teres</i>), found along the African east coast south to Durban, and is thought to overlap distribution with the redeye round herring, potentially leading to confusion in fishery sampling. Although some fishing is carried out by Namibian and international vessels, the large majority of redeye herring landings are by South African vessels. For example, in 2009 the totally global catch, according to the FAO, was around 40,000 tonnes, of which South Africa was responsible for 37,000t. The management of the two main targets in the small pelagic fishery, sardine and anchovy, is designed around the biology of the species. As the targeted redeye fishery is still considered underdeveloped, and information on the species is comparatively limited, fishery removals are not currently factored in to its management. However, landings data is recorded, and total catch is monitored and used to ensure fishing does not exceed the precautionary upper catch limit. The round herring resource in South African waters is currently believed to be under-utilised at present, and attempts at greater exploitation have been encouraged Since June 2008, South Africa has been a member of the South East Atlantic Fisheries Organisation (SEAFO). The objective of the organisation is to ensure the long-term conservation and sustainable use of the fishery resources in the Convention Area through the effective implementation of the Convention.</p> <p>The PUCL is set at around 10% of estimated biomass, and so as long as landings remain below the PUCL (which they have to date), the exploitation rate will remain fairly low. Landings vary between 30,000 to 55,000 tonnes annually (FishStat 2009). Landings for 2013 were 32,000t.</p>		M

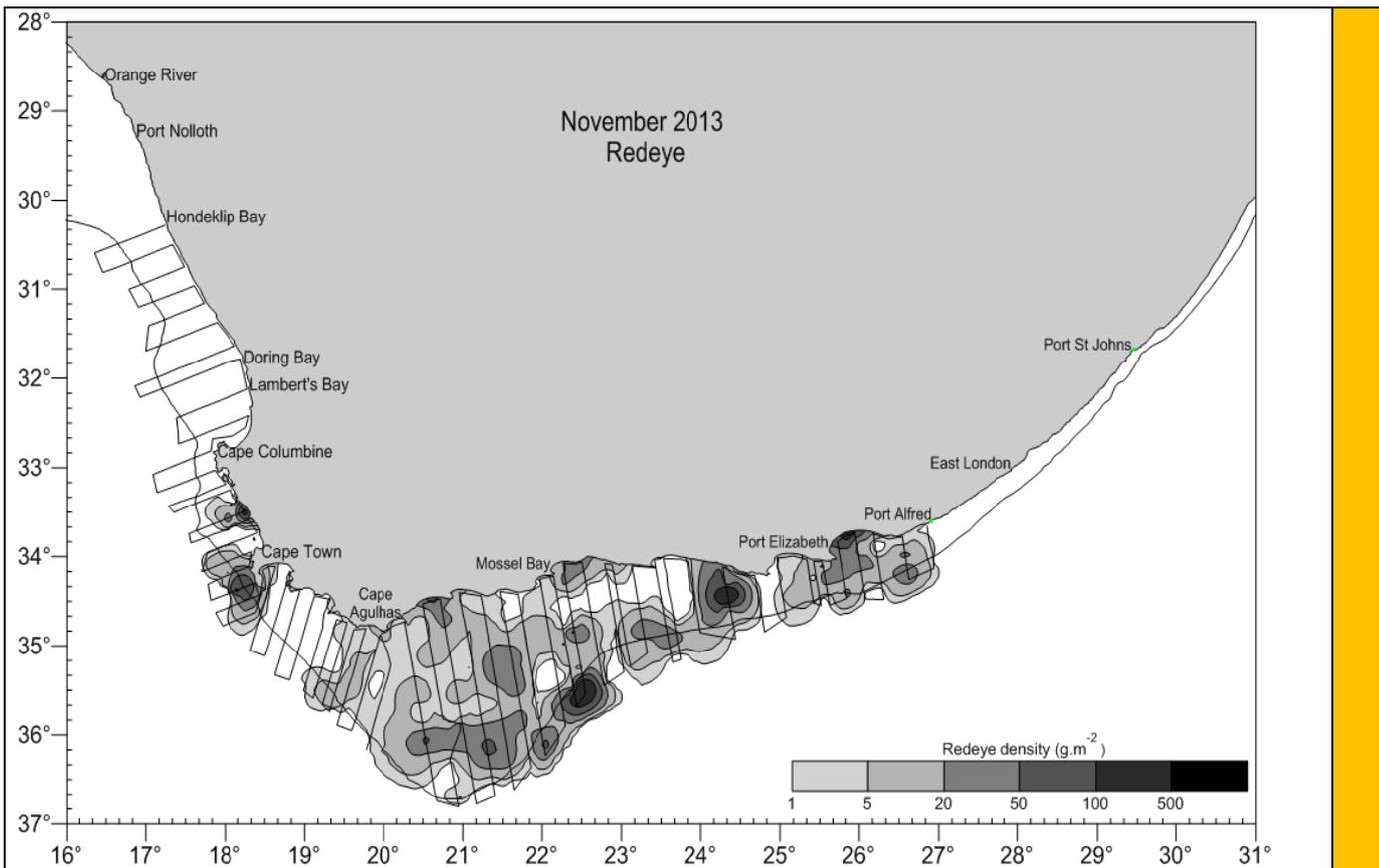


Figure 1. South African red-eye *E. whiteheadi* distribution and relative density for the 2013 spawner biomass survey (Mhlongo et al., 2013)

R4, R5, R6

LEVEL OF COMPLIANCE

A3. Management actions should be based on long-term conservation objectives

LOW	Management actions are not based on long term management objectives.
MEDIUM	Management actions are based on long term management objectives. However the actions are not scientifically formulated.
HIGH	Management actions are based on long term management objectives, and actions are science based.

Determination: Long-term management aims of the fishery are currently limited to ensuring that annual catches remain below 100,000t.

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The long-term conservation objectives of the management of the South African small pelagic fishery are set out in the Operational Management Procedure (OMP). At the time of the initial and first surveillance assessments, the active OMP was OMP-08, which was due to be replaced by OMP-13 towards the end of 2013. A new OMP-14 has been implemented, however it does not mention redeye herring.

The only long-term objective for redeye herring in OMP-08 was to ensure the total fishing level did not exceed 100,00t per year, which represented a conservative estimate of a sustainable level of fishing given the stock data available. The previous assessments concluded that as the long-term aims for the primary target species in the pelagic fishery are specific and risk-based, and it is likely that as the redeye fishery develops similar aims will also be developed. This management action seems to be still in place as TACs for 2014 and 2015 were capped at 100,000t.

R7, R8

B. STOCK ASSESSMENT PROCEDURES AND MANAGEMENT ADVICE

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Form No: 9	Report Ref:	Page 7 of 16	CCM Code:

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LEVEL OF COMPLIANCE	
<i>B1. Research in support of fisheries conservation and management should exist.</i>	
LOW	Research to support the conservation and management of the stock, non-target species and physical environment does not exist
MEDIUM	Research to support the conservation and the management of the stock, non-target species and physical environment exists, however research programmes could be significantly improved to decrease scientific advice uncertainty.
HIGH	Research to support the conservation and the management of the stock, non-target species and physical environment exist, and existent research is considered most adequate for the long term conservation of the target, non-target and physical environment

Determination: Management of the South African small pelagic fishery is supported by ongoing fishery dependent and annual fishery independent research. H

Fishery dependent: Information collected from pelagic landing sites includes the catch weight, species composition, and catch location (grouped into 10 × 10 mile blocks). Anchovy catch data are used to ensure quotas are not exceeded.

Additionally, anchovy catch data and the ratio of juvenile sardine to anchovy as observed in commercial catches during May are both used as input in the operational management procedure in the mid-year determination of the revised anchovy total allowable catch and sardine total allowable bycatch. Catch location data are used to monitor spatial trends in fishing patterns and from those infer distribution patterns of pelagic species. For example, anchovy, round herring and sardine appear to have increased substantially in their distribution ranges between mid- to late 1980s and the 1990s and, since 1997, the average location of sardine catches has shifted further eastwards each year. Additionally, this data may be used in conjunction with other data sources to derive spatial ecosystem indicators such as an index of spatial biodiversity and the exploited fraction of the ecosystem surface for the pelagic fishery. Catch-at-age and weight-at-age data for both anchovy and sardine are generated from age-length keys derived from commercial catch samples, and are required for the stock assessment models. Biological data have been used to construct time series of indicators that characterise the state of the target stock and the fisheries they support. Observers on boats have been deployed in the pelagic fishery since 1999, to provide data relating to catch weight and locality, catch composition, and length frequencies of important species, in addition to collecting some biological data. Observer data has been used to validate catch data (primarily catch weight and species composition) recorded by fisheries inspectors at landing sites, and to compare the fishing behaviour of observed versus unobserved vessels. The most significant gap in the observer data pertains to the low coverage of the pelagic fleet, which is currently around 8% of fishing trips. Permit conditions place the emphasis on vessel owners to ensure that at least 5% of trips have an observer presence. Catch may only be landed in the presence of a fishery control officer. Vessel monitoring systems are presently required on board every pelagic vessel and provide data on location (with a temporal resolution of six hours), but are currently only used for compliance purposes to ensure that vessels do not fish in restricted areas.

Fishery-independent: A hydroacoustic survey programme to estimate pelagic fish biomass was initiated in 1983. These surveys cover much of the continental shelf around South Africa, although the spawner biomass survey has a greater offshore coverage than does the recruitment survey. Annual biomass estimates of anchovy and sardine spawner biomass have been made every November since 1984, resulting in an uninterrupted time series that spans 30 years. The collection of ichthyoplankton samples during spawner biomass surveys permitted estimates of anchovy spawner biomass using the daily egg production method

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Form No: 9	Report Ref:	Page 8 of 16	CCM Code:

(DEPM), and between 1984 and 1993 concomitant acoustic and DEPM estimates were made which were combined to obtain a single, unbiased measure of population size. The DEPM estimates and acoustic survey estimates for anchovy spawner biomass showed good agreement over a period of ten years, leading to discontinuation of the DEPM due to the additional work load required to produce two essentially similar biomass estimates. Ichthyoplankton data have also been used more broadly to study other life history characteristics of the small pelagic species, such as spawning habitat and nursery areas.

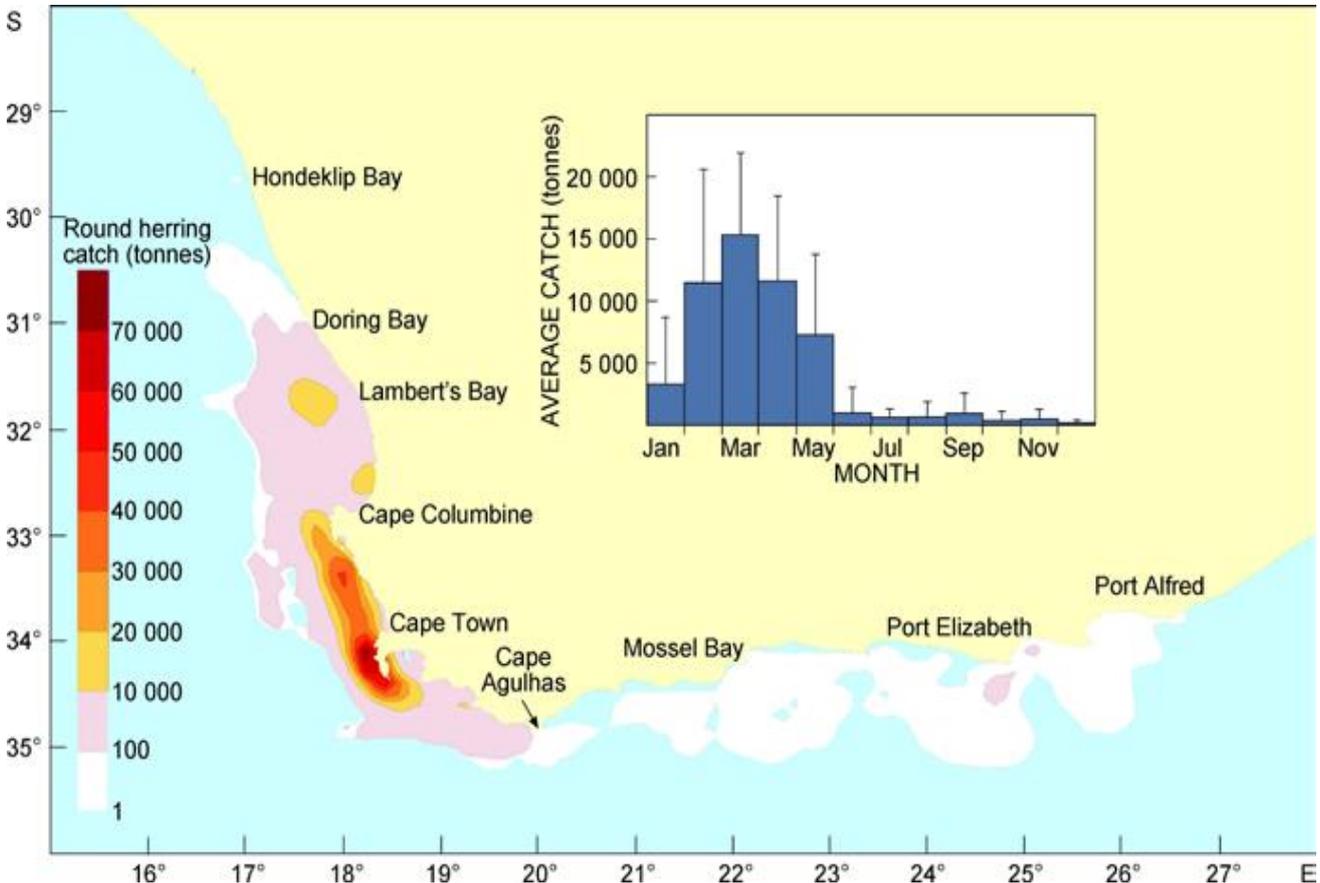


Figure 2. Composite catch distribution and average monthly catch (histogram, with one standard deviation shown), of round herring (directed and bycatch combined) over the period 1987-2012.

R9, R10

LEVEL OF COMPLIANCE	
<i>B2. Best scientific evidence available should be taken into account when designing conservation and management measures.</i>	
LOW	Scientific advice is not taken into account when designing conservation and management measures.
MEDIUM	Scientific advice is taken into account, when designing conservation and management measures. However some areas of discrepancy are identified that could have a significant impact in the long term conservation of the marine environment.
HIGH	Scientific advice is taken into account, when designing conservation and management measures, in a comprehensively manner.

Determination: Scientific Working Groups (SWGs) continue to be involved throughout the management process. There do not appear to have been any substantial changes to the implementation of scientific advice in the management of the stock since the 2013 surveillance assessment.

By constituting various scientific working groups, such as the Ecosystems Effects of Fishing Working Group and the Small Pelagic Scientific Working Group, the Fisheries Management Branch ensures that the best available scientific evidence is taken into account when designing conservation and management measures.

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Form No: 9	Report Ref:	Page 9 of 16	CCM Code:

The scientific working group for the sustainable management of small pelagic resources produces recommendations, including seasonal and sub-seasonal TACs and TABs, and other management measures where relevant. For example, the marine areas around the largest penguin breeding colony in the Eastern Cape (St Croix Island off Port Elizabeth) have been closed to pelagic fishing for several years as a result of scientific advice. These closures are codified in the pelagic fishing permits.

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.

C. THE PRECAUTIONARY APPROACH

LEVEL OF COMPLIANCE

C1. The precautionary approach is applied in the formulation of management plans.

LOW	The precautionary approach is not applied in the formulation of management plans.
MEDIUM	The precautionary approach is applied, however not all uncertainties are taken into account.
HIGH	The precautionary approach is applied, taking into account uncertainties relating to the dynamic of fish population (recruitment, mortality, growth and fecundity), and the impact of the fishing activities, such as discards and by-catch of non-target species as well as on the physical environment (Habitats).

Determination: *Determination: South African fisheries policy states the application of the precautionary approach as one of the primary aims. There is little information available on redeye herring specifically, and as a result a highly precautionary catch limit is in place. It is the opinion of the assessment team that given the scarcity of specific scientific information on the species, this approach is satisfactorily precautionary; however there is room for improvement, and a more thorough risk-based assessment should be developed as the directed fishery develops. Initial models are already in development.*

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The Marine Living Resources Act, 1998 includes as one of its recognised principals “the need to apply precautionary approaches in respect of the management and development of marine living resources”.

The small pelagic fishery is managed by Operational Management Plan, the most recent of which was implemented in 2014. As there is no mention of redeye herring we can only assume that the level of precautionality applied in the management of this fishery has not changed.

At the time of the initial and first surveillance assessments, the small pelagic fishery was managed by OMP-08. This OMP performed a risk analysis, which allowed 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 for the two main target species, sardine and anchovy. The lack of information, plus the comparatively small commercial interest in the species, meant that no such analysis is carried out for redeye herring. However, A 2006 study stated that ‘The present stock control method of setting a Precautionary Upper Catch Limit (PUCL) seems to be a conservative way of protecting a stock that is not very well researched and that forms a portion (up to 30%) of the catch of a large pelagic fishery.’

R1, R7, R8

D. MANAGEMENT MEASURES

LEVEL OF COMPLIANCE

D1. The level of fishing permitted should be set according to management advice given by research organisations.

LOW	The level of fishing permitted is not set according to management advice given by research organisations.
MEDIUM	The level of fishing permitted is higher than management advice given by research organisations. However, the difference is not considered to have a significant impact of the sustainability of the stock
HIGH	The level of fishing permitted is set according to management advice given by research organisations.

Determination: *The initial and first surveillance assessments determined that the annual Precautionary Upper Catch Limit of 100,000t had never been breached and that fishing effort was largely self-regulating. There is currently no new landings information available to the assessment team since the 2013*

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surveillance, so it is not clear whether this is still the case.

Redeye round herring is not allocated a Total Allowable Catch (TAC), but rather a Precautionary Upper Catch Limit (PUCL). The PUCL is set at 100,000t per annum, which is 10% of the conservative estimate of stock size and as of 2013 had never been exceeded since the inception of the fishery in 1958. On-site questioning conducted as part of the initial assessment of the fishery confirmed that the entire small pelagic fishery would be closed if the PUCL were exceeded at any point; however there are no new landings data available to the assessment team since the 2013 surveillance (32,000t) and so it is not clear whether the increasing trend in landings observed at that time has continued. It is known that the PUCL currently remains at 100,000t.

The PUCL is not allocated to individual vessels, which therefore have no specific catch limit. Small pelagic vessel preferentially fish for anchovy and sardine, and the total redeye fishing effort appears to be largely self-limiting.

South African small pelagic fishery TACs and TABs set for 2015 (DAFF, 2015):

Round Herring PUCL : Target round herring PUCL (not allocated to specific rights holders)	100,000t
Round Herring Target TAB : Adult sardine TAB permitted in directed round herring and anchovy fishing	7 000t
Round Herring Target TAB : Juvenile sardine TAB with directed round herring fishing	1 000t

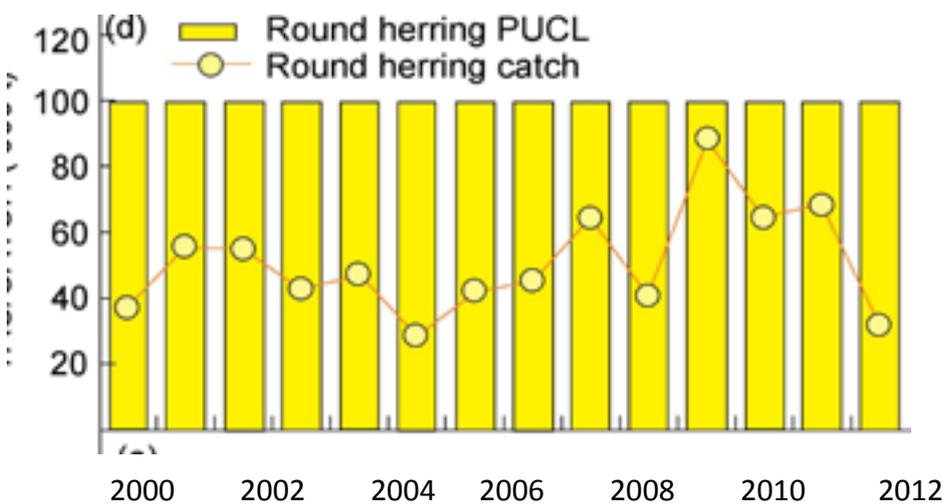


Figure 3: Precautionary Upper Catch Limits (PUCLs), and subsequent landings for the South African round herring 2000–2013.

LEVEL OF COMPLIANCE

D2. Where excess fishing capacity exist, mechanisms should be in established to reduced capacity to allow for the recovery of the stock to sustainable levels.

LOW	Mechanisms to allow for recovery of the stock to sustainable levels are not established.
MEDIUM	Mechanisms to allow for recovery of the stock to sustainable levels are somehow established. However there is no evidence of the efficiency of the methods used.
HIGH	Mechanisms are established to reduce capacity to allow for the recovery of the stock to sustainable levels and there are evidences of recovery.

Determination: *South Africa has several mechanisms in place to reduce excess fishing capacity, including the setting of strict, enforced quotas, vessel registering and commercial fishing licences. There is currently not considered to be excess fishing capacity in this fishery.*

H

Any commercial fishing in South Africa requires an annually-renewed license. Commercial fishers are considered to be exercising a fishing right. The right must first be applied for and granted, to exploit, harvest fish or engage in a fishing related activity for trade purposes. It also includes engagement in fishing related and non-consumptive activities. Commercial fishing permits are granted by the Minister of Department of Agriculture, Forestry and Fisheries (or the delegated authority). Full or limited commercial fishing rights are granted in selected fishing sectors based on a Total Allowable Catch or Effort (TAC/E) which is determined annually by the Minister of the Department of Agriculture, Forestry and Fisheries. It is illegal to engage in commercial fishing without a permit. In addition, any vessel which is “used for, or equipped for the management, harvesting and exploitation of living marine resources, or in support of related activities” must be registered with and approved by the DAFF and African Maritime Safety Authority (AMSA). Historically, when anchovy and sardine biomass levels have been low, TACs and TABs have been adjusted accordingly to allow stock recovery, extending as far as the closure of the anchovy fishery in 1997. At present the stock analysis of the redeye stock is insufficient to set annually varying quotas; however the conservative PUCL has never been exceeded, and at present the level of fishing of this stock appears to be self-limiting for economic reasons.

LEVEL OF COMPLIANCE

D3. Management measures should ensure that fishing gear and fishing practices do not have a significant impact on non-target species and the physical environment.

LOW	There are no management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment.
MEDIUM	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. However it is not science based.
HIGH	There are management measures to prevent the impact of the fishing methods and fishing practices on non-target species and the physical environment. Measures are based on scientific information.

Determination: Purse-seine nets are not considered to have a major impact on the physical environment. The major bycatch species in the small pelagic fishery are subject to quotas, and in any case the fishery is considered highly targeted (within the four main species caught). DAFF scientists have stated that there is no PET bycatch in the fishery.

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Redeye herring are caught using purse-seine nets in the mid-water. This method is preferred for capturing commercially important fish species which aggregate close to the water’s surface, and is not considered destructive to the benthic habitat or species within the benthic habitat. Bycatch in the small pelagic fishery is less than 10 %, due to the dense schooling behaviour of target species and the fishing methods employed. Some reef species traditionally referred to as linefish (e.g. yellowtail, white steenbras and kob) are occasionally caught. The major bycatch species, anchovy, sardine and horse mackerel, are subject to annual quotas. Small pelagic fishing permits set out a detailed plan for regional fishery closures if bycatch exceeds defined minimums, and processor permits prohibit certain gear types to minimise Cape fur seal casualties. Government scientists (from the Small Pelagic Scientific Working Group, SPSWG) have stated that there is no TEP bycatch in the small pelagic fishery. Sealions and seals are scared out of the nets by skippers when they are seen. All landings are monitored by a government official, who completes a pelagic landing report for each vessel. Skippers also complete a report, which must match the monitor’s figures to within 10%. Samples are taken of landings every 30 minutes to check bycatch composition. Excessive bycatch of certain species leads to area closures, as described in the assessment report. Small pelagic fish such as redeye herring are an important part of the food chain in the Benguela Current, and as such they are important for the functioning

of the ecosystem in the region. It is illegal in South Africa to use any explosive, fire arm, poison or other noxious substance to catch fish.

African Penguins

The African Penguins are severely under threat and are now considered Endangered by the World Conservation Union (www.iucnredlist.org). Their populations have decreased by over 70% in the last ten years, initially as a result of egg collecting and guano scraping but more recently as a result of competition between man and penguins for a source of food – sardines and anchovies. The RFA therefore opted to support a study by Dr Lorien Pichegru and Alistair McInnes of the University of Cape Town’s Percy FitzPatrick Institute of African Ornithology to assess the relationship between penguin foraging behaviour, prey abundance and fishing activity in the Algoa Bay region. St Croix Island is host to the world’s largest colony of African penguins (75 000 pairs) and was closed to fishing from 1 January 2009 to 31 December 2011 and nearby Bird Island (2500 pairs) remained open to fishing until the 1 of January 2012 after which it was closed for 3 years.

The project was aimed at defining the links between fishing closures and food availability for penguins, understanding how penguins respond to variable prey availability, and optimizing closures regarding both economic and biological needs. Acoustic surveys were used to assess the penguin’s prey availability, while high numbers of GPS tracking devices were simultaneously deployed on breeding penguins from colonies open and closed to fishing pressure to track foraging behaviour.

Although this study is part of a bigger project which still requires further work, the findings at this stage indicate that:

1. Foraging effort could be related to fish abundance in Algoa Bay, as low fish abundance was concomitant with high foraging effort on both islands in 2012 whereas the opposite was encountered in 2013.
2. Obvious difference in fish abundance was not observed between fished and non-fished areas. However, the identification of the small pelagic species encountered still need to be assessed as it is possible that fishing depletes certain species, thereby modifying the general structure of the fish assemblages.
3. Industrial fishing pressure negatively impacts foraging effort of penguins breeding on St Croix Island and the implementation of a 20km exclusion zone has been demonstrated to benefit penguins. However, further data and the influence of natural physical drivers of fish abundance need to be investigated for stronger conclusions.

The assessment of local fish abundance in this study adds nuances to previously published results: while the size of commercial fishing clearly influences foraging effort, the magnitude of such influence certainly depends on local fish abundance which can vary annually. The results of this study will serve to inform the planning and future development of Marine Protected Areas in South Africa.

Table 1. Some examples of how the EAMR is being applied in the South African small pelagic fishery

Table of Exemples				
The Issue	Indicators	Research Approaches	Technical Management	Implementation
Impacts of removal of	Bird population sizes; breeding	Routine monitoring of seabird colonies;	Avoid populations falling below levels that exceed	Good potential for

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Form No: 9	Report Ref:	Page 13 of 16	CCM Code:
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<p>forage fish on species bound to breeding sites on land (i.e. seabirds)</p>	<p>success (fledgling weight, fledglings raised per breeding pair, breeding proportion); seabird diet composition; spatial indicators(e.g. overlap of seabird foraging and pelagic fisheries)</p>	<p>satellite tracking to assess foraging ranges; minimum realistic models; spatialised models of pelagic fish around seabird colonies</p> <p>Quantify and formalise the link between the pelagic fishery and seabirds; quantify functional responses of seabirds to small pelagic prey and identify thresholds below which there are serious negative implications for seabirds</p>	<p>limit reference points according to IUCN conservation criteria by reducing TACs or closing areas within foraging ranges; allow sufficient escapement of forage fish for predators; avoid threshold levels of pelagic fish below which the implications for seabirds are detrimental</p>	<p>implementation of management response/ability to manage</p>
<p>Poor understanding of decadal scale fluctuations in abundance of small pelagic fish and thus availability to fisheries</p>	<p>Biomass; catches; trophic replacement index; diet of predators (e.g. seabirds)</p>	<p>Develop indicators to track ecosystem changes; hindcast to pre-fishing period to provide information on ecosystem effects of fishing; develop expert system models to detect ecosystem changes (using indicators); compare ecosystem functioning over different periods and between systems; quantify trophic controls (bottom-up,top-down, wasp-waist); time-series analyses</p>	<p>Manage catches within productivity states/regimes, as identified using indicators of ecosystem state/ change</p> <p>Benefit: optimisation of catches while keeping the risk low that catch levels will accelerate stock decline</p>	<p>Fair potential for implementation of management response/ability to manage</p>

R11, R12

E. IMPLEMENTATION

LEVEL OF COMPLIANCE

E1. There should be a framework for sanctions of violation of Laws and regulations.

LOW A framework for sanctions of violation of Laws and regulations do not efficiently exist.

MEDIUM	A framework for sanctions of violation of Laws and regulations do exist but do not work efficiently.
HIGH	A framework for sanctions of violation of Laws and regulations exists and is proven to be efficient.
<p>Determination: There is a detailed legal framework for sanctions of violations of laws and regulations by South African fishers. H</p> <p>A framework of sanctions for violations of laws and regulations is established by the Marine Living Resources Act, 1998 (Act No. 18, 1998) of South Africa, with jurisdiction throughout the South-African EEZ. There are numerous other Acts that add to the marine legislative framework that work in conjunction with the MLRA. These include the National Environmental Management: Protected Areas Act (No. 57 of 2003), the National Environmental Management: Biodiversity Act (No. 10 of 2004), the Maritime Zones Act (No. 15 of 1994), Sea Birds and Seals Protection Act (No. 46 of 1973), Sea Shore Act (No. 21 of 1935) and the Nature and Environmental Conservation Ordinance, (Ordinance 19 of 1974). Sanctions include the suspension or removal of fishing rights, the seizure of gear or vessels, fines of up to 5 million rand (approx. US\$500,000), or imprisonment for up to five years. A detailed list of sanctions is presented in Chapter 7 of the Marine Living Resources Act. The conditions for small pelagic fishing permits include a section detailing the process of sanctions for violations.</p>	
LEVEL OF COMPLIANCE	
<i>E2. A management system for fisheries control and enforcement should be established.</i>	
LOW	A management system for fisheries control and enforcement is not established.
MEDIUM	A management system for fisheries control and enforcement is established but do not work efficiently.
HIGH	A management system for fisheries control and enforcement is established and works efficiently.
<p>Determination: A management system for fisheries control and enforcement is established and works efficiently. H</p> <p>Enforcement is the responsibility of the Fisheries Management Branch of the Department of Agriculture, Forestry and Fisheries. Compliance is maintained through a comprehensive monitoring, control and surveillance strategy, 4 fishery patrol vessel warships and one chase vessel (used for all South African fisheries), officers and vessel monitoring systems. Vessel monitoring systems are presently on board every pelagic vessel and provide data on location (with a temporal resolution of six hours), and are used for compliance purposes to ensure that vessels do not fish in restricted areas. Both the skipper and holder of fishing rights of vessels detected fishing in closed or restricted areas are subject to fines. Fish must be landed in the presence of a Fishery Control Officer, who completes a pelagic landing report for each vessel. Skippers also complete a report, which must match the monitor’s figures to within 10%. Samples are taken of landings every 30 minutes to check bycatch composition. Excessive bycatch of certain species leads to area closures, as described above. Fishing permits also contain restrictions on where fish can be landed.</p> <p>Catch data are recorded at landing, and observers are present on approximately 8% of fishing trips. All commercial fishing vessels are required by law to have a license and fishing permit, and all licensed vessels are required to permit observers and fishery control officers on board when requested. Full details of the powers of fishery control officers are set out in Chapter 6 of the Marine Living Resources Act, 1998.</p>	

7. KEY STAKEHOLDERS

8. REFERENCES

R1 – South Africa Marine Living Resources Amendment Bill, 2013:

https://jutralaw.co.za/media/filestore/2013/11/B30B_2013.pdf

R2 – South Africa Redeye Herring initial IFFO RS assessment, 2011: <http://www.iffonet.net/files/iffoweb/approved-raw-materials/whole-fish/red-eye-herring-south-africa.pdf>

R3 – South Africa Marine Living Resources Amendment Bill, 2013:

https://jutralaw.co.za/media/filestore/2013/11/B30B_2013.pdf

R4 – Lindsay, 2006: An assessment of the fishery potential for the redeye round herring (Etrumeus whiteheadi) in the Eastern Cape: <http://www.ecdc.co.za/files/documents/Fisheries/Redeye%20study.pdf>

R5- Mhlongo N, Coetzee J, Shabangu F, Merkle D, Hendricks M, Geja Y (2013) Results of the 2013 Spawner Biomass Survey. Fisheries Management Scientific Working Group – Small pelagics. FISHERIES/2013/DEC/SWG-PEL/45

R6 – South East Atlantic Fisheries Organisation: <http://www.seafo.org/>

R7 – South Africa OMP-14: Provided by client. OMP-14 C.L. de Moor* and D.S. Butterworth* FISHERIES/2014/DEC/SWG-PEL/60

R8 - South Africa OMP-08: Provided by client.

R9 – Hutchings, L. et al, 2009: Marine fisheries monitoring programmes in South Africa. South African Journal of Science 105

R10 – Status of the South Africa Marine Fishery Resources 2014:

http://www.nda.agric.za/daDev/sideMenu/fisheries/03_areasofwork/Resources%20Research/STATUS%20OF%20THE%20SOUTH%20AFRICAN%20MARINE%20FISHERY%20RESOURCES%202014%20WEB.pdf

R11- Ecosystem Approach to the South African small pelagic fishery

http://www.vliz.be/wiki/Ecosystem_Approach_to_the_South_African_small_pelagic_fishery

R12 - <http://www.iucnredlist.org/details/22697810/0>

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Form No: 9	Report Ref:	Page 16 of 16	CCM Code:

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