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Ecological Risk Assessment (ERA) Workshop for the Patagonian Toothfish Fishery

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As a signatory nation to the 2002 World Summit on Sustainable Development (WSSD), South Africa is committed to develop and implement an Ecosystem Approach to Fisheries (EAF) Management. An Ecosystem Approach is based on two main principles. The first relates to maintaining and enhancing the ecosystem health as a whole and the second refers to balancing diverse societal needs and values. Towards this goal an Ecological Risk Assessment (ERA) was undertaken in Cape Town, South Africa, between the 8th and 9th June of, 2010 for the South African Patagonian Toothfish Fishery. The workshop was hosted by Department of Agriculture, Forestry and Fisheries (DAFF), and facilitated by Dr. Samantha Petersen of WWF-South Africa. After wide distribution of invitations, the workshop was attended by a total of 17 participants. Most attendees were from DAFF (including representatives from research, compliance and resource management) and good representation from industry and NGO's. This allowed for very healthy debate. Please see Appendix 3 for a complete list of attendees.

An ERA is viewed as a tool to track and stimulate the implementation of an EAF and broadly reviews progress towards implementing systems and processes to address the following ten EAF objectives:

1. The managing authority has a good understanding of the ecosystem impacts of fisheries including target, non-target and general ecosystem impacts
2. Ecosystem impacts of fisheries are included into management advice
3. The social wellbeing of dependent fishing communities is accounted for in management advice
4. The economic wellbeing of the fishing industry is accounted for in management advice
5. The managing authority has transparent and participatory management structures that ensures good communication and information sharing locally and regionally
6. Management plans incorporate EAF considerations
7. Compliance to regulations reduces ecosystem impacts of fisheries
8. Sufficient capacity, skills, equipment and funding exist to support the implementation of an EAF
9. Good data procedures exist to support EAF implementation
10. External impacts of fisheries are addressed (e.g. the effect of other sectors, other industries, climate change etc.)

A brief description of the Patagonian Toothfish Fishery

Patagonian toothfish, also known as Chilean sea bass, is a deep-water, demersal species which is found on sub-Antarctic continental shelves down to 3 000 metres. Patagonian toothfish live for over 50 years and reach a length of over two metres. Maturity is attained between six and nine years of age, equivalent to a length range of 70 to 95 centimetres.

Several countries can lay claim to Patagonian toothfish which occur within the exclusive economic zones ("EEZ's") of Chile, Argentina and other countries with sovereignty over the southern Ocean islands. South Africa's EEZ around the Prince Edward Islands ("PEI") is a prime fishing ground for Patagonian toothfish. Much of the range of Patagonian toothfish, however, falls within the high seas.

Global catches of Patagonian toothfish have declined sharply since the origins of the fishery in the late 1980s. A combination of its high value, late maturity and occurrence in the high seas has caused the near-collapse of the fishery, which has seen unprecedented levels of illegal, unregulated and unreported ("IUU") fishing. South Africa's waters around the Prince Edward Islands were extensively targeted and the Commission for the Conservation of Antarctic Marine Living Resources ("CCAMLR") estimates that as much as 32 000 tons of toothfish, with a value of US\$100 million was illegally fished from the PEI-EEZ between 1996 and 1998.

The harvesting of Patagonian toothfish has been authorised by South Africa since 1996. In 1996, five experimental permits were issued (under the Sea Fisheries Act of 1988) for the harvesting of Patagonian toothfish within the EEZ of the Prince Edward Islands ("the PEI-EEZ"). Today, long-term rights have been allocated for this sector. The TAC for the 1996/1997 fishing season was set at 3000 tons. However, the TAC for the experimental toothfish fishery has declined steadily and was set at 500 tons for the 2003/2004 fishing season. Currently (2010) the TAC is 450 tons.

The Prince Edward Islands are situated within the jurisdiction of the CCAMLR Convention Area. South Africa is a founding member of CCAMLR, the regional fishery management organisation tasked with primarily monitoring and allocating catching rights for Patagonian toothfish in Antarctic waters. South Africa remains an active member of CCAMLR and implements all conservation measures through permit conditions.

Patagonian toothfish is a high value white fish that fetches prices as high as US\$13 000 per ton. It is the fish's high value that has led to the high levels of IUU fishing in the fishery. Poaching in the PEI-EEZ has largely been brought under control. The fishery remains commercially sustainable provided that it is effectively regulated with participants in terms of the Guidelines determined by CCAMLR.

The fishery is a high-risk, extremely capital-intensive fishery that requires right-holders to make substantial investments in vessels, gear, research and marketing. Start-up costs would require a capital investment of several million rand and operational costs are substantial.

Catches recorded in the early 90s indicate that the pristine standing stock was substantial and therefore if rebuilt this fishery could become a significant revenue earner. Early IUU activity was brought under control by a combination of reduced interest in the area due to the serial depletion of stocks, but also through compliance assisted by the French government and the legal South African Toothfish fishery. Today the fishery only has one rightsholder who consistently fishes around the PEI, but if appropriately managed and

given the resources to implement a well-planned MCS strategy, this fishery has the potential to be one of the more profitable fisheries resources owned by South Africa.

Methodology

The method used for this ERA is broadly based on the Australian and New Zealand Standard Risk Analysis, which was adapted for use in a fisheries context (Fletcher *et al.* 2002, Fletcher 2005, Nel *et al.* 2007). It has since been further adapted, based on the outputs of the original ERAs carried out in South Africa and Namibia (Nel *et al.* 2007, Petersen *et al.* 2010), through several iterations (i.e. applied in local workshops, tested and modified accordingly) to ensure regional applicability. It provides a structure to consider divergent issues in a transparent and accountable manner. Risk Analysis in the ERA method involves consideration of the sources of risk and reaching consensus on the consequence and likelihood that they may occur. Moreover, it allows for the prioritisation of issues or hazards with justification and the subsequent prioritization of management responses. It requires stakeholders to deliberate and develop a shared position. This process results in an agreed-upon roadmap for the way forward. In essence, it is a way of operationalizing policy.

The methodology relies on a three step process:

1. Identification of concerns or issues

Generic component trees help participants tease out the main issues or concerns that the fishery faces. The process starts by breaking the fishery down into three main categories: 'Ecological Wellbeing', 'Human Wellbeing' and 'Ability to Achieve' (Figure 1). Each component is then further disaggregated. These hierarchical trees were developed based on the outputs of the original ERA conducted in South Africa and Namibia and reported in Nel *et al.* 2007 and Petersen *et al.* 2010. It is important to note that discussion should not be limited by the hierarchical trees. Rather the trees should serve to structure and facilitate discussion. Through the identification process all issues present in the fishery are recorded. Any issue identified by one or more participants is included in the list of issues, whether or not it is supported by others. The result is a comprehensive list of concerns as perceived by all participants in the workshop.

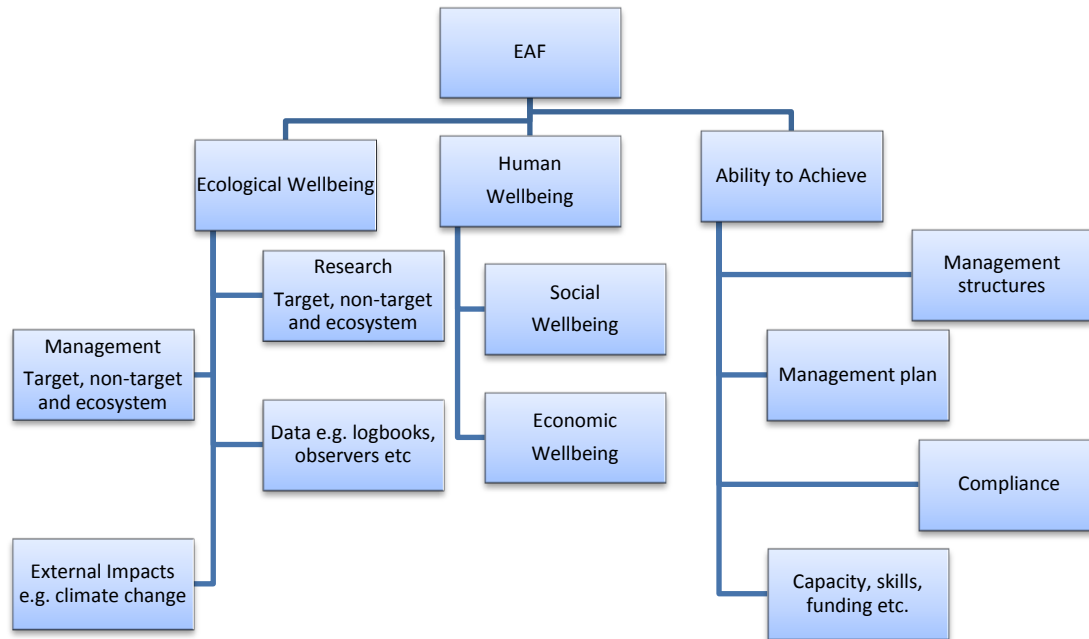


Figure 1: Diagrammatic representation of the ten EAF major components included into the ERA process.

2. Prioritisation of Issues

Each identified issue is then prioritised by scoring the likelihood of a given risk and the consequence if it did actually occur. The likelihood is scored on a scale of 1 to 6, and the consequence is scored on a scale of 0 to 5. A risk value rating is then calculated as the product of the ‘consequence’ and ‘likelihood’ scores; these “risk scores” provide a means of prioritising the entire set of identified issues. At this step it is important to gain consensus, as far as possible, on the consequence and likelihood scores. While this can be a contentious stage during the workshop, there was generally a high level of agreement experienced during the workshop reported here and in previous workshops (Nel *et al.* 2007, Petersen *et al.* 2010).

Each issue is categorised as being of ‘Negligible’ (score of 0), ‘Low’ (score of 1-6), ‘Moderate’ (score of 7-12), ‘High’ (score of 13-17) and ‘Extreme’ (score of 18 or greater) priority, according to their overall risk score. Once ranked, it is assumed that issues scoring ‘Low’ or ‘Negligible’ should not require specific management actions whereas issues with ‘High’ and ‘Extreme’ scores should all require urgent management actions. At the end of each ERA workshop, issues which scored ‘risk’ values of 7 and higher were retained as ‘High’ priority issues to be brought to the attention of the relevant Fisheries Management Agency, in this case the Department of Agriculture, Forestry and Fisheries (DAFF) for potential remedial management action.

3. Identification of management responses

Using a standardized framework based on the ten EAF objectives, the issues were linked to an operational objective and weighted according to their priority. For each operational objective a 7 step process has been identified to achieve the goal. Stakeholders identified the step the fishery was currently at and substantiated their decisions. They also identified possible barriers to progress and agreed on next steps to be taken. This framework also allowed for the reporting of areas where good progress had taken place. This need was

accommodated based on feedback from the original EAR process where concern were raised that the process omitted to capture good progress towards implementing an EAF in a particular fishery.

Results of the Workshop

Identification of issues

A total of 47 issues were identified for this fishery by the workshop participants. These issues are listed and described in full in Appendix 1. Most (44%) issues fell within Objective 1 i.e. the managing authority has a good understanding of the ecosystem impacts of fisheries including target, non-target and general ecosystem impacts (Figure 2).

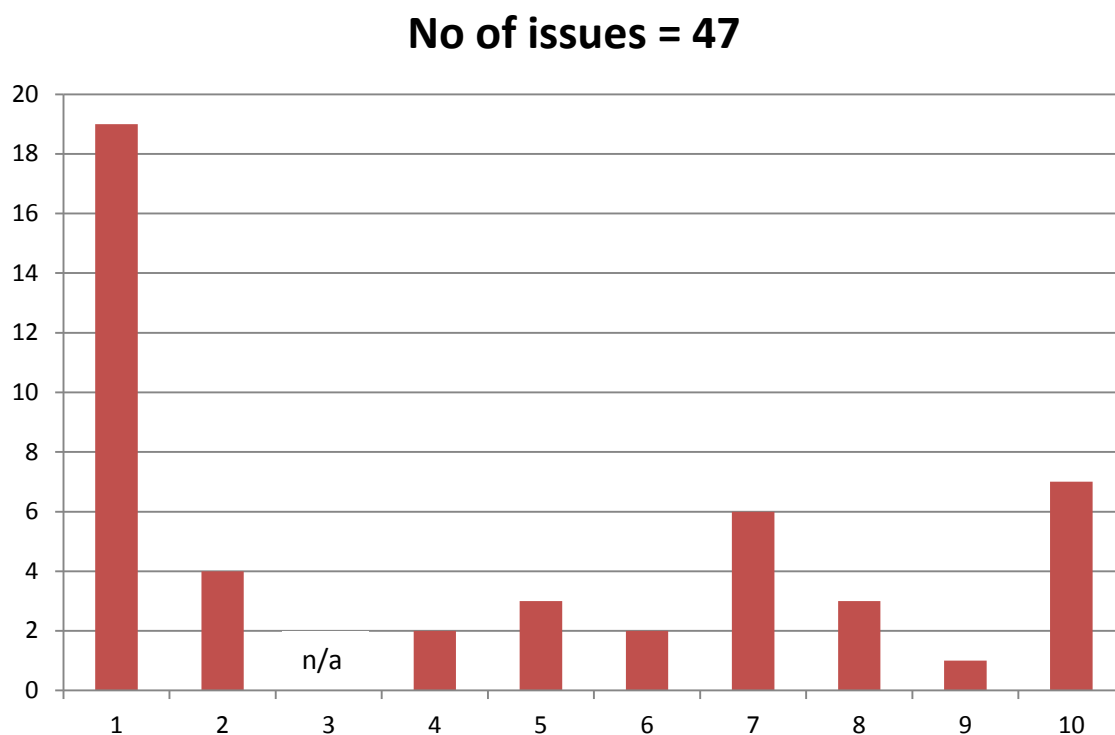


Figure 2. Numbers of issues that were identified under each objective.

Prioritization of issues

The prioritization process resulted in the majority (44%) of issues falling into the 'Extreme' category (Figure 3). 'High' and 'Moderate' rated issues accounted for 9% and 26% respectively.

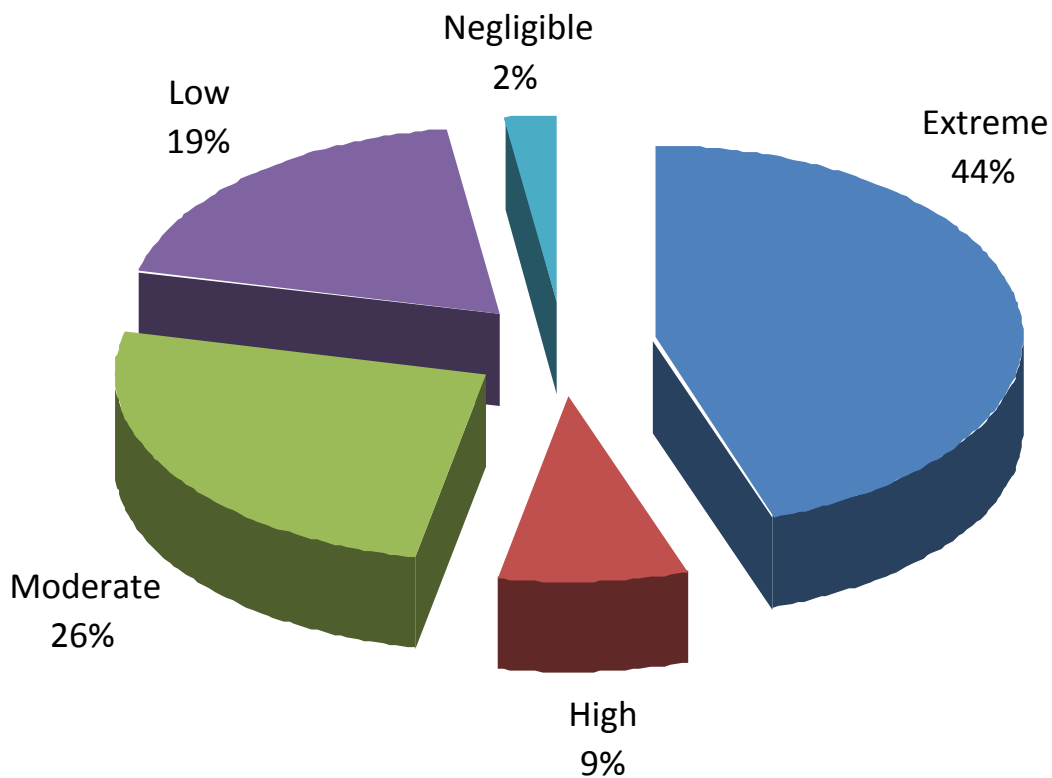


Figure 3. Percentages of issues per risk category

Performance reports

The complete performance report table can be found in Appendix 2. The following section will distil some of the key issues raised and their agreed responses discussed by objective. Please refer to the complete performance reports for a more overall understanding of these needs.

Objective 1: The managing authority has a good understanding of the ecosystem impacts of fisheries including target, non-target and general ecosystem impacts

No dedicated research is underway in this fishery, but observers collect information on 100% of trips and collect a significant amount of useful data. A significant barrier to furthering our understanding of the target, non-target and ecosystem impacts of this fishery is the lack of a dedicated researcher.

The current understanding of toothfish life history, stock identity etc., largely comes from research conducted elsewhere. A key next step is to conduct a genetic study to evaluate the appropriateness of this. Some tagging is currently being undertaken by observers and industry, however workshop participants suggested that a chemical marker study be conducted to augment this work. Observers currently collect

biological samples for sex and maturity to give an indication of spawning and nursery areas. Furthermore, seabird diet samples collected at Marion Island could provide insights into spatial patterns of early life history stages of toothfish.

Seabird bycatch was, in the past, a significant ecosystem impact of this fishery. However, it is now well understood and reduced to negligible. A further ecosystem consideration is the impact of fishing gear on Vulnerable Marine Ecosystems (VMEs). Currently, observers collect VME data in line with CCAMLR requirements (conservation measures 24/06 and 24/07). The Del Cano Rise project, a collaboration between South African and French scientists and funded by WWF, is identifying important top predator (e.g. seabirds, seals etc.) foraging areas for regional spatial planning to feed into the CCAMLR bio-regionalization project.

Gear loss was a concern highlighted by workshop participants. In the past gear loss information was recorded in an ad-hoc manner by observers. More recently (in 2009), CCAMLR required all gear loss to be recorded and have initiated a gear identification programme.

Various gear types are used in this fishery across the region e.g. pot, trot and longlines, each with a varying effect on the target and ecosystem. For example, changing fishing method will impact on the CPUE trend of the target, with obvious implications for stock assessment. Fishing gear can also impact on VME's e.g. pots will have a larger impact than longlines and trot lines having the smallest direct impact. However, trot lines can be used over VME's, many of which were inaccessible to pot or longline techniques in the past. Each method also has differing bycatch considerations. The trot line system holds promise of reduced depredation by cetaceans, a significant economic concern for the fishery.

Objective 2: Ecosystem impacts of fisheries are included into management advice

Toothfish is currently managed using an Operational Management Procedure (OMP). Historically, illegal catches were considered significant, but more recently there is little evidence of IUU fishing. However, fishing mortality is conservatively estimated and include at 156 tones thought to be caught by IUU fishing in the model. A key outstanding challenge is the inconsistency between CPUE and Catch at length (CAL). This concern is addressed by taking an intermediate value from model outputs. At present Toothfish caught in South Africa's EEZ is considered a single stock and not spatial disaggregated in the OMP. It is unknown whether this is appropriate or not. Fishing patterns have differed substantially from year to year. The cause of this is currently unknown, but could be the result of the depletion of resident populations. Preliminary results of a tagging study underway indicate that fish could be resident or that they are following similar annual migration patterns.

Seabird bycatch is well managed through the requirements of the vessels permit conditions that embody CCAMLR Conservation Measures 25-02, which include; minimum line weighting, the use of tori lines, requirement to set lines at night only, "night setting" and the prohibition of discarding offal or bycatch on the same side as hauling. The vessel is also required to deploy mitigation measures at the hauling station to prevent the incidental catches of seabirds during hauling operations. No seabirds have been caught in the last few years. Bycatch of other species is similarly controlled in the permit conditions and through the implementation of CCAMLR Conservation Measures 33-03, which limits the take of all bycatch species. The Conservation Measure also specifically incorporates a "move on" rule for *Macrourus* spp. If more than one-ton is caught on a single line. There is no concern at present for the status of rat tails. The bycatch of skates

could be a potential concern given their intrinsic vulnerability but skate bycatch is currently relatively low.

Objective 3: The social wellbeing of dependent fishing communities is accounted for in management advice

Workshop participants felt that this objective was not appropriate for this fishery given the high seas nature and the current size of the industry (i.e. only one active vessel). As a result it was not considered in any detail in the workshop.

Objective 4: The economic wellbeing of the fishing industry is maintained

This fishery is currently only marginally economically viable. Some individual allocations are considered too small to be viable on their own and most rights holders have seen the need to enter into joint venture agreements. There are currently five rights holders, only one (130t quota) of which is active at present (the remaining four each have an 80t allocation) resulting in the TAC of 450 tonnes not being fully utilized in most years. The TAC was set at a level considered to be the minimum level at which the fishery is economically viable and for South Africa to maintain a presence in the area, it was not based on sustainable utilization levels recommended by CPUE models. TAC is also set higher than CCAMLR FSA-WG suggestion which was conservatively set based on the limited research and understanding of stock dynamics in the areas. The reason for this is that South Africa wishes strongly to maintain a presence in the area and the CCAMLR-suggested TAC could result in the only active operator withdrawing from the area (under the current quota allocation regime). For similar reasons the CCAMLR recommended closed seasons (based on breeding seasons of white chinned petrels) are also not applied. The workshop recommended that a review of the economic viability of the fishery and individual rights be conducted given that currently only one of five rights holders has been able to maintain a continuous marginally viable operation. Furthermore, the industry should consider amalgamating rights. The economic viability of the fishery and the optimal utilization of the resource by South Africans are also threatened by illegal catches. A threat that is likely to increase as the stock is re-built.

Most rights holders have the necessary skills to participate in co-management structures e.g. working groups and interpret CCAMLR reports. Health and safety, and operational seamanship training is available for crew through accredited training colleges. Fishing masters are also briefed by fisheries observers and rights holders prior to departure to ensure they understand and implement permit conditions. The industry will consider sending fishing masters on the WWF responsible fisheries training course to increase their understanding of an Ecosystems Approach to Fisheries management.

Objective 5: The managing authority has transparent and participatory management structures that ensures good communication and information sharing locally and regionally

There is no dedicated scientific working group for the Patagonian toothfishery at present and this responsibility has been assigned to the demersal scientific working group which is largely focused on furthering the understanding of hakes. There is also no dedicated researcher for the sector. This was highlighted as an extreme risk and a key next step is to appoint a researcher.

There is however a dedicated resource management working group which meets twice a year. Currently within DAFF there are communication channels but there are concerns about the implications of the split between DAFF and Department of Environmental Affairs (DEA) for communication. At present there are no formal communication channels between DAFF and DEA. The division of responsibilities needs to be resolved at a ministerial level.

Regionally, the fishery is managed by the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). South Africa is a founder member and has been an active participant including implementing all of CCAMLR conservation measures. However, an extreme risk identified was the lack of a strategy and no dedicated driver to take this work forward locally especially in light of the division of powers and responsibility between local authorities (DAFF & DEA). Furthermore, South Africa is regarded as a regional leader in the SADC region. The SADC convention should be used increasingly to encourage regional cooperation with respect to RFMO's, port state control, straddling stocks and other issues of common interest to the region. South Africa's CCAMLR commissioner together with other RFMO commissioners should consider implementation of SADC fisheries protocol agreements and bilateral MOUs.

Objective 6: Management plans incorporate EAF considerations

At present no sector management plan is in place. A framework to include EAF considerations is under development and the outputs of this Ecological Risk Assessment will form the base of such a plan. However, an Operational Management Procedure (OMP) has been developed and adopted. There is also a need to develop an NPOA IUU which should be taken forward by the Directorate: MCS of DAFF. The NPOA-seabirds has been developed and well implemented.

Objective 7: Good compliance to regulations reduces ecosystem impacts of fisheries

Illegal, unregulated and unreporting (IUU) fishing in the past has led to the near collapse of the resource with the concurrent loss of economic opportunity to South Africa. Any rebuilding of the stock would be undermined by IUU fishing if a comprehensive compliance plan is not put in place for the Prince Edward Islands (PEI) EEZ. There is currently little evidence of large scale IUU fishing taking place, but there is fishing activity in the area just north of the PEI EEZ, which could move into EEZ in the future. At present very few sea and air patrols take place due to budgetary constraints. There is thus, an urgent need to develop a comprehensive compliance plan including an investigation of the most cost effective mechanism to monitor the EEZ, including the possible use of radar. Furthermore, the appropriate budget should be allocated to this activity. In the past there has been good co-operation between South Africa and other countries, especially France to jointly apprehend IUU fishers. Participants of the workshop agreed that this informal co-operation should be formalized through an MOU.

Good MCS measures are in place in port including the CCAMLR catch documentation scheme which documents the fish from 'boat to plate' and all landings are monitored. The legal fishery is well monitored at sea through a VMS system. The operations room has recently been upgraded, but a key outstanding challenge is that vessels have no way of establishing whether their signal is received by the operations room (DAFF). This is a similar issue faced by other sectors in the region. Koryo maru 11 has an Automatic Identification system (AIS) on board. This should be considered industry-wide. The legal fishery also has 100% observer coverage through the CCAMLR observer programme. Although observers do not have an explicit compliance function they do monitor compliance.

Objective 8: Sufficient capacity, skills, equipment and funding exist to support the implementation of an EAF

An extreme risk to the effective management of this fishery is the lack of a dedicated researcher. Some human resources have been allocated to this sector via participation in Demersal Scientific Working Group and stock assessments are conducted annually by a fisheries consultant. A key next step is to appoint a dedicated researcher. This post should also have sufficient budget allocated to allow for priority research to be undertaken. Given the high seas nature of the fishery, sufficient budget to allow continued participation in CCAMLR meetings should also be allocated as a priority.

Although sufficient capacity exists for port side landings, there is an extreme shortfall in the capacity to address IUU fishing. Furthermore, compliance staff are under-valued largely because they are inadequately trained. There is thus an urgent need to improve the training and support (e.g. 24hour on call back up support) for Fisheries Control Officers (FCO). Some funding has been made available e.g. for the upgrade of the VMS system, but there is a need to motivate for increased funding allocation especially to improve systems to address IUU fishing.

Objective 9: Good data procedures exist to support EAF implementation

This fishery has a very good observer programme with a 100% at sea coverage. Observers are well trained and briefed/de-briefed before and after fishing trips. They also collect information on target as well as non-target and general ecosystem considerations. Observer could however, be more effectively used to address more specific research questions. There is also limited local use of observer data. A key next step is to identify research needs and to train observers to fulfill these needs.

There are also further good data procedures including five-day catch and effort reporting and monthly C2 data requirements which include detailed EAF information. In addition VME and seabird data is submitted to CCAMLR. At port the CCAMLR catch documentation scheme (CDS) is in place which monitors the catch from landing to the point of sale to the end consumer.

Objective 10: External impacts of fisheries are addressed (e.g. the effect of other sectors, other industries, climate change etc.)

There are a number of external impacts thought to affect this fishery, including the effect of climate change, economic drivers such as fuel prices and exchange rates. A potentially critical external risk is that of IUU fishing which is likely to grow as the stock rebuilds.

Appendix 1: List of issues.

*Note: Risk score is product of the consequence score (CONS) and the likelihood score (LIKE)

** Categories: E=Extreme, H=High, M=Moderate, L=Low, N=Negligible

| Objective 1: | The managing authority has a good understanding of the ecosystem impacts of fisheries including target, non-target and general ecosystem impacts | Cons | Like | Risk | Category | Comments |
|---|--|------|------|------|----------|--|
| Target species or valuable retained bycatch (Objective: Research and management should aim to ensure sustainable utilisation = Type A species) Toothfish | | | | | | |
| 1 | Lack of data on illegal catches (Implications for stock assessment reliability) | 2 | 6 | 12 | M | Illegal fishing is not as big a factor now as it used to be as management has improved significantly over the last decade. -IUU has been conservatively estimated in the OMP, but this has implications for the long term optimum utilisation of the resource. -IUU is better controlled now than ever before, however if stock does recover IUU may become a threat once more. This would need to be reassessed if stock recovery took place. |
| 2 | Lack of data on illegal catches (Implications for stock recovery) | 4 | 6 | 24 | E | |
| 3 | Lack of data on illegal catches (Implications for optimal utilisation) | 2 | 6 | 12 | M | |
| 4 | Lack of dedicated local research on recruitment, aging, spawning processes and growth rates parameters | 4 | 6 | 24 | E | Recruitment is not well understood and unpredictable. Recruitment appears to occur in pulses. CCAMLR has research on this, unknown how relevant this research is for PEI. |
| 5 | Lack of information on the impacts of different fishing methods (Trot lines, | 2 | 4 | 8 | M | Relates to selectivity and catch rates and benthic impacts. -Trot lines can fish in areas previously unfished and potentially have |

| | | | | | | |
|--|--|-------------|-------------|-------------|-----------------|---|
| | autolining, Spanish double line system) | | | | | harmful impacts on spawner biomass. -Trot lines are used on vulnerable areas. |
| 6 | Lack of dedicated local research on nursery areas and migration patterns | 4 | 6 | 24 | E | |
| 7 | Lack of data on illegal gillnetting | 4 | 2 | 8 | M | Seems to be an increasing problem. This has broader implications for ecosystems and habitat. -Should the fishery show signs of recovery or an increase in the economic viability of the resource this risk is likely to increase. |
| 8 | Lack of data on depredation on catch by cetaceans, squid, lice etc. (implications for the reliability for the stock assessment-estimates of total fishing mortality) | 4 | 6 | 24 | E | More than 50% of catch lost to depredation, has implications for fishing. |
| 9 | Stock identity is unknown and poor understanding of genetics | 4 | 6 | 24 | E | |
| 10 | Inconsistency between CPUE and catch at length data | 5 | 6 | 30 | E | Should be covered if point 1.4 and 1.5 are improved. |
| <i>By catch species that are threatened e.g. seabirds, vulnerable to over exploitation or the target of another fishery (Objective: to minimize bycatch = Type B species)</i> | | Cons | Like | Risk | Category | Comments |
| 11 | Seabird bycatch IUU fishing operations is unknown | 4 | 6 | 24 | E | Very little IUU but If gillnetting is used, it is unknown what impact this method has on seabirds. |
| 12 | Seabird bycatch by legal fishery | 0 | 1 | 0 | N | In the past seabird bycatch was significant but through the introduction of management measures this has been reduced to acceptable levels. These scores can be maintained as long as management is maintained. Trot Lines have no seabird bycatch. |

| | | | | | | |
|--|---|-------------|-------------|-------------|-----------------|--|
| 13 | Seabird night strikes | 1 | 1 | 1 | L | |
| 14 | Lack of understanding of mortality on 0 year-old fish by predators | 1 | 3 | 3 | L | Evidence of seabird predation on toothfish recruits (seals may be important too). There is a 12nm exclusion zone around PEI to protect seabird populations. Links to life-history stages of toothfish. |
| Other bycatch species that, based on existing understanding, are unlikely to be vulnerable to the current level of exploitation (Objective: keep a watching brief = Type C species) | | Cons | Like | Risk | Category | Comments |
| 15 | Poor understanding of various bycatch species (e.g. Skates, rattails) | 1 | 1 | 1 | L | If the fishery expanded, it is likely that there would be consequences for some of these bycatch species. |
| General Ecosystem considerations (Impacts will vary depending on gear utilised) | | Cons | Like | Risk | Category | Comments |
| 16 | Poor understanding of benthic habitat implications of Trot lines and their use over VMEs | 4 | 4 | 16 | H | Trot lines don't have large contact area but are used over VME's. |
| 17 | Poor understanding of benthic habitats around the PEI | 5 | 1 | 5 | L | This would need to be re-assessed if fishing activity increased. Need to track current research being done on this issue. |
| 18 | Depredation on catch by cetaceans (implications of this behavioural change for cetaceans) | 1 | 3 | 3 | L | More than 50% of catch lost to depredation -Hard to know what impacts will occur on other species. -Boats are not there all year round. |
| 19 | Lack of understanding on impacts of gear loss (entanglements and ghost fishing) | 1 | 3 | 3 | L | Has been case of sperm whales caught in other regions. Longline entanglements unlikely but ghost fishing and gill netting entanglements could be a concern. |
| Objective 2: | Ecosystem impacts of fisheries are included into management advice | Cons | Like | Risk | Category | Comments |

| Target species or valuable retained bycatch (Objective: Research and management should aim to ensure sustainable utilisation = Type A species) Toothfish | | | | | | |
|---|--|-------------|-------------|-------------|-----------------|--|
| 20 | Inconsistency between CPUE and catch at length data | 5 | 6 | 30 | E | |
| General Ecosystem considerations | | Cons | Like | Risk | Category | Comments |
| 21 | Management does not currently address gear loss | 2 | 2 | 4 | L | Gear loss is covered by MARPOL but there are then compliance issues. |
| 22 | Scientific recommendations not implemented e.g. PEI MPA | 4 | 6 | 24 | E | |
| 23 | Lack of any formal habitat protection on toothfish fishing grounds around PEI (subject to the size of the current fishery) | 5 | 1 | 5 | L | There is a 12nm exclusion zone in the permit conditions but this is not formally promulgated as an MPA. If the fishery were to increase, there could be significant risks to the marine environment as there have been a number of wrecks over the last decade. Proposed MPA may lead to higher IUU catches. |
| Objective 3: | The social wellbeing of dependent fishing communities is accounted for in management advice | Cons | Like | Risk | Category | Comments |
| | Given the offshore nature of this sector this objective is considered to not to be relevant in this fishery | | | 0 | | |
| Objective 4: | The wellbeing of the fishing industry is incorporated into management advice. | Cons | Like | Risk | Category | Comments |
| 24 | Depredation on catch by cetaceans (implications for the economic viability) | 4 | 6 | 24 | E | More than 50% of catch lost to depredation. |

| | | | | | | |
|---------------------|---|-------------|-------------|-------------|-----------------|---|
| | for the fishery) | | | | | |
| 48 | Not all rights holders have been active in the fishery. (Economic viability needs to be considered, currently only one of five rights holders has been able to maintain a continuous marginally viable operation) | 4 | 6 | 24 | E | This has implications for compliance of the fishery through a legal presence around the PEI and for management (allocation of long-term rights and quota) |
| 25 | Implications of illegal catches for optimal utilisation of the resource | 5 | 3 | 15 | H | Dependant on the status of the resource and the effectiveness of compliance. |
| Objective 5: | The managing authority has transparent and participatory management structures that ensures good communication and information sharing locally and regionally | Cons | Like | Risk | Category | Comments |
| 26 | Division of powers and responsibility between local authorities (DAFF & DEA) | 4 | 6 | 24 | E | DAFF is responsible for management of the fishery whereas DEA is responsible for representation at CCAMLR. |
| 27 | Lack of a strategy and no dedicated driver for CCAMLR | 4 | 6 | 24 | E | Potentially has impact on SA's relationship with CCAMLR. Missed opportunities to lead Antarctic research for the region. |
| 28 | Lack of dedicated scientific working group | 4 | 6 | 24 | E | |
| Objective 6: | Management plans incorporate EAF considerations | Cons | Like | Risk | Category | Comments |
| 29 | Lack of a management plan | 4 | 6 | 24 | E | OMP has been developed and adopted. |
| 30 | Lack of NPOA to address IUU for this sector | 4 | 6 | 24 | E | |
| Objective 7: | Good compliance to regulations reduces ecosystem impacts of fisheries | Cons | Like | Risk | Category | Comments |

| | | | | | | |
|---------------------|--|-------------|-------------|-------------|-----------------|---|
| 31 | MPA could lead to increased IUU catches | 5 | 2 | 10 | M | Likely to increase over time. |
| 32 | Inadequate overarching compliance strategy (MARPOL, tourism, IUU) within the vicinity of PEI | 5 | 6 | 30 | E | SA has voluntarily implemented the FAO's Port State model but has not ratified the Port State agreement. -SA voluntarily applies the CCAMLR requirements. -There is good compliance to permit conditions within the legal fishery including 100% observer coverage. |
| 33 | Insufficient monitoring of EEZ (e.g. Radar, regular sea and aerial patrols) | 5 | 6 | 30 | E | |
| 34 | Absence of MOU to address IUU within the CCAMLR convention area around PEI (e.g. France, Mauritius, Australia) | 4 | 5 | 20 | H | There is informal co-operation with the French. Legal fishery has 100% observer coverage. |
| 35 | Insufficient funds for compliance | 4 | 5 | 20 | H | The cost benefit should be considered. |
| 36 | Continued compliance to CCAMLR conservation measures | 3 | 1 | 3 | L | |
| Objective 8: | Sufficient capacity, skills, equipment and funding exist to support the implementation of an EAF | Cons | Like | Risk | Category | Comments |
| 37 | Lack of dedicated researcher working on Southern Ocean | 4 | 6 | 24 | E | General comment: Good buy in from industry to implement an EAF. |
| 38 | Loss of research capacity to management/administration | 3 | 4 | 12 | M | |
| 39 | Insufficient funding for research | 4 | 6 | 24 | E | Only one research survey has taken place in the past - took place on a commercial vessel. |
| Objective 9: | Good data procedures exist to support EAF implementation | Cons | Like | Risk | Category | Comments |

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| 40 | Limited local utilisation of observer data | 4 | 3 | 12 | M | 100% observer coverage and good data collection procedures, data submitted to CCAMLR. |
| Objective 10: | External impacts of fisheries are addressed (e.g. the effect of other sectors, other industries, climate change etc) | Cons | Like | Risk | Category | Comments |
| 41 | The impact of at sea waste disposal by unregulated boats and from the large pelagic fleet on the ecosystem wellbeing | 3 | 4 | 12 | M | Impact is negligible on the fishing industry, but likely to be moderate on the ecosystem. |
| 42 | Unknown effect of global climate change | 3 | 5 | 15 | M | |
| 43 | Fuel price/exchange rates | 4 | 6 | 24 | E | |
| 44 | IUU | 4 | 6 | 24 | E | |
| 45 | Missed opportunities to lead Antarctic research for the region | 3 | 4 | 12 | M | Impacts could be related to more than just toothfishing boats. |
| 46 | Increased shipping leading to increased likelihoods of incidents e.g. Unregulated tourism (pollution etc) | 3 | 4 | 12 | M | |
| 47 | Potential for mining in the future | 3 | 4 | 12 | M | |

Appendix 2. Summary of Performance Reports

| Objective 1: | The managing authority has a good understanding of the ecosystem impacts of fisheries including target, non-target and general | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
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| ecosystem impacts | | | | | | | |
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| Target species or valuable retained bycatch (Objective: Research and management should aim to ensure sustainable utilisation = Type A species) | | | | | | | |
| 1.1 | Good understanding of life history parameters that enable adequate stock assessment (e.g. natural mortality, age length key, age at maturity, factors affecting recruitment) | | | | | | |
| A | <i>Toothfish</i> | 4 | Extreme | 2 | <p>Currently using info from stocks from elsewhere.</p> <p>Current tagging programme has been running for 5 years, 4-5 tag returns to date.</p> | <p>Find budget and employ a researcher.</p> <p>Increase tagging research.</p> <p>Consider how observer program can be improved.</p> <p>Consider using chemical markers to help with age and growth studies.</p> | <p>Offshore research section/</p> <p>Demersal scientific working group (DSWG)</p> |
| 1.2 | Good understanding of the fisheries dependent parameters that enable adequate stock assessment (e.g. fishing mortality, fishing effort) | | | | | | |
| A | <i>Toothfish</i> | 5,8,10 | Extreme | 2 | <p>Catch at length (CAL) and CPUE inconsistency is taken into account in OMP by taking an intermediate value model output.</p> | <p>Research to improve understanding of selectivity of various gear types.</p> <p>-Investigate whether CPUE or CAL info is more reliable.</p> | <p>Industry and Demersal scientific working group (DSWG)</p> |
| 1.3 | All fishing mortality including bycatch, poaching and discarding is adequately understood | | | | | | |

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| A | <i>Toothfish</i> | 1,2,3, 7,8 | Extrem e | 2 | <p>Historically, illegal catches were estimated on sightings, currently still based on estimated 156 tonnes. Currently no evidence of IUU fishing taking place, therefore this is likely to be a conservative estimate.</p> <p>Trot line system holds promise of reduced predation by cetaceans.</p> <p>Observers are collecting information on all depredation.</p> | <p>Long-term management should consider implementing a radar monitoring system.</p> | <p>MCS & Patagonian Toothfish Resource management Working Group (PTMWG)</p> |
| 1.4 | The spatial distribution (incl transboundary distribution) is adequately understood | | | | | | |
| A | <i>Toothfish</i> | 6 | Extrem e | 2 | <p>Current tagging programme has been running for 5 years, 4-5 tag returns to date.</p> <p>Nursery area was identified by research cruise in 2000.</p> | <p>Increase tagging of all size classes.</p> <p>Consider using chemical markers to help with age and growth studies.</p> <p>Seabird diet samples should be analysed for information on toothfish 0 year olds.</p> | <p>Demersal scientific working group (DSWG)</p> |
| 1.5 | The stock identity and/or genetics is well understood | | | | | | |

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| A | Toothfish | 9 | Extreme | 2 | Hasn't been a dedicated research to date but some samples have been taken but there has been no feedback as yet. | <p>Potential MSc project for a student.</p> <p>Investigate whether other genetic studies have been done elsewhere.</p> <p>Conduct genetic analysis both within the PEI and between PEI and other fishing grounds.</p> | <p>Offshore research section/ Demersal scientific working group (DSWG)</p> | |
| By catch species that are threatened e.g. seabirds, vulnerable to over exploitation or the target of another fishery (Objective: to minimize bycatch = Type B species) | | | | | | | | |
| 1.6 | The impacts of the fishery on bycatch or vulnerable species have been quantified | | | | | | | |
| A | Seabirds | 11,12,13 | Low | 7 | Seabird bycatch is well understood and mitigation has resulted in negligible bycatch at present. | None required. | | |
| Other bycatch species that, based on existing understanding, are unlikely to be vulnerable to the current level of exploitation (Objective: keep a watching brief = Type C species) | | | | | | | | |
| 1.7 | Skates, rat tails etc | 15 | Low | 4 | Observer programme is currently capturing this information. | <p>Maintain a watching brief and consider evaluating observer data (esp. Macrouridae).</p> <p>Should be investigated further if fishing activity increases in the future.</p> | | |
| General Ecosystem considerations | | | | | | | | |

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| 1.8 | Fishing impacts on marine habitats and ecologically important areas e.g. spawning areas, nursery areas, predator foraging areas, have been assessed and quantified | 5,16,17 | High | 4 | <p>Observers currently collect VME data in line with CCAMLR requirements (conservation measures 24/06 and 24/07).</p> <p>All lines are biologically sampled for sex and maturity to give an indication of spawning and nursery areas.</p> <p>Del Cano Rise project is looking at predator foraging areas e.g. seabirds, seals etc. for regional spatial planning (CCAMLR bio-regionalisation project, collaboration between SA and French scientists funded by WWF).</p> | <p>Utilisation of observer data and feedback from CCAMLR (esp. ground-truthing experiments being conducted elsewhere).</p> <p>Observer data should be taken into consideration for spatial planning.</p> | <p>DWSG</p> <p>WWF & Del Cano Rise project</p> |
| 1.9 | There is good understanding of the trophic role, diets and foraging behaviour of predators that are dependent on Toothfish species | 14 | Low | 1 | | | |
| 1.10 | There is good understanding of the diet and role of Toothfish as secondary consumers in the trophic web | | | 1 | Diet analysis has been undertaken elsewhere but nothing has been done in SA. Appear to be opportunistic foragers. | | |
| 1.11 | There is good understanding of the ecosystem impacts of supplementary feeding (by making offal and/or catches available to predators) | 18 | Low | 2 | Impacts or benefits for cetaceans and seabirds are unknown. | None warranted at present. | |

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| 1.12 | There is good understanding of ecosystem impacts of depredation by top predators including its impact on the economic viability of the fishery | 24 | Extreme | 2 | Some fishing masters estimate depredation as high as 50%. This is monitored by observers. Trot lines hold promise for reducing cetacean depredation. | Follow up on results of South Georgian and Chilean studies on Trot lines. | Industry |
| 1.13 | There is a good understanding of gear loss and/or ghost fishing including entanglement | 19 | Low | | Data is recorded in an ad-hoc manner by observers. More recently in 2009, CCAMLR requires all gear loss to be recorded. CCAMLR has started a gear identification programme. | All gear loss needs to be accurately reported (affects fishing mortality and CPUE estimates). Continue to implement CCAMLR re: gear identification requirements. | PTMWG |
| Objective 2: | Ecosystem impacts of fisheries are included into management advice | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| Target species or valuable retained bycatch (Objective: Research and management should aim to ensure sustainable utilisation = Type A species) | | | | | | | |
| 2.1 | The relevant life history parameters for Toothfish are incorporated into management strategies and appropriate management actions are implemented | | | | | | |
| A | <i>Toothfish</i> | 20 | Extreme | 5 | Catch at length (CAL) and CPUE inconsistency is taken into account in OMP by taking an intermediate value model output. | Await the outcome of further research on gear selectivity, genetics and tagging studies. | DSWG |
| 2.2 | All fisheries data are incorporated into management strategies and appropriate management actions are implemented | | | | | | |
| A | <i>Toothfish</i> | | | 5 | | Await the outcome of further research. | |

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| 2.3 | All fishing mortality including bycatch, poaching and discarding is adequately incorporated into stock assessment models | | | | | | |
| A | <i>Toothfish</i> | | | 5 | <p>Taken into account in the OMP by including an estimate of illegal catches. Historically this figure was based on sightings, but now that the legal fishery does not operate year round the estimate has been pegged on this historic figure of 156 tonnes. Currently no evidence of IUU fishing taking place, therefore this is likely to be a conservative estimate.</p> <p>There is known fishing activity in the area just North of the PEI EEZ, it is likely that they will move into EEZ in the future.</p> | Needs to be monitored closely but currently no further action needed until situation changes. | DSWG |
| 2.4 | The spatial distribution (incl transboundary distribution) is adequately incorporated into stock assessment or other management advice including the broader MPA planning process. | | | | | | |
| A | <i>Toothfish</i> | | | 1 | <p>Spatial distribution is not included in the OMP at all as there is very little known about this fishery.</p> <p>Fishing patterns have differed substantially from year to year. Tagging data suggests that fish may be resident or that they are following similar annual migration patterns.</p> <p>In CCAMLR report there is a section on fishing patterns.</p> | <p>Awaiting research outcomes.</p> <p>Consider developing model which includes spatial distribution issues.</p> | DSWG |

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|--|---|-----------|-----|-----|--|---|--|
| 2.5 | The stock identity and/or genetics is incorporated into stock assessment models or other management advise | | | | | | |
| A | <i>Toothfish</i> | | | N/A | Not incorporated into stock assessment models but at present there is no data to incorporate. | Awaiting outcomes of genetic research. | |
| <i>By catch species that are threatened e.g. seabirds, vulnerable to over exploitation or the target of another fishery (Objective: to minimize bycatch = Type B species)</i> | | | | | | | |
| 2.6 | Appropriate management actions, e.g. gear restrictions, closed areas/seasons etc., have been identified and tested and are supported by stakeholders. | | | | | | |
| A | <i>Seabirds</i> | 11,12, 13 | Low | 7 | Mitigation measures e.g. tori lines, night setting etc are implemented through permit conditions. No seabirds have been caught in the last few years. | None warranted at present. | |
| A | <i>Skates, rat tails etc</i> | | | | There are existing control measures in place in terms of CCAMLR conservation measures which limit the take of all bycatch species and are implemented through permit conditions. 1 tonne move-on rule. No concern at present about rat tails, skates could be less resilient but skate bycatch is currently relatively low. In the past, pot fishing resulted in high bycatch of some species (esp. | No action unless fishing methods change or research indicates a need. | |

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| | | | | | crustaceans) but is no longer active in fishery. | | |
| General Ecosystem considerations | | | | | | | |
| 2.9 | Appropriate management actions, e.g. gear restrictions, closed areas/seasons etc., have been identified and tested and are supported by stakeholders to address fishing impacts on marine habitats and ecologically important areas | 22,23 | Extreme | 5 | WWF initiated a project to develop a spatial plan in order to identify priority areas for protection. Areas were proposed, a management and compliance plan was developed, proposals were sent out for public comment and final decision on MPA has yet to be finalised. | Awaiting decision on MPA promulgation by the minister (DEA). | DEA Minister |
| 2.10 | The necessary biomass to sustain healthy populations of these predators (by volume and spatially) has been quantified and these needs are formally included into | | | N/A | | | |

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| | management procedures | | | | | | |
| 2.11 | The biomass needed to ensure stability in the ecosystem has been quantified and the ecosystem impacts of fishing on secondary consumers has been formally included in management procedures | | | N/A | | | |
| 2.12 | Fisheries operations have been amended to mitigate the impacts of diet supplementation on top predators | | | N/A | | | |
| 2.13 | Fisheries operations have been amended to mitigate the impacts of depredation | | | N/A | | | |
| 2.14 | The impact of gear loss and/or ghost fishing including entanglement are included in management procedures | 21 | Low | 4 | Gear loss is being monitored. Pot fishery operated for two years (non-biodegradable pots were used), lost a few thousand pots. | No management response required at present. Refer to 1.13 for continued monitoring. | |
| 2.16 | Discarding of pollutants (e.g. plastics) is included in management procedures | | | 7 | Currently covered by MARPOL. Given the size and management of the current fishery this is not a | | |

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| | | | | | current concern. | | |
| Objective 3: | The social wellbeing of dependent fishing communities is accounted for in management advice | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| Workshop participants considered this objective not to be relevant to the fishery given that it's a high seas fishery and no community is directly dependent on this fishery other than those employed by the sector. Objective 4 speaks to this need. | | | | | | | |
| Objective 4: | The wellbeing of the fishing industry is incorporated into management advice. | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 4.1 | Individual rights are economically viable | 48 | Extreme | 5 | <p>Some individual allocations are too small to be viable on their own; most rights holders have seen the need to enter into joint venture agreements.</p> <p>Currently 5 rights holders in the fishery, most years the TAC (450 tonnes) is not fully utilised.</p> <p>TAC was set as minimum viable level for SA to maintain a presence in the area; it was not based on sustainable utilisation levels recommended by</p> | Policy for rights transfer has been finalised (section 21 MLRA); industry needs to investigate amalgamating rights. | Industry |

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| | | | | | CPUE models. | | |
| 4.2 | An appropriate and fair rights allocation process is in place | | | 5 | Long-term rights are currently under review. Performance criteria have been defined. | Complete the performance review. | Resource management and legal dept. (DAFF). |

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| 4.3 | Management of the fishery is aimed at long-term financial stability and security | 25 | High | 4 | <p>Refer to objective 4.1.</p> <p>Given that this fishery is currently economically marginal this is a vital consideration and is at present not adequately addressed through current management.</p> <p>TAC is set higher than CCAMLR FSA-WG suggestions. SA wishes strongly to maintain a presence in the area and the CCAMLR-suggested TAC could result in the only active operator withdrawing from the area, given the current quota allocations. CCAMLR made recommendation that TAC should be reduced because of a lack of research.</p> <p>For similar reasons the CCAMLR recommended closed seasons (based on breeding seasons of white chinned petrels) are also not applied.</p> | There is a need to review the long-term financial security of this fishery. | PTMWG |
| 4.4 | All new entrants and rights holders have adequate business skills and marketing skills | | | N/A | | | |
| 4.5 | All stakeholders possess adequate skills to participate in co-management | | | 6 | Most rights holders are able to participate in management working groups and interpret CCAMLR reports | No actions needed | |

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| 4.6 | Effective training mechanisms are in place to provide EAF skills development to relevant members of the industry (e.g. responsible fisheries training courses, safety at sea) | | | 6 | <p>Formal training is available through accredited training colleges (health and safety and operational seamanship).</p> <p>Prior to each trip, observers brief fishing master on permit conditions, a similar brief is held by the rights holder with the fishing master.</p> <p>Training also supplied by equipment suppliers.</p> | Consider sending fishing master on WWF responsible fisheries training course. | Industry |
| 4.7 | The fishery is eco-labeled | | | 1 | Industry has considered MSC certification but is currently too expensive. Industry already complies with CCAMLR electronic catch documents which already meet the MSC's traceability requirements. | | |
| 4.8 | Processes are in place to ensure the traceability of products as desired by the export market (e.g. EU requirements) | | | 7 | Industry already complies with CCAMLR electronic catch documentations scheme (recognised by EU). | | |
| 4.9 | The industry has a strategy to ensure long-term market security (e.g. diversity of markets/products, product branding) | | | N/A | Markets are difficult to predict, current market is in the US. | | |

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| 4.10 | There is a clear understanding of the economic context of the fishery | | | 5 | Industry has a good understanding of economic context. | | |
| 4.11 | Economic implications of management decisions are clearly integrated into fisheries management advice and procedures | | | N/A | refer to objective 4.1 | | |
| Objective 5: | The managing authority has transparent and participatory management structures that ensures good communication and information sharing locally and regionally | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 5.1 | Effective and cohesive industry associations are in place and functioning | | | 2 | There is an industry association but it is currently inactive (currently there is one regularly active operator and 4 non-active operators). Meetings take place on an ad-hoc basis prior to CCAMLR meetings or when necessary. | Association could consider playing a greater role in promoting research. When other operators become more active there will be a greater need for regular meetings. | Industry |
| 5.2 | Effective participatory management fora (e.g. Working Groups) are functioning | 28 | Extreme | 2 | There is no dedicated scientific working group for the patagonian toothfishery. But has been added to the responsibility of the demersal working group. There is a resource management working group which meets twice a | Appoint a dedicated researcher. | Offshore research |

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| | | | | 7 | year. | | |
| 5.3 | Working groups have good stakeholder participation (e.g. fishing industry, NGO etc.) | 28 | Extreme | 7 | Industry, research, management, NGO's (ASOC), compliance are represented on PTMWG. In addition to formal channels, informal communication is effective because of the size of the fishery. | | |
| 5.4 | Channels or forums are in place for communication with other government agencies (e.g. oil and minerals, transport, safety at sea, health standards, and customs) | | | 3 | Issues are raised with customs on a case-by-case basis. Currently no real need for more formal mechanisms. | If situation changes, structures would need to be created. | |
| 5.5 | Channels or forums are in place to facilitate communication among senior managers of the different fisheries directorates (i.e. compliance, research and resource management). | 26 | Extreme | 2 | Currently within DAFF there are communication channels but there are concerns about the implications of the split between DAFF and DEA for communication. At present there are no formal communication channels between DAFF and DEA. | Awaiting resolution at a ministerial level. Division of responsibilities needs to be resolved at a ministerial level. | DAFF and DEA ministers |

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| 5.6 | Channels or forums are in place to facilitate communication among operational managers of the different fisheries departments (i.e. compliance, research and resource management) | | | 3 | Structures were established; two meetings took place but since then have stagnated. | Re-establish groups and hold formal regular (at least monthly) meetings. | Resource Mngt operational managers |
| 5.7 | Regional co-operation is operational and has been institutionalized (e.g. Namibia, Mozambique) | | | 3 | Ad-hoc communications take place with other countries to jointly address issues as they arise. SADC does not have a specific forum to address RFMO issues. | SADC should be used increasingly to encourage regional cooperation with respect to international organisation, port state control, straddling stocks and other issues of common interest. SA's CCAMLR commissioner together with other RFMO commissioners must consider implementation of SADC fisheries protocol agreements and bilateral MOUs. | CCAMLR commissioner |
| 5.8 | South Africa is an active member of relevant RFMO | | | | | | |

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| A | SWIOFS | | | 4 | <p>Indian ocean ports are important for the landing of illegal catches. SA is involved in SWIOFS and is currently setting up observer programme which will cover landings.</p> | SA should continue to attend meetings. | |
| B | <i>SEAFO</i> | | | 6 | <p>SA is a member and regularly attends meetings.</p> <p>SEAFO has control over a straddling toothfish stock. There is a likelihood that SA will want to fish in SEAFO area in the future.</p> | | |

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| C | CCAMLR | 27, 36 | Extreme | 7 | SA is a founder member of CCAMLR and is an active participant of CCAMLR and is currently implementing CCAMLR conservation measures. SA is a regional leader in the SADC region. | SA should continue to be active participants in CCAMLR meetings and continue to implement CCAMLR conservation measures in the EEZ. Develop a clear RFMO strategy, appropriately funded and allowing continuity of participation by relevant persons and there may be merit in appointing a dedicated person similar to that undertaken by other countries. Foreign affairs representative should remain part of the SA delegation. Intercessional and preparatory work should be more appropriately co-ordinated. | Foreign Affairs and DAFF |
| Objective 6: | Management plans incorporate EAF considerations | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 6.1 | Sector management plans which incorporate EAF considerations for all three dimensions of EAF are in place and peer reviewed | 29 | Extreme | 1 | OMP has been developed and adopted. | | Resource management: Craig Smith |
| 6.2 | All relevant National Plans of Actions have been developed and implemented | | | | | | |

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| A | <i>Seabirds NPOA</i> | | | 7 | | | |
| C | <i>IUU NPOA</i> | 30 | Extrem e | 2 | Develop NPOA IUU. | Compliance/MCS | MCS |
| Objective 7: | Good compliance to regulations reduces ecosystem impacts of fisheries | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 7.1 | Appropriate regulatory mechanisms exist and adequate follow-through provide effective dis-incentive for non-compliance | | | 7 | SA Fishery: Over and above national penalties, non-compliance is communicated to CCAMLR which has implications for fishing internationally. | | MCS |
| 7.2 | Adequate mechanisms are in place to support voluntary compliance (e.g. performance review procedures, eco-labeling, etc.) | | | 7 | CCAMLR observer programme: 100% coverage. | | |
| 7.3 | All aspects of MCS are functioning well and are leading to good compliance | 31,32, 33,36 | Extrem e | | | | |

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| A | <i>Regular at sea patrols are undertaken</i> | 33, 34 | | 2 | At present very few sea patrols take place due to budgetary constraints. Informal arrangements with other countries including the French exist. | Develop and implement an MOU with the relevant governments e.g. France. | MCS |
| B | <i>Adequate shore based controls are in place (e.g. in harbours, at landing sites etc.)</i> | 33 | | 7 | CCAMLR catch documentation scheme in place which documents the fish from catching to consumer. Landings are monitored. | | MCS/Resource Mngt |
| C | <i>The specialised unit (SU) functions well</i> | | | 4 | In place, but have limited capacity resulting in delayed response times. | Increase capacity. | |
| D | <i>Functional VMS system implemented</i> | | | 6 | All vessels are required to have a functional VMS system. The operations room has recently been upgraded. Vessels have no way of establishing whether their signal is being received by DAFF. This is a similar issue faced by other sectors in the region. Koryo maru 11 has an Automatic Identification system (AIS) on board. This should be considered industry-wide. | This is currently being addressed jointly by SADC. It is important that the VMS ops room to take appropriate action (poll) should a vessels VMS suddenly stop reporting. | VMS ops room to follow up. |
| E | <i>Legal/Court system adequately apprehends offenders</i> | | | 6 | J534/admission of guilt fines in place. CCAMLR SCIC also takes note of all non-compliance to conservation measures and these are reported to member states that are expected to take action. | Green courts should be re-established. | MCS |

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| F | <i>Regular aerial patrols are undertaken</i> | | | 2 | At present very few aerial patrols take place due to budgetary constraints. | Investigate alternative monitoring methods (e.g. Satellite, radar) | MCS |
| g | <i>Section 28</i> | | | 1 | A section 28 has not been used in this fishery. Need well trained compliance officers. | | MCS |
| Objective 8: | Sufficient capacity, skills, equipment and funding exist to support the implementation of an EAF | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 8.1 | Good research capacity is available to adequately understand EAF in this sector | 37,38 | Extreme | 1 | At present no dedicated researcher. Some human resources allocated to this sector via participation in DSWG. Stock assessment is undertaken by a fisheries consultant. | Appointed researcher. | HR |
| 8.2 | The skills development mechanisms (e.g. training courses etc.) are adequate to allow EAF related research | | Low | 2 | EAF SWG in place to co-ordinate EAF specific research. | | EAF SWG |
| 8.3 | The funding to facilitate adequate capacity, equipment and skills for research are understood and met | 39 | Extreme | 1 | Limited research budget allocated at present to conduct stock assessment only. | | HR |

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| 8.4 | DAFF has adequate capacity to advise fisheries management decisions | | | 7 | Maintain existing expertise. | | |
| 8.5 | DAFF has the necessary skills to support EAF management i.e. the technical expertise which allows for the identification of the appropriate management tools (e.g. closed area/season, quota, gear restriction) | | | 6 | | | |
| 8.6 | DAFF has funding to facilitate adequate capacity, equipment and skills for implementing management decisions | | | 3 | Funding to attend CCAMLR meetings. | Review funding needs. | Resource Mngt |
| 8.7 | There is adequate capacity to address compliance issues | | | 1 6 | Inadequate capacity to address IUU. Sufficient capacity exists for port side landings. | | MCS |
| 8.8 | The compliance section has the necessary skills to implement an EAF (including a good understanding of the regulations, the appropriate penalties and evidence collection) | | | 3 | Compliance staff are under valued largely because they are inadequately trained. | Urgent need to improve the training and support (24hour on call back up support) of FCO. | MCS |
| 8.9 | There is adequate funding to facilitate capacity, equipment and skills for compliance | 35 | Extreme | 4 | Some funding available e.g. upgrade of VMS system. | Motivate for increased funding allocation especially to improve patrols for IUU | MCS |

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| | | | | | | fishing. | |
| 8.10 | Employment equity within DAFF according to transformation goals has been achieved | | | 7 | | | |
| Objective 9: | Good data procedures exist to support EAF implementation | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 9.1 | Both land-based and at sea observer programme is operational and provides accurate information to inform the management of the sector | 40 | Moderate | 6 | 100% at sea observer programme. Adequate for current needs. Could be improved to address more advanced research. CCAMLR is currently investigating accreditation of observer training. | Identify research needs and train observers to fulfill these needs. | DSWG/CapFish |
| 9.2 | Accurate logbook information informs research and management of the sector | | | 7 | CCAMLR have comprehensive requirements. Five day catch and effort information is submitted. Monthly C2 data includes detailed EAF information. In addition VME data is submitted to CCAMLR. | | |
| 9.3 | Accurate Landing declaration information informs the management of the sector | | | 7 | CCAMLR catch documentation scheme (CDS) in place. | | |

| | | | | | | | |
|----------------------|--|---------------|-----------------|-------------|--|--|-----------------------|
| 9.4 | Appropriate electronic data management systems are in place (research and catch data) | | | 7 | All reports are electronically. Industry also records metrological data, cetaceans etc. | | |
| 9.5 | Data management systems for socio-economic data are in place and are being used | | | n/a | Not considered relevant to this sector. | | |
| 9.6 | Electronic data management systems (operational data) are in place | | | 7 | All CDS are electronically. | | |
| Objective 10: | External impacts of fisheries are addressed (e.g. the effect of other sectors, other industries, climate change etc.) | Issues | Priority | Step | Comments (incl details of progress, barriers etc.) | Next steps (to be undertaken within the next 18 months) | Responsibility |
| 10.1 | There is good understanding of the effect of other fisheries on this fishery and vice versa or within the fishery | 41 | Moderate | N/A | Out of the jurisdiction of this fishery. | | |
| 10.2 | There is a good understanding of the effect of external ecological changes and climate change on this fishery | 42 | Moderate | 5 | Currently unknown affect on the fishery. A number of publications report changes on PEI. | | EAF SWG |
| 10.3 | There is a good understanding of the effect of other industries (e.g. mining) on this fishery | 47, 45 | Moderate | | Out of the jurisdiction of this fishery. | | |

| | | | | | | | |
|------|---|----|---------|---|--|--|--|
| 10.4 | There is a good understanding of economic drivers (e.g. oil price, exchange rates etc.) on this fishery | 43 | Extreme | 5 | Catches are exported to the US. This fishery is dependent on the US and Japanese market. | | |
| 10.5 | There is a good understanding of the effect of social factors (e.g. HIV/Aids) on this fishery | | High | 6 | Concern for this fishery given the high seas nature of this fishery and length of the trips. Rigid health checks are undertaken prior to leaving port. | | |

Appendix 3: List of participants

| Name: | Institute/Affiliation: |
|-------------------|-------------------------------|
| Phoebius Mullins | DAFF |
| Bruce Dyer | DEA |
| Magda Burger | DAFF |
| Rii Baci | TAFISA |
| Chris Heinecken | CapFish |
| Daniel Bailey | Bato Star |
| Peter Chadwick | WWF South Africa |
| Craig Smith | DAFF |
| Saasa Pheeha | DAFF |
| Estelle vd Merwe | PEW Environmental Group |
| Rob Leslie | DAFF |
| Pumla Feni | DAFF |
| Sithembile Kuyane | DAFF |
| Sonwabo Mjelo | DAFF |
| Ross Wanless | BLSA |
| Samantha Petersen | WWF South Africa |
| John Duncan | WWF South Africa |

References

Fletcher, W.J., Chesson, J., Fisher, M., Sainsbury, K.J., Hundloe, T., Smith, A.D.M. and B. Whitworth. 2002. National ESD Reporting Framework for Australian Fisheries: The 'How To' Guide for Wild Capture Fisheries. FRDC Project 2000/145, Canberra, Australia.

Fletcher, W.J. 2005. The application of qualitative risk assessment methodology to prioritise issues for fisheries management *ICES J. of Mar. Sci.* 62: 1576 – 1587

Nel, D. C., Cochcrane, K. L., Petersen, S. L., Shannon, L. J., van Zyl, B. and M. B. Honig (eds). 2007. Ecological Risk Assessments: a tool for implementing an Ecosystem Approach to Southern African Fisheries. WWF Report Series – 2007/Marine/002. 203 pp.

Petersen, S.L., Paterson, B., Basson, J., Moroff, N., Roux, J-P, Augustyn, J. and G. D'Almeida (eds). 2010. Tracking the Implementation of an Ecosystem Approach to Fisheries in Southern Africa. WWF South Africa Report Series – 2010/Marine/001.