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Re-Certification Public Certification Report for

**SOUTH GEORGIA PATAGONIAN TOOTHFISH LONGLINE
FISHERY**

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1. SUMMARY

1. This report sets out the results of the re assessment of the South Georgia Patagonian Toothfish Longline Fishery against the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing. The re assessment was carried out over the period November 2007 to August 2009. The client is the Government of South Georgia and South Sandwich Islands (GSGSSI).
2. The assessment was carried out by a team of three independent expert assessors: Paul Medley, Graham Pilling and Jake Rice leading the assessment of Principle 1, Principle 2 and Principle 3 respectively. A full account of the assessment team relevant experience is set out in section 7.1 of this report.
3. The evaluation process for this assessment involved gathering information relevant to the fishery during a site visit to South Georgia and a remote site visit held in England; discussions with experts and stakeholders; and reviewing relevant literature. The assessment team then compiled a draft report, and met to 'score' the performance of the fishery. The draft report that was produced by the team has been considered by the client, subject to peer review, and then published for stakeholder comment (in June 2009) before being published as a Final Report on the MSC website (in Aug 2009).
4. The main strengths of this fishery are that the stock is well researched and in a good state; the fishery and its interactions have been studied by international scientists for a considerable time; and the client has clear policies and procedures in place for managing the fishery. The fleet is licensed annually and operates under a robust management regime that links together scientific advice and fisheries regulation. Compliance with this regime is measured and is reported to be good.
5. Moody Marine has determined that this fishery should be certified according to the Marine Stewardship Council Principles and Criteria. The fishery scored 80 or more against all performance indicators and so conditions have not been raised. [Note that the first certification of this fishery (March 2004 – March 2009) had raised conditions relating to areas of uncertainty. These conditions were all fulfilled before the current re certification could proceed.

2. INTRODUCTION

This report sets out the results of the re-assessment of the South Georgia Patagonian Toothfish Longline Fishery against the Marine Stewardship Council Principles and Criteria for Sustainable Fishing.

1.1 The fishery proposed for certification

The MSC Guidelines to Certifiers specify that the unit of certification is "The fishery or fish stock (=biologically distinct unit) combined with the fishing method/gear and practice (=vessel(s) pursuing the fish of that stock) and management framework."

The fishery proposed for certification is therefore defined as:

Species:	Patagonian toothfish <i>Dissostichus eleginoides</i>
Geographical Area:	The fishery is located around the island of South Georgia and the associated plateau to the west around Shag Rocks, within the Government of South Georgia and the South Sandwich Islands (GSGSSI) 200nm Maritime Zone. Adult Patagonian toothfish are found in deep water, in the range 200 – 2000m, but the fishery tends to concentrate in waters less than 1500 m. The fishery falls within CCAMLR sub-area 48.3 (Figure 1). Those parts of the GSGSSI Maritime Zone which fall within other CCAMLR sub-areas (48.2; 48.4, including the South Sandwich Islands) are NOT considered as part of the fishery proposed for certification.
Method of Capture:	Bottom Set Longline. Although small amounts of toothfish are also taken in an experimental pot fishery, this is not subject to certification. All landings are, however, set against the TAC.
Stock:	The South Georgia Patagonian toothfish population is considered to be a separate stock
Management:	CCAMLR / GSGSSI
Client Group:	Not applicable, certification to apply to whole South Georgia Longline Fishery

1.2 Report Structure and Assessment Process

The aims of the assessment are to determine the degree of compliance of the fishery with the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing, as set out in Section 5.

This report firstly sets out:

- the background to the fishery under assessment
- the qualifications and experience of the team undertaking the assessment
- the standard used (MSC Principles and Criteria)
- stakeholder consultation carried out. Stakeholders include all those parties with an interest in the management of the fishery and include fishers, management bodies, scientists and Non-Governmental Organisations (NGO's)

Section 9 of the report sets out the methodology used to assess ('score') the fishery against the MSC Standard. The scoring table then sets out the Scoring Indicators adopted by the assessment team and Scoring Guidelines which aid the team in allocating scores to the fishery. The commentary in this table then sets out the position of the fishery in relation to these Scoring Indicators.

The intention of the earlier sections of the report is to provide the reader with background information to interpret the scoring commentary in context.

Finally, as a result of the scoring, the Certification Recommendation of the assessment team is presented, together with any conditions attached to certification.

In draft form, this report is subject to critical review by appropriate, independent, scientists ('peer review'). The comments of these scientists are appended to this report. Responses are given in the peer review texts and, where amendments are made to the report on the basis of Peer Review comments, these are also noted in the peer review text. The updated report is then circulated for public scrutiny on the MSC website.

The report, containing the recommendation of the assessment team, any further stakeholder comments and the peer review comments is then considered by the Moody Marine Governing Board (a body independent of the assessment team). The Governing Board then make the final certification determination on behalf of Moody Marine.

It should be noted that, in response to comments by peer reviewers, stakeholders and the Moody Marine Governing Board, some points of clarification may be added to the final report.

Finally, the complete report, containing the Moody Marine Ltd Determination and all amendments, will be released for further stakeholder scrutiny.

1.3 Information sources used

Information used in the main assessment has been obtained from interviews and correspondence with stakeholders in the fisheries, notably:

Glossary of abbreviations and terms used

Abbreviations and terms	Explanation
BAS	British Antarctic Survey
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CPUE	Catch per unit of fishing effort
GSGSSI	Government of South Georgia and South Sandwich Islands
IUU	Illegal unregulated unreported fishing activity
KEP	King Edwards Point, GSGSSI and BAS base on South Georgia
MRAG	Marine Resources Assessment Group
NPOA - Seabirds	National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries.
RIA	Reduced Impact Areas (relating to fishery impacts)
ROV	Remotely operated vehicles
WG - FSA	Working Group on Fish Stock Assessment (<i>CCAMLR</i>)
FCO	Foreign and Commonwealth Office (department of UK Government)
SGSSI MZ	South Georgia and South Sandwich Islands Maritime zone
EDCD or DCD	[Electronic] Dissostichus Catch Document - Catch Document Scheme for Toothfish

Meetings

Date	Activity	Organisation	Name	Position
17 Apr 08 – 10 May 08.	J. Combes conducted site visit to Falklands and South Georgia.	SGSSI government	Harriet Hall Richard McKee	Director of Fisheries Executive Officer
	J Combes attended pre licensing inspection of fishing vessels	SGSSI government	Emma Jones	Government Officer
	J. Combes participated in fishery patrol and boardings	SGSSI government	Roy Summers. Pharos Fishery Patrol Vessel	Fishery Officer
7-11 July	Assessment Team met with scientific advisors to SGSSI Government	MRAG BAS	Rebecca Mitchell John Pearce Mark Belchier	Fisheries Consultant Senior Consultant Science Coordinator

Other information sources

Published information and unpublished reports used during the assessment are:

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2 BACKGROUND TO THE FISHERY

2.1 Biology of the Target Species:

The species is easily recognised and not confused with others. The life history is reasonably well understood for a deep water species. On going research should continue to improve understanding of the distribution of toothfish by sex, size and age (Roberts 2006; Collins *et al.* 2007), growth and natural mortality rates, and the position of the species in the food web and ecosystem (Croxall and Wood, 2002).

Genetic research has been used for stock identification and to verify that the stock in Area 48.3 is well mixed and does not require any special measures to protect genetic diversity (Roberts *et al.* 2006). The genetic structure of Patagonian toothfish populations in the Atlantic and western Indian Ocean Sectors of the Southern Ocean (SO) indicated that populations of toothfish from around the Falkland Islands were genetically distinct from those at South Georgia, around Bouvet Island and the Ob Seamount populations. Genetic differentiation between these populations can be explained by their hydrographic isolation, as the sites are separated by two, full-depth, ocean-fronts and topographic isolation (Rogers *et al.* 2006).

Mark-recapture experiments (tagging) has been used to help identify stock structure, and results support treating SGSSI toothfish as a single stock for management purposes (CCAMLR 2007, Agnew *et al.* 2006, Hillary and Agnew 2007, Roberts and Agnew 2007). The tagging data, now substantial, shows no evidence of significant movement of individuals from the SGSSI stock to exploited populations in other areas of the south Atlantic. In total, 17 815 fish have been tagged in Subarea 48.3 since the program started in 2000, and 1199 so far recaptured. In 2007, 530 tagged animals were recovered; seven of these were tagged in 2000 as juveniles. Fish have moved between sub-areas within 48.3, but no recaptures have been reported outside area 48.3 (CCAMLR 2007). The spatial and temporal pattern of recaptures of tagged toothfish implies individuals do not move great distances from year to year, but there is an ongoing exchange of fish among adjacent blocks.

The legal catches are very well documented and very reliable. The total catch is recorded and verified at landing in Port Stanley, Falkland Islands. On board observers provide excellent information on catch composition (length, sex and maturity of individual fish), as well as a description and check on fishing operations (see observer reports).

Historical IUU catch biomass estimates are included in stock assessments. The pattern of IUU fishing in global toothfish fisheries is well understood (Agnew, 2000), and has been statistically assessed for 48.3 (Agnew and Kirkwood 2002 and 2005). IUU fishing however does not represent a very large proportion of the total catch in area 48.3 (0.09% over the last 6 years). IUU estimates are based on the reasonable assumption that the same methods and gear types are used. However, there inevitably remains a degree of uncertainty around the amount of IUU fishing taking place and future IUU fishing may be dependent upon conditions outside Area 48.3 (increased enforcement elsewhere, relative changes in stock status etc).

The primary abundance index consists of fishery dependent CPUE data. There are some fishery independent data, but it is not used directly in the stock assessment. There are several reasons why longline CPUE is likely to be better than other gears in tracking population trends. Longlines are passive gears laid over significant areas. Catches will be dependent on fish density, as well as how much fish move, bait, hook size and so on, but it is more likely that fish density will remain correlated with longline catch per hook under a wide range of circumstances. A significant advantage of CPUE is the quantity of data provided compared to fishery independent surveys. Standardised commercial longline CPUE is therefore considered a suitable index.

The more important use of tagging, rather than stock identification, is now to provide information for the stock assessment on growth, mortality and population size. (CCAMLR 2007, Agnew *et al.* 2006).

The CASAL assessment model is able to make direct use of tagging data, which are important for growth estimates. These data have led to ongoing improvements in population parameter estimates both within and outside the model (e.g. suggesting natural mortality is lower than assumed in previous assessment models). The tagging data also provide a check on the CPUE abundance trends.

The fishery independent surveys are conducted by the UK and in the past by Russia on an annual basis. The fishery independent surveys are considered when interpreting the assessment and reserved to verify observed patterns estimated from the assessment model (e.g. year class strength). The surveys take place in shallower water and probably are most useful as a recruitment index. However, their coverage means that they are not currently considered appropriate for inclusion in the stock assessment itself.

On going research is being conducted on environmental factors (BAS Discovery 2010 programme). For example, there is some evidence that recruitment is higher in cooler conditions. Climate and ecosystem factors should be considered and taken into account when setting reference points and controls. There is evidence that various relationships have been regularly discussed and considered during WG-FSA meetings (see WG-FSA reports), and where data are lacking, suitably precautionary scientific advice is given.

2.2 History of the Fishery:

Around 58% of all finfish catch in Antarctic waters reported to CCAMLR between 1969 and 1997 took place around South Georgia. Finfishing, predominantly with bottom trawls, began in the mid-1960s, before the South Georgia Maritime Zone was put into effect in 1993. A rapid depletion in a number of rockcod (Nototheniidae) stocks occurred, notably Marbled Rockcod *Notothenia rossii*, firstly around South Georgia and, by the end of 1980 throughout the Antarctic. Other species caught in bottom trawls, such as *Gobionotothen gibberifrons* and *Lepidonotothen squamifrons* were also reduced throughout the Antarctic by the early 1980s. Marbled Rockcod remains at less than 5% of its pre-exploitation abundance.

Fishing for Patagonian toothfish occurred at an exploratory scale in Chilean waters as early as 1955, but it was not until the later development of deep-water longline systems that it was exploited on a larger scale. Exploitation of Patagonian toothfish around South Georgia began in the 1970s as by-catch from a bottom trawl fishery. Longlining was introduced to the South Georgia area in the late 1980s and early 1990s, and allowed exploitation of older, mature fish in areas where trawls could not be used. Table 1 shows the catch history for sub-area 48.3, catch levels have remained fairly stable since 2004. Longlining is now the only fishing method for toothfish allowed commercially in sub-area 48.3 (although trawling still takes place around some other sub-Antarctic islands). Potting is still being carried out experimentally around South Georgia. The pot fishery is not considered within this assessment, but landings are set against the TAC.

Large amounts of Illegal, Unreported and Unregulated (IUU) fishing for Patagonian toothfish occurred in sub-Antarctic Atlantic waters during the 1990s, reaching an estimated four times the regulated catch in 1997. Measures have been put into place by CCAMLR in an attempt to deal with this, including most recently a Catch Documentation Scheme adopted at the 1999 CCAMLR meeting. In South Georgia waters, three arrests of vessels fishing illegally were made in 1994 - 1996 and illegal fishing is reported to have declined rapidly thereafter with no subsequent arrests. Recently, levels of IUU activity have been estimated to be zero, an isolated event being the sighting and capture of the *Elqui* in 2005.

Table 1 Catch history for *Dissostichus eleginoides* in sub-area 48.3. Fishing areas are given (i.e. 1988 / 89 is 1 December 1988 to 30th November 1988), the management areas are defined in Conservation Measure 41-02. Source: STATLANT and fine scale data (note: only 10 vessels were fishing in 2005/06 season).

Season	Regulated fishery			Estimated IUU catch (tonnes)	Total removals (tonnes)		
	Effort (no. vessels)	<i>D. eleginoides</i> catch (tonnes)			SGSR	West	Subarea
		Limit	Reported				
1984/85	1	-	521	0	517	4	521
1985/86	1	-	733	0	733	0	733
1986/87	1	-	1 954	0	1 954	0	1 954
1987/88	2	-	876	0	876	0	876
1988/89	3	-	7 060	144	6 963	241	7 204
1989/90	2	-	6 785	437	6 838	384	7 222
1990/91	1	2 500	1 756	1 775	3 531	0	3 531
1991/92	23	3 500	3 809	3 066	6 864	11	6 875
1992/93	18	3 350	3 020	4 019	7 039	0	7 039
1993/94	4	1 300	658	4 780	5 246	191	5 438
1994/95	13	2800	3 371	1 674	4 972	73	5 045
1995/96	13	4 000	3 602	0	3 530	72	3 602
1996/97	10	5000	3 812	0	3 808	4	3 812
1997/98	9	3 300	3 201	146	3 347	0	3 347
1998/99	12	3 500	3 636	667	4 303	0	4 303
1999/00	17	5 310	4 904	1 015	5 910	9	5 919
2000/01	18	4 500	4 047	196	4 232	11	4 243
2001/02	17	5 820	5 742	3	5 717	29	5 745
2002/03	19	7 810	7 528	0	7 510	18	7 528
2003/04	17	4 420	4 497	0	4 460	37	4 497
2004/05	8	3 050	3 039	23	3 062	0	3 062
2005/06	11	3 556	3 535	0	3 535	0	3 535
2006/07	10	3 554	3 535	0	3 535	0	3 535

(Note. Effort in 2007/08 season was 11 vessels)

Mortality of seabirds caught during setting of longlines can be high if not managed, and longline fisheries for Southern Bluefin Tuna (*Thunnus maccoyii*) and Patagonian toothfish have been strongly implicated in reducing populations of several species of albatross and petrels. A number of measures to combat seabird bycatch have been introduced by CCAMLR, and bird mortalities associated with Patagonian toothfish fishing in the South Georgia area recently have been greatly reduced as a consequence. Indeed, bird catch rates are now at negligible levels in terms of population impacts. These effectively 'negligible' levels were achieved largely by restricting fishing to winter but also in part to the improving compliance with Conservation Measure 29/XIX in respect of night setting and line weighting. Recent catches have been estimated at zero.

Fishing season	By-catch (birds/thousand hooks)	rate	Estimated by-catch
1996/97	0.23		5 755
1997/98	0.032		640
1998/99	0.013*		210*
1999/00	0.002		21
2000/01	0.002		30
2001/02	0.0015		27
2002/03	0.0003		8
2003/04	0.0015		27
2004/05	0.0015		13
2005/06	0		0
2006/07	0		0

2.2 Vessels and Gear

Fishing licences are applied for and issued on an annual basis. Vessels are subjected to a pre licensing inspection by SGSSI at KEP before they are issued with the papers to enter the fishery.

All MFV are set up specifically to fish with long lines. The longlines are rigged in different ways. Note measurements are approximate in the following text.

Spanish long line

An 18-22mm rope (fatherline), with 8.5kg stone weights attached at regular intervals to make it sink, is used as a backrope/heaving line. A second line (motherline) of 5mm rope or 3mm monofilament is tied to the back rope in short lengths. The snoods with the hooks attached are tied/clipped to the motherline.

Autoline long line

A 15mm rope (motherline) is used. The rope is leaded so that it sinks. The snoods with the hooks attached are tied/clipped to the motherline.

Trot-line system also referred to as ‘cachalotera’ or ‘umbrella system’

Fishing masters are developing a modification to the rigging of the longline fishing method to try to reduce the losses of toothfish to Orca and sperm whale depredation during hauling. The hooks are rigged in a slightly different arrangement, trot lines, more like a bunch of grapes, but exact rigging is determined by the fishing master. ‘Umbrellas’ are a cone shaped piece of fishing net resembling an umbrella. The net is slightly buoyant so that the umbrella floats at the mother line end of the snood. As the hauling process lifts the gear off the seabed drag from the water makes the umbrella slide down the snood and covers the fish on the hooks. The use of umbrellas takes extra time and slows the fishing operation down so fishing masters only use them in areas where whale depredation has been experienced. The umbrella system is being scientifically trialled in 2008 and a paper will be sent to CCCAMLR. There could be concerns that lost umbrellas could ghost fish by entanglement. The umbrellas are easily used by the Spanish system, not so easy for the autoliners and not possible for use with moon pools.

The design of hook used on longlines is unrestricted. Hook design is fairly standard although particular companies, fishing masters or campaigns may use specific hook designs, hook manufacturers or colour/material of snood. Specimen hooks with snoods have been collected from toothfish longliner fishing boats during the pre licence inspection and are retained at the BAS base at KEP. BAS operate a base on Bird Island, South Georgia where many seabirds nest. The reference collection can be used in the event of the recovery of hooks from nesting birds and chicks. Importantly the hook library may reveal that hooks recovered from seabirds did not originate from the SG fishery.

Fish traps/pots

A small amount of toothfish are also taken in an experimental pot fishery. All landings are set against the TAC. The toothfish pot fishery is not subject to MSC certification.

2.3 Fishing Locations and Administrative Boundaries:

The administrative boundaries for the SGSSI toothfish fisheries are the 200 mile maritime zone (MZ) extending from South Georgia and the South Sandwich Islands (see Fig 1). Exclusive management jurisdiction is exercised within that boundary. All vessels fishing within those boundaries are considered to be subject to all administrative and management regulations implemented by the Fisheries Commissioner for South Georgia. Surveillance and enforcement by SGSSI authorities is exercised fully within those boundaries as well.

All of the SGSSI Maritime Zone falls within the boundaries of the Convention on the Conservation of Antarctic Marine Living Resources, conservation measures for which are set by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), a multinational organisation.

Although the Maritime Zone covers three CCAMLR statistical subareas, the entire catch for this fishery comes from within only one: subarea 48.3.

The convention was adopted in 1980 and entered into force in 1982. Currently 24 members have subscribed to the Commission (the executive body), including the European Community. The aim of the Convention is the conservation of Antarctic marine life. Conservation is defined to include rational use, although there is no activity directed at management of seals and whales as harvestable resources, these being covered by other conventions. Fisheries management in South Georgia waters is therefore based directly on the annual scientific advice and recommended management measures of CCAMLR.

As an Overseas Territory of the UK, GSGSSI has no formal direct contact with CCAMLR, but is represented at CCAMLR by the Polar Regions Section of the Overseas Territories, Foreign and Commonwealth Office of the UK. Enforcement is conducted by GSGSSI patrol vessels, operating consistent with CCAMLR standards and procedures. GSGSSI puts into effect the conservation measures set by CCAMLR, which is advised by its Scientific Committee (SC-CCAMLR), which is in turn advised by its Working Group on Fish Stock Assessment. Some conservation measures are aimed at preservation of the target stock while others are aimed at the reduction of direct or incidental impacts on other species. Conservation measures for target species of fisheries include the setting of annual Total Allowable Catches (TACs) for each species according to individual sub-areas.

The fishery is not evenly distributed within that zone. Rather, the large majority of fishing effort is concentrated above the 2000 m contour and below the 500 m contour. In recent years the large majority of effort is within the specified depth range around Sought Georgia and the plateau around the Shag Rocks, with substantially less effort in the same depths around the South Sandwich Islands. Although this Maritime Zone spans three CCAMLR subareas, the assessed fishery occurs entirely within CCAMLR subarea 48.3. In the previous MSC assessment report some fishing was reported to occur outside of the South Georgia Maritime Zone but still within sub-area 48.3. This took place mainly in the area immediately to the west of Shag Rocks. Catch rates were lower in this fishery than in the fishery within the SGSSI MZ, and effort in the fishery in 48.3 but outside the SGSSI MZ has declined further; in recent years being at or near zero. Any legal fishing in this area is reported to CCAMLR and is included in stock assessments and total catch statistics.

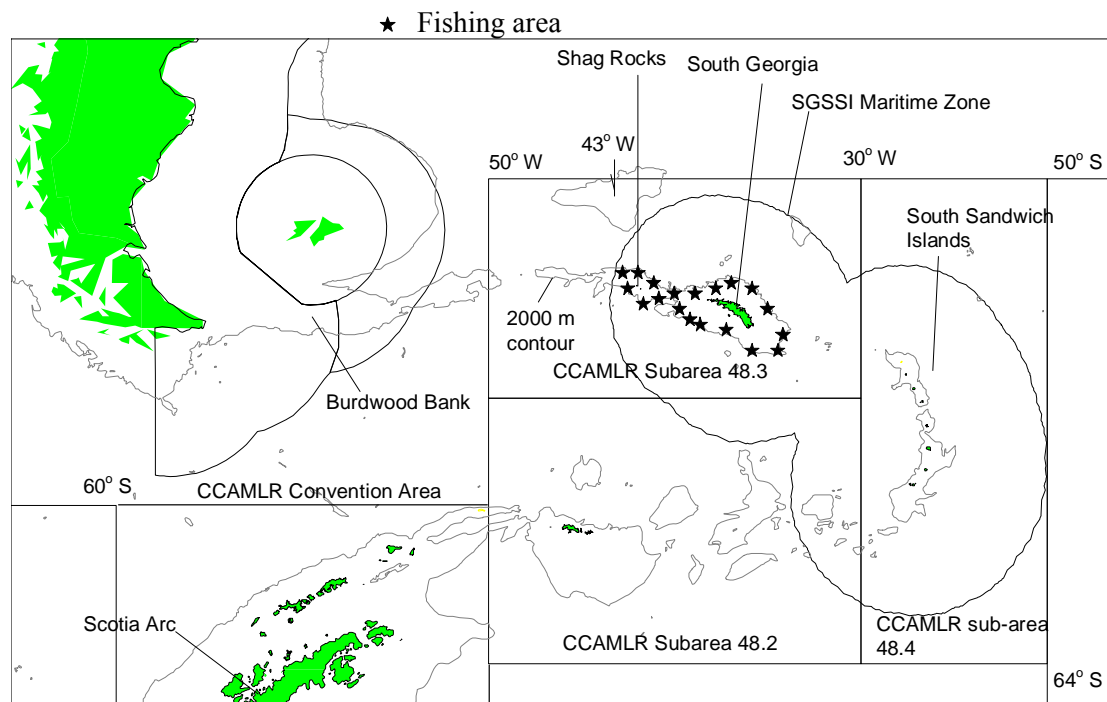


Figure 1. Map of the area, showing the main fishing ground around South Georgia and Shag Rocks, the South Georgia and South Sandwich Islands Maritime Zone, the CCAMLR Convention Area and, specifically, Subarea 48.3, and the bathymetry (2000m contours presented). Map provided by MRAG Ltd. The fishing area defines the main concentration of the South Georgia stock, the boundaries of which are defined with 48.3.

2.4 Ecosystem Characteristics:

The ecosystem around SGSSI has been well studied through research by BAS, MRAG and CCAMLR, and is a subject of ongoing research (e.g. Agnew, 1997; Constable et al. 2000; Hill et al., 2007). This research contributes towards fishery management and conservation for SGSSI and also supports the work of CCAMLR whose Scientific Committee have been developing an ecosystem approach to the regulation of fisheries. This includes management approaches that assess the status of the ecosystem and its health.

A key area for study in relation to the toothfish fishery has been the development of knowledge on the nature, sensitivity and distribution of habitats in relation to fishing activities. Key areas of sensitive habitat have been identified, involving swath bathymetry mapping studies, performed from research vessel platforms. This has been supplemented by echosounder records from commercial vessels and observations from the observer programme. Resulting data are available from the BAS website at 150m resolution. Further research is planned on the distribution and identification of sessile invertebrate organisms, linked to the Zoological Society. Further work has been initiated to define and identify through data collection Vulnerable Marine Ecosystems (VMEs; see Conservation Measure 22-06 of 2008), with the aim of protecting them. For example, reporting of by-catch of all Vulnerable Marine Ecosystem (VME) indicator organisms is mandatory for all fishing vessels, implemented in most cases through the international observer programme. CCAMLR has also agreed a procedure to close areas to fishing when the occurrence of VME indicator organisms in an area exceeds a specific threshold level.

Understanding the direct impacts of longline toothfish fishing on habitats requires the locations of fishing (available from VMS and observer data) to be related to this habitat information. The process of overlaying biological information over the bathymetric map has begun. Data on the biological

diversity of deepwater corals taken as a bycatch within the fishery is available, indicating that the SGSSI area is species-rich. Information such as this from the longline fleet is relatively depth-limited and open to uncertainty. Improved information is planned through camera and ROV surveys to capture images of benthos directly.

Fishing in key areas (Reduced Impact Areas; RIAs) has been banned as a precautionary measure with the specific intention of protecting benthic habitats, taking into account impacts on the fishery, and on the potential subsequent relocation of fishing activity. However, the fishery is considered to have a relatively low benthic impact, and estimates indicate that the impact of fishing in terms of seabed area is less than 1 km², or about 0.001% of the overall area of fishable seabed.

Ecosystem modelling has been initiated, with knowledge of the position of toothfish within the food web around SGSSI being improved considerably in recent years. Current information suggests that toothfish does not have a key role in the ecosystem, and that management should result in a standing stock of toothfish large enough to play its ecosystem role as a predator. An ECOPATH model for the Scotia Sea/South Georgia shelf has also been developed under the BAS Discovery 2010 programme. This research programme is also using fatty acid and stable isotope analysis to improve both food web structure and model performance. In turn, international cooperation through CCAMLR will improve the model further, with an upcoming joint IWC/CCAMLR workshop aiming to include whales within ecosystem models, including that for the Scotia Sea, by sharing consumption/provisioning rates. The role of bycatch species within the toothfish fishery (see below) in the ecosystem is also being considered by their inclusion within this ECOPATH model.

2.4.1 By-catch and Discards

Bycatch and discards of organisms within the toothfish fishery under certification is limited to three main groups: discarding of toothfish; bycatch of macrourids and bycatch of skates and rays. In addition, 27 tonnes of 'other species' were noted in 2006/07, and these species are monitored through the observer programme.

Discarding of toothfish in the SGSSI toothfish fishery is relatively uncommon. However, there are occasional accidental losses of fish from hooks. These losses usually result from difficulties in gaffing fish when weather conditions are poor. There is also very occasional discard of toothfish with a condition known as jellymeat, which makes the flesh unfit for sale.

Fish by-catch involves mainly rays (Rajidae) and grenadiers (Macrouridae). The landed (on the boat) catch of rays in 2007 was 4 tonnes (the level being below 10 tonnes since the 2004/05 season) and the catch of grenadiers was 131 tonnes. The latter has been increasing over time, but remains below the catch limit set based on the "5% precautionary rule" used within CCAMLR. The effects of this by-catch on ecosystem structure and function are considered by the assessment team to be insignificant. Stock assessments performed for rajidae indicate that current removals are sustainable and that the stock is well above estimated Bmsy levels. While assessments have not been performed for macrourid populations, knowledge from other fisheries suggests the current level of bycatch to be sustainable. However, the increase in bycatch levels of this group over time is of some concern. Both rajidae and macrouridae are part of the BAS Ecopath model, which will help identify the overall impact of bycatch mortality on the ecosystem. In turn, mitigation approaches have been put in place for both fish groups.

For rays, GSGSSI has in place a number of conservation measures. These include i) a "move-on" rule for ray catches greater than 1 ton, whereby if the estimated catch of rays exceeds 1 ton in any one day the boat should move at least five nautical miles to an area where the catch of skates and rays is expected to be significantly lower, and not return for at least five days; ii) the requirement to limit by-catch of rays for any one vessel for the season. CCAMLR incorporated these rules into the toothfish

conservation measure for sub-area 48.3; iii) a cut-off rule for rays, monitored by observers. For macrourids, in addition to the move-on rule and overall limit on catches within a season, the GSGSSI authorities limit the number of autoliners within the licensed fleet, as this fishing method appears to have a higher bycatch of macrourids than other longline systems.

Ongoing work on the biology of both skates/rays and macrourids to support current and future assessments is undertaken as part of the BAS Science Plan for South Georgia, by MRAG, and through the observer programme. As part of these programmes information has been prepared on distribution, identification and ageing in rays (e.g. Everson et al., 2000; Endicott et al., 2000, 2004), and on identification, ageing and general biology of macrourids (e.g. Morley and Belchier 2002, Morley et al., 2004). Ongoing work includes a PhD study on the effects of ray by-catch on populations. Tagging studies on rays include injecting with oxy-tetracycline to validate ageing studies.

2.4.2 Interactions with Protected, Endangered and Threatened Species:

Interactions of the longline fishery with PET species have historically focussed on endangered seabirds, in particular petrels and albatrosses. Mortalities before the year 2000 numbered in the hundreds within a season, mainly occurring as the line was being set, but also during hauling. Strong action was taken in the legal fishery to minimise this impact through CCAMLR conservation measures (particularly restriction of fishing to winter months when the affected species have largely left the area; setting of lines only at night when the birds forage less; use of appropriate streamer lines to keep birds away while setting; discharge of offal on the opposite side to hauling to reduce foul-hooking; use of appropriate line weighting regimes and defrosting of bait so that lines quickly sink below the foraging depth of the birds). These measures led to a considerable reduction in seabird by-catch in the licensed fishery. They have proved extremely successful, with zero bird mortalities in the last two seasons. In turn, elimination of IUU fishing has also improved the situation.

Further work has focused on the reduction of hook discarding within offal, which can be swallowed and impact chicks when regurgitated during feeding in the nest. Many vessels now have a macerator on board for offal, while new regulations prohibit hook discarding in offal. This has virtually eliminated hook discards from the GSGSSI fishery, and declines in the occurrence of hooks within nests have been noted.

As a result, the recent International Plan of Action for seabirds around South Georgia (Varty et al., 2008) noted “there is no evidence to suggest that the South Georgia toothfish fishery has a seabird bycatch problem, and therefore there is currently no need to develop a NPOA-Seabirds for this fishery. However, recommendations are made that would improve the management of the fishery to ensure seabird mortality is maintained as close to zero as possible, eradicate residual haul bycatch and help reduce the incidence of hook ingestion.”

Interactions of marine mammals with the fishery are noted by observers. Fur seals have been noted taking toothfish from the line at the surface, while depredation of toothfish by whales is also seen. Neither interaction has a detrimental impact on individual marine mammals. Furthermore, trophic impacts resulting from interactions of key species with the fishery are considered insignificant.

2.5 Other Fisheries Relevant to this Assessment

Patagonian toothfish is fished in a number of other locations around the Southern Ocean including other island groups and off the coasts of South America. However, the South Georgia and Shag Rocks stock has been demonstrated to be distinct from these other stocks.

The only other species of toothfish fished (the Antarctic toothfish, *D. mawsoni*) has a more southerly distribution and has not been reported around South Georgia, although the two species do overlap in distribution in other parts of the Antarctic, including the South Sandwich Islands.

There are fisheries within the GSGSSI Maritime Zone for Icefish (Channichthyidae) and Antarctic Krill (*Euphausia superba*) both using midwater trawls, the latter operating in shallower water than the Patagonian toothfish fishery. A small amount of toothfish is taken in an experimental pot fishery within SGSSI waters. All landings are set against the TAC. The toothfish pot fishery is not subject to MSC certification. Other fisheries that are currently allowed but are not actively pursued are an exploratory fishery for squid (jigging), and pot fishing for crabs. No bottom trawling is allowed in the area.

3. ADMINISTRATIVE CONTEXT

3.1 Legislation and regulation

The core legislation providing the basis for management of the SGSSI toothfish fishery is GSGSSI: GSGSSI Fisheries (Conservation and Management) Ordinance 2000, along with the subsequent amendments, particularly in 2002 and 2004. This Ordinance specifies clearly the authorities and responsibilities of the Commissioner, Director of Fisheries, and Officers, with regard to management of the fishery. The Ordinance is consistent with the legal standards and protocols of the UK, according to standards applied in the governance of overseas territories.

The Regulations in this fishery are derived directly from the Conservation Regulations of CCAMLR, with regard to management of fisheries within the CCAMLR Treaty zone. The numbering system for CCAMLR Regulations was changed recently, but many of the Regulations in the current system are exact continuations of the Regulations that have been developed over the entire span of CCAMLR operations. The full cross-reference of new to old numbering of Regulations can be found at http://www.ccamlr.org/pu/E/e_pubs/cm/07-08/toc.htm.

The particular CCAMLR Regulations of relevance to this fishery include:

Compliance

- 10-01 – Marking of Fishing Vessels and Gears
- 10-02 – Licensing and Inspection Obligations of contracting Parties
- 10-03 – Port Inspection of Vessels Carrying Toothfish
- 10-04 – Automated Satellite-linked Vessel Monitoring System (VMS)
- 10-05 – Catch Documentation Scheme for *Dissostichus*
- 10-06 – Scheme to Promote Compliance by Contracting Party Vessels
- 10-07 – Scheme to Promote Compliance by Non-contracting Party Vessels
- 10-08 – Scheme to Promote Compliance by Contracting Party Nationals

Data Reporting

- 23-01 - Five-day Catch and effort Reporting
- 23-03 - Monthly catch and Effort reporting – All Vessels
- 23-04 – Monthly Fine-scale Catch and Effort reporting – Trawl, LL & Pot
- 23-05 – Monthly Fine-Scale Biological Reporting – Trawl, LL & Pot

Research and Experiments

- 25-01 – Application of Measures to Research for Minimization of Incidental Mortality
- 25-02 – Minimization of Incidental Mortality of Seabirds in the Course of Long-lining

Environmental Protection

- 26-01 – General Environmental Protection during Fishing

Fisheries Regulations

- 31-01 - Regulation of Fishing around South Georgia (SubArea 48.3)
- 31-02 – General Measures for the Closure of All Fisheries

Fishing Seasons and Closed Areas

32-01 – Limitations to the By-catch of *Gobionotothen gibberifrons*, *Channenocephalus aceratus*, *Pseudochaenichthys georgianus*, *Notothenia rossii*, and *Lepidonotothen squamifrons*, in SubArea 48.3

Toothfish

41-02 Limits on the Fishery for *Dissostichus eleginoides* in Sub-Area 48.3

These Regulations are reflected in the annual Licensing documentation developed by the SGSSI fisheries authorities, such that the Management Objectives and actions of the SGSSI authorities are consistent with the objectives and guidance provided by CCAMLR for sustainable use of living marine resources and conservation of biodiversity in the Southern Oceans.

3.2 Management Responsibilities and Interactions

Within the Maritime Zone of SGSSI, management is implemented by the GSGSSI Commissioner, the Director of Fisheries, and officers. As an Overseas Territory of the UK, international relations relating to SGSSI are the responsibility of the UK Government and are dealt with through the Polar Regions Section of the Overseas Territories of the Foreign and Commonwealth Office, UK (FCO). In particular, the FCO is the competent UK Authority on CCAMLR matters, including representing the interests of the Government of South Georgia and the South Sandwich Islands. Consequently there are frequent interactions between the fisheries authorities in SGSSI and officers in the Polar Regions Section of the Overseas Territories of the UK. In practice, the same experts from MRAG and BAS (British Antarctic Survey) are often advising SGSSI officers and the Polar region Section of the Overseas Territories on issues related to the management of SGSSI fisheries and conservation and sustainable use of living marine resources in the SGSSI area, and these same experts are active in CCAMLR and its expert groups. The MRAG experts are generally involved in the fishery itself and its direct impacts on the target species, key bycatch species, and direct ecosystem effects. BAS's engagement is more on the science support for the more indirect effects of the fishery on the marine ecosystems, and the potential impacts of changes in the marine ecosystems on the fisheries. Consequently the flow of information is smooth and direct among the major players in governance and management of these fisheries, and management responsibilities are clear: SGSSI authorities are responsible for management of the fisheries as they occur within the SGSSI MZ, the Overseas Territories of the Foreign and Commonwealth Office are responsible for any international diplomatic issues that may arise, and CCAMLR is responsible for the overall conservation framework of this and other fisheries in the southern oceans.

3.3. Enforcement and control

Enforcement of regulations on vessels fishing legally in the SGSSI is the responsibility of GSGSSI Fishery Officers who are also accredited CCAMLR Inspectors. Any infringements of Conservation Measures or other Licence Conditions are reported to the Attorney General for SGSSI who may prosecute the vessel on the basis of this evidence. GSGSSI contracts the fishery protection vessel 'Pharos', whose patrols are augmented by British forces assets operating in the South Atlantic. There is increasing use of VMS and satellite tracking in monitoring fishing vessel activity in the SGSSI area. Frequency of the at-sea enforcement efforts has increased through the 2000s.

CCAMLR conservation measures regarding gear and record keeping are checked through pre licensing inspections by the Government Officers at King Edward Point (KEP). For example catch documents authorised by ship owner are checked; bird scaring streamer lines measured; offal discharge point on the vessel or on-board processing facilities are checked. Inspection reports go to fisheries patrol officers who can follow up on any potential issues.

Consistent with CCAMLR standards, SGSSI authorities require 100% observer coverage of vessels in the toothfish fishery. The GSGSSI shares the cost of the Fishery Officer posts based on the Falklands so that at any time one is available for the SGSSI fishery patrol ship. The Fishery Officers are also UK-designated CCAMLR inspectors. The observers collect a variety of data during their monitoring of fishing activities at sea such as night setting, regular use of streamer lines etc. Although they provide information that may be later used to measure compliance, they do not enforce CCAMLR conservation measures. Rather, the results of their observations are summarised by CCAMLR and made available to GSGSSI for consideration during the licensing procedure for the following year. Fisheries inspectors and the Government Officers at KEP have regular contact with observers so that major issues quickly become known, although in doing so, it is necessary to respect the role of Observers whose role is to report factually on fishing operations, rather than to monitor compliance.

Vessels fishing illegally in SGSSI waters are subject to enforcement actions by the UK and GSGSSI fishery patrol vessel, consistent with international law and CCAMLR regulations and protocols. Enforcement in these cases is enacted by the GSGSSI fisheries authorities, and penalties can be severe and promptly enforced.

Allied to these efforts is the use of the Catch Document Scheme for Toothfish ([Electronic] Dissostichus Catch Document - EDCD or DCD), which was implemented to reduce demand for IUU toothfish in general. The program has resulted in a number of positive developments, including a strongly substantiated price premium for fish with a valid [E]DCD; participation in the scheme of a number of non CCAMLR contracting parties including China; and rejection of IUU toothfish from a number of ports. There are also reported to have been a small number of fake Catch Documents detected. The fact that they were detected suggests the [E]DCD is being treated seriously, although the number of undetected fake documents that may have been in circulation is unknown.

4 STOCK ASSESSMENT

4.1 Monitoring of Stock Status

Assessments are discussed and analysed within a recognised forum, the CCAMLR Working Group on Fish Stock Assessment. Various assessment models have been used at South Georgia to assess the toothfish stock from a Generalised Yield Mode (GYM) through analysis of localised depletions, to the current age structured CASAL assessment model, which was first used to assess the toothfish stock in 48.3 in 2006. The CCAMLR WG-FSA in 2007 agreed on a single CASAL assessment model, which was structurally similar to that presented at WG-FSA 2006 as the basis for the latest assessment.

Uncertainties in the model's structure and assumptions have been assessed. For example, WG-FSA-06/53 looked at sensitivity to the assumed IUU catch and found the results are insensitive to estimates of past IUU catch. Agnew *et al.* (2006) investigated the possible sources of bias in the tagging estimate of population size, and identified an important source of uncertainty in natural mortality and growth rate estimates. Statistical uncertainty in the data is explicitly included in the decision rule.

A new proposed assessment model was presented in WG-FSA-07/29, utilising catch-at-age data, new tagging parameters and estimating year-class strength. The Working Group recommended that the new model be reviewed at the next WG-SAM meeting. This model made improvements to the fit of the tag data mainly through adjustments in assumptions on tag induced mortality and growth retardation. There has been a general improvement to the fit of the data, and to some extent the model is corroborated by fishery independent surveys. Improvements have been in response to requests of the WG-FSA, showing that the assessment team is responsive to the internal peer review process. However, as the stock assessment has not been fully tested, only small changes to the TAC have been recommended until such time that the assessment is no longer preliminary. This second model has several new features:

- catch-at-age data from 1998–2007 are used in the model;
- revised tag growth-shock and mortality parameters are used (WG-FSA-07/29);
- year-class strength is estimated within the model;
- the growth parameters k and L_{∞} are estimated within the model, and the age–length data from 1998–2005 are used as observations within the estimation scheme;
- GLMM standardised CPUE data are used from 1998 to 2007 only.

However a number of issues arising, mainly to do with growth estimation, led to the new model being sent to review by the WG SAM before a final version can be adopted. The working group gave the new model support as the basis for further development. Development of the new model includes:

- investigating the best way to account for the length-specific trends seen in tag growth-shock and mortality;
- identifying suitable values of recruitment variability to be used when calculating the yields via projections, given that this model now estimates year-class strength;
- identifying the best way to estimate the growth parameters within the assessment model, and the potential implications of fixing the t_0 parameter;
- investigating the mechanism(s) driving the apparent trends seen in the tag recapture fits;
- including sexual dimorphism within the model.

This new model will also address the recommendations suggested in the MSC certification report for improving the stock assessment modelling from the previous certification. The catch limit for 2008/09, if estimated with this new model, may be different from the current 3 920 tonnes (2008).

In addition, alternative stock assessment methods have been explored including local depletion models (WG-FSA-SAM-04/18), age structured production model (APSM WG-FSA-SAM-04/17, WG-FSA-06/59) and tagging experiment models (WG-FSA-SAM-04/17). These provided alternative estimates of absolute biomass, but have been superseded by the CASAL which tries to use most of this information simultaneously. The ASPM assessment (WG-FSA-06/59) does not use mark-recapture data, and therefore was rejected by WG-FSA and not used for management advice.

4.2 Current Stock Status

The latest assessment (WG-FSA-07 Appendix J) was reviewed by the WG-FSA (WG-FSA-07 Annex 5 Pg. 293). The assessment used to determine the state of the stock was the same as that used in 2006, but with the dataset updated from the most recent fishing season. The data used are the catch-weighted length-frequencies, the standardised GLMM CPUE series and the tag release (2000–2006) and recapture (2004–2007) data. The assessment indicates that the stock is well above its biomass target reference point.

The Fish Stock Assessment Working Group recommended that the catch limit for toothfish in Subarea 48.3 (SGSR stock) should be 3920 tonnes for the 2007/08 fishing season which is based on the stock assessment and the harvest control rule adopted by CCAMLR.

4.3 Management Advice

The general strategy is to allow the exploitation rate to increase slowly over time towards a precautionary spawning biomass of 50% of the unexploited level. This strategy is encapsulated in the decision rule which, each year, sets the total allowable catch (TAC) on the basis of the stock size estimated from the stock assessment. As long as the stock assessment is accurate and there is no fishing beyond the TAC, the strategy should guarantee the fishery is sustainable. The strategy includes continuous feedback to management, from setting the controls through data collection and analysis, which estimates the outcome and subsequently will lead to an adjustment in the controls. An outline of the strategy and other aspects of the CCAMLR management regime are available from the CCAMLR website (<http://www.ccamlr.org/>). The full range of conservation measures are described in (WG-FSA-07 Appendix J).

The TAC is administrated through a licensing system and quota allocation. Vessels are licensed on the basis of previous licensing and good behaviour. The numbers of licences reflect the size of the quota, so fewer licences would be issued should the TAC be reduced. Since licences are strictly allocated on an annual basis only, any adjustment of licences is possible. There have been no recent overshoots of the TAC and during the past ten years, a minor overshoot of the TAC has occurred twice (WG-FSA-07 Appendix J). The TAC is also allocated among three management areas (A-C) defined in Conservation Measure 41-02, with no quota allocated to management area A (West Shag).

The catch limits are set to achieve the objectives of Article II of the Convention (Constable and de la Mare, 1996 and Constable *et al.* 2000). Achievement of the TAC is estimated by CCAMLR on the basis of ongoing catch reports during the season, and the measures to close the fishery each year when the TAC is achieved are effective at stopping the licensed fishery.

The licensing system increases the interest in sustainable management and understanding of the regulations (see GSGSSI Licensing Criteria). The system builds an improving relationship between the industry and management, which should improve compliance. Compliance with the quota is enforced by inspectors at the landing site in Port Stanley, Falkland Islands.

The fishing gear is limited to bottomset longline. There is also an experimental pot fishery (Agnew *et al.* 2000), which does not form part of this certification. The objective of the conservation measures on the gear are mainly to minimise bycatch, particularly of albatross, rather than control catch composition. toothfish size can probably be best controlled by controlling the fishing location and depth.

The only fishing methods allowed are long-line (Spanish type and Mustad autoline) and a pot fishery (not included in this assessment). The “Spanish” type has a main line, taking the snoods and hooks, suspended from a heavy hauling line. The autoline system uses a single line. Lines are set usually with 8000-10000 hooks, at depths of between 500 m and 2500 m on the shelf slope. Trawls are prohibited because they target shallow areas holding young immature toothfish, and bycatch. All fishing methods are well known and understood and each vessel’s operations are recorded in detail in the CCAMLR haul by haul logbooks and verified by independent fishery observers. A series of different gear modifications are being tested to reduce bycatch and cetacean depredation (Mitchell *et al.* 2007, Mitchell and Agnew 2007, Agnew and Mitchell, 2007). These are being conducted to enable full recording and analysis of the different gear configurations used. Most catch has been taken by longlines, but 66 tonnes was taken by the experimental pots in 2001 and 24 tonnes in 2006.

The other main controls on fishing are through area closures. Closed area design is based on CPUE data: identified areas with mature animals in spawning condition and bycatch, including rays, skates and rates of snagging vulnerable benthic animals such as deep water corals and sponges (Roberts 2006). Several likely spawning grounds have been identified which could be closed off to fishing to protect recruitment if necessary, and at least one spawning area is located in the same place as a CWC/sponge aggregation site and closing off this area could meet two objectives. In any case, fishing does not occur in waters shallower than 500m. It is also recognised that closing off larger areas

requires the displacement of larger amounts of fishing effort into the non-protected areas and this could compromise both the assessment and conservation objectives. Currently fishing is excluded from management area A (West Shag).

While the legal fishery is well controlled, most concern in the past has been with illegal, unreported and unregulated (IUU) fishing. Current levels of surveillance and enforcement appears to be effective in addressing IUU fishing (Agnew and Kirkwood 2002 and 2005) and the IUU catch can be safely considered negligible (WG FSA 2007 Appendix J). However, there inevitably remains a degree of uncertainty around the amount of IUU fishing taking place and future IUU fishing may be dependent upon conditions outside Area 48.3. Increased enforcement elsewhere or additional lucrative markets for illegal catch, and so on, could encourage IUU fishing in area 48.3 even if risks of seizure remain high.

All evidence so far suggests that the stock within the Area 48.3 is isolated from other populations and therefore can be managed separately. If this were not the case, then other catches would need to be taken into account. Furthermore, the stock does not appear to be made up of separate sub-populations, which would require changes in administering the catch among different areas. This is supported by tagging (Roberts and Agnew 2007) and genetic (Rogers *et al.* 2006) work.

Clear documented harvest control rules are in place and are applied annually in CCAMLR advice on TACs. The decision rule procedure requires Monte Carlo simulations of the population trajectory over 35 years under a constant TAC. A TAC is found such that if this TAC is applied over 35 years in a projection there is a 10% chance or less of the spawning stock falling below 20% of the pre-exploitation level, and the median spawning biomass is at or above 50% of its pre-exploitation level (see Fig. 2). More precisely, the rule is stated as follows. A constant catch calculation must satisfy the CCAMLR decision rules:

1. Choose a yield γ_1 , so that the probability of the spawning biomass dropping below 20% of its median pre-exploitation level, over a 35-year harvesting period, is 10% (depletion probability).
2. Choose a yield γ_2 , so that the median escapement in the SSB over a 35-year period is 50% of the median pre-exploitation level, at the end of the projection period.
3. Select the lower of γ_1 and γ_2 as the yield.

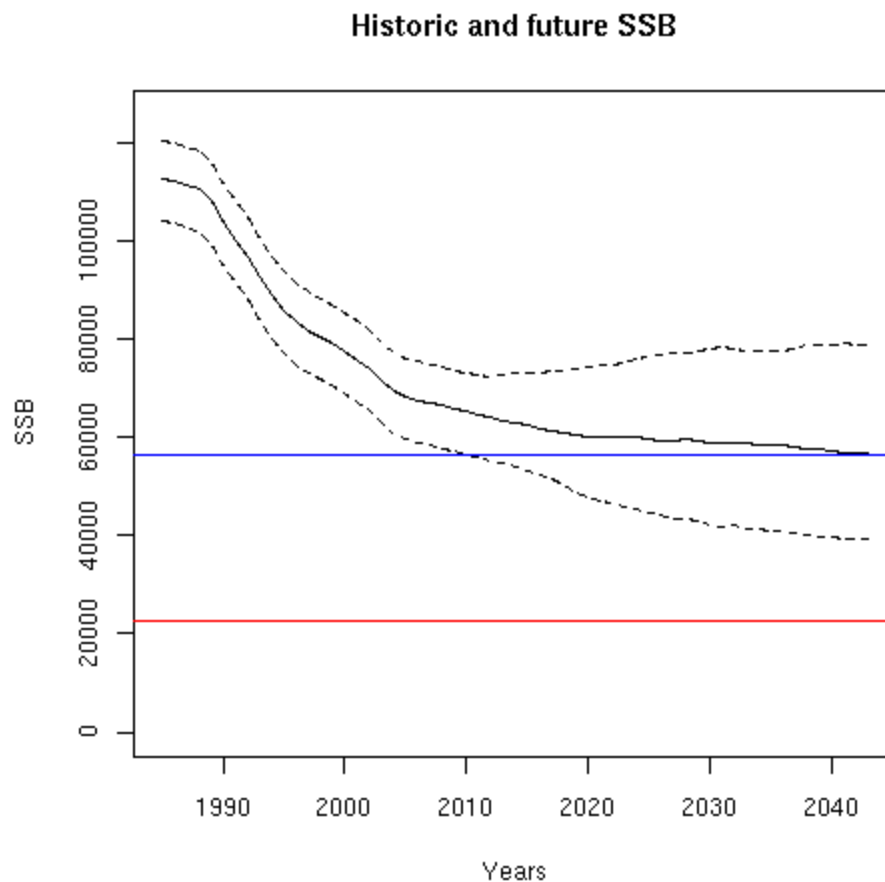


Figure 2. Historic and projected SSB dynamics for a constant future (2008–2043) yield of 3 920 tonnes proscribed for 2008. The solid line represents the median with the dotted lines representing the 80% credible interval. The blue and red lines are the medians of 50% and 20% of pre-exploitation biomass respectively (WG-FSA-07 Appendix J).

IUU catch is not included in the projection. Currently it is considered negligible and the effects of excluding IUU catch from the TAC is not additive over time as each year's assessment takes account of the estimated IUU fishing that has occurred in the previous assessment periods.

The reference points (20% and 50% of the pre-exploitation spawning biomass) are based on a precautionary approach and conform to the CCAMLR standard for management. The biological basis for the level of risk aversion and depletion level are not tightly tied to the biology of this species, but are conservative compared to the standard practice in fisheries.

Males and females are not handled in assessment or decision rule, which could be a problem if females, in particular, are more vulnerable to fishing. However, some evidence would be expected to be seen in the available data had this been the case, e.g. a higher preponderance of females in the catches for example. The slow trajectory (the target is only reached after 35 years) and on-going research should ensure that these and other uncertainties are covered by this decision rule.

5 FISHERY MANAGEMENT

5.1 Management Objectives

CCAMLR has its overarching objective for conservation and fisheries management entrenched in Article II of the Convention which states:

- 1) The objective of this Convention is the conservation of Antarctic marine living resources.
- 2) For the purposes of this Convention, the term ‘conservation’ includes rational use.

This very high level objective is referenced in many other Articles of the Convention, forming the basis for the operations of the Organization.

This high level objective is also made more specific and operational through CCAMLR’s explicit criteria and principles for application of the Ecosystem Approach, which is the foundation for all CCAMLR assessment and management decision-making. CCAMLR’s principles for the application of the Ecosystem Approach are:

- a) prevention of decrease in the size of any harvested population to levels below those which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment;
- b) maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; and
- c) prevention of change(s) or minimisation of the risk of change(s) in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.

From these principles, two central concepts have evolved in the way in which CCAMLR has approached its management responsibilities, namely:

- 1) Management strives to follow a ‘precautionary’ approach. This means that CCAMLR collects the data it can, then weighs up the extent and effect of the uncertainties and gaps in such data before making a management decision. The approach aims to minimise the risk of long-term adverse effects rather than delaying decisions until all necessary data are available.
- 2) Management also follows an ‘ecosystem’ approach. Ideally, this takes into account all the delicate and complex relationships between organisms (of all sizes) and physical processes (such as currents, sea temperature) that constitute the Antarctic marine ecosystem. Obviously, this is a difficult task which is compounded by the Southern Ocean’s size – approximately 35 million square kilometres.”

In SGSSI, these overall objectives of CCAMLR are confirmed in the Fisheries (Conservation and Management) Ordinance 2000, and its earlier versions. The Ordinance guides the management of fisheries by SGSSI authorities. It confirmed that the conservation measures required by CCAMLR, to promote achievement of the CCAMLR overarching objective and the sub-objectives associated with the ecosystem approach, will be required on all vessels licensed to participate in fisheries in SGSSI waters. Beyond that the social and economic objectives for fisheries within SGSSI waters are to provide sufficient revenues to offset costs for management of the fisheries (including assessment, surveillance and enforcement).

5.2 Consultative Process

The SGSSI Director of Fisheries holds annual consultations with participants in the toothfish fishery, and these meetings are open to all parties participating in the fisheries or in the management of these fisheries. The meetings review recent performance of the fishery, new information and advice from CCAMLR, management objectives and proposed changes to management measures for the coming year, and concerns raised by participants in the consultations. The meetings are usually, but not always, held in UK so travel to attend the meeting should not be an impediment to wide participation, however, questions can be directed to the Director of Fisheries at any time. The Assessment Team is unaware of any problems with inquiries receiving timely and informative responses.

The general conservation framework and annual assessment advice comes from CCAMLR. The operating rules for CCAMLR include several provisions intended to ensure openness and transparency of CCAMLR operations, consistent with the standards in the FAO Code of Conduct for Responsible Fisheries that are relevant to Regional Fisheries Management Organizations. Although there have been some at least informal complaints that the CCAMLR appeals process is not always fully satisfactory in its treatment of appeals from non-Parties to the Convention, its standards for consultation and transparency are often held up as a model for operations by an RFMO.

5.3 Reviews of the management system

The annual CCAMLR assessment process includes reviews of aspects of the management process on a regular basis, although the effectiveness of every conservation measure is not re-evaluated every year. A comprehensive and independent review of the CCAMLR assessment processes, and their processes for evaluation of the effectiveness of management measures was called for several years ago. An initial call for bids to conduct such a review was issued, but no bids were tendered. Feedback varies with regard to whether the lack of interest was due to the Terms of Reference specified for the review or the amount of funding that was being offered to support the review. In either case, a second call for bids has issued, with revised Terms of Reference and an increased budget. At the time of the site visit by the Assessment Team (Aug 08) assurances were received that bids were being evaluated and a contract for the evaluation would be issued soon. A review consistent with the Terms of Reference associated with the bid would meet the standards being set for RFMOs to undergo independent and rigorous reviews of their operations, outputs, and outcomes. Hence although a fully independent review of the management system has not been completed, processes consistent with industry standards are underway. [NB: It is important to remember that the first MSC assessment of this fishery also conducted a thorough review of the management system; a review that was thoroughly scrutinized by peer review, stakeholders and the objections process that took place.]

6 STANDARD USED

The MSC Principles and Criteria for Sustainable Fisheries form the standard against which the fishery is assessed and are organised in terms of three principles. Principle 1 addresses the need to maintain the target stock at a sustainable level; Principle 2 addresses the need to maintain the ecosystem in which the target stock exists, and Principle 3 addresses the need for an effective fishery management system to fulfil Principles 1 and 2 and ensure compliance with national and international regulations. The Principles and their supporting Criteria are presented below.

Principle 1

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.¹

Intent:

The intent of this principle is to ensure that the productive capacities of resources are maintained at high levels and are not sacrificed in favour of short term interests. Thus, exploited populations would be maintained at high levels of abundance designed to retain their productivity, provide margins of safety for error and uncertainty, and restore and retain their capacities for yields over the long term.

Criteria:

1. The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.
2. Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.
3. Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.

Principle 2

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Intent:

The intent of this principle is to encourage the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem.

Criteria:

1. The fishery is conducted in a way that maintains natural functional relationships among species and should not lead to trophic cascades or ecosystem state changes.
2. The fishery is conducted in a manner that does not threaten biological diversity at the genetic, species or population levels and avoids or minimises mortality of, or injuries to endangered, threatened or protected species.

¹ The sequence in which the Principles and Criteria appear does not represent a ranking of their significance, but is rather intended to provide a logical guide to certifiers when assessing a fishery. The criteria by which the MSC Principles will be implemented will be reviewed and revised as appropriate in light of relevant new information, technologies and additional consultations

3. Where exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.

Principle 3

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.

Intent:

The intent of this principle is to ensure that there is an institutional and operational framework for implementing Principles 1 and 2, appropriate to the size and scale of the fishery.

A. Management System Criteria:

1. The fishery shall not be conducted under a controversial unilateral exemption to an international agreement.

The management system shall:

2. Demonstrate clear long-term objectives consistent with MSC Principles and Criteria and contain a consultative process that is transparent and involves all interested and affected parties so as to consider all relevant information, including local knowledge. The impact of fishery management decisions on all those who depend on the fishery for their livelihoods, including, but not confined to subsistence, artisanal, and fishing-dependent communities shall be addressed as part of this process.
3. Be appropriate to the cultural context, scale and intensity of the fishery – reflecting specific objectives, incorporating operational criteria, containing procedures for implementation and a process for monitoring and evaluating performance and acting on findings.
4. Observe the legal and customary rights and long term interests of people dependent on fishing for food and livelihood, in a manner consistent with ecological sustainability.
5. Incorporates an appropriate mechanism for the resolution of disputes arising within the system².
6. Provide economic and social incentives that contribute to sustainable fishing and shall not operate with subsidies that contribute to unsustainable fishing.
7. Act in a timely and adaptive fashion on the basis of the best available information using a precautionary approach particularly when dealing with scientific uncertainty.
8. Incorporate a research plan – appropriate to the scale and intensity of the fishery – that addresses the information needs of management and provides for the dissemination of research results to all interested parties in a timely fashion.

² Outstanding disputes of substantial magnitude involving a significant number of interests will normally disqualify a fishery from certification.

9. Require that assessments of the biological status of the resource and impacts of the fishery have been and are periodically conducted.
10. Specify measures and strategies that demonstrably control the degree of exploitation of the resource, including, but not limited to:
 - a) setting catch levels that will maintain the target population and ecological community's high productivity relative to its potential productivity, and account for the non-target species (or size, age, sex) captured and landed in association with, or as a consequence of, fishing for target species;
 - b) identifying appropriate fishing methods that minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas;
 - c) providing for the recovery and rebuilding of depleted fish populations to specified levels within specified time frames;
 - d) mechanisms in place to limit or close fisheries when designated catch limits are reached;
 - e) establishing no-take zones where appropriate.
11. Contains appropriate procedures for effective compliance, monitoring, control, surveillance and enforcement which ensure that established limits to exploitation are not exceeded and specifies corrective actions to be taken in the event that they are.

B. Operational Criteria

Fishing operation shall:

12. Make use of fishing gear and practices designed to avoid the capture of non-target species (and non-target size, age, and/or sex of the target species); minimise mortality of this catch where it cannot be avoided, and reduce discards of what cannot be released alive.
13. Implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning and nursery areas.
14. Not use destructive fishing practices such as fishing with poisons or explosives;
15. Minimise operational waste such as lost fishing gear, oil spills, on-board spoilage of catch etc.
16. Be conducted in compliance with the fishery management system and all legal and administrative requirements.
17. Assist and co-operate with management authorities in the collection of catch, discard, and other information of importance to effective management of the resources and the fishery.

7 BACKGROUND TO THE EVALUATION

7.1 Evaluation Team

Evaluation leader: Dr Andrew Hough: Moody Marine Limited. Dr Hough has a PhD in marine ecology from the University of Wales, Bangor and fourteen years post-doctoral experience in commercial marine and coastal environmental management projects. He is manager of Moody Marine operations within Moody International Certification with particular responsibility for the implementation of MSC Certification procedures and development of MSC methodologies. Dr. Hough has acted as lead assessor on the majority of Moody Marine MSC pre assessments and main assessments.

Fishery Auditor: Dr Jason Combes: Moody Marine Limited. Dr Combes has a PhD in marine fishery and ecology from the University of London. He has worked for Seafish Industry Authority in the UK. He was project officer for the Clyde Fishery Development Project helping to progress the Nephrops fishery towards MSC assessment. He is a fishery auditor with Moody Marine operations within Moody International Certification with particular responsibility for the implementation of the MSC Certification programme. Dr. Combes has participated as fishery auditor on MSC pre assessments, main assessments, re assessments and surveillance audits with Moody Marine.

Expert advisor: Dr Paul Medley Paul is an independent fisheries consultant, based in the UK. His expertise includes mathematical modeling of fisheries and ecological systems, techniques for multispecies stock assessment and external review of stock assessment methodologies. He has been an invited expert for a number of stock assessment working group meetings. He has a wide practical experience in marine biology, including design and implementation of surveys and fisheries experiments. This includes addressing wider environmental issues of ecological management, including maintenance of marine biodiversity. He has also taken part in several MSC assessments including the initial South Georgia Patagonian Toothfish fishery and has worked with MSC on developments of a new methodology.

Expert advisor: Dr Graham Pilling. Graham is Fisheries Biologist & Advisor with the Centre for Environment, Fisheries and Aquaculture Science, UK. His experience includes performing assessments and providing advice on demersal and pelagic fish stocks around the world, numerous reviews of the NMFS fisheries stock assessments, development of a fisheries management plan for Lake Paliastomi, Republic of Georgia, review of bycatch in the US Atlantic pelagic longline fleet for the US National Marine Fisheries Service, and implementing review recommendations, growth parameter estimation and effect of fishing on the assessment and management of snappers and emperors in the Indian Ocean, including capacity building of local institutions to improve stock assessment techniques, assessment of squid and finfish resources on the Patagonian shelf, South Atlantic. He has also been the expert advisor on principle 2 issues for MSC evaluations of a number of demersal and pelagic fisheries.

Expert advisor: Dr Jake Rice. Jake is based at the Canadian Stock Assessment Secretariat, Department of Fisheries and Oceans, Canada, where he is responsible for coordinating all national and regional processes for peer review and provision of scientific advice on fisheries and marine science issues. The job includes integrating traditional knowledge with scientific results (and fishers with scientists at peer review meetings), thereby ensuring all review processes are open and transparent to all clients, while maintaining highest standards for objectivity and scientific quality. He is responsible for organising and chairing review meetings and workshops on trans-regional topics, chairing many national working groups, and serving as Headquarters liaison for many Regional science review and advisory groups. Jake also represents Canada at many international fisheries science bodies. He retains some research activities of international stature, particularly in the areas of ecosystem management and the effects of fishing on marine ecosystems. He has also taken part in the MSC assessment of the South Georgia Patagonian Toothfish fishery and Alaskan Pollock surveillance

audits and was part of the MSC Objections Panel for the New Zealand Hoki fishery.

7.2 Previous certification evaluations

The fishery has been previously assessed against the MSC standard receiving its first certificate in March 2004.

7.3 Inspections of the Fishery

Inspection of the fishery focused on the practicalities of fishing operations, the mechanisms and effectiveness of management agencies and the operation of the fleet. The landing and subsequent handling of fish was also investigated to determine the suitability of fish landed to enter into a subsequent chain of custody.

J Combes conducted a site visit to the Falkland Islands and South Georgia 17 Apr - 10 May 08. The GSGSSI Government and CCAMLLR procedures and processes were audited/witnessed as appropriate including. GSGSSI in Stanley,

- MFV licensing for the 2008 campaign from initial applications, initial sift, guidance from UK Foreign Office, checking applicants against the criteria set by the UK Foreign Office, justification to the Commissioner, right through to MFV being issued licence at KEP SG
- Catch reporting and recording
- Pre licensing inspection of MFV; Argos Helena, MFV Viking Bay
- At sea boarding during fishing operations; MFV Tronio
- Observer reporting and reports
- GSGSSI response to issues within the fishery
- TAC and quota monitoring
- Catch verification at Port Stanley

The transit to and from Stanley to KEP was an active fishery patrol

Meetings were held as follows. The key issues discussed have been identified for each meeting.

Name	Affiliation	Date	Key Issues
Harriet Hall –Director of Fisheries Richard McKee – Executive Officer Emma Jones – Government Officer	GSGSSI	Various 17 Apr – 10 May 08	Fishery licensing, management, monitoring. Catch verification
Roy Summers – FI, GSGSSI & CCAMLLR Fishery Officer	GSGSSI	25 Apr – 7 May 08	Fishery Officer duties, procedures and reports
Rebecca Mitchell John Pearce Mark Belchier	MRAG BAS	7-11 July	Fishery science and management

STAKEHOLDER CONSULTATION

7.4 Stakeholder Consultation

An eventual total of 43 stakeholders were identified and consulted specifically by Moody Marine. Information was also made publicly available at the following stages of the assessment:

Stakeholder Consultations Held

Date	Purpose	Media
21 Nov 07	Notification of confirmation of assessment	Direct E-mail/letter Notification on MSC website Advertisement in press
21 Jan 08	Notification of Assessment Team nominees	Direct E-mail Notification on MSC website
04 Feb 08	Confirmation of Assessment Team	Direct E-mail Notification on MSC website
07 Mar 08	Consultation on draft Performance Indicators and Scoring Guideposts	Direct E-mail Notification on MSC website
26 Jun 08	Release of final Performance Indicators and Scoring Guideposts	Direct E-mail Notification on MSC website
5 Jun 08	Notification of assessment visit and call for meeting requests	Direct E-mail Notification on MSC website
7-11 Jul 08	Assessment visit	Meetings
23 Apr 09	Notification of Proposed Peer Reviewers	Direct E-mail Notification on MSC website
18 Jun 09	Notification of Draft Report	Direct E-mail Notification on MSC website
17 Aug 2009	Notification of Final Report	Direct E-mail Notification on MSC website

7.5 Stakeholder Issues

Feedback from stakeholders has not resulted in the identification of issues requiring specific investigation.

8 OBSERVATIONS AND SCORING

8.1 Introduction to scoring methodology

The MSC Principles and Criteria set out the requirements of certified fishery. The certification methodology adopted by the MSC involves the interpretation of these Principles and Criteria into specific Performance Indicators against which the performance of fishery can be measured according to pre-specified guideposts.

The Performance Indicators developed by the Moody Marine assessment team have been identified on the MSC website (Performance Indicators and Scoring Guideposts). In order to make the assessment process as clear and transparent as possible, these guideposts identify the level of performance necessary to achieve 100, 80 (a pass score), and 60 scores for each Performance Indicator.

These generic Performance Indicators and Scoring Guideposts have been the subject of stakeholder consultation and have been confirmed or modified following this process based on the judgement of the assessment team. Prior to scoring, the Indicators are also 'weighted' in relative importance according to the nature of the fishery undergoing certification.

At the top level, no weightings are assigned in terms of each MSC Principle; a fishery must 'pass' each of Principles 1, 2 and 3 in order to achieve certification and these are of equal importance.

Within each Principle, and related to each MSC Criterion, Sub-criteria and Performance Indicators are grouped in a hierarchy. Each level represents separate areas of important information (e.g. Indicator 1.1 requires a sufficient level of information on the target species and stock, 1.2 requires information on the effects of the fishery on the stock and so on).

At the level of the Performance Indicators, the performance of the fishery is assessed as a 'score'. In order for the fishery to achieve certification, an overall weighted average score of 80 is necessary for each of the three Principles and no Indicator should score less than 60. Accordingly, 100 represents a theoretically ideal level of performance and 60 a measurable shortfall. As it is not considered possible to allocate precise scores, a scoring interval of five is used in evaluations. As this represents a relatively crude level of scoring, weighted average scores are rounded to the nearest whole number.

Weights and scores for the Fishery are presented in the scoring table. Weights for criteria, sub-criteria and Performance Indicators add to a total of 100 at each level of the hierarchy. Scores are allocated relative to the Scoring Guideposts.

8.2 Evaluation results

Observations are presented in the scoring table, together with any weighting applied to the Fishery and the scores allocated.

9 LIMIT OF IDENTIFICATION OF LANDINGS

Traceability of product from the sea to the consumer is vital to ensure that the MSC standard is maintained. There are several aspects to traceability that the MSC require to be evaluated: Traceability within the fishery; at-sea processing; at the point of landing; and subsequently the eligibility of product to enter the chain of custody. These requirements are assessed here.

9.1 Traceability within the fishery

The whole of the South Georgia Patagonian Toothfish longline fishery is MSC certified and GSGSSI issue fishing licences on an annual basis to allow fishing for that annual campaign. The scope of the fishery certification covers from capture of Patagonian toothfish *Dissostichus eleginoides* until it is landed as trunks and byproduct (cheeks and collars) at the registered port, Port Stanley, Falklands Islands, where verification, recording and reporting of landings takes place.

GSGSSI operate a group chain of custody (CoC) to allow MSC certified Toothfish to be landed. The concessionaries to the fishery licences are allowed to join the group CoC on an annual basis. The scope of the group chain of custody covers from capture of Patagonian toothfish *Dissostichus eleginoides* until it is landed as trunks and byproduct (cheeks and collars) at the registered port, Port Stanley, Falklands Islands, where verification, recording and reporting of landings takes place. To be eligible to carry the MSC logo, these fish must then (at reloading at Port Stanley) enter into separate Chain of Custody certification.

All boxes and bags of fish are double labelled with a unique code amongst other details. Key information on the label is transmitted from the fishing vessel to a secure database held by a subcontractor of GSGSSI. This provides a high degree of traceability even to the level of the individual item, until such time as the label and the bag/box remains intact.

9.2 At-sea processing

Processing at sea consists of the removal and discard of the guts and head from the fish. Then a cut is made to produce trunks and byproduct (cheeks and collars). All retained product is either bagged or boxed, labelled and frozen.

9.3 Points of landing

Landings are only permitted at the registered port, Port Stanley, Falklands Islands, where verification, recording and reporting of landings takes place. Transhipping is not permitted.

9.4 Eligibility to enter chains of custody

Certified South Georgia Patagonian Toothfish (presented as trunks cheeks and collars) can only be sourced from a fishing vessel that belongs to GSGSSI group chain of custody (CoC) and after the catch has been verified at Port Stanley. In the 2009/10 campaign the following MFVs belong to the GSGSSI group CoC and are permitted to make landings of MSC certified fish.

Company	Vessel name
Argos Georgia Ltd	Argos Georgia, Argos Helena, Argos Froyanes
Tofisco Ltd	Koryo Maru 11
Sanford Ltd	San Aspiring
Beauchene Fishing Co	Viking Bay
Antarctic Sea Fisheries	Antarctic Bay
Quark Fishing Ltd	Jacqueline
Georgia Seafoods Ltd	Tronio

To remain MSC certified these fish must then (at reloading at Port Stanley onto onward transport) enter into separate Chain of Custody certification.

The fish landed by those fishing vessels that do not belong to the GSGSSI group CoC cannot be sold as MSC certified.

9.5 Target Eligibility date

As this report relates to a re certification there will be a continuity of supply as one certificate expires and the new certificate commences.

10 CERTIFICATION RECOMMENDATION

10.1 Certification recommendation

The Performance of the Fishery in relation to MSC Principles 1, 2 and 3 is summarised below:

MSC Principle	Fishery Performance
Principle 1: Sustainability of Exploited Stock	Overall : 93 PASS
Principle 2: Maintenance of Ecosystem	Overall : 91 PASS
Principle 3: Effective Management System	Overall : 96 PASS

The fishery attained a score of 80 or more against each of the MSC Principles and did not score less than 60 against any Indicators. It is therefore recommended that the South Georgia Patagonian Toothfish Longline Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries.

10.2 Scope of Certification

This assessment relates only to the fishery defined in Section 1.1 up to the point of landing as defined in Section 10.

Monitoring and control of fishing locations and methods is considered sufficient to ensure fish and fish products, invoiced as such by the fishery, originate from within the evaluated fishery.

10.3 Conditions or Recommendations Associated with Certification

10.3.1 Conditions

The fishery scored 80 or more against the Performance Indicators and as a consequence no Conditions are required. A client action plan, how the client plans to address the conditions raised, is therefore not necessary. None the less GSGSSI asked for the opportunity to pledge a continued commitment to the fishery and this is available in Appendix C.

11 APPENDICES

11.1 Appendix A: Scoring Table

Principle 1		A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.		33.3	93
1.1 (MSC Criterion 1)		The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.		85.7	92
1.1.1		There should be sufficient information on the target species and stock separation to allow the effects of the fishery on the stock to be evaluated.		17.1	-
1.1.1.1	Is the species readily identified as adults and juveniles?			14.3	100
60	Misidentification is possible and increases recording errors of catches, but this does not compromise monitoring to unacceptable levels. Methods to improve identification are under development.	The species was first described taxonomically in Smitt (1898) and more recently in Dewitt, Heemstra and Gon (1990) and Kock (1992) together with its distribution. Fishers can readily differentiate <i>D. eliginoides</i> from the other toothfish species <i>D. mawsoni</i> . In any case, the distributions of the two species do not overlap within Area 48.3, the South Georgia Fishing Area. Observers have well defined ID guides for toothfish and all bycatch species that will be observed within the fishery. Observers have not reported other toothfish species in the catches. The species is readily identified by fishers and by observers and is recorded appropriately.		Smitt, 1898 Dewitt, Heemstra and Gon, 1990 Kock, 1992 http://www.fishbase.org/Summary/SpeciesSummary.php?id=467	
80	The target species is unlikely to be confused with any other species and is recorded appropriately.				
100	The species is readily identified by fishers and by regulators and is recorded appropriately.				

1.1.1.2	Is the life history of the species understood and the spawning and nursery areas described?			14.3	85
60	The basis of the life history is understood, although knowledge may be incomplete. Information is adequate to support a general population model, but some assumptions are required. There is some information on major spawning and nursery areas.	<p>Considering it is a deep water species, considerable information exists on the life history and, in particular, on the parameters needed for population models and stock assessment. Detailed information is lacking on some aspects of behaviour and ecology particularly of larvae and juveniles. Surveys collect some juveniles and good length frequency distribution information on cohorts is available from survey information.</p> <p>Size and sexual maturity well defined with good easily determined maturity stages for identification. Life history and diet have been examined through the examination of toothfish stomach contents. Natural mortality estimates have been recently updated from mark-recapture data (from the tagging ongoing tagging studies) and catch-at-age data from the examination of otoliths. Toothfish eggs are pelagic with maturity data suggesting that spawning takes place in July /August and possibly to a lesser extent in April / May. Movement of adults and maturity stages suggest breeding takes place at between 800m to 1200m depth, and spawning areas are determined by depth. Shag Rocks may be an important breeding area.</p> <p>The main sources of natural mortality are known, but quantitative information is difficult to estimate. Natural mortality includes predation by other fish, seals and toothed whales varying with age and size of toothfish. The extent of predation is taken into account in modelling.</p>	<p>Evseenko <i>et al.</i> 1995</p> <p>Collins <i>et al.</i> 2007</p> <p>Everson and Murray, 1999</p> <p>Pilling <i>et al.</i> 2000</p> <p>Pilling <i>et al.</i> 2001</p> <p>Hillary and Agnew, 2007</p> <p>Agnew 1997</p>		
80	The life history of the species is documented and generally understood. Information is adequate to support an appropriate population model. The major spawning and nursery areas are adequately well described.				
100	The life history of the species is clearly documented and understood including behaviour and ecological interactions. Spawning and nursery areas are sufficiently well documented to support spatial and temporal management measures, including possible closures, where these are deemed necessary.	The life history of the species is clearly documented and understood including the main elements of behaviour and ecological interactions (through Ecosim and other food web modelling). Spawning behaviour is known and nursery areas are sufficiently well described to support spatial and management measures such as the closure of nearshore areas.			

1.1.1.3	Is the geographical range of the target stock known and any seasonal migration described?			14.3	90
60	A management unit approximating the stock is used with some biological justification. This is based upon a sufficiently robust estimation of the geographical range of the target stock, and taking account of uncertainties.	<p>The stock is believed to be discrete and separated from stocks on the Burdwood Bank and elsewhere by ocean current circulation and deep waters. Range of the stock is fairly well delineated geographically and by depth.</p> <p>A tagging programme has been developed to determine the movement of fish between stocks along with research on the population genetics of the Southern Atlantic Ocean stocks by BAS ANGEL (Antarctic genomics laboratory). Results of these so far clearly show no significant mixing between this management unit and other populations outside the SGSSI jurisdiction.</p> <p>The major part of the geographic range of the stock, including seasonal patterns of movement/availability, is estimated and documented and is kept under review. There is high confidence, supported by surveys and tagging, that the management areas covers the majority distribution of the stock. While it is not clear that this information can be claimed to be complete, the detail of the information is relatively high given the strong relationship with bathymetry.</p>	Rogers <i>et al.</i> 2006		
80	A reliable estimate of the geographic range of the target stock is available including seasonal patterns of movement and availability. Stock assessment and management units are consistent with the majority distribution of the stock.		Ward <i>et al.</i> 2007		
100	The complete geographic range of the stock, including seasonal patterns of movement/availability, is estimated and documented and is kept under review.		Roberts and Agnew 2007		
			Payne and Agnew 2006		
			Marlow <i>et al.</i> 2003		

1.1.1.4	Is there information on fecundity and growth?			14.3	90
60	There is some appropriate information available on fecundity and growth.	Maturity ogives are derived from highly detailed large datasets obtained from the observer programme, and are updated annually by CCAMLR. Maturity ogive and biomass for each age class is used as the basis for determining the spawning stock size. Current data on fecundity considered adequate for the stock assessment being conducted. There is some fecundity at size and gonad weight data from Russian surveys.	CCAMLR Annual Fishery Reports		
80	Reliable estimates or indices are available of fecundity at size and/or weight and growth rates.		Agnew <i>et al.</i> 2005		
100	There is comprehensive and reliable information on fecundity at size, growth rates, and length and weight at age, and these are monitored over time to detect trends and shifts.		Constable and de la Mare, 1996		
		Growth studies are continuing with the tagging studies detailing growth rates and otolith analysis determining ages. As this is a long-lived species, the estimates of growth rates will continue to improve as the study builds a longer time series.	Ashford <i>et al.</i> 2002		
			Marlow, Agnew and Everson, 2003		
		There is comprehensive and reliable information on growth rates, and length and weight at age, and these are monitored over time to detect trends. Fecundity at size is less reliably estimated, but adequate for the purposes of stock assessment.	Purves <i>et al.</i> 2003		

1.1.1. 5	Is there an understanding of the relationship of recruitment to parental stock?			14.3	80
60	Indices of recruitment levels and recruiting ages, and corresponding spawning stock levels are available and used as appropriate.	Determination of the stock recruitment relationship is precluded by the high biomass of the stock (i.e. there is little contrast in stock and recruitment time series). Good estimates of recruitment are available from the stock assessment and a time series of stock size and subsequent recruitment is being generated over time. Clearly, other influences besides spawning stock size influence recruitment, and information on these is also being developed. Adequate indices of recruitment and spawning stock are estimated and used. A general relationship has been established in the sense that spawning stock size is well above the level at which recruitment is put at risk. Therefore the relationship is determined adequately for the harvest control rule.	WG-FSA 2007		
80	Adequate indices of recruitment and spawning stock are estimated and used. Sufficient years of data are available to establish a general relationship between stock and recruitment.				
100	The relationship between stock and recruitment is well understood with high statistical reliability.				

1.1.1. 6	Is information collected on the abundance/density of the stock?			14.3	80
60	Either fishery dependent or fishery independent indices are available on the abundance of the stock biomass. Qualitative information exists supporting the appropriateness of the indices as relative indicators of stock size.	Commercial CPUE data are used as the main abundance / density index for the main fishable stock. The commercial CPUE and survey data appear to be consistent with the mark-recapture data from the tagging studies.	Payne and Agnew, 2006		
80	Fishery dependent and/or fishery independent indices are available on the abundance/density of the stock. Uncertainties have been analysed and any uncertainties addressed in ways which allow trends to be determined from the indices. Indices are suitable, either independently or in conjunction with other analyses, to provide a high degree of confidence in the evaluation of stock abundance trends.	<p>Abundance and density of the stock is collected by research surveys at specific stations down to 400m deep to provide a measure of recruitment and provide an index of the adult stock to that depth. Biomass surveys have been conducted by the UK every year since 2003 and historically by other CCAMLR Parties, notably Russia and Argentina. Results are generally consistent between surveys and they are considered statistically rigorous and robust. However, due to difficulties in interpreting these data in relation to the exploitable biomass, they are not currently used in the stock assessment.</p> <p>Given the now mature development of the assessment model where year-class strength is now estimated (historically given the new catch-at-age information), the survey data are to be re-introduced into the stock assessment as relative recruitment density information for estimating the most recent year-class strengths, given the catch data lag behind by around 3-5 years in this regard (see also 1.1.5.2.)</p>	<p>Roberts and Agnew, 2007</p> <p>WG-FSA 2007</p> <p>Yau <i>et al.</i> 2001</p>		

100	Multiple fishery dependent and fishery independent indices are available on the abundance/density of the stock with sufficient time series to allow trends in abundance to be quantified. Where fishery independent surveys are used (for juveniles and/or adults) the design of the survey(s) is statistically rigorous and robust, indices are consistent and there is clear evidence that they are proportional to the stock size. Uncertainties have been fully accounted for.	Fishery dependent (CPUE) and fishery independent indices are available for monitoring the abundance of the stock. Uncertainties have been analysed and addressed and trends can be determined from the indices. Indices are suitable to provide a high degree of confidence in the evaluation of stock abundance trends. The score would be higher if the fishery independent survey indices were appropriate to be used directly in the stock assessment. It is accepted that the survey data are to be re-introduced into the stock assessment as relative recruitment density information for estimating the most recent year-class strengths.			
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1.1.1. 7	Is information available on environmental influences on the stock dynamics?			14.3	85
60	Some relevant studies have been undertaken on the effects of biological and physical factors which could affect the stock (including natural mortality). Research is encouraged and ongoing.	Because this species is relatively long-lived and slow growing, knowledge of factors affecting natural mortality is difficult to determine. There is, however, knowledge of biological (prey and predators) and physical factors (temperature and seabed/oceanographic factors) affecting distribution (notably of larvae), survival and year class strength (through recruitment indices and age composition). Factors causing natural mortality are determined and included in ecosystem modelling. This information is used to inform the stock assessment process, particularly with respect to recruitment information. There is therefore knowledge of biological and physical factors affecting distribution, survival and year class strength. Much of the information is sufficiently robust for use in the stock assessment process and in the interpretation of results of assessment models. The knowledge is not yet comprehensive, but increasing and key information is sufficiently robust for the stock assessment.	WG-FSA 2007 Belchier and Collins 2008		
80	There is knowledge of biological and physical factors affecting distribution, survival and year class strength (including natural mortality). Some information is sufficiently robust for use in the stock assessment process.				
100	There is comprehensive knowledge of biological and physical factors affecting distribution, survival and year class strength (including natural mortality). Key information is sufficiently robust for use in the stock assessment process, either in the assessment models or formally in the interpretation of results of assessment models.				

1.1.2	There should be sufficient information on the fishery to allow its effects on the target stock to be evaluated			17.1	-
1.1.2.1	Are all major sources of mortality recorded/ estimated for the fishery under assessment, including landings, discards, incidental mortality and any mortality of juveniles?			33.0	95
60	Sufficient information is available on the fishery to allow accurate estimates to be made of landings, broken down as required for an evaluation to be made. Estimates of discards and incidental mortality are available.	All CCAMLR catches in area 48.3 (landings and discards) are accurately recorded on CCAMLR forms, checked by observers, and included in the TAC. Conversion factors are provided by observers. Landings data are verified by GSGSSI inspectors on the dockside in Stanley, Falkland Islands, which is the only port where the licensed vessels are currently allowed to land their catches.	WG-FSA 2007 CCAMLR Observer Reports GSGSSI Landings Inspections.		
80	Landings are accurately recorded. Discards and incidental mortality are well estimated for the fishery.	There are no other fisheries that would catch toothfish as an incidental bycatch operating in the SGMZ or area 48.3. Current tag data and the catch at age data from otoliths collected from observers have been used to generate estimates of natural and fishing mortality for toothfish (Hillary and Agnew, 2007). All data are held by CCAMLR.			
100	Landings, discards and incidental mortality are accurately recorded and monitored consistently.	Landings and discards are accurately recorded and monitored consistently. Reliable estimates are made of incidental mortality (whale depredation).			

1.1.2.2	Are fleet descriptions, fishing methods and gear types known throughout the fishery under assessment?				16.7	100
60	Significant fishing methods and gear types are known for the fishery with some information on geographical areas of use. Appropriate information is available on the size and composition of the fleets, and is updated periodically.	Fleet descriptions and the gear types used are well known and publicly available from CCAMLR. The fleet is international, comprised only of CCAMLR Members (Chile, UK, Spain, South Africa, Korea, New Zealand etc.) The only fishing methods allowed are long-line (Spanish type and Mustad autoline) and a pot fishery (not included in this assessment). The “Spanish” type where the main line taking the snoods and hooks is suspended from a heavy hauling line. The autoline system uses a single line. Lines are set usually with 8000-10000 hooks, at depths of between 500 m and 2500 m on the shelf slope. Trawls are prohibited because they target shallow areas holding young immature toothfish, and bycatch other regulated All fishing methods are well known and understood and each vessel’s operations are recorded in detail in the CCAMLR haul by haul logbooks and verified by independent fishery observers. A series of different gear modifications are being tested to reduce bycatch and cetacean depredation. These are being conducted to enable full recording and analysis of the different gear configurations used. The new system is being trialled this year: the ‘cachalotera’ or trot-line system. This system is designed to reduce the losses to marine mammals from the fishery. All fishing methods and gear types employed in the fishery are known. <i>In-situ</i> observations are made by observers of fishing practices. Comprehensive knowledge is recorded and regularly updated, on the size and composition of the fleets during each season.	WG-FSA 2007 http://www.ccamlr.org/pu/e/sc/fish-monit/vess-licensed.htm Mitchell <i>et al.</i> 2007 Mitchell and Agnew 2007 Agnew and Mitchell, 2007			
80	Significant fishing methods and gear types are known and appropriate information is available on the geographical areas of use. Appropriate recorded information is available on the size and composition of the fleets. This is reviewed and updated at appropriate intervals.					
100	All fishing methods and gear types employed in the fishery are known. <i>In-situ</i> observations are made of fishing practices. Comprehensive knowledge is recorded and regularly updated, on the size and composition of the fleets.					

1.1.2.3	Is gear selectivity known for the fishery?			16.7	90
60	Appropriate information is available on selectivity and qualitative changes in selectivity.	<p>The main variant in gear selectivity is between the two long line types (Spanish type and Mustad autoline), the other main variant being hook size which is constant for each vessel. Another cause of changes in size composition is depth, due to the population distribution where different ages and sizes of fish are found at different depths.</p> <p>The selectivity of the new ‘cachalotera’ system will be investigated at the end of the current 2007 / 2008 season.</p> <p>The full size and sex composition of the toothfish catch (and other bycatch species) is recorded and checked by fisheries observers and is used in the stock assessments. These data can be linked to location and depth.</p> <p>Selectivities have been accurately estimated for all gears, locations and times of fishing over time, principally from biological sampling by observers. The score is lower than the maximum however, because selectivity information does not appear to be used in the analytical modelling and therefore is not separated from aspects of population structure and distribution.</p>	CCAMLR Observer Reports and Database		
80	Selectivities of gear types and fishing methods are well estimated by size, age and/or sex as appropriate. Information is sufficient to determine any changes in selectivity over time, if any.		WG-FSA 2007		
100	Full selectivities have been accurately estimated for all gears, locations and times of fishing over time.		Mitchell and Agnew, 2007		

1.1.2.4	Is the target species taken in other fisheries in the area that are not subject to this certification, and are such catches recorded or estimated?			33.3	100
60	There is an appropriate level of information relating to other fisheries in the area that are not subject to this certification, although these are not fully identified. The catches are estimated in the stock assessments. Levels of IUU fishing are estimated, but with some uncertainty.	<p>The only other legal fishery is an experimental pot fishery consisting of two vessels. This is also managed within CCAMLR regulations. The pot fishery is subject to the same controls as the longline fishery so catches are accurately reported and monitored.</p> <p>In addition, the target stock is also subject to a 10t research allocation in management area A of Subarea 48.3. This is outside the SGMZ but within CCAMLR. This research allocation allows the monitoring of tag release and recapture from within this otherwise closed area.</p> <p>IUU fishing is now subject to estimation through an analytical model. Levels of IUU fishing are currently reliably estimated to be negligible. The estimate of IUU catches (currently zero) is used in the assessment, as are estimates of all historical IUU catches. The pattern of IUU fishing in global toothfish fisheries is well understood, and has been statistically assessed for 48.3. IUU fishing however does not now represent a very large proportion of the total catch in area 48.3. (0.09% over the last 6 years). IUU estimates are based on the reasonable assumption that the same methods and gear types are used.</p>	<p>SC-CCAMLR-XXVI, 2007</p> <p>Agnew <i>et al.</i> 2000</p> <p>Agnew, 2000</p> <p>Agnew and Kirkwood, 2002</p>		
80	The main fisheries not subject to certification are identified. Significant catches of the target species (including IUU fishing) are either recorded or reliably estimated.	<p>IUU fishing is now subject to estimation through an analytical model. Levels of IUU fishing are currently reliably estimated to be negligible. The estimate of IUU catches (currently zero) is used in the assessment, as are estimates of all historical IUU catches. The pattern of IUU fishing in global toothfish fisheries is well understood, and has been statistically assessed for 48.3. IUU fishing however does not now represent a very large proportion of the total catch in area 48.3. (0.09% over the last 6 years). IUU estimates are based on the reasonable assumption that the same methods and gear types are used.</p>	<p>Agnew and Kirkwood, 2005</p>		
100	All fisheries (and other significant sources of human-induced mortality) in the area that are not subject to this certification are identified and monitored. All the catches are recorded and used in the stock assessment. Levels of IUU fishing are reliably estimated to be negligible.	<p>There are no other human-induced sources of mortality.</p> <p>All fisheries (and other significant sources of human-induced mortality) in the area that are not subject to this certification are therefore identified and monitored. All the catches are recorded and used in the stock assessment. Levels of IUU fishing are reliably estimated to be negligible.</p>			

1.1.3	Appropriate reference levels have been developed for the stock			14.7	-
1.1.3.1	Are there appropriate limit and target reference points based on stock biomass and/or fishing mortality?			100	85
60	Appropriate limit and target reference points have been set based on justifiable and reasonable practice appropriate to the species.	<p>The reference points are based on a precautionary approach and are designed to meet objectives of Article II of the Convention. The biological basis for the level of risk aversion and depletion level are not tightly tied to the biology of this species, but are conservative compared to the standard practice in fisheries and therefore account for any lack of knowledge of the population dynamics. The reference points are used in the context of the decision rule which simulates the population in a projection. The parameters of the population model are entirely justified based on biology.</p> <p>Appropriate limit and target biomass reference points are used, which are justified based on biology and are internally consistent given data and assessment limitations. Reference points are sufficiently precautionary to account fully for uncertainties. Robustness of reference points has been tested previously, but not tested based on recent advances in knowledge of the fishery.</p>	<p>Constable and de la Mare, 1996</p> <p>Constable <i>et al.</i> 2000</p>		
80	Appropriate limit and target reference points are justified based on stock biology (e.g. a stock-recruitment relationship) and are internally consistent given data and assessment limitations. Reference points may be probability based, but account fully for known uncertainties in data and assessment models.				
100	Limit and target reference points are justified based on stock biology, uncertainty, variability, data limitations and statistical simulations of these factors.				

1.1.4		There is a well-defined and effective harvest strategy to manage the target stock.		17.7	-
1.1.4.1	Is there a mechanism in place to contain harvest as required?			33.3	95
60	Mechanisms are in place to monitor and (if necessary) reduce harvest, but do not fully contain harvest, or have not been tested. Measures provide a reasonable degree of confidence in stock management.	The TAC is set annually at or below the recommendation from the decision rule. The TAC is allocated as a quota to licensed vessels and administrated through 5-day reporting. The fishery can be closed when the TAC forecast to have been met. Also, GSGSSI can close the fishery independently of CCAMLR if this is considered necessary.	WG-FSA-07 Constable and de la Mare, 1996 Constable <i>et al.</i> 2000 MRAG 2000		
80	Appropriate mechanisms are utilised to contain harvest as and when required to maintain, or allow the target stock to return to, productive levels. These have been tested if/as appropriate for robustness against uncertainties in the assessment and management process	The TAC is set before each season and can be increased and lowered as required. : The TAC is set before each season by CCAMLR and is revised higher or lower depending on scientific advice of WG FSA and Scientific Committee. The quota is allocated on an annual basis to vessels which apply for a licence, giving an opportunity to exclude vessels which do not comply with various controls and regulations.			
100	Mechanisms are in place to contain harvest as and when required to maintain (or allow the target stock to return to) productive levels. Measures are robust to uncertainty in data inputs or stock biology. Specific measures to demonstrate effectiveness are in place and their robustness has been examined against a wide range of uncertainties	Therefore, mechanisms are in place to contain harvest through licensing and TACs and maintain the stock at productive levels. The various measures have been shown to be robust against a wide range of uncertainties. The control rule has been shown to be very effective in regulating catch relative to stock status. The relatively small impact of whale depredation has not, however, been taken into account.			

1.1.4.2	Are clear, tested decision rules set out?				33.3	100
60	It can be demonstrated that decision making, though not necessarily formally documented, is recorded, logical and appropriate. Rules may not have not been tested, but appear appropriate for management.	<p>The decision rule is based on approaching a generic maximum sustainable yield point (50% of the initial spawning biomass) over a period of thirty five years. This provides the rule under which the TAC is set. The very long time frame for approaching this point means that there is plenty of time to continue data collection and evaluate the rule, and adjust it in the light of new information and research. So, while the decision rule is not tailored to this species, it is highly suitable given the current level of knowledge and short history of the fishery.</p> <p>Therefore, clear, documented and tested decision rules are fully implemented. They have been fully reconciled with reference points, have been periodically evaluated and shown to be robust to all major uncertainties.</p>	WG-FSA-07 WG-FSA-00 (4.147)			
80	Clear decision making rules exist, are fully documented, and have undergone testing - through implementation or simulation. Decision rules are reconciled with reference points and with data and assessment limitations.					
100	Clear, documented and tested decision rules are fully implemented. They have been fully reconciled with reference points, have been periodically evaluated and shown to be robust to all major uncertainties.					

1.1.4.3	Are appropriate management tools specified to implement decisions in terms of input and/or output controls?			33.3	100
60	Management tools exist within the fishery under assessment to implement decisions of input and/or output controls. Evidence shows that tools are effective enough to achieve the minimum level of control necessary to meet the main management objectives.	<p>The administration of fishing activity and TAC has clearly been effective. All vessels operating within the GSGSSI Maritime Zone are licensed by the GSGSSI. The number of licensed vessels is determined on an annual basis to control fishing. The licence system, offering licences to vessels with good behaviour and favouring those which have already operated in the fishery, improves compliance with existing regulations and allows rapid promulgation of new regulations.</p> <p>A quota is allocated to each vessel, with the overall TAC at or below the scientific advice. The number of licences allocated is commensurate with the size of the TAC. Quotas are monitored in real time using daily reports direct to GSGSSI from the vessel and 5-day reporting to CCAMLR, so there is little chance for overshooting. During the past ten years, on only two occasions of a minor overshoot of the TAC has occurred and none recently. Vessels leave once their quota is complete and the whole fishery is closed by CCAMLR on a proactive basis when the TAC is forecast to have been met.</p>	<p>WG-FSA-07</p> <p>GSGSSI records</p> <p>CCAMLR STATLANT data</p> <p>MRAG 2000</p>		
80	Management tools have been specified to implement decisions on the level of input and/or output controls. Evidence exists to show clearly that tools are appropriately effective in achieving relevant management objectives.	<p>In order to reduce and eliminate IUU, a variety of surveillance and enforcement methods are in place. IUU fishing has recently been negligible with the CCAMLR estimate set at zero for the past two seasons. There is strong evidence that control and surveillance activities have reduced IUU including the identification, arrest and conviction of the IUU vessel Elqui in 2005. The CCAMLR WG-FSA subgroup on IUU Fishing in 2007 reviewed and developed approaches for improved estimation of IUU fishing and total removals.</p>	<p>SGSSI</p> <p>Environmental Management Plan</p> <p>Observer reports</p> <p>Court reports relating to Elqui prosecution.</p>		
100	Management tools have been specified to implement decisions on the level of input and/or output controls. Tools are responsive, relevant and timely. Performance of the tools has been evaluated and evidence exists to show clearly that the tools are effective in achieving relevant management objectives.	<p>Appropriate management tools have been used to implement decisions on the level of input (licensed vessels per season) and output controls (TAC and quota). These have been responsive, relevant and timely. Performance of the tools has been evaluated and evidence exists to show clearly that the tools are effective in achieving relevant management objectives for individual vessels and the fishery as a whole.</p>			

1.1.5		There is a robust assessment of stocks.		17.7	-
1.1.5.1	Are assessment models used and are they appropriate to the biology of the target species and the type of fishery?			20.0	90
60	Robust assessment models are used. These are generic and do not account for specific characteristics of either the biology of the species or the nature of the fishery.	<p>The latest assessment was reviewed by the WG-FSA in 2007. The assessment used to determine the state of the stock was the same as that used in 2006, but with the dataset updated. The data used are the catch-weighted length-frequencies, the standardised GLMM CPUE series and the tag release (2000–2006) and recapture (2004–2007) data.</p>	WG-FSA-06 WG-FSA-07 Constable <i>et al.</i> 2000		
80	Adequate assessment models are used. These are appropriate for the species biology, nature of the fishery and the available data.	<p>Assessments are discussed and analysed within a recognised forum with the leading fisheries scientists working with these species around the world. Various assessment models have been used at South Georgia to assess the toothfish stock from a Generalised Yield Mode (GYM) through analysis of localised depletions, to the current age structured CASAL assessment model which was first used to assess the toothfish stock in 48.3 in 2006. The CCAMLR WG-FSA in 2007 agreed on a single CASAL assessment model, which was structurally similar to that presented at WG-FSA-6 as the basis for the latest assessment. A new proposed assessment model was presented in WG-FSA-07/29, utilising catch-at-age data, new tagging parameters and estimating year-class strength. The Working Group recommended that the new model be reviewed at the next WG-SAM meeting.</p>	Agnew <i>et al.</i> 2007 Agnew and Pearce, 2004		
100	Adequate assessment models are used and capture all major features appropriate to the biology of the species and the nature of the fishery and the nature of the management questions being asked, and the available data.	<p>Adequate assessment models are used (and have been subject to review) and capture most major features appropriate to the biology of the species, the nature of the fishery, the nature of the management questions being asked, and the available data. However, not all key population attributes, such as the sexual dimorphism, are yet modelled. There is evidence that these issues are being dealt with through continued data collection, research and review.</p>	Agnew <i>et al.</i> 2004		

1.1.5. 2	Does the assessment take into account major uncertainties in data and have assumptions been evaluated?			20.0	85
60	Major uncertainties are identified. Some attempt has been made to evaluate these in the assessment.	Uncertainties are taken into account through Monte Carlo simulation of recruitment and demographic parameters, and are fully reflected in yield estimates. The current model does not take into account uncertainties in some aspects of population structure (e.g. age structure, sex structure) nor losses of catch to whales. The model is constantly updated based on latest data and scientific information to reduce uncertainties. Some uncertainties with the current CASAL assessment remain, as demonstrated, for example, by the fits to the tag-return data. A significant revision of the model is under development which will allow direct estimation of present and future recruiting cohort strength which is not possible with the current model, and other uncertainties will be reduced as more data are collected on tag releases and returns. The assessment takes into account major uncertainties in the data and functional relationships. The most important assumptions have been evaluated and the consequences are known. The assessment model has been shown to meet sufficient levels of precision and accuracy to allow the management process to achieve its objectives.	WG-FSA-06 WG-FSA-07		
80	The assessment takes into account major uncertainties in the data and functional relationships. The most important assumptions have been evaluated and the consequences are known.		Constable and de la Mare 1996 Constable <i>et al.</i> 2000 Agnew <i>et al.</i> 2007		
100	The assessment addresses all significant uncertainties in the data and functional relationships and evaluates the assumptions in terms of scope, direction and bias relative to management-related quantities. The assessment model has been shown to meet sufficient levels of precision and accuracy to allow the management process to achieve its objectives.				

1.1.5.3	Are uncertainties and assumptions explored and reflected in management advice?			20.0	80
60	Major uncertainties are recognised and are reported in management advice, as well as possible implications of those uncertainties on the management advice.	<p>The TAC reflects CCAMLR precautionary policy, and involves risk-averse choices derived from the quantified uncertainty in future stock trajectory. More specific uncertainties could be taken into account in future as more information on climate change, ecosystem effects and other factors become better understood.</p> <p>An exception is that decision rules do not explicitly take into account potential future IUU fishing in excess of advised TACs, which increases the risk of overfishing even if the licensed fishery is within the estimated yield. However, the seriousness of this depends on the magnitude of future IUU fishing within area 48.3. If the current enforcement operations continue to suppress IUU activities, the significance of IUU fishing as an uncertainty will decline as confidence in the enforcement regime increases. Accurate estimates provide high confidence on the current negligible incidence of IUU activity.</p>	<p>WG-FSA-06</p> <p>WG-FSA-07</p> <p>Constable <i>et al.</i> 2000</p>		
80	Major uncertainties and assumptions are described and addressed in the management advice and through the appropriate decision rules to address those limitations.				
100	All significant uncertainties and assumptions are addressed and reflected in the management advice, including appropriate decision rules.	<p>The major uncertainties and assumptions are therefore described and addressed in the management advice (including IUU, currently estimated to be zero) and through the appropriate decision rules to address those limitations.</p>			

1.1.5. 4	Does the assessment evaluate current stock status relative to reference points and make forecasts for the future?			20.0	90
60	The stock status is estimated relative to reference points, with an appropriate level of understanding of stock trends.	<p>Past harvests and future constant harvests are included in the assessment and projections. The decision rules include the consequences of the TAC set by the management authority explicitly taking account of target and limit reference points. Forecasts are part of the decision rule rather than probabilistic predictions of the future, and do not take account of possible changes or trends in the fishery and environment.</p> <p>The assessment makes a reliable probabilistic evaluation of the stock status relative to the reference points and projects these into the future over suitable timescales and under assumptions of future management actions, although this is only on the basis of constant harvest and assuming circumstances do not change.</p>	<p>WG-FSA-06</p> <p>WG-FSA-07</p> <p>Agnew, Hillary and Pearce, 2007</p>		
80	The assessment makes an evaluation of the stock status relative to the reference points. Adequate short and medium term forecasts are made.				
100	The assessment makes a reliable probabilistic evaluation of the stock status relative to the reference points and projects these into the future over appropriate timescales and under appropriate assumptions about future management actions.				

1.1.5. 5	Does the assessment include the consequences of current harvest strategies?	20.0	85
60	The assessment gives a credible indication of the consequences of current harvest strategies.	Information now approaches a point where more projections are possible, not just assumptions of constant harvest. The current projections test a constant harvest strategy, when the real harvest can and does change from year to year. As long as the harvest level does not change much, this is a minor problem, and the decision rule is sufficiently precautionary to avoid this becoming a problem. Full testing of the current harvest strategy using management strategy evaluations is an area of work which could improve the score in future. This would allow management to test its strategy's robustness to various which may arise, including increased IUU fishing and climate change, for example.	WG-FSA-06 WG-FSA-07 Agnew, Hillary and Pearce, 2007
80	The assessment includes a robust approximation of the consequences of current harvest strategies. Uncertainties in the model are considered in harvest strategy evaluations.		
100	The assessment includes the consequences of current harvest strategies, forecasts future consequences of these and evaluates stock trajectories under harvest control rules.		
		GSGSSI is committed to funding a two year programme to validate the current assessment methods, investigate new methods and investigate the effects of new decision rules for this fishery. The assessment, increasingly robust and less generic in recent years, includes the consequences of current harvest strategies, forecasts future consequences of these and evaluates stock trajectories under harvest control rules. Major uncertainties are considered within harvest strategy evaluations. However, a full management strategy evaluation has not been conducted for this stock, which would provide a more complete probabilistic forecast based on appropriate management actions.	

1.1.6		The stock(s) is/are at appropriate reference level(s).		15.7	-
1.1.6.1	Is there evidence that stock status is consistent with that providing long-term productivity? [Score 80+: Criterion 1.1 is complete and Criterion 1.2 does not apply. Score 79 or less: Answer Criteria 1.2 in addition]			100	100
60	The stock has a high probability of being above its limit reference point	The stock has a high probability of being consistently at or above its target reference level. The current estimate of SSB places it well above the target biomass (50% unexploited), so that the 80% credible interval excludes the target and is only approaching it slowly (over 35 years). The latest assessment was reviewed by the WG-FSA in 2007. The stock has a high probability of being consistently at or above its target reference levels	WG-FSA-07 Agnew, Hillary and Pearce, 2007		
80	The stock has a high probability of being above its limit reference point and the stock is at, or fluctuating around, its target reference point.				
100	The stock has a high probability of being consistently at or above its target reference levels.				

1.2 (MSC Criterion 2)		Where the exploited populations are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level consistent with the precautionary approach and the ability of the populations to produce long-term potential yields within a specified time frame.		n/a	n/a
1.2.1	If the stock is below the precautionary reference points, are measures to rebuild the stock specified?				
60	<p>Appropriate rebuilding measures through reduction in exploitation exist and are being implemented. Rebuilding aims to restore the stock such that it is likely to return to reference levels, including precautionary levels.</p> <p>Measures are implemented, which may be reasonably expected to work in this situation.</p>	As the exploited population is not depleted, this performance indicator is not applicable.	WG-FSA-07	n/a	n/a
80	<p>Appropriate rebuilding measures have been implemented to promote recovery within reasonable time frames. Rebuilding has explicit targets which aim to restore the stock such that it is likely to return to target levels.</p> <p>Measures have been tested, in this or a highly comparable situation, and can be shown to be effective in rebuilding the stock through either simulation analysis or actual case histories of implementation.</p>				

100	Appropriate and demonstrably effective rebuilding measures have been implemented to promote recovery within specified and appropriate timeframes. Rebuilding aims to restore the stock such that it is likely to be consistently above precautionary reference levels.				
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1.3 (MSC Criterion 3)		Fishing is conducted in a manner that does not alter the age or genetic structure or sex composition to a degree that impairs reproductive capacity.			14.3	95
1.3.1		Fishing activity maintains the age, genetic structure or sex composition of the stock to a degree that does not impair reproductive capacity.			100	-
1.3.1.1	Is the age/sex/genetic structure of the stock monitored so as to detect any impairment of reproductive capacity?				50.0	90
60	<p>There is some information available on the sub-population/sex/age structure of the stock, and the relationship of these to reproductive capacity.</p> <p>Some monitoring of age/sex and/or sub-populations is conducted and evaluated periodically.</p>	<p>Stock structure and gear selectivity are well known and monitored. Age and sex of the catch are monitored routinely and the sample size is adequate to determine changes. These data are interpreted in terms of their implications to the population structure through the stock assessment. Any shifts in the length / age frequency distributions or any sex bias effects that could potentially damage the reproductive capacity in the catch will be detected and can be acted upon. The extensive genetic and tagging studies show considerable movement between shag rocks and south Georgia (the two main areas of population density), but have not shown that the stock extends outside the SGSSI management area.</p> <p>There is comprehensive and reliable information on the age structure of the stock, and differences in relationship to depth, and the relationship of these to reproductive capacity. There are evaluations of the implications of shifts in these parameters on productivity and management quantities. Information is less clear on sex structure, but there are no obvious trends of concern. Population structure is well estimated with only insignificant errors. Appropriate genetic studies have been conducted and show no differentiation within the stock.</p>	<p>WG-FSA-07</p> <p>Agnew, Hillary and Pearce, 2007</p> <p>Rogers et al. 2006</p>			
80	<p>Estimates are available of the sex and size structure, based on adequate sampling and verification for this stock, and the relationship of these to reproductive capacity. Genetic or sub-population studies have been carried out as appropriate. Monitoring is continuing to collect such information on a time scale appropriate to the species and fishery.</p>					

100	<p>There is comprehensive and reliable information on the sub-population/sex/age structure of the stock, and the relationship of these to reproductive capacity as well as evaluations of the implications of shifts in these parameters on productivity and management quantities.</p> <p>Population structure is well estimated with only insignificant errors. Appropriate genetic studies have been conducted.</p>				
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1.3.1.2	Does information indicate any changes in structure that would alter reproductive capacity?			50.0	100
60	Changes in stock structure may have been detected but there is no evidence of negative effect on recruitment of the stock. Or potentially adverse changes in structure are identified and appropriate remedial measures are in the process of implementation over defined timeframes.	The level of monitoring means that it is highly unlikely that any changes that would threaten reproductive capacity would not be detected, and no changes in structure have been observed. This supported at least qualitatively by data not used in the stock assessment, the recruitment survey. Furthermore, the harvest strategy is such that the past level of exploitation has been low, and is increasing slowly enough that any such changes should be detected. The available information suggests that it is a single stock and as long as SSB is maintained relatively high, genetic structure should remain unaffected. Therefore, score reflects that considering the level of research and monitoring, having uncovered no special concerns, the risks have been reduced with respect to this criteria. Data strongly indicate a robust age, sex and genetic structure in the stock, such as would maintain reproductive capacity.	WG-FSA-07 Agnew, Hillary and Pearce, 2007		
80	Evidence exists that the fishery has not caused changes in stock structure that would affect recruitment. Or potentially adverse changes in structure are clearly identified and effective remedial measures are in place to address impacts over defined timeframes.				
100	Data strongly indicate a robust age, sex and genetic structure in the stock, such as would maintain reproductive capacity.				

Principle 2		Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends	33.3	91
2.1 (MSC Criterion 1)		The fishery shall be conducted at catch levels that continually maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.	71.4	88
2.1.1		There is adequate determination of ecosystem factors relevant to the geographical scale and life history strategy of the target species.	22.2	-
2.1.1.1	Are the nature, sensitivity and distribution of habitats relevant to the fishing operations known?		33.3	85
60	Appropriate information on the nature and sensitivity of main habitats exists but may not be comprehensive regarding distribution, or up to date. The seasonal distribution of fishing operations is mapped.	Examination of the nature, sensitivity and distribution of habitats now represents an area of major on-going research and activity. Key areas of sensitive habitat have been identified through swath bathymetry mapping studies performed by the James Clark Ross and Endurance research vessels. This has been supplemented by echosounder records from commercial vessels, and related to observations by observer programmes. This programme is supplemented by the activities of the Zoological Society, with combined research looking at the distribution and identification of sessile invert organisms. Bathymetric data for South Georgia at 150m resolution is now available from the BAS website.	http://www.antarctica.ac.uk/bas_research/data/access/search.php Smale et al. (2008).	
80	Nature, sensitivity and distribution of all main habitats are known in adequate detail. Information is recent. The distribution of fishing operations is monitored.	Further information is collected through the process underpinning the identification of Vulnerable Marine Ecosystems by CCAMLR, the SCAR-Marine Biodiversity Information	Wakeford et al., (2004a). Risk et al., (2002). Wakeford et	

100	<p>The nature, sensitivity and the distribution of all habitats relevant to the fishing operations are known in detail. Information is recent and adequate to assess the risk of significant impacts. The distribution of fishing operations is monitored, and an appropriate time series of information is available.</p>	<p>Network (SCAR-MarBIN), and the CCAMLR related bioregionalisation workshop of 2006.</p> <p>The process of overlaying biological information over the bathymetric map has been initiated. Data on the biological diversity of corals taken as bycatch in the fishery is available, and adequate to identify that the SGSSI area is species-rich, both with many types of corals present and particularly with many species of Primnoidae. Information from the longline fleet is relatively depth-limited, however, and uncertainty remains over the retention of samples from depth to the surface. Further studies will examine whether information on material retrieved from longlines is representative of actual bottom conditions. Examination of shallow-water information is being considered through shallow water longline sets, with the use of genetic analyses (part of a PhD study) as well as the use of camera equipment and ROVs being considered to capture images of benthos. This would contribute significantly to the knowledge available on benthic communities in the area, and offer insights into the impacts of longline fishing in general.</p> <p>The sensitivity of cold water corals is being considered based upon growth rates of similar gorgonian species from Alaska, where potentially greater diversity may be expected.</p> <p>Fishing activity is monitored through VMS and observer fishing location information at very regular intervals. Fishing in particular key areas has been banned (RIAs) as a precautionary measure, based upon the identified presence of cold water corals. The closure of these areas was based on a benefit/impact analysis of the potential consequences of closures of these areas. It estimated both the potential reduction in benthic impacts that could accrue from excluding the fishery from specific areas and the consequences with regard to catch rates of the target species and increased impact on benthos elsewhere due to the relocation of fish effort to alternative areas.</p> <p>In summary, the nature, sensitivity and distribution of all main habitats are known in adequate detail and increasing, but cannot be said to be fully detailed as yet. In this context, the fishery is relatively low impact and main areas of sensitive habitat have been identified. Information is recent. The distribution of fishing operations is monitored in detail and a time series is available, which contributes to a score higher than 80.</p>	<p>al.,(2004b).</p> <p>Wakeford et al., (2004c).</p> <p>http://www.scarmarbin.be/</p>		
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2.1.1.2	Is information available on the trophic position, status and relationships of the target species within the food web?			33.3	85
60	Key prey, predators and competitors are known.	<p>The position of toothfish within the food web around SGSSI has been studied considerably in recent years. Stomach analyses of fish caught using pots (which suffer lower stomach evacuation rates than fish caught on longlines, but also show some differences between gears) indicate that adult toothfish are opportunistic carnivores. Feeding habits depend on the local availability of food items, as well as factors such as depth and predator size. Recent work has documented aspects of juvenile diet, which has enabled models to cover an increased range of the life history of the species.</p> <p>There is less information on the role of toothfish as prey for other species in the food web. At depth, it is plausible that whales may take toothfish as prey, while on the upper slope it may feature in the diet of seals. The BAS Discovery 2010 program is using fatty acid and stable isotope analysis to investigate food web structure. These techniques integrate diet over longer time scales than direct diet sampling. Using fatty acid analysis, Brown et al. (1999) identified southern elephant seals as a potentially important toothfish predator at South Georgia. The trophic role of southern elephant seals is one of the major uncertainties identified in the food web modelling exercise, but this uncertainty is being reduced as a result of further fatty acid analysis. Studies of fatty acid content in other higher predators provide an indication of the role that fish (generically) play in the diet of killer whales and sperm whales. Further information on predator abundance, fluctuation and feeding is being gained through activities related to the CCAMLR Ecosystem Monitoring Program (CEMP). The Information collected through CEMP has two main functions in order to identify and understand the key elements of the Antarctic ecosystem: (1) Detect and record significant changes in critical components of the marine ecosystem within the Convention Area, to serve as a basis for the conservation of Antarctic marine living resources; and (2) Distinguish between changes due to harvesting of commercial species and changes due to environmental variability, both physical and biological.</p> <p>Current information suggests that toothfish does not have a key role in the ecosystem. An ecopath model for the Scotia Sea/South Georgia shelf has also been developed under the BAS Discovery 2010 programme. This includes toothfish as a functional group. The exercise has improved understanding of the structure and operation of the food web but also revealed key uncertainties which require targeted data collection. The model needs improvement, since the consumption of Patagonian toothfish (including fishery catch) currently exceeds production by about 25%. This is largely due to likely underestimates of the availability of toothfish prey and</p>	Garcia de la Rosa et al 1997		
80	Appropriate information is available on the position, relationships and importance of target species in the food web at key life stages.		Pilling et al., 2001		
100	Quantitative information is available on the position and importance of the target species and their relationships within the food web at key life stages.		Hill et al., (2007).		
			Collins et al., (2007).		
			Brown et al., (1999)		
			Croxall et al., (2002).		
			Phillips et al., (2005).		
			Murphy et al., (2007).		
			Constable (2008)		

		<p>likely overestimates of the impact of seabird predation on juvenile toothfish. An MSc student from Imperial college is currently working on extending the model beyond the shelf area, and improving its resolution for toothfish by considering dividing the toothfish population into at least two functional groups (adults and juveniles).</p> <p>There was also a joint IWC/CCAMLR workshop that aimed to include whales within ecosystem models, including that for the Scotia Sea, by sharing consumption/provisioning rates.</p> <p>Appropriate information is available on the position, relationships and importance of target species in the food web at key life stages, including quantitative modelling outputs.</p>			
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2.1.1.3	Is there information on the potential for the ecosystem to recover from fishery related impacts?	33.3	85
60	The most significant elements of the functioning of the ecosystem, relevant to the fishery, are identified and generally understood, adequately to allow a general assessment of recovery potential to be made.	Impacts of this fishery on the ecosystem include the bycatch of skates and rays and grenadiers. Skates and grenadiers are considered as part of the CCAMLR assessment and management process. The magnitude of the impact on this species by the fishery is becoming known, the impacts of mitigation measures is being considered, but the impacts on ecosystem structure and function remains uncertain. However, the relatively low catch levels for both groups in relation to the estimated or anticipated stock sizes, suggests that the impact on the ecosystem resulting from the removal of these species is likely minor. Global literature gives information on skate and ray recovery potential, while continued studies by MRAG, Imperial College and BAS underpin these judgements with improved knowledge of the biology of these species. In turn, these groups are included in the ecopath model being developed, which will allow further study of the potential impacts of fisheries and the ability of the ecosystem to sustain or recover from those impacts. The continued improvement of knowledge on the potential impacts and activities will provide a better view on any concerns over recovery. There is evidence that depleted fish stocks could be very slow to recover, based on the experience of marbled rock cod in this area and general information on recovery of high-latitude and deep-water long-lived	<p>Smale et al., (2007).</p> <p>Woehler & Croxall, (1997).</p> <p>Woehler et al.</p> <p>Latest BAS ann rep</p> <p>ICES 2001 (advice to EU on deepwater species)</p> <p>Agnew et al.,</p>
80	The main elements of the functioning of the ecosystem, relevant to the fishery, have been documented and are understood, allowing reasonable assessment of recovery potential.		

100	Detailed information is available on the potential for all major affected elements of the ecosystem to recover from fishery related impacts.	<p>species.</p> <p>A further impact is that of the use of gear on benthos, in particular cold water corals. The fishery is relatively low impact and main areas of sensitive habitat have been identified. In turn, precautionary RIAs (Reduced Impact Areas) have been put in place in these areas with the specific intention to protect benthic habitats. The ability of cold water corals to recover from impacts is not known specifically for SGSSI, but parallels have been drawn through studies of similar species in Canada, and through the impact of iceberg scouring on seabed benthos on the Antarctic peninsula (although these were shallow water and not down to the 1000m fished by commercial vessels).</p> <p>BAS collects demographic and foraging ecology data for South Georgia seabirds affected by longlining. Data are made available to CCAMLR and SCAR for analysis and modelling purposes. There is some evidence of albatross recovery once fishery mortalities have been reduced. Recent mitigation measures have proved highly successful and bird bycatch has been reported to be zero in SGSSI in the last two years. The contribution of the fishery's action to seabird recovery is therefore complete.</p> <p>The main elements of the functioning of the ecosystem, impacts of the fishery and reduction of impact (by-catches, particularly of rajids; trophic impacts; main areas of sensitive habitat) have therefore been documented and are understood, allowing reasonable assessment of recovery potential.</p>	<p>(1999)</p> <p>Murphy et al. (2007)</p>		
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2.1.2	General risk factors are adequately determined.			22.2	-
2.1.2.1	Is information available on the nature and extent of the by-catch (capture of non-target species)?			22.2	90
60	The main non-target species affected have been identified and adequate qualitative information is available on significantly impacted by-catch.	Detailed data on the nature and extent of by-catch is available through the 100% observer coverage on board licensed fishing vessels. This includes both landed and encountered (i.e. those knocked off the snood before landing). The apparent elimination of IUU fishing from SGSSI waters means that the licensed vessels represent the only bycatch impact related to the toothfish fishery.	Observer data CCAMLR records Agnew et al.,(2003).		
80	Information is available on non-target species directly affected by the fishery including their distribution and/or ecology. Quantitative information is available on significantly impacted by-catch. If obtained by sampling, this is considered sufficient to provide adequate information.	Bycatch in the longline fishery is of rays and skates, grenadiers and to a much lesser extent antimora. The catch of rays in 2006/07 was 4 tonnes, with 9,265 individuals released before capture. Catches of grenadiers has increased from 51 tonnes in 2001/02 to 131 tonnes in 2006/07. This level was still below the '5% precautionary rule' level of 177 tonnes in that year. The distribution of bycatches has been mapped, with grenadiers more common on the southern shelf, rays on the northwestern shelf. Vessels are requested to cut rays off at the waterline, and these are recorded by observers. Survival of rays is very vessel dependent, but tagging studies suggests that survivorship can be	Endicott et al.,(2000). Morley et al., (2004). CCAMLR (2007).		

100	<p>Information is available on all non-target species directly affected by the fishery including the distribution and ecology. Accurate records are kept on the nature and extent of all by-catch species including species size and, where appropriate, sex composition.</p>	<p>high, tag returns having been achieved from rays that were originally caught from considerable depth. In turn, skates with scars from previous capture have survived, while skates kept in cold water tanks post capture have shown good survivorship.</p> <p>Some issues with skate species identification have been encountered, particularly when individuals are cut off the line prior to being brought on board. However, these issues are being addressed. Observers collect information on biological characteristics (length, weight, sex etc.) from a sub-sample of individuals brought on board, particularly rays as part of the current research programme for this group. 15-20000 grenadier length frequencies have been taken, and research by BAS provided details on the biology of the key grenadier species. 2-3000 skate length frequencies have been collected through observer sampling and from scientific surveys. This data collection has provided information for skate and ray stock assessments, while data, issues and potential mitigation measures have been discussed at CCAMLR WGFSA.</p> <p>Breeding grounds of skate appear to be in waters shallower than those in which the longline fishery operates. Information on ray distribution with depth from scientific surveys is being combined with data limited to the depth range of fishing obtained by observers. Feeding ecology of skates and rays (and to a lesser extent grenadiers due to their regurgitation of food when brought up from depth) has been studied.</p> <p>Information is therefore available on non-target species directly affected by the fishery including their distribution and some elements of their ecology. Quantitative information is available on significantly impacted by-catch, either directly recorded or through observer sampling. If obtained by sampling, this is considered sufficient to provide adequate information.</p>			
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2.1.2.2	Is information available on the extent of discard and slippage (the proportion of the catch not landed)?			22.2	90
60	Appropriate information is available to estimate the extent of discarding and slippage, including an assessment of the main species represented.	There is negligible intentional discard of the target species, the hook sizes used mean almost all toothfish retained by the gear used are of the desired size range. IUU fishing has essentially been eliminated from SGSSI waters, and hence no additional component of discarding occurs.	MRAG (2007) Observer data		
80	Adequate information is available to allow estimates of discard and slippage to be calculated and interpreted.	For the licensed fishery estimates of non-target species discard is equivalent to by-catch, these not being landed. Data for bycatch discards are available from logbooks and the 100% coverage of the observer programme (see 2.1.2.1). Measurements of 'as many specimens of other non-commercial species of fish in a by-catch as possible' are required as per the CCAMLR observer programme manual. Issues of bird discard are considered elsewhere, although recent data suggests this has been essentially reduced to zero.			
100	Accurate and verifiable information is available on the extent of all discards and slippage (by age/size), and the consequences of these has been evaluated. Or the entire catch is verifiably landed.	Assessment of the implications of this bycatch and discard for rays has been performed, but no similar assessment has yet been made for grenadiers. Accurate and verifiable information is available on the extent of most discards, and the consequences of these have been evaluated, notably for toothfish and rays, less so for grenadiers.			

2.1.2.3	Is information available on other unobserved fishing mortality on target or other species?	22.2	90
60	Sources of potential unobserved mortality have been identified.	<p>Sources of unobserved mortality for the target species is limited to that through whale (Orca and to a lesser extent sperm whales and seals) depredation of toothfish off the longline. This is difficult to get reliable estimates on, as only the head remains on the hook. Cheek and collar cuts may be taken from these heads that remain. However, an analysis of this has been made by MRAG for policy advice, with the level of loss felt to be 'very small' and estimates under 4% of the TAC calculated, a one-off estimation of the issue. Fishing companies are attempting to minimise this through the use of new gear setups and by moving from the area in which depredation is being experienced and returning to haul lines at a later date.</p> <p>Unobserved mortality on bycatch species will be through the mortality of rays cut off the line prior to being brought on board. Quantitative estimates of this are available from tagging studies and rays retained in fish tanks on board after hauling. Mortality is somewhat depth dependent. These estimates have been incorporated into stock assessments.</p> <p>Mortality of rays cut from lines has been quantitatively estimated (through tagging and experimental studies). Depredation of toothfish has been estimated to some extent (at <4% of the TAC).</p>	Endicott et al., (2004).
80	Appropriate information is available to allow estimates to be made of unobserved mortality.		MRAG interview
100	Information is available to allow quantitative estimates to be made.		<p>Agnew et al., (2007).</p> <p>Observer reports UK (2007).</p> <p>Clark, J.M. (2003).</p> <p>Endicott et al. (2000)</p>

2.1.2.4	Are the effects of supply and use of bait known?	22.2	90
60	Types of bait, extent of use and sources of supply are known. Although little information is known on the amounts used, the general conservation risks of bait collection are known.	Quantities of bait used in the fishery are known based on number of hooks deployed. Two main types of bait are used: squid from south west Atlantic and horse mackerel (Spanish sardines/JAX) from Namibian coast. All are stored frozen, but thawed prior to use, so introduction of exotic species is not an issue. Both Falkland Island squid and Namibian horse mackerel stocks are reasonably well managed fisheries, both being monitored by fishery catch statistics and acoustic assessment surveys, subject to stock assessment and management protocols, including operational management procedures. Catches subsequently used for bait will be recorded and accounted for within assessments and management decisions. Both stocks fluctuate relative to environmental conditions. Implications of bait usage compared to the targeted fishery for these species means impacts likely to be negligible compared to target fisheries. There is therefore adequate knowledge of the use of bait including sources and amounts and there is sufficient information to indicate that collection of bait does not cause significant conservation problems.	Observer records of bait
80	There is adequate knowledge of the use of bait including sources and amounts and there is sufficient information to indicate whether collection of bait causes significant conservation problems.		
100	All significant impacts of the supply and use of bait are known.		

2.1.2.5	Are the potential and significance of introduced / relocated species known?			11.1	90
60	There is recognition of potential sources of introduced / relocated species.	Bait is transported frozen (usually around –20°C) and is thawed only prior to setting. All bait must be thoroughly thawed to ensure it does not float at the surface on deployment, presenting an increased opportunity for birds to take bait. This is monitored by observers. No other routes of introduced or relocated species were apparent. The fishery would not score 100 as there is no information that this issue is monitored and this monitoring subsequently recorded. However, the significance of the fishery in introducing species to the area is considered low. If the source of bait changes, e.g. to focus on species from the northern rather than southern hemisphere, increased concern would be warranted. This would be identified through the observer programme. Fishing vessels tend to remain in the southern hemisphere and hence re-location of species through bilge water discharge is not expected to be an issue. However, these movement patterns should be monitored, particularly if from the northern to southern hemisphere. Potential routes and significance of introduced/relocated species (mainly through bait supply) are therefore known and monitored.	MRAG and BAS interview		
80	Potential routes and significance of introduced/relocated species directly related to the fishery are known		Observer records of bait		
100	Potential routes and significance of introduced/relocated species directly related to the fishery are known and monitored. Records are kept.				

2.1.3		There is adequate knowledge of the effects of gear-use on the receiving ecosystem and extent and type of gear losses.		11.1	-
2.1.3.1	Is there adequate knowledge of the physical impacts on the habitat due to use of gear?			50.0	80
60	Main impacts of gear use on the habitat are identified, and there is some information on the extent, timing and location of use.	The impacts of the fishing gear on habitats are monitored through the 100% coverage observer programme. Observer reports indicate somewhat restricted fishing areas, and a preference by fishing masters/skippers for areas of hard substrate. Some entanglement in coral is reported. An assessment by MRAG suggests minimal likely importance as only static gear is used.	Observer Reports D Agnew, Unpublished study, pers. comm		
80	All impacts of gear use on the habitat are adequately identified, and there is reliable information on the extent, including extent, timing and location of use.	Through the work described under 2.1.1.1, the main sensitive habitats have been identified. Action has been taken to protect them (e.g. RIAs), but studies continue. Two-hourly VMS monitoring and 100% observer coverage ensures these areas are avoided. This information has been used to map fishing operations against the benthic habitats identified, combined with the analysis of relative catch rates by the different gear types used. An annual summary of the distribution and level of impacts observed would be useful.			
100	The physical impacts on the habitat due to use of gear have been studied and quantified, including details of any irreversible changes.	<p>Vulnerabilities of benthic habitats to static gear are generally not thought to be high. Analysis carried out (Agnew pers. comm.) estimated the overall benthic impact of longline hooks and weights combined from a typical season in which 14 vessels fished for 100 days each. This was calculated at less than 1 km², or about 0.001% of the overall area of fishable seabed. Therefore, fishing areas are known to comprise only a modest portion of the total benthic area, which supports the view that habitat impacts, to the extent they occur, are sustainable. These studies are on going.</p> <p>The nature of impacts associated with this gear type in the habitats present can be identified or inferred. There is very reliable information on the extent, timing and location of use.</p>			

2.1.3.2	Is any gear lost during fishing operations and can ‘ghost fishing’ occur?			50.0	90
60	The is a general knowledge of the rate of gear losses that takes place such that an assessment can be made of ecosystem impacts, including possible ‘ghost fishing’.	<p>All gear losses are recorded by observers and their location noted. Gear is marked by buoys with the vessel call sign marked. Longline fishing allows two attempts at recovering gear, since hauling can occur from either end of the line. Losses are therefore generally limited to sections of the line that are entangled on benthic features.</p> <p>Once bait is removed from the line (which is said to occur in a matter of hours due to feeding by amphipods) ghost fishing will not occur. Therefore the window for ghost fishing is short.</p>	<p>Roberts (2000)</p> <p>SC-CAMLR 2000</p> <p>Agnew pers comm.</p>		
80	There is reliable information on the type, quantity and location of gear lost during fishing operations. Estimates have been made on the extent of adverse effects, including ‘ghost fishing’.	<p>A further issue considered to be ‘ghost fishing’ is the swallowing of hooks in discarded offal by birds. These hooks can also be lost in cut-away entanglements and in discarded fish heads. These can be returned to the nest of the bird and can cause injury and death to chicks feeding on that regurgitated offal. As a result of this, regulations (Conservation Measure 25-02 (2002)) have been put in place, whereby hooks are to be removed from offal before discarding. Any hooks lost in offal are reported by observers. The extent of hook loss in offal may vary considerably between vessels.</p>	<p>Observer data, reports, and workshop</p>		
100	There is detailed knowledge of the type, quantity and location of gear types lost during fishing operations. The impact of gear loss on habitat, target and non-target species has been well estimated or recorded.	<p>To combat this, macerators are now present on some vessels to remove or destroy hooks before the offal is discarded. All vessels are required to retrieve hooks and are monitored by the observers. These approaches have reduced the impact of lost gear on birds, to the extent that the fish-head issue has largely been eliminated. For example, six of the eight licensed vessels were reported as having discarded no hooks in 2004/05. It is also noted that effective actions were taken to address the problem in the one vessel which regularly discarded hooks. The continued reduction of toothfish hooks found in association with wandering albatrosses on Bird Island, South Georgia is also noted, which may, at least in part, be attributed to the efforts made within the South Georgia fishery.</p> <p>There is very detailed knowledge of the type, quantity and location of gear types lost during fishing operations. Hooks in offal are retrieved prior to disposal. The impact of gear loss on habitat, target and non-target species has been well estimated.</p>			

2.1.4		Strategies have been developed within the fisheries management system to address and restrain any significant impacts of the fishery on the ecosystem.			22.2	-
2.1.4.1	Are management strategies in place to address impact identification and avoidance/reduction?				100	95
60	Management strategies include some appropriate consideration of ecosystem impact identification and avoidance/reduction. The strategies may not be tested, but there is reason to expect them to be successful, based on experience in this or other fisheries.	<p>Overall ecosystem objectives are set by CCAMLR, and translated into operational objectives for this fishery. In addition, GSGSSI implements additional management measures as issues are identified.</p> <p>A wide range of management strategies have been put into place to address identified impacts. This includes the 100% coverage of observers on board all toothfish vessels fishing in SGSSI waters.</p> <p>The bycatch levels in the fishery are limited by precautionary TAC levels. The bycatch limit is calculated relative to the agreed toothfish TAC. The evolution of the relative levels is difficult</p>	<p>Agnew and Mitchell (2007).</p> <p>Mitchell et al. (2007).</p> <p>Agnew et al., (2007)</p> <p>Mitchell et al., (2007).</p>			

80	Management strategies are in place to detect and reduce ecosystem impacts, although these may not have been fully tested. Strategies are appropriate to adequately protect key aspects of the ecosystem within main fishing areas.	<p>to trace, but is considered to be based upon comparisons of estimated sustainable bycatch levels within areas that are likely less productive than the SGSSI area, and hence the relative levels are considered precautionary. CCAMLR-XX, para 9.41, states “For the longline fishery in Subarea 48.3, an interim precautionary by-catch limit for <i>Macrourus</i> spp. and skates and rays should be set at 5% for each by-catch species group of the catch limit of the target species, or 50 tonnes, whichever is the greater”, and this percentage has subsequently been maintained. Catch limits from 2007/08 have been carried over into the 2008/09 season through Commission agreement, based on the new assessment of <i>D. eleginoides</i> in 48.3 being carried out at 2-year intervals (subject to conditions).</p> <p>The level of skate and ray bycatch is insufficient to reach these levels (and preliminary assessments of skate and ray populations indicate that the bycatch levels are not having a detrimental impact on populations). The cut-off rule implemented by GSGSSI and monitored by observers appears to be effective.</p> <p>Bycatch levels of grenadier appear to be increasing and are reasonably close to precautionary TAC levels for this group. While the level of catch is unlikely to threaten populations of this species, based on productivity levels in other systems (see also 2.1.5.2), this is an area already identified for further study. Mitigation of grenadier bycatch is also achieved by control on the number of autoliners in the licensed fleet, which have a higher grenadier bycatch level.</p> <p>For both groups, there is a move-on rule. This is a daily catch ceiling above which vessels must stop fishing and move to different grounds. Conservation measure 41-02 states that “if the by-catch of any one species is equal to or greater than 1 tonne in any one haul or set, then the fishing vessel shall move to another location at least 5 n miles distant. The fishing vessel shall not return to any point within 5 nautical miles of the location where the by-catch exceeded 1 tonne for a period of at least five days”.</p>			
100	Management strategies are in place to monitor, detect and reduce impacts. These are appropriate to adequately protect ecosystems, habitats and populations of target and non-target species and keep impacts within determined acceptable levels. Key components of the strategies have been shown to be effective in this or similar fisheries.	<p>Identified areas of vulnerable and key habitats are now protected by benthic restricted impact areas (RIAs), which are monitored by VMS and observer coverage. This approach has proved effective in other fisheries.</p> <p>Various management strategies are in place to monitor, detect and reduce significant sources of impact. These are appropriate to adequately protect ecosystems (precautionary TAC), habitats (RIAs) and populations of target and non-target species (especially rajids, less so for</p>			

		grenadiers) and keep impacts within determined levels. These strategies have been shown to be effective in this or similar fisheries.			
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2.1.5		Assessments of impacts associated with the fishery including the significance and risk of each impact, show no unacceptable impacts on the ecosystem structure and/or function, on habitats or on the populations of associated species.		22.2	-
2.1.5.1	Does the mortality of target stocks have unacceptable impacts on ecosystem structure and function?			25.0	85
60	The mortality of target stocks could lead to impacts upon ecological systems (applying the precautionary approach where necessary), but there is no evidence that they are seriously detrimental under current fishery conditions. A program is in development to identify these and, if appropriate, reduce these to acceptable, defined limits.	Although trophodynamic effects are not fully quantified (this is underway), and the limits for the ecosystem that if exceeded will cause breakdown of ecosystem structure and function have not been identified. Toothfish are not consider to be a “keystone species” in the South Georgia ecosystem, either as an essential prey species (as juveniles) for many predators, or as a dominant predator (as adults) exerting significant top-down down control on energy flows and biomass. The management objective should not allow juvenile abundance to be depressed and should result in a standing stock of toothfish large enough to play its role as a predator in the ecosystem. In turn, toothfish removals are not considered to be high enough to affect its role. CCAMLR adopts a precautionary approach to ecosystem management, expected to preclude unacceptable impacts. There is knowledge of the amount of stock taken, and the management system adjusts annually to licensed catch, to keep the population above CCAMLR objective limits. Ecosystem modelling work carried out by the BAS Discovery programme is exploring this issue further.	SC-CAMLR 2000 SC CCAMLR reports MRAG 2007 Croxall and Wood (2002).		
80	Sufficient information is available on consequences of current levels of mortality of target species to generally evaluate major impacts, and the information suggests no unacceptable impacts of the fishery on ecological systems.				
100	The ecological consequences of current levels of mortality of target stocks has been quantified and documented to be within acceptable, pre-determined, limits.				

2.1.5. 2	Does the mortality of non-target stocks have unacceptable impacts on the populations concerned and/or ecosystem structure and function?			25.0	80
60	The mortality of non-target stocks could lead to impacts upon ecological systems but there is no evidence that the impacts are causing harm that is serious or irreversible (applying the precautionary approach where necessary). A program is in development to identify these and, if appropriate, reduce these to acceptable, defined limits.	Analysis of the impact of ray and grenadier bycatch mortality on the populations is underway. The priority given to training observers to recognize and record rajids as part of catch monitoring has increased knowledge of rate and distribution of bycatch of rajids in the toothfish fishery, and the reliability of the information on those properties. A preliminary assessment has been made of the ray population in 48.3 using a surplus production model implemented with a Bayesian framework (see WG-SAM -07/11). There are limitations on data available for model parameterization, such that in particular the productivity (r) is poorly determined. Nonetheless the results of the validation and sensitivity tests support considering the model to be adequate for an assessment of the risk that specific mortality sources, including the fishery, may be unsustainable. This assessment suggests that removals are sustainable and that the stock is well above estimated Bmsy levels. CCAMLR has set quotas for these species at what is considered a precautionary level. Research to support this is now being performed. Reported levels are below the catch limits set in each year. The impact of ray removals on ecosystem functioning is therefore considered very low.	Agnew pers comm. Constable et al., 2000 SC-CCAMLR reports and FSA-WG reports Roberts, 2000;		
80	Sufficient information is available on consequences of current levels of mortality of non-target species to suggest no unacceptable impacts of the fishery on ecological systems.	Additional information and knowledge gained during the 2008 “year of the skate” should	MRAG 2007 Agnew et al., (2007a). Endicott et al.		

100	<p>The ecological consequences of current levels of mortality of non-target stocks has been quantified and documented to be within acceptable, pre-determined, limits.</p>	<p>further improve the knowledge available to manage these impacts, monitor the impact of the SGSSI toothfish fishery on skates and rays, explore measures to further reduce bycatch mortality on the species, and increase the confidence that the impacts of the fishery on stakes and rays and on the ecosystem will remain sustainable into the future.</p> <p>Grenadier population analysis is being initiated, with the additional information required for an assessment having been identified and collected. The TAC level set for grenadiers is at 5% of toothfish TACs, and based on HIMI is expected to be precautionary. Although a formal assessment has not been performed, based on knowledge from other fisheries, $F=0.2$ should be sustainable by grenadier populations. Based on current catch levels would require a total biomass estimate of 1500t within the area. The total biomass seems highly likely to be greater than this. Therefore, concern for the biomass of this stock, and the impact of removals on the ecosystem function, is low. However, catch levels have increased from 21 tonnes in 2000/01 to 131 tonnes in 2006/07. Furthermore, it is noted that the 5% rule may not perform well when a strong toothfish year class arrives in the fishery (which means the 5% bycatch level will allow a bigger TAC). In turn, if grenadier stocks are declining the 5% limit would not be limiting.</p> <p>Effects on ecosystem structure are explored through ongoing modelling work by BAS (see 2.1.1.2). Both grenadiers and skates are part of the developing Ecopath model. Parameterisation of this component, in particular grenadiers, is difficult, given the prevalence of regurgitation in sampled individuals. However, diet information on skates is being gathered (including krill) that will place these species with more certainty within the ecosystem.</p> <p>Sufficient information is available on consequences of current levels of mortality of rajids (notably with the instigation of mitigation measures) to suggest no unacceptable impacts of the fishery, which is above Bmsy. However, the evidence for macrourids is weaker than for rajids. Mortality of macrourids is below the determined by-catch level (5%), and does not suggest an unacceptable impact at current catch levels. It is noted that additional research is underway for macrourids and this will be reviewed in future surveillance audits, particularly in relation to toothfish TACs and macrourid catches. Seabirds are considered under Criterion 2.2.</p>	<p>(2000).</p> <p>Agnew et al., (2003).</p> <p>Murphy et al. (2007)</p>		
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2.1.5.3	Does the fishery have unacceptable impacts on habitat structure?			25.0	85
60	There is no evidence that the fishery is having unacceptable impacts, further work is planned or underway if appropriate.	Information available on the potential impacts of relatively static longlines on habitat structure, and the monitoring of what is brought up on the gear, suggests that the impacts of the gear is small. The main interaction is expected to be entanglement. Further research involving benthic surveys and underwater cameras will be used to confirm this. Vulnerabilities of benthic habitats to static gear are generally not thought to be high. As noted in section 2.1.3.1, analyses estimate the overall benthic impact of longline hooks and weights combined from a typical season are less than 1 km ² , or about 0.001% of the overall area of fishable seabed. Therefore, fishing areas are known to comprise only a modest portion of the total benthic area, which supports the view that habitat impacts, to the extent they occur, are sustainable. Key habitats have been identified, and RIAs developed based on the information gathered. Information is therefore available on the effects of the fishery on habitat within major fishing areas, which has now led to the establishment of RIAs. This would prevent any unacceptable impacts.	MRAG interview AS interview D Agnew, unpublished study, pers. comm		
80	Information is available on the effects of the fishery on habitat within major fishing areas. This does not indicate any unacceptable impacts.				
100	Effects on habitat structure are well documented and are within acceptable tested/justified limits.				

2.1.5.4	Are associated biological diversity, community structure and productivity affected to unacceptable levels?				25.0	85
60	There is no evidence that the fishery is having unacceptable impacts, further work is planned or underway if appropriate.	Based on knowledge of the ecosystem around South Georgia, the impacts of fishery removals and interactions are expected to be very small. This is because krill are the overall dominant driver of the ecosystem. There are no indications of depletion in skates (from preliminary assessments) or grenadiers (from expert knowledge, although risk assessments are expected in the future). Reviews of the status of bycatch species also occur through CCAMLR. Precautionary TAC levels and RIAs have been put in place, while an Ecopath model is being developed. Further study into VMEs is being performed under CCAMLR auspices. Despite absence of a fully developed ecosystem model, no elements of the fishery would be expected to affect productivity based upon existing information and knowledge, the results of modelling performed so far, and expert expectation based upon the mode of fishing. However, levels and trends have not been compared to tested/justified limits. All species brought up on the longline are noted by observers. These data do not suggest major impacts on biodiversity in terms of those on vulnerable species. Reductions in population sizes of affected seabirds at South Georgia reported by BAS are, in some cases, unacceptably large. However, mitigation measures put in place in licensed fisheries have addressed this issue, evidenced by the fact that in recent years bird bycatches are absent from the fishery. New mitigation measures on the discard of hooks in offal have also been noted to be effective. The effects of the fishery on biological diversity, community structure and productivity have been quantified (through ecological modelling studies). There are no tested/justified limits in relation to harvest of toothfish, but the TAC is considered sufficiently precautionary to prevent any unacceptable impacts.	Roberts, 2000			
80	Information is available on the effects of the fishery on biological diversity, community structure and productivity. This does not indicate any unacceptable impacts.		SC-CAMLR 2000			
100	The effects of the fishery on biological diversity, community structure and productivity have been quantified and are within acceptable tested/justified limits		MRAG 2007 Morley et al. (2004). Murphy et al. (2007)			

2.2 (MSC Criterion 2)		The fishery is conducted in a manner that does not threaten biological diversity (at the genetic, species or population levels and avoids or minimises mortality of, or injuries to endangered, threatened or protected species.			28.6	99
2.2.1		Fishing is conducted in a manner, which does not have unacceptable impacts on recognised protected, endangered or threatened species.			50.0	-
2.2.1.1	Is there information on the presence and populations of protected, endangered or threatened (PET) species?				33.3	100
60	There is a programme in place to identify protected, threatened and endangered species directly related to the fishery. There is periodic monitoring of the main population trends and status of protected, endangered and threatened species.	British Antarctic Survey collects demographic and foraging ecology and at-sea distributional data for South Georgia seabirds that may be affected by longlining. This includes including diet, at-sea distribution and activity. The studies are related to the International plan of action for seabirds. Data are published and made available to CCAMLR and SCAR for analysis and modelling purposes. The work also contributes to the global assessments of the conservation status by BirdLife International on behalf of IUCN. Conservation status of “Red Data” species affected by longlining is given in terms of IUCN Categories of Threat. There are records of foraging range, breeding areas, and post-fledging dispersal. Birds on the list would notably include albatross species, while the white chinned petrel is currently classed as ‘vulnerable’. A long time series of bird monitoring data are available from Bird Island. Island-wide surveys are now being undertaken, providing more reliable estimates of seabirds from diving petrels to penguins and albatross, as well as marine mammals – e.g. fur seals. BAS’s monitoring of dependent predators such as penguins and seals are reported to CCAMLR WG-EMM meetings, primarily with a view to setting appropriate catch limits for Antarctic krill. Seals are also monitored by CCAMLR’s Ecosystem Monitoring Programme.			Robertson & Gales 1998	
80	All protected, threatened and endangered species significantly (directly or indirectly) related to the fishery have been identified. Populations of key species are monitored on a regular basis.				BirdLife International 2000	
			SC CCAMLR reports			
			Ashford et al., (1996)			
			Purves, et al. (2004)			

100	<p>There is knowledge of all populations of protected species directly or indirectly related to the fishery including threats to their status and recovery. Regular monitoring of protected, endangered and threatened species is undertaken, supported by research programmes to assess threats and promote their conservation. The type and distribution of critical habitats have been identified.</p>	<p>There were recent censuses over most or all of South Georgia for Antarctic fur seals, giant petrels and white-chinned petrels, results of which are unpublished. In addition, a PhD student at BAS is currently researching baleen whale distribution around South Georgia using passive acoustic moorings.</p> <p>Routine monitoring of whale populations is carried out by the International Whaling Commission. CCAMLR monitors dependent predators through the observer and CEMP programmes. The two species primarily interacting with longlines were orcas (killer whales) (<i>Orcinus orca</i>) and male sperm whales (<i>Physeter macrocephalus</i>). Records show that cetacean and seal mortalities are rare in the toothfish longline fishery across the southern ocean, and that no cetacean or seal mortalities have occurred as a result of fishing within Subarea 48.3, within the time series of data following commencement of the fishery.</p> <p>Critical benthic habitats (e.g. cold water corals) have been investigated, as described in 2.1.1.1.</p> <p>There is knowledge of all populations of protected species directly or indirectly related to the fishery (notably albatross) including threats to their status and recovery. Regular monitoring of protected, endangered and threatened species is undertaken (at Bird Island and South Georgia), supported by research programmes to assess threats and promote their conservation. The type and distribution of critical habitats have been identified.</p>	<p>Reid and Nevitt (1998).</p> <p>BirdLife International (2004).</p> <p>Phillips et al. (2005).</p> <p>Poncet et al., (2004)</p> <p>Phillips et al., (2004)</p> <p>Koch et al., (2006)</p>		
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2.2.1. 2	Are interactions of the fishery with such species adequately determined?	33.3	100
60	The main interactions directly related to the fishery are known.	Observers record all direct interactions of seabirds with longline gears. Zero records of bird catches in last few years, demonstrating how successful the bird-mitigation methods have been. IUU fishing has been virtually eliminated, while improved estimates of bird bycatch in these fisheries historically have been developed. Any impacts by and with marine mammals are also noted; for example, elephant seals have been occasionally noted taking toothfish from the line at the surface, while depredation of toothfish by whales was discussed under 2.1.2.3.	Roberts, 2000; Woehler and Croxall (1997)
80	Adequate quantitative estimates are made of the effects of interactions directly related to the fishery. Appropriate monitoring is in place to detect direct incidental mortalities.	The issue of discarded hooks in offal found in birds nests has been discussed in detail, being monitored through BAS activities. Many vessels now have a macerator on board for offal, while as noted in 2.1.3.2, new regulations have considerably reduced the discarding of hooks in offal. This has virtually eliminated hook discards from the SGSSI fishery and declines in the occurrence of hooks within nests have been noted. Given the success of mitigation measures within the SGSSI longline fishery, remaining issues for seabirds will accrue from fisheries outside that considered within this assessment.	Woehler et al. Latest British Antarctic Survey annual report
100	Reliable quantitative estimates are made of the interactions of all populations directly related to the fishery, and qualitative information is available on indirect impacts. Incidental mortalities are recorded and reported.	<p>The CCAMLR ad hoc Working Group on Incidental Mortality arising from Longline Fishing (WG-IMAF) analyses seabird mortality data annually. The Bird Biology Subcommittee of the Scientific Committee on Antarctic Research (SCAR) analyses population status and trends of affected seabirds at CCAMLR's request, at four-yearly intervals. This utilises modelling approaches where long-term data sets exist. SCAR recently assessed the regional conservation status of the Southern giant petrel, a species that is potentially affected by longline fisheries, and concluded that it was Least Concern. The UK makes annual reports to CCAMLR of fishing gear found associated with seabirds (predominantly wandering albatrosses) and seals at Bird Island, South Georgia.</p> <p>Trophic impacts resulting from the interaction of the fishery with key species is considered under 2.1.5.2, and given the level of the fishery are not considered significant.</p> <p>Reliable records and transparent reports are made of the interactions of all populations directly related to the fishery (seabird mortality), and qualitative information is available on indirect impacts (through ecosystem modelling).</p>	MRAG 2007 Agnew and Kirkwood (2002).

2.2.1.3	Do interactions pose an unacceptable risk to such species?			33.3	95
60	Known effects are within acceptable limits of national and international legislative requirements and are believed to create no biological threats to the species concerned.	<p>Interactions of seabirds from the longline fishery in SGSSI have been subject to a large number of mitigation measures to limit the bycatch of seabirds. While no explicit limit has been set, the implicit expected level has been a zero bycatch of seabirds within the fishery. Mitigation measures have been in place to reduce bycatch during setting and hauling. These measures appear to have been effective and successful, with a zero bird bycatch noted within the fishery by observers in the past two fishing seasons. IUU fishing, which has the potential to lead to further bird bycatch, has essentially been reduced to zero, further reducing the incidence of bird bycatch, while estimates of IUU bycatch had been improved in previous years.</p> <p>The numbers of lost hooks in discarded fish heads and offal have been reduced through measures required in the terms of licensing (see 2.2.1.2).</p> <p>Nonetheless, globally, seabird mortality from longline fishing remains a serious conservation issue and while bird bycatch has effectively been eliminated in the legal toothfish fishery in the South Georgia region, local breeding populations continue to decline because of incidental mortality in distant waters (outside the area of certification). These are visited on long foraging trips by some species, particularly wandering albatrosses, during the breeding season, and by birds of all species except light-mantled sooty albatross during the non-breeding period.</p> <p>Records show no cetacean and one seal mortality in whole southern ocean.</p> <p>It is established that the direct and indirect effects of fishing on threatened and endangered species are within acceptable pre-defined limits. The target seabird mortality rate is zero and this has been consistently achieved in recent years. Incidental mortalities are considered insignificant but no predetermined levels have been established.</p>	Brothers et al. (1999)		
80	Critical interactions (which could be direct or indirect effects) are well estimated. Available information shows interactions to be below a level which poses a significant additional risk to PET species. Interactions are monitored at appropriate intervals.		Robertson & Gales 1998		
100	It is established that the direct and indirect effects of fishing on threatened and endangered species are within acceptable pre-defined limits.		BirdLife International 2000		
			BAS Annual Report		
			WG-FSA WG-IMALF 2000 7.149		

2.2.2		Strategies have been developed within the fisheries management system to address and restrain any significant impacts of the fishery on protected, endangered or threatened species.			50.0	-
2.2.2.1	Are management objectives and accompanying strategies in place in relation to impact identification and avoidance/reduction?				100	100
60	Management objectives and accompanying strategies are in place to address key areas of impact identification and avoidance/reduction.	A wide range of management objectives and accompanying strategies to mitigate impacts of the longline fishery on PET and related species has been developed. In particular, an international plan of action for seabirds has been developed and initiated. The ultimate objective is to maintain seabird bycatches at current extremely low levels (which has been zero in recent years).		SC-CAMLR 2000		
80	Management objectives are set to detect and reduce impacts as appropriate. Accompanying strategies are designed to adequately protect recognised protected, endangered or threatened species.			Agnew pers. comm.		
		A large number of protocols are in place through both CCAMLR regulations and linked to this SGSSI licence conditions. These include the requirement for bird streamers, fishing at night, protocols for dealing with offal (and removal of hooks), a closed summer season to fishing to avoid the breeding season, full defrosting of bait to ensure it sinks rather than floats on the surface, and weighting of the line. Autoliners are being limited in their number to reduce the bycatch of particular species.		Ashford and Croxall (1998)		
				WG-IMALF 2000		
				CCAMLR conservation		

100	<p>Management objectives are set to detect and reduce impacts as appropriate, and they have a sound biological basis. Accompanying strategies are designed to adequately protect recognised protected, endangered or threatened species, and their effectiveness has been tested through simulation or experience with this or very similar fisheries and PET species.</p>	<p>A full monitoring programme remains in place to monitor seabird abundance, and hence potential for interactions of gears with birds. CCAMLR Ecosystem and Monitoring (EMM) and IMALF Working Groups assess population trends and impacts on seabirds from longlining annually, recommending further mitigation measures to keep impacts low.</p> <p>CCAMLR and GSGSSI check compliance with CCAMLR mitigation measures through observers and their reports, and by at-sea patrols and inspections, and GSGSSI rewards compliance when issuing licenses in subsequent years. It is now a licence condition that 'no hooks shall be discarded', which could enable prosecution in the case of non-compliance - e.g. if hooks are found in offal discards. Impacts of the success of mitigations is monitored through bird counts and breeding surveys undertaken by observers and BAS scientists.</p> <p>The drive to reduce (basically eliminate) IUU fishing in SGSSI waters has further reduced mortality coming from that section of the fishery.</p> <p>Management objectives are therefore set to detect and reduce impacts as appropriate – notably for seabirds. Accompanying strategies are designed to adequately protect recognised protected, endangered or threatened species, and their effectiveness has been carefully tested through direct experience with this and other fisheries.</p>	<p>measures</p> <p>GSGSSI 2002</p>		
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2.3 (MSC Criterion 3)		Where exploited populations (of non-target species) are depleted, the fishery will be executed such that recovery and rebuilding is allowed to occur to a specified level within specified time frames, consistent with the precautionary approach and considering the ability of the population to produce long-term potential yields.		n/a	n/a
2.3.1		There are management measures in place that allow for the rebuilding of affected populations.		n/a	n/a
2.3.1.1.	Is there sufficient information to allow determination of necessary changes in fishery management to allow recovery of depleted populations?			n/a	n/a
60	There is some information on functional relationships, sufficient to allow alterations to be made to fishing to recover and rebuild depleted species.	No non-target species affected by the fishery are considered depleted. Therefore, this criterion is not relevant for this assessment.			
80	There is adequate information, combined with a precautionary approach wherever necessary, to allow alterations to be made to fishing that would be expected to ensure that the fishery would not impede recovery and rebuilding of depleted species to specified levels within appropriate specified timeframes.				

100	There is a clear understanding of functional relationships between the impacted population and the fishery. Intervention measures based on this understanding have been tested and /or are known to be effective in maximizing the likelihood of promoting recovery of depleted species to specified levels within appropriate timeframes.				
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2.3.1.2	Are management measures in place to modify fishery practices in light of the identification of unacceptable impacts?	n/a	n/a
60	An appropriate mechanism exists for the modification of fishing practices in light of the identification of unacceptable impacts.	n/a No non-target species affected by the fishery are considered depleted. Therefore, this criterion is not relevant for this assessment.	
80	Effective and timely management measures are in place to modify fishery practices in light of the identification of unacceptable impacts.		
100	Monitoring programs are in place within the management system to allow timely modification of fishery practices in light of the identification of unacceptable impacts. Objectives and limits taking account of environmental change are used to guide operational practices. It is demonstrated that these are effective.		

2.3.1. 3	Do management measures allow for recovery of affected populations?	n/a	n/a
60	Appropriate rebuilding measures exist and are fully implemented. Measures may not have been tested.	n/a No non-target species affected by the fishery are considered depleted. Therefore, this criterion is not relevant for this assessment.	
80	Appropriate rebuilding measures have been implemented. Measures have been tested and can be shown to be promoting the rebuilding of affected populations and recovery of exploited populations to a specified level within specified time frames.		
100	Appropriate rebuilding measures are being implemented to promote recovery as quickly as is possible and recovery of exploited populations to a specified level within specified time frames. Additional measures are being implemented to prevent problems in the future.		

Principle 3		The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable	33.3	96
3.A		Management System Criteria	50.0	96
3A.1 (<i>MSC Principle 3 Intent and Criterion 3</i>)		A management system containing an institutional and operational framework exists with clear lines of responsibility.	11.8	-
3A.1.1	Are organisations with management responsibility clearly defined including areas of responsibility and interactions?		25.0	100
60	Organisations with management responsibility are known. Responsibilities and interactions may require clarification but are effective in critical areas.	Overall management lines and responsibilities of different management bodies are clear. The main responsibility for developing and promulgating the management plan for the fishery within SGSSI clearly lies with the Government of South Georgia and South Sandwich Islands (GSGSSI). The management plan (Ordinance of 2000) specifies clearly the authorities and responsibilities of the Commissioner, Director of Fisheries, and Officers. The Director of Fisheries is responsible for the conservation and assessment of fish stocks, the development and management of fisheries, the monitoring, control and surveillance of fishing and fishing-related operations. South Georgia Management Plan is well defined.	GSGSSI Fisheries (Conservation and Management) Ordinance 2000; Agnew 2004 Interviews with MRAG and BAS CCAMLR Convention and website (Section on	
80	Organisations with management responsibility have been defined including key areas of responsibility and interaction. In general, interactions are effective and operate without serious difficulties.	The overall TAC for subareas 48.3 and 48.4 within which the SGMZ is found is set by CCAMLR. Member states acceding to this Convention comply with all regulations and requirements set by CCAMLR (as Conservation Measures) and subsequently licence their own flagged vessels.		

100	Organisations with management responsibility are clearly defined including all areas of responsibility and interaction. Interactions are demonstrably effective.	<p>GSGSSI may impose additional requirements or controls in addition to the CCAMLR requirements.</p> <p>Individual fishing companies also ensure compliance and operation consistent with the regulations and principles</p> <p>BAS and MRAG contracted directly by GSG to provide support to fishery management. Both also have separate commitments to UK government. BAS 5 year science program agreed with GSG. MRAG and BAS interactions are coordinated through scientific cross-over. Division of responsibility between BAS and MRAG is generally along lines of general ecological research and support (BAS) and direct support for assessment and management decision-making (MRAG).</p> <p>Responsibility for developing and promulgating the management plan for the fishery within SGSSI clearly lies with Government of the Territories of SGSSI. The Management Plan (Ordinance) specifies clearly the authorities and responsibilities of the Commissioner, Director of Fisheries, and Officers. The role of CCAMLR with regard to the catch certification system is less clear, because implementation is at the level of member states. Obligations of member states to enforce all provisions of catch certification scheme and assess penalties for non-compliance are present in the CCAMLR Convention and responsibilities, but some responsibilities and methods for accountability are not fully specified. Fishing under flags of convenience and trans-shipping in ports of states not signatories to CCAMLR create opportunities for fishing with few or no lines of responsibility, but licensing system is partial deterrent to this factor.</p> <p>Overall management lines are clear. Opportunity to change flag state makes lines of responsibility weaker, but this is addressed in SG licensing arrangements.</p> <p>Organisations with responsibility for management of the fishery (CCAMLR, GSGSSI scientific consultants MRAG and BAS) are clearly identified and divisions of responsibility well established. Interactions between these are demonstrably effective, including interactions and synergies between MRAG and BAS.</p>	Mandate)		
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3A.1.2	Is the management system consistent with the cultural context, scale and intensity of the fishery?		25.0	100
60	Inconsistencies may arise in some key areas but a programme is in place to address these.	<p>The intense management of the fishery reflects the sensitivity of the environment within which it operates. The system is therefore entirely consistent with the context and scale of the fishery.</p> <p>CCAMLR: The Convention on the Conservation of Antarctic Marine Living Resources came into force in 1982 as part of the Antarctic Treaty System. It was established mainly in response to concerns that an increase in krill catches in the Southern Ocean could have a serious effect on populations of krill and other marine life; particularly on birds, seals and fish which mainly depend on krill for food.</p> <p>The aim of the Convention is to conserve marine life. This does not exclude harvesting as long as such harvesting is carried out in a rational manner. The Antarctic Convergence acts as an effective biological barrier, and the Southern Ocean is therefore substantially a closed ecosystem allowing management of a defined area. Each full member of the Commission is involved in fishing or research in the Southern Ocean, or both, and through the Commission and Scientific Committee these operations are coordinated and regulated to fulfil Members' obligations under the Convention.</p> <p>GSGSSI: The GSGSSI Ordinance requires the Commissioner to appoint a Director of Fisheries who shall be responsible for the conservation and assessment of fish stocks, the development and management of fisheries, the monitoring, control and surveillance of fishing and fishing-related operations.</p> <p>The investment in research and management of this fishery is comparatively very high, considering the scale of number of vessels participating in this fishery and the level of removals. However, the large investment is justified given the sensitivity of these higher-latitude marine ecosystems to perturbations, long recovery times from harm, and overall commitment of both CCAMLR and SGSSI to application of precautionary and the ecosystem approaches.</p>	CCAMLR Convention and Annual reports; Interviews with MRAG Environmental Management Plan for South Georgia. Stakeholder response from ASOC.	
80	The system is consistent with key elements of the cultural context, scale and intensity of the fishery.			
100	The system is entirely consistent with the cultural context, scale and intensity of the fishery.			

3A.1.3	Is the management system subject to internal review?	25.0	90
60	There are mechanisms in place to allow for internal review.	CCAMLR: All fishery divisions managed under CCAMLR responsibility undergo annual review as required under Article 2, Paragraph (c.) of the Convention (see Appendix 1). The Commission makes decisions based on annual advice from multinational and multidiscipline scientific and technical working groups which is reviewed by the CCAMLR Scientific Committee (SC-CAMLR). Conservation Measures set by CCAMLR are reviewed annually during the Commission meeting and re-adopted following review (with amendment where necessary). All decisions such as Conservation Measures and other resolutions are made by Member consensus taking a precautionary ecosystem approach.	CCAMLR website (Operating Procedures and General Information);
80	The major components of the management system are subject to internal review at appropriate intervals. Consideration of the recommendations of reviews is demonstrated.		Interview with MRAG and SGSSI

100	<p>The management system is subject to regular and frequent internal review. This includes evidence that the assessment methodology has been evaluated extensively and that any recommended changes have been made. Monitoring and evaluation are ongoing and improvements quickly tested and implemented.</p>	<p>GSGSSI: The levels of fishing (quotas and number of vessels), the types of vessels licensed and the allowed locations of fishing are reviewed annually internally by GSGSSI and their scientific advisors as part of the licensing policy review.</p> <p>The CCAMLR system includes provisions for regular and rigorous review of the management plan and performance of the fishery. This is possible at each annual meeting. These reviews often address specific aspects of the assessment or management in depth (e.g. bycatches of birds, rays, etc), but there are periodic reviews of the full management system. Regular stock assessments in CCAMLR also provide opportunities to detect failures in the management system to ensure sustainable use of the resource.</p> <p>There is apparently no review within GSGSSI on effectiveness of the management system, although advice taken from consultants provides a <i>de facto</i> internal review. Moreover regular assessments of status of target stocks will <i>de facto</i> identify evidence if management is ineffective at conserving the resource, and reviews of Observer reports for annual licensing decisions will detect if implementation of management provisions is ineffective. The annual licensing round gives an opportunity for revision of licence conditions. There is also internal civil service review. 1993 ordinances were updated in 2000 and amended in 2002 and 2004.</p> <p>The science and management of the fishery is subject to review. Internal reviews within CCAMLR and GSGSSI provide reviews of major elements of the management system. Stock assessment methods have been reviewed and modified and reviews are annual. However, other conservation measures are reviewed less frequently and improvements are not rapidly tested and implemented. The score has therefore been lowered to 90.</p>	<p>officials</p> <p>CCAMLR Annual Meeting Reports CCAMLR XXVI and preceding ones</p> <p>GSGSSI Ordinance and Amendments e.g. fsa 00/59; fsa 03/58; fsa 07/33</p>		
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3A.1.4	Is the management system subject to external review?		25.0	80
60	There are mechanisms in place to allow for external review.	<p>CCAMLR: Terms of reference and auditors for an external review to be carried out during 2008 were proposed and discussed at CCAMLR XXVI during October 2007 (Proposal for a CCAMLR decision to undertake a performance review of the organisation - Delegations of the European Community and the USA. CCAMLR-XXVI/32).</p> <p>The review of the fishery by CCAMLR ensures the SGSSI management system is subjected to international review as part of the CCAMLR process. However, this, by itself does not constitute full external review of the management system, as CCAMLR plays several roles in the management system through conduct of assessments and provision of harvesting advice, and evaluating potential impacts of the fishery and effectiveness of mitigation options for those impacts. There are no formal provisions within CCAMLR for external review. However, the UK first requested CCAMLR hold an external review in 2004. The initial call was unsuccessful, for both technical and budgetary reasons. However, the call for an independent external review was repeated at CCAMLR 2007, and this time the call for reviewers was successful. The Terms of Reference for the review were provided to the Assessment Team by the GSGSSI Director of Fisheries, and they were considered to fully address the issues appropriate for an independent review of the management system. This review is expected to be considered in the next CCAMLR meeting, before the end of 2008. There is no explicit provision to formally make such reviews a recurrent activity, but a reasonable interval before repeating such a review would be longer than the certification period.</p> <p>GSGSSI has no external review system, but internal reviews by CCAMLR (multi-national review and other stakeholder representation) are considered appropriate in this context.</p>	CCAMLR Resolution XXVI/132 ;	
80	The major components of management system are subject to external review at appropriate intervals. Consideration of the recommendations of reviews is demonstrated.		Interview with MRAG;	
100	The management system is subject to regular and frequent external review. Monitoring and evaluation are ongoing and improvements quickly tested and implemented		Dialogue with Fisheries Officers in SGSSI Director of Fisheries	

3 A.2 (MSC Criteria 1, 2, 4)		The management system has a clear legal basis.		11.8	-
3A.2.1	Is the fishery consistent with International Conventions and Agreements?			42.9	100
60	The management system operates under relevant international conventions and agreements, but some management actions may be open to interpretation and challenge in relation to the terms of these.	<p>The fishery is demonstrably compliant with CCAMLR requirements. CCAMLR meets and exceeds the requirements of other conventions, as delineated in the FAO code of conduct and its Annexes. Many elements of fishery management have been evaluated at a number of meetings of the Standing Committee on Observation and Inspection.</p> <p>CCAMLR (The Convention on the Conservation of Antarctic Marine Living Resources) came into force in 1982 as part of the Antarctic Treaty System. This agreement is recognised by 25 signatory nations and is the sole management organisation for fish and krill harvesting within international waters encompassing all Antarctic fisheries. The legal fishery is regulated completely within the CCAMLR Convention, and is therefore consistent with applicable international agreements. Many parts of the fishery have been evaluated at a number of Meetings of the Standing Committee on Operations and Inspection.</p>	Annual Reports from SCOI to the Commission. Annex V, CCAMLR Report of the twenty-sixth Meeting of the Commission - CCAMLR – XXVI		
80	The management system is generally consistent with relevant international conventions and agreements. The management system does not operate under any controversial exemption to an international fisheries or environment-related agreement.	<p>Any illegal fishery would be operating in direct violation of relevant international agreements and IUU fishing and would clearly not be compliant with CCAMLR and GSGSSI requirements. However, as noted in other scoring criteria under P1, there has been evidence that IUU fishing has not occurred in this area in recent years, and is being effectively deterred</p>			

100	<p>The management system is demonstrably compliant with all relevant international conventions and agreements.</p>	<p>by the current level of management, control, and surveillance.</p> <p>Control methods implemented regionally by CCAMLR and locally by GSGSSI for combating IUU such as enhanced monitoring, arrest of illegal vessels, legal penalties etc – are consistent with international conventions and agreements</p> <p>The assessment concluded that the UK does not exempt South Georgia fisheries from any relevant CCAMLR conservation measures, resolutions or decisions. In particular, it is noted that CCAMLR allows for the implementation of national conservation measures within waters adjacent to islands within the CCAMLR area over which the existence of state sovereignty is recognised (Statement by the Chairman of the CCAMLR, 1980).</p> <p>South Georgia and the South Sandwich Islands are subject to an on-going sovereignty dispute between the UK and Argentina. Whilst we acknowledge the dispute over which state has sovereignty, the existence of sovereignty by some state, and the acknowledgement by CCAMLR of a states ability to implement National measures within adjacent waters, seems clear. The assessment therefore considered both CCAMLR management measures and measures implemented by the relevant authority in South Georgia, as established by the Chairman of the CCAMLR, 1980.</p>			
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3A.2.2	Is the fishery consistent with national legislation?		42.9	100
60	The management system operates under relevant national legislation, but some management actions may be open to interpretation and challenge in relation to the terms of these.	<p>CCAMLR operates as a Regional Fisheries Management Organisation (RFMO) with specific responsibility for Antarctic waters and as such is transparently open for scrutiny in its operations by all individual members.</p> <p>The legal fishery is completely consistent with the SGSSI ordinances. An IUU fishery would, by definition not be compliant, as the relevant Ordinance requires a license issued by the Government of SGSSI. However, in recent years there is strong evidence that IUU fishing is being effectively deterred within the area being managed by GSGSSI.</p>	GSSSSI Ordinance 2000, and annual reports of performance of the fishery.	
80	The management system makes consistent, good faith efforts to be consistent with relevant national legislation. Management organisations have not been found to be repeatedly in violation of national law.	<p>There is an on-going sovereignty dispute between the UK and Argentina. However, we presume this dispute does not include the act of implementing CCAMLR conservation measures, with which, as a member of CCAMLR, Argentina agrees.</p> <p>Any IUU fishery would be non-compliant with SGSSI ordinances. Approaches used to deter and control IUU fishing are consistent with national legislation.</p>		
100	The management system is demonstrably compliant with all relevant national legislation.	<p>The management system is demonstrably compliant with GSGSSI ordinances, and the fishery is operated in compliance with the management system.</p>		

3A.2.3	Does the system observe the legal and customary rights of people dependent upon fishing?			14.3	100
60	The customary and legal rights of the people dependent upon fishing are known and no major conflicts have occurred.	CCAMLR: There is no impact on the legal and customary rights of people dependent upon fishing in waters managed by CCAMLR	Interviews with GSGSSI officers		
80	The system observes the legal and customary rights of people dependent upon fishing but does not necessarily have a formal codified system.	GSGSSI: There are no indigenous inhabitants of SGSSI. No settlers were historically dependent on this new fishery as Falkland Islanders historically were only associated with the whaling stations on South Georgia. The system for application, and award, of licenses are codified. There are no people historically dependent upon fishing in South Georgia.	Agnew 2004 and background reports		
100	The system observes all legal and customary rights of people dependent upon fishing under a formal codified system.				

3A.3 (MSC Criteria 2, 5, 7)		The management system includes strategies to meet objectives including consultative procedures and dispute resolutions.		11.8	-
3A.3.1	Does the management system contain clear short and long-term objectives?			16.7	90
60	Short and long-term resource and environment objectives are implicit within the management system.	CCAMLR: The management system is encapsulated in Article 2 of the Convention. Specific objectives are: a) Prevention of decrease in the size of any harvested population to levels below those, which ensure its stable recruitment. For this purpose its size should not be allowed to fall below a level close to that which ensures the greatest net annual increment; b) Maintenance of the ecological relationships between harvested, dependent and related populations of Antarctic marine living resources and the restoration of depleted populations to the levels defined in sub-paragraph (a) above; c) Prevention of changes or minimization of the risk of changes in the marine ecosystem which are not potentially reversible over two or three decades, taking into account the state of available knowledge of the direct and indirect impact of harvesting, the effect of the introduction of alien species, the effects of associated activities on the marine ecosystem	CCAMLR Convention (Article 2), CCAMLR Ecosystem Approach documentation on website; all CCAMLR Conservation Measures and their associated rationales. GSGSSI Environmental		
80	The management system contains an appropriate set of clear and explicit short and long-term resource and environment objectives.				

100	<p>The management system contains clear and explicit short and long-term resource and environment objectives that can be measured by performance indicators.</p>	<p>and of the effects of environmental changes, with the aim of making possible the sustained conservation of Antarctic marine living resources.</p> <p>Short-term goals for CCAMLR are reflected in quantitative annual TACs advised to comply with long-term objectives for exploited species, and conservation measures that have been analytically tested and found to result in tactical outcomes for bycatch species and habitats that are consistent with the long-term goals. Some of the tactical objectives for some Conservation Measures do not have a comprehensive biological background in the life history and vulnerability of the bycatch species or habitat features of concern, but are considered sufficiently precautionary</p> <p>GSGSSI: The Environmental Charter for South Georgia (adopted in 2001) contains clear and specific long-term goals for fisheries in the area, and for the ecosystem.</p> <p>Short Term goals for SGSSI are implicit not explicit, although short-term goals of the management plans are similar to those of CCAMLR, where the short-term objectives are explicit. Research objectives have included bycatch reduction resulting in the implementation of closed areas to fishing to reduce bycatch of benthos. No time-specific targets are set for IUU control or by-catch reduction.</p> <p>There are clear long and short term objectives for both the resource and environment, including the target species and some elements of ecosystem. There are specific short-term objectives for the target species. Objectives for by-catch (i.e. percentages of catch), however, do not represent appropriate biologically based performance indicators and so the score is only 90.</p>	Management Plan		
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3A.3.2	Do operational procedures exist for meeting objectives?			16.7	95
60	Generally adequate operational procedures exist which are applied to the meeting of objectives.	CCAMLR: The annual review of CCAMLR managed fisheries by WG-FSA and SC-CAMLR assesses the status of each of these using as base criteria the principles set out in the Convention and the indicators and reference points as explained in CCAMLR documentation on Implementing the Ecosystem Approach. GSGSSI : Detailed operational procedures exist for: a) Management of South Georgia Fisheries b) Management of harvesting activities within CCAMLR jurisdiction c) Catch monitoring system, including mandatory inspections and unloading in Stanley at the	GSGSSI Annual Licensing Conditions, Provisions in GSGSSI call for applications for licenses; regular CCCAMLR assessments of		
80	Transparent operational procedures are applied to the meeting of objectives. These procedures can be shown to support the objectives.				

100	Operational procedures are transparent and clearly applied. There is a feedback mechanism testing effective application.	<p>end of each fishing trip</p> <p>There is an annual analysis of efficacy, and feedback on control, of the legal fishery. All vessels licensed to fish in South Georgia are also licensed by their flag states to fish in CCAMLR waters and notified with CCCAMLR.</p> <p>For the IUU fishery, CCAMLR informs GSGSSI on control of IUU fishing, as well as GSGSSI reviews of their surveillance reports and Observer Reports. Control measures implemented by GSGSSI (utilising advice from MRAG) include the fishery patrol vessel 'FPV Pharos'. There is also 100% Observer Coverage on the legal fishery.</p> <p>Procedures are transparent, clearly applied and support long and short-term objectives. Again, however, there are some elements of by-catch control which lack appropriate feedback mechanisms, lowering the score to 95.</p>	<p>ecosystem components and target species. E.g. XXVI/4</p> <p>SGSSI Fisheries Ordinance 2000 and amendments</p> <p>Constable et al 2000 & refs therein;</p> <p>CCAMLR Observers manual, CCAMLR conservation measures (listing on website) CCAMLR Conservation measures XXVI 07/08</p> <p>Agnew 2004</p>		
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3A.3.3	Are there procedures for measuring performance relative to the objectives?		16.7	100
60	Operational procedures exist which can be used to measure performance relative to the objectives.	CCAMLR: CCAMLR has a tested system for measuring performance of resource management actions relative to objectives for target species and the ecosystem. For the target species, this system relies on the feedback provided by the annual assessments of stock status, compared to the expected status of the stock given the previous year's assessment, the management measures implemented, and the survey and fisheries monitoring data collected during the year. The annual assessments provide estimates of stock status, age and size composition, and the catch monitoring provides data on yields. These can be compared directly to objectives for conservation of stock biomass and productivity, and provision of sustainable yield. The harvest control rule for the fishery adjusts advised harvest in direct response to the feedback on achievement of conservation objectives, and the fees assessed for access to fishing opportunities are adjusted to ensure that the economic and social objectives of the SGSSI government are achieved. For the objectives for the ecosystem, bycatch relative to objectives are managed in real-time, based on observer observations of bycatches of species of concern. Objectives for ecosystem dynamics are reviewed periodically by the Working Group on Ecosystem Monitoring And Management (WG-EMM), and adjustments to exploitation levels and patterns of fisheries operations in space and time can be altered in response to concerns identified by that group. There are a number of scientific and technical working groups that provide advice to the CCAMLR Scientific Committee (SC-CAMLR) which in turn advises the Commission. These include the Working Group on Statistics, Assessments, and Modelling (WG-SAM), the Subgroup on Acoustic Survey and Analysis Methods (SG-ASAM), The Working Group on Ecosystem Monitoring And Management (WG-EMM), the Working Group on Fish Stock Assessment (WG-FSA), and the ad hoc Working Group on Incidental Mortality attributed to Fishing (ad hoc IMAF). Representation on these groups includes specialists from Member research organisations (both private and government), fishing industry, and environmental groups. Specifically WG-SAM annually reviews the assessment methods used and is tasked with refining methods and procedures to best meet the objectives of CCAMLR. These expert groups have developed and tested a variety of performance measures relative to each of the CCAMLR Objectives, and these are considered to be good, and often state-of-the-art. GSGSSI relies on CCAMLR (technical and policy bodies) for feedback on management	Interviews with MRAG and BAS, CCAMLR Working Group Reports, particularly FSA and SAM. Kock et al 2006 Agnew, 1997	
80	There are appropriate procedures used for measuring performance relative to the objectives, applied at appropriate intervals.			
100	Tested procedures are used for regular measurement of performance relative to the objectives.			

		<p>performance. Responsibilities for review of performance within GSGSSI, for objectives that are not the same as objectives of CCAMLR, are part of the contracted association with MRAG. Ecological research by BAS provides further opportunity to monitor performance of the fishery relative to long-term term ecological objectives. GSGSSI does monitor observer records in-season and can close the fishery before CCAMLR request closure.</p> <p>Fisheries management policy is reviewed as part of wider Environmental Management reviews (set out in the Environmental Management Plan (2001) and first reviewed in 2006 (Plan for Progress; Managing the Environment 2006-2010). The review process includes an opportunity for public comment, as well as consultation with known stakeholders. Annual meetings with stakeholders in the fishery also allow an opportunity to discuss revisions to GSGSSI policy.</p> <p>Tested procedures are therefore applied regularly to measure meeting of objectives within both CCAMLR and GSGSSI.</p>			
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3A.3.4	Do procedures enable a precautionary approach in the absence of sufficient information?			16.7	95
60	Measures exist to implement a precautionary approach in the absence of sufficient information. There is some evidence that this is occurring.	CCAMLR recognises the need for a precautionary approach from the outset and has stringent requirements for any new and exploratory fishery.	CCAMLR Website – Introductory Page; Preamble to CCAMLR Conservation Measures		
80	Formalised and appropriate measures are in place which implement a precautionary approach in the development and application of operational procedures in the absence of sufficient information.	The South Georgia toothfish fishery is now classed as an “assessed” fishery but still retains a precautionary approach. Many of the individual Conservation measures of CCAMLR explicitly refer to application of a precautionary approach, and are intended to increase the margin of safety when uncertainty is high. Catch reporting, observer reports, and the annual assessment cycle monitor effectiveness of precautionary measures. CCAMLR objectives and risk averse decision making are considered adequate and can react correctively in the following year for estimated amount of IUU fishing. Risk aversion increases as uncertainty increases.			

100	All procedures include for evaluation of uncertainty and application of precaution at an appropriate level.	<p>GSGSSI only licence vessels with a high compliance with GSGSSI and with CCAMLR. Problems with compliance reported to CCAMLR have been addressed by individual vessels in order to improve compliance. Better estimates of the level of IUU have been made in recent years in order to ensure that the TAC set is sufficiently risk averse as to not jeopardise the long-term sustainability of the stock</p> <p>Many of the individual Conservation measures of CCAMLR explicitly refer to application of a precautionary approach, and are intended to increase the margin of safety when uncertainty is high. Catch reporting, observer reports, and the annual assessment cycle monitor effectiveness of precautionary measures. The need for compliance by non-signatories and the opportunity to "opt out" of provisions may weaken effectiveness, but GSGSSI licensing processes do not allow opting out of any Conservation Measures when fishing within that management area.</p> <p>CCAMLR objectives and risk averse decision making are considered adequate and can react correctively in the following year for estimated amount of IUU fishing. Risk aversion increases as uncertainty increases.</p> <p>Improved estimation of IUU address issues identified in the initial assessment and precaution is explicitly used in identifying impacts on by-catch species and benthic habitats (RIAs), even though these are expected to be low. Most, if not all, procedures therefore include for evaluation of uncertainty and application of precaution at an appropriate level.</p>			
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3A.3.5	Does the system include a consultative process including relevant and affected parties?			16.7	100
60	The system includes an appropriate consultative process including key stakeholders within the fishery.	CCAMLR: In addition to representation by all members a number of other organisations such as Environmental NGO's such as ASOC, Fishing Industry groups such as COLTO (the Coalition of Legal Toothfish Operators), and other interested parties are invited as observers to the annual meetings of the CCAMLR Scientific Committee and Commission. Observers may make presentations and pose questions during some parts of the meetings of CCAMLR. Records of these meetings are documented and are available after each annual meeting for scrutiny. For CCAMLR Conservation Measures, all signatory countries must reach consensus, so there is a significant opportunity (often a requirement) to consult with signatory governments and their industries. The opportunity exists for consultation with non-signatory states, e.g. when there is a sighting of a non-member vessel or over the CDS (the latter	Interview with MRAG and GSGSSI officers, and industry		
80	The system includes an appropriate consultative process including all main public and private stakeholders and can demonstrate consideration of representations made.		CCAMLR Rules of Procedure (Basic Documents – Part 3, December 2000)		

100	The system includes an appropriate consultative process including all affected stakeholders. Decisions specifically discuss and/or address stakeholder concerns.	<p>including, for example Mauritius and Namibia). Consultation mechanisms of member states with their industries are highly variable and poorly documented.</p> <p>GSGSSI: For management measures based on GSGSSI actions, the GSGSSI licensing process has become more transparent in recent years. Since the review in May 2001, annual South Georgia Science Meetings at which GSGSSI, UK Govt, Industry, Environmental and Scientific Advisers (BAS / MRAG) meet to discuss fisheries issues, have been introduced. These discussions serve as an effective consultation forum for those directly engaged in the fishery as harvesters and processors, or as providers of information. The logistics of these meetings result in limited opportunity for ENGO participation in them, but that function is considered to be more efficiently served through the CCAMLR process, where the broader ecosystem issues are discussed thoroughly. This does not provide ENGOs with opportunity to comment directly on the management actions taken by GSGSSI each year, so the CCAMLR process must ensure the ENGO concerns are addressed effectively in that forum. The on-going effectiveness of that process can be evaluated in the annual surveillance audits during the period of certification, but structurally the opportunity for input does exist.</p> <p><i>Ad-hoc</i> meetings are also held on an informal basis between GSGSSI, scientific advisers and industry to discuss licensing requirements and the operation of the fishery.</p> <p>The system therefore includes an appropriate consultative process including all affected stakeholders. Decisions specifically discuss and/or address stakeholder concerns within both CCAMLR and GSGSSI.</p>	CCAMLR Report of the Twenty-sixth Meeting of the Commission - CCAMLR XXVI		
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3A.3.6	Is there an appropriate mechanism for the resolution of disputes within the system?			16.7	95
60	Mechanisms are theoretically adequate but have not been consistently applied or fully implemented.	CCAMLR: The management system is based on CCAMLR rules and principles. Any policy changes or management directives are based on collective discussion by the 25 Member states and is based on consensus. Disputes and the resolution of issues are addressed within the consensus decision making process and all policy or management direction must be based on full agreement of all Members. Within CCAMLR there are extensive measures for resolution of disputes among member states. These include the ability of parties formally to file disputes for resolution. These appeal processes within CCAMLR are specified transparently in the CCAMLR rules of operation for members.	GSGSSI: GSGSSI Fisheries (Conservation and Management) Ordinance 2000 (along with the 2002 and 2004 Amendments)		
80	There is an appropriate and established mechanism for the resolution of disputes within the system and it is generally applied.				

100	<p>There is an appropriate and tested mechanism within the system for the documentation and resolution of disputes of varying magnitude and it is consistently applied.</p>	<p>There are few mechanisms for resolution of disputes with non-members of CCAMLR. There is substantial external criticism of effectiveness of mechanisms to resolve disputes between CCAMLR and non-member states.</p> <p>For SGSSI operations, appeal mechanisms are specified in Fisheries Ordinances. The appeal mechanisms are not applicable to all forms of disputes, but are typical of fishery enforcement systems. Several levels of appeal are available, from GSGSSI, to the legal authorities in the Falkland Islands, and to the legal processes in the UK. These judicial review mechanisms were tested in 2005 and 2006 and are considered to be effective.</p> <p>GSGSSI give clear guidance to licensing requirements, but there is little opportunity to dispute licensing arrangements. GSGSSI explains verbally reason for non-licensing. The only formal appeal mechanism is through legal means. Again, though it is noted that the degree of transparency surrounding this process is now increasing with a statement of fishery licence policy and increased dialogue with boat owners.</p> <p>Interviews with CCAMLR participants and CCAMLR documentation indicates that their dispute resolution mechanisms have been tested on a range of issues, although rarely with disputes over this particular fishery. The mechanisms appear to provide satisfactory outcomes for disputes registered by member States, but less so for disputes with non-members. The dispute settlement mechanism for the GSGSSI has only been applied in a few very case-specific issues, but has functioned effectively.</p> <p>There is an appropriate and tested mechanism within the CCAMLR and GSGSSI system for the documentation and resolution of disputes of varying magnitude and it is consistently applied. However, there remain few mechanisms for resolution of disputes with non-members of CCAMLR. There is substantial external criticism of effectiveness of mechanisms to resolve disputes between CCAMLR and non-member states.</p>	<p>CCAMLR: Current and historical deliberations of the CCAMLR organisation.</p> <p>Judicial Review applications in 2005 and 2006.</p> <p>SC/CIV/8/06, The Queen (on the application of Isla Alegranza) and The Director of Fisheries of The Government of South Georgia and the South Sandwich Islands. Judicial Review 18th December 2006.</p> <p>Interviews with MRAG and GSGSSI fishery officers.</p>		
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3A.4 (MSC Criterion 6)		The management system operates in a manner appropriate to the objectives of the fishery.		6.2	-
3A.4.1	Does the system include subsidies that may contribute to unsustainable fishing?			50.0	100
60	Subsidies exist that may contribute indirectly to unsustainable fishing. These are short-term and are in the process of being removed within acceptable timescales.	GSGSSI: The Government of South Georgia and South Sandwich Islands do not provide subsidies of any sort. Costs for operations are recovered from licensed vessels. CCAMLR: The CCAMLR system has no capacity to provide subsidies of any sort. Its costs are fully recovered from member states through their membership fees. CCAMLR has no policy on whether member states should subsidise their vessels No direct subsidies are known to contribute specifically to fishing for toothfish. However, the fishery is made up of vessels from many nations. Direct and indirect subsidies almost certainly exist to varying degrees in the individual states, but would be very difficult to track, particularly because vessels may re-flag when participating in this fishery. The system has no subsidies that may contribute to unsustainable fishing or ecosystem degradation.		Interviews with MRAG, industry, GSGSSI fishery officers.	
80	The system is essentially free from subsidies that may contribute to unsustainable fishing or ecosystem degradation.				
100	The system has no subsidies that may contribute to unsustainable fishing or ecosystem degradation.				

3A.4.2	Does the system include economic/social incentives that contribute to sustainable fishing?	50.0	100
60	Measures to allocate fishing opportunities and/or entry to the fishery, or other incentives, are generally supportive of achieving fishery objectives.	The management system for the legal fishery includes stiff penalties for violations, and rewards compliant fishers with continued opportunities to gain licenses and access. Licensing procedures are considered very strong and effective in rewarding compliance in licensed companies, and hence provide an effective positive incentive for complying with all fishery regulations.	GSGSSI annual call for applications for licenses; GSGSSI instructions to license holders;
80	Allocations of fishing opportunities and/or entry to the fishery, and/or other incentives, promote fishery and ecosystem management goals.	The catch documentation system has economic incentives to reward compliance and deter trade in IUU harvested toothfish, but this is considered too new to have yet had a measurable impact	Interviews with MRAG and GSGSSI fishery officers
100	The system has established economic and social incentives that contribute to sustainable fishing and ecosystem management.	<p>When allocating fishing opportunities GSGSSI takes into account willingness to take part in research and this is made clear in the Licensing policy document issued to all applicants and available on the South Georgia official website. There does not seem to be a formally codified or publicised system making clear to prospective applicants of the areas where research should be directed. Arrangements appear to be ad hoc, based on what is offered and how that might integrate with work that needs to be undertaken</p> <p>The system has established economic and social incentives that contribute to sustainable fishing and ecosystem management.</p>	<p>Conservation Measures 118/XVII; 147/XIX; 193/XIX SGSSI Fisheries Ordinance</p> <p>CCAMLR Conservation measures 170/XIX; Resolution 14/XIX; Resolution 15/XIX</p> <p>Agnew 2004</p>

3A.5 (MSC Criterion 8)		A research plan exists in line with the management system to address information needs.		11.8	-
3A.5.1	Have key research areas requiring further information been identified?			33.3	100
60	Some major areas requiring further research have been identified.	British Antarctic Survey conducts ecological and long-term demographic research on affected seabirds at Bird Island, South Georgia, and surveys seabirds elsewhere on South Georgia from time to time. CCAMLR have identified skate and ray, and other benthic species conservation issues, which has led to the introduction of the “Year of the Skate” in 2009. The CCAMLR system allows for the tabling of scientific papers on new issues which can then be addressed. Mechanisms for such measures clearly exist and are seen to be effective. A comprehensive review of necessary information requirements has been undertaken within both CCAMLR and GSGSSI/MRAG/BAS. The Scientific Committee of CCAMLR regularly reviews adequacy of information and research needs.	CCAMLR Scientific Committee reports Interviews with MRAG, BAS		
80	All key areas requiring further research have been identified.				
100	A comprehensive review of necessary information requirements has been undertaken.				

3A.5.2	Is research planned/undertaken by the scientific advisers to meet the specific requirements of the management plan?			33.3	95
60	Research is planned for highest priority information needs, and some capacity exists to conduct the planned research	British Antarctic Survey conducts ecological and long-term demographic research on affected seabirds at Bird Island, South Georgia, and surveys and counts seabirds elsewhere on South Georgia from time to time.	5-year Research Plan for MRAG, Research Plan for BAS.		
80	Research is planned and undertaken to provide necessary scientific support to the plan. There are demonstrable resources to allow implementation of the programme.	GSGSSI has developed a multi-year research plan with MRAG with priorities reflecting the specific information needs of the toothfish and icefish fisheries. In addition CCAMLR has multi-year research plans for many ecological questions of relevance to SGSSI fisheries. These include the “Year of the Ray” and the “Year of the Macrourids”. Results of this CCAMLR work may increase knowledge about vulnerability of these species groups to fisheries impacts, and effectiveness of mitigation measures for such impacts.	CCAMLR website – pages of CCAMLR Scientific Committee Reports SC-CAMLR-XXVI and others n		

100	There is an ongoing, adequately funded, comprehensive and balanced research programme, linking research to the management plan.	<p>There is a comprehensive plan for research to fill information needs. Because of the high cost and difficult logistics of research in the southern Oceans, effective research programs often take more than one year to plan and implement. However the planning is balanced, well co-ordinated, and the results generally meet the objectives of the planned research.</p> <p>There is an ongoing, adequately funded, comprehensive and balanced research programme, linking research to the management plan within CCAMLR and GSGSSI/MRAG/BAS. However the majority of GSGSSI's revenue is derived from the sale of fishing licences and should this reduce then the current research programme may be subject to re-prioritisation.</p>	Research		
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3A.5.3	Is relevant research carried out by other organizations (e.g. Universities) and is this taken into consideration?			33.3	95
60	The management system is aware of research carried out by other organisations and elements of this are taken into consideration.	CCAMLR: Collectively - members of the science working groups represent a large number of international government and private research organisations. At an individual level there is a broad knowledge of associated work in each Member nation being carried out by other organisations or individuals which may not have direct representation at CCAMLR. The logistics and geography of the southern Oceans means that almost all research is planned through CCAMLR and implemented by member states with strong co-ordination by CCAMLR. Member states do contribute all domestic research results of relevance to toothfish to CCAMLR. Assessments of this stock shows good use of knowledge from global research and management experience on large, long-lived marine species. Research is undertaken directly or identified by members and brought to CCAMLR attention. Management and research plans considered to be integrated. Assessments of this stock shows	Interviews and assessment of documents provided by MRAG CCAMLR Scientific Committee Reports SC-CAMLR-XXVI and others		
80	Appropriate research carried out by other organisations is taken into consideration, although there is not necessarily any proactive co-ordination between organisations.				

100	<p>Relevant research carried out by other organisations is taken into account for management considerations. Relevant research of other organisations is often co-ordinated with existing research plans of the management system, or there is an active program to ensure that management is well informed of relevant research carried out by other organisations.</p>	<p>good use of knowledge from global research and management experience on large, long-lived marine species. Oceanographic and biodiversity classification models and analyses reflect extensive use of theory and analytical methods developed elsewhere and adapted for the Southern Ocean.</p> <p>British Antarctic Survey conducts ecological and long-term demographic research on affected seabirds at Bird Island, South Georgia, and surveys and counts seabirds elsewhere on South Georgia from time to time.</p> <p>The FAO International Plan of Action - Seabirds Assessment for fisheries operating in South Georgia and the South Sandwich Islands has been prepared by Birdlife International, and reflects expertise on seabird – fishery interactions from many parts of the world.</p> <p>Any research which takes place in South Georgia waters must be permitted by South Georgia Government (in the case of research cruises by non-UK vessels permitting is carried out through the UK which consults GSGSSI) so there is opportunity for links to be made.</p>			
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3A.6 (MSC Criteria 7, 9, 10)		The management system includes measures to pursue objectives for the stock.		11.8	-
3A.6.1	Are the resource and effects of the fishery monitored?			33.3	100
60	A monitoring programme is in place that addresses some aspects of resource and effects and which can be extended.	GSGSSI: The licensed fishery is closely monitored with daily catch reporting, and inspections of all port calls. 100% observer coverage ensures monitoring is accurate and adds biological sampling of catches, bycatch and incidental mortality. GSGSSI carries out research surveys at regular intervals to allow fishery-independent evaluation of impact of catches on stock size and productivity. Record keeping is complete and reliable, (although access to Observer Reports due to confidentiality reasons is only available to fisheries managers and not to the general public). IUU fishing is not considered here as IUU fishers are not being considered for certification, The consequences of IUU fishing have been considered elsewhere. Moreover, with the current evidence that IUU fishing has been negligible in recent years, the monitoring of the legal fishery is equivalent to monitoring of the entire fishery. The resource and effects of the fishery are closely monitored over appropriate geographical areas and time periods. Full records are kept of monitoring results and these are made available promptly to relevant research and management bodies (CCAMLR, GSGSSI and scientists). The fishery is closely monitored with daily catch reporting, and inspections of trans-shipments or at any port calls. Observers ensure monitoring is accurate, and add biological sampling of catches	Annual reports of SGSSI fishery. CCAMLR summaries of monitoring results.;		
80	A monitoring programme is in place that addresses all key aspects of resource and effects at appropriate intervals and results are recorded and available for science and management purposes.		Interviews with MRAG SCOI Reports SGSSI Fisheries Ordinance. Conservation Measure 196/XIX		
100	The resource and effects of the fishery are closely monitored over appropriate geographical areas and time periods. Full records are kept of monitoring results and these are made available promptly to relevant research and management bodies.		Report of Working Group on Fish Stock Assessments [SC-CAMLR-XIX/4. CCAMLR website – Fisheries Monitoring and Data		

3A.6.2	Are results evaluated against precautionary target and limit reference points?			33.3	100
60	Target and limit reference points exist and some level of evaluation against these is possible. These take account of the precautionary approach, but this may not be explicit.	Results of monitoring are quantitatively evaluated against precautionary target and limit reference points on a regular and timely basis. The assessment not only evaluates current stock status relative to reference points, it also makes forecasts into the future for long-term sustainability, relative to reference points. The standard assessment model is used in setting these biological reference points. A Monte Carlo procedure is used to account for most major sources of uncertainty in stock status and dynamics, and these are taken into account in setting the reference points. .	Agnew, Hillary and Pearce 2007.		
80	Results of monitoring are regularly interpreted in relation to precautionary, target and limit reference points.		Agnew et al. 2006.		
100	Results of monitoring are quantitatively evaluated against precautionary target and limit reference points on a regular and timely basis.		FSA 06/53 Reports of CCAMLR Working Group on Fish Stock Assessment [SC-CAMLR-XXVI/4 and others.].		

3A.6.3	Do procedures exist for reductions in harvest in light of monitoring results and how quickly and effectively can these be implemented?			33.3	100
60	Adequate procedures exist to reduce harvest. Programmes to link these with monitoring results are underway.	<p>The TAC for the legal fishery is set annually, in response to analytical assessments that use the most up to date data available, and methods that result in annual adjustments of estimates of stock status and risk of harvests of various levels. There is an effective catch monitoring system, which gives the ability to close the fishery on notice of a day or less. The system ensures that if the TAC is reduced, the catch of the legal fishery is effectively reduced. Rebuilding targets have not been set for this stock because it is not considered depleted and in need of a recovery target. Hence there are no provisions which would ensure recovery to a particular size within a specified time frame. There is instead heavy reliance on the success of the decision rule to keep the stock well above a biologically based limit reference point, and not falling below a biologically based target reference point.</p> <p>It is noted that no recovery plan is in place or considered necessary at this time. However, it is considered desirable that management measures be identified in advance for recovery of this stock should at some future time it become depleted below the long-term biomass target used by CCAMLR.</p> <p>Effective procedures exist to reduce harvest in light of monitoring results. There is evidence that these procedures to implement changes can be effectively introduced in real-time. There is a clear expectation that these would provide for stock recovery to target levels if required.</p>	<p>CCSAMLRL assessment of SGSSI toothfish - fas-07/29; fsa 06/53</p> <p>CCAMLR Conservation Measure 196/XIX</p> <p>CCAMLR Annual Reports</p> <p>CAMLR XXVI and others</p> <p>Reports of CCAMLR Working Group on Fish Stock Assessment [SC-CAMLR-XIX/4 and others.].</p> <p>SGSSI Fishing Ordinance 2000</p>		
80	Appropriate procedures exist to reduce harvest in the light of monitoring results and provide for stock recovery to specified levels. Measures can be implemented in a timely manner.				
100	Practical and effective procedures exist to reduce harvest in light of monitoring results and provide for stock recovery to specified levels within specified time frames. There is evidence or a clear expectation that these procedures to implement changes can be effectively introduced on an appropriate timescale.				

3A.7(MSC Criterion 10)		The management system includes measures to pursue objectives for the affected ecosystem.		11.8	-
3A.7.1	Are measures in place to address (avoid or minimise) significant environmental impacts?			66.7	95
60	Significant environmental impacts are known and measures are being applied to reduce them.	Licensed vessels are required to follow all CCAMLR and GSGSSI mitigation measures to reduce seabird mortality, including a closed summer season (during seabird breeding seasons), night-setting, use of approved streamer lines and strategic offal discharge or retention by some vessels within CCAMLR waters. Measures are also in place to reduce the loss of hooks in offal to essentially zero. As a consequence of generally good compliance, bird mortality during setting and hauling has been very low in the last two years and is currently not considered to be of conservation concern in the legal fishery. As a consequence of generally good compliance, bird mortality during setting and hauling has been reduced to virtually zero and is currently not thought to be of conservation concern in the legal fishery.	CCAMLR evaluations of their Conservation measures.		
80	Environmental impacts are known. Measures are being applied to minimise all significant ones and there is evidence that the measures are working.		Interviews with MRAG SC-CAMLR 1999; SC-CAMLR 2000		

100	Measures are in place to avoid all significant environmental impacts and are subject to monitoring and periodic review.	<p>There is some bycatch of skates and rays and grenadiers in the longline fishery. Observer records indicate that these by catches are generally small compared to the target species catch and are within the precautionary bycatch limits set by CCAMLR, although the biological basis for these limits is incomplete. There is a Conservation Measure to cut all skates and rays off the lines during retrieval of the gear, and survival of these released skates and rays is considered to be high.</p> <p>Research is currently underway to gain a clearer understanding of the ecosystem linkages on the South Georgia shelf through the BAS Discovery 2010 programme which has compiled an Ecopath model of the South Georgia food-web. This research is now entering its second phase, and mechanisms exist through CCAMLR expert working groups to ensure that any results of relevance to the impacts of this fishery are considered and, if appropriate, additional Conservation measures introduced.</p> <p>Toothfish are one of several major predators in the Southern Oceans. The secondary tropho-dynamic consequences of reducing the abundance of toothfish as a predator are unknown. However, in many other systems, abundance of large predatory fish have had to be reduced by a much greater amount before detectable tropho-dynamic effects have been unambiguously demonstrated. The conservative management objective for the target species in the fishery should result in a standing stock of toothfish large enough to play its role as a predator in the ecosystem.</p> <p>There are some gaps in knowledge on ecosystem vulnerability – for example, the vulnerability of rays and skates to bycatch has not been fully evaluated, but is subject to new and ongoing research.</p> <p>Measures are in place to avoid all significant environmental impacts (e.g. by-catch mitigation, RIAs, seabird mitigation measures) and are subject to monitoring (principally through observers). However, the effectiveness of all measures is not necessarily subject to review, and so the score is lowered to 95.</p>	(para. 7.149)		
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3A.7.2	Are no take zones, Marine Protected Areas or closed areas for specific periods appropriate and, if so, are these established and enforced?			33.3	95
60	Suitability of no-take zones and/or closed areas / seasons has been reviewed against objective biological criteria. Where these are considered to be appropriate, plans are in place to implement some or all of these as appropriate.	<p>Reduced Impact Areas (RIAs) are appropriate for the protection of sensitive habitats, are established and enforced, but monitoring of these are not yet undertaken</p> <p>GSGSSI: The Government of South Georgia has implemented a minimum depth band of 500m and other closed areas to protect the benthos in specific areas The 500m minimum depth band was implemented in 2004 and other precautionary closed areas, RIA, were implemented in 3 areas (West Shag, West Gully and Northeast South Georgia) in 2007 after a period of extensive collection of benthic data, which is continuing. Other RIAs may be implemented as needed in future to protect specific benthic habitat features or communities but only as part of a suite of management measures which would still feature controls on catch, effort, and gear.</p>	<p>GSGSSI Management Plan;</p> <p>Interviews</p> <p>Roberts 2006</p>		
80	Suitability of no-take zones and closed areas / seasons has been reviewed against objective biological criteria. Where these are considered appropriate they have been, or are currently being, implemented and adequately enforced.	<p>Certain exclusions to these rules exist to allow limited research fishing by specific vessels to ensure research objectives are met.</p> <p>Some areas of the SGSSI zone are closed to all fishing for the protection of marine mammals and seabirds and these are being monitored</p>			

100	No-take zones and closed areas / seasons are established and effectively enforced if and where appropriate and, if implemented, the consequences are being monitored.	<p>Effective protection of the target species is considered to be achieved through existing mechanisms. Although the need or value of closed areas for target species is not established, the 500m minimum depth restriction was also created as precautionary protection of toothfish juveniles, and one of the three RIA areas closed in 2007 (West Gully) was selected from a number of sites due to the additional protection it would provide to toothfish spawning areas. TAC implementation is considered sufficient on the basis of current knowledge. It is noted that the species concerned would not necessarily benefit from the establishment of no take zones.</p> <p>Information on benthic habitats and communities has been consolidated into a set of spatial management options to reduce the impact of the toothfish fishery on corals, these options are being implemented in the 2008 fishery. There remain many components of the benthic community that are poorly known, and scope for increasing knowledge, through use of underwater visual recording, monitoring bycatches, etc remains. Nonetheless, there is now enough information to identify the major risks associated with the potential impacts of the toothfish longline fishery on the benthic communities and habitats, and to manage those risks. There is also evidence that actions are being taken consistent with an objective of reducing further such risks, even though the risks were never identified as high and serious.</p>			
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3 A.8 (MSC Criterion 11)		There are control measures in place to ensure the management system is effectively implemented.		22.9	-
3A.8.1	Are information, instruction and/or training provided to fishery operatives in the aims and methods of the management system?			33.3	90
60	Mechanisms exist for the dissemination of information, instruction and training of fishery operatives. Implementation of these mechanisms may not be universally implemented.	CCAMLR: There are a number of information and training aids provided by or supported by CCAMLR GSGSSI: Annual SG Science meetings are held between Government official, scientists, industry, and NGO observers. At these meetings industry are briefed on any forthcoming issues and any proposed requirements for the upcoming season. These measures are also specified in the letters to each vessel operator, when the operator is informed that that a license has been awarded for this fishery. Before commencing fishing all Captains and Fishing Masters are briefed orally in person by the Government Officer and given a letter outlining the season’s requirements.	Letters to license holders Interviews with GSGSSI officers and MRAG		
80	Information, instruction and training are provided to fishery operatives in the aims and methods of the management system allowing effective management of the system.	Licensing requirements mean that, <i>de facto</i> , fishery operatives must familiarise themselves with the aims and methods of the management system. The information given to skippers, in	Call for applications for licenses; summaries of Observer reports		

100	<p>Information, instruction and training are provided to fishery operatives in the aims and methods of the management system allowing effective management of the fishery and operatives demonstrate comprehensive knowledge of this information.</p>	<p>both paper format and a verbal briefing during the pre licensing inspection, is extensive and detailed. Skippers are responsible for the behaviours of the crew under their command. Observers are able to witness these behaviours. The requirement for 100% observer coverage on the legal fishery means that observers are providing continuing feedback to fishery operatives with regard to activities that are and are not in accordance with the aims and methods of fishery management. There is also the annual meeting where fishing companies can meet with GSGSSI, and provide an opportunity to discuss possible improvements to the methods for getting information and training to captains and crews.</p> <p>Fishers have a good history with the fishery and therefore have a generally good knowledge of the aims and methods of the system. Those companies and vessels requesting licences are asked to provide evidence that they can meet the conditions of licensing as part of the application process, also requiring a demonstration of knowledge of the provisions of the management plans. There is evidence, however, that some fishers may not be fully aware of the aims and methods of the system.</p> <p>There is no systematic training programme in place for the crews on the vessels, although individual vessels or countries fishing in the area may have their own training programs. The lack of continuity of these programs limits their value.</p> <p>Information, instruction and training are provided to fishery operatives in the aims and methods of the management system allowing effective management of the fishery and most (but not all) operatives have demonstrated a comprehensive knowledge of this information.</p>	SGSSI Fishery Ordinance		
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3A.8.2	Is surveillance and monitoring in place to ensure that requirements of the management system are complied with?			33.3	95
60	An enforcement system has been implemented; however, its effectiveness and/or compliance have not been fully demonstrated relative to conservation objectives.	An effective enforcement system has been implemented (through observers, pre and post-season inspection, at-sea inspections etc) and there is a high degree of control and compliance. Robust enforcement systems are in place to control IUU fishing, involving the fishery patrol vessel Pharos, fishing vessels monitoring AIS and radar and cruise vessels (the only recent example being the Elqui which was captured and sunk upon conviction). However, control of IUU is to some extent dependent upon continuing license revenue and fishing vessels presence, both of which could decrease with a lower stock level, as discussed below CCAMLR: There is a requirement under CM (2007) for 100% observer coverage. Under CM 10-04 (2007) each Contracting Party shall ensure that its fishing vessels, licensed in accordance with Conservation Measure 10-02, are equipped with a satellite-linked vessel monitoring device allowing for the continuous reporting of their position in the Convention Area for the duration of the licence issued by the Flag State. The vessel monitoring device must automatically communicate at least every four hours to a land-based fisheries monitoring centre (FMC) of the Flag State of the vessel the following data:	CCAMLR Conservation Measure CM 10-04 and 2007		
80	An effective enforcement system has been implemented and there is an appropriate degree of control and compliance. Enforcement systems include measures to control IUU fishing and misreporting.		GSGSSI Management Plan Summaries of Observer reports CCAMLR Reports of SCOI,		

100	An effective enforcement system has been implemented and there is a high degree of control and compliance. Robust enforcement systems are in place to effectively control IUU fishing misreporting.	<ul style="list-style-type: none"> i. fishing vessel identification; ii. the current geographical position (latitude and longitude) of the vessel, with a position error which shall be less than 500 m, with a confidence interval of 99%; <p>and</p> <ul style="list-style-type: none"> iii. the date and time (expressed in UTC) of the fixing of the said position of the vessel. <p>Each Contracting Party as a Flag State shall ensure that the vessel monitoring device(s) carried on board its vessels, that these are tamper proof, i.e. are of a type and configuration that prevent the input or output of false positions, and that are not capable of being over-ridden, whether manually, electronically or otherwise.</p> <p>Vessels report their positions and transitions between SSRU's / subareas directly to the CCAMLR Secretariat in addition to the requirement under 10-02 to report to the Flag state. AIS (Automatic Identification System) is now a requirement for all vessels operating within the fishery. This enables an optimisation of patrol assets that can now target IUU more efficiently. The GSGSSI fisheries patrol vessel 'Pharos' undertakes patrols and inspections within the SG MZ. Surveillance effort is maintained at a high level and has been proven to be effective in recent years</p> <p>The licensed fishery has surveillance and monitoring procedures including 100% observer coverage. Although the Observers do not have direct enforcement authority on the vessel, they are authorized and mandated to report all violations to management authorities. This arrangement has been shown to provide high levels of compliance with the management plan, including conservation measures.</p>	SGSSI Fishery Ordinance		
			CCAMLR Conservation Measures 170/XIX; Resolution 14/XIX;		

3A.8.3	Can corrective actions be applied in the event of non-compliance and is there evidence of their effectiveness?			33.3	100
60	Mechanisms exist or are being developed which can be implemented or applied to deal with non-compliance.	Strong and effective penalties can be levied for violations of fisheries regulations, including seizure of vessels and/or gear and fines. Recent penalties assessed by courts indicate judicial willingness to exercise full extent of the law, such as the arrest, seizure and sinking of the Elqui for IUU fishing and the prosecution and fining of the (licensed vessel) Jacqueline in 2004 for infringements of licence conditions. For the licensed fishery, observers reporting problems can result in appropriate corrective actions. Feedback from vessels to companies on corrective actions could be improved through greater communication between CCAMLR, the management agency and vessel/licence owners. This is performed by GSGSSI independently asking companies for comments and directing them on ways to improve their compliance based on observer reports. Breaches of compliance are also referred to the Attorney General’s Chambers to consider prosecution. Agreed and tested corrective actions can be applied in the event of non-compliance. Major consideration is the threat of not being licensed in next season. Licenses can also be withdrawn mid-season <i>in extremis</i> .	Background reports		
80	There are set measures that can be applied in the event of non-compliance although these may not be included in a formal or codified system. These have been tested if/as appropriate to demonstrate their effectiveness.		SGSSI management Plan CCAMLR Conservation Measures Interviews with GSGSSI fishery officers		
100	Agreed and tested corrective actions can be applied in the event of non-compliance.		News reports SGSSI Fishery Ordinance Report of Working Group on Fish Stock Assessments SC-CAMLR XXVI/4		

3 B		Operational Criteria	50.0	96
3B.1 (MSC Criterion 12)		There are management measures that include practices to reduce impacts on non-target species and inadvertent impacts upon target species.	18.1	-
3B.1.1	Do measures, principally through the use of gear and alternative fishing practices, include avoidance of impacts on non-target species and inadvertent impacts upon target species? These would include by-catch, discard, slippage and high grading		100	95
60	Appropriate measures have been implemented that are intended to reduce the major impacts on non-target species and inadvertent impacts on target species, but their effectiveness is uncertain.	<p>There is no commercial by-catch, and by-catch reduces the effectiveness of gear to catch toothfish, all measures to reduce by-catch are therefore adopted. Any available measures will therefore be implemented to consistently avoid or reduce the major impacts on non-target species. Measures to avoid impacts on rays are fully implemented, seabird mitigation appears 100% effective and other measures exist for macrourids. Gear selectivity and fishing locations avoids inadvertent impacts on target species. The effectiveness of measures is clearly demonstrated through the observer programme. Research into other appropriate mitigation measures for by-catch is ongoing. Research planned by CCAMLR are part of the “Year of the Ray” and the subsequent “Year of the Macrurids” should increase the ability to quantify the effectiveness of the existing mitigation measures, and if necessary, to improve them or develop additional ones.</p> <p>Licensed vessels are required to follow CCAMLR and GSGSSI mitigation measures to reduce seabird mortality, including a closed summer season (during breeding), night-setting, use of approved streamer lines, bait defrosting, appropriate line weightings, and strategic offal discharge. As a consequence of generally good compliance, bird mortality during setting and hauling has been reduced to zero in the last two years and is currently not thought to be of conservation concern.</p> <p>Currently investigations are underway into the effect of different line-weighting regimes on the catch rates of target and bycatch species. This will potentially allow alternative fishing practices to be developed to minimise impacts on non-target species.</p> <p>No slippage occurs due to the fishing methods employed. No high grading occurs on board due to the high value of toothfish and the 100% observer coverage.</p>	<p>Summaries of Observer reports.</p> <p>CCAMLR reviews of Conservation Measures</p> <p>SC-CAMLR 1999;</p> <p>SC-CAMLR 2000, 2007</p>	
80	Measures have been implemented as and when appropriate to avoid or reduce the major impacts on non-target species and inadvertent impacts on target species and there is evidence that they are having the desired effect.			
100	Measures have been implemented to consistently avoid or reduce the major impacts on non-target species and inadvertent impacts on target species, and their effectiveness is clearly demonstrated.			

3B.2 (MSC Criterion 13)		There are management systems in place that encourage fishing methods that minimise adverse impacts on habitat.		18.1	-
3B.2.1	Do fishing operations implement appropriate fishing methods designed to minimise adverse impacts on habitat, especially in critical or sensitive zones such as spawning or nursery areas?			100	95
60	Fishing operations use measures to reduce major impacts on habitat, especially in critical or sensitive zones such as spawning or nursery areas.	Longline fisheries have relatively little effect on marine habitats. Based on global experience, some damage to complex biogenic structures by longlines is likely from line dragging etc. However the damage is expected to be relatively small and local at the effort levels allowed under current TACs. The implementation of Reduced Impact Areas and the 500 meter depth contour limit for this fishery both contribute to reducing the impact of this fishery on benthic communities and habitats, including corals. The long-line gear is considered to be a comparatively low-impact gear with regard to habitat damage, but alternative fishing practices regarding line-weighting regimes may provide some opportunity to reduce impacts on habitats even further, along with reducing bycatch. 11.1.1.1 Trawling is specifically not allowed.	Fishery reports , XXVI and previous Mortensen-Buhl and Mortenseon 2005 Risk et al. 2002. Roberts 2006.		
80	There is evidence that fishing operations are effective in avoiding significant adverse effects on the environment, especially in critical or sensitive zones such as spawning or nursery areas.				
100	There is direct evidence that fishing operations implement appropriate methods to avoid significant adverse impacts on all habitats.				

3B.3 (MSC Criterion 14)		The management system incorporates measures that discourage destructive practices.		22.2	-
3B.3.1	Does the fishery employ destructive fishing practices (such as poisons or explosives)?			100	100
60	The fishery does not allow any such destructive fishing practices.	No destructive fishing practices are used in the fishery. Only gears approved by CCAMLR and GSSGSI may be used in fisheries in their areas, and longlines and pots are the only methods approved by GSGSSI and CCAMLR for fishing for toothfish in this area. The fishery does not employ any such destructive fishing practices and enforcement is considered sufficient to prevent their use. There is also a code of conduct for responsible fishing, prohibiting these, that is supported by fishers.	Management Plan CCAMLR Guidelines		
80	The fishery does not employ any such destructive fishing practices and enforcement is considered sufficient to prevent their use.				
100	The fishery does not employ any such destructive fishing practices and enforcement is considered sufficient to prevent their use. There is also a code of conduct for responsible fishing, prohibiting these, that is fully supported by fishers.				

3B.4 (MSC Criterion 15)		The management system incorporate measures that reduce operational waste.		18.1	-
3B.4.1	Do measures exist to reduce operational waste?			100	95
60	Measures/facilities are in place to reduce sources of operational waste that are known to have detrimental environmental consequences, but further reductions may be possible.	Measures/facilities are in place to minimise all sources of operational waste that are known to have detrimental environmental consequences (such as prohibiting discharge of hooks in offal, verification that garbage is not thrown away). There is evidence these measures are effective (through observer programme) and these measures appear to be supported by the fishers. Some vessels that operate within CCAMLR have adopted the measures implemented in the Ross Sea (zero dumping of waste and offal) throughout their operations including South Georgia waters. The offal is stored, in bilge tanks or frozen, and discharged when out of area 48.3. There are restrictions imposed by CCAMLR on the dumping of and processing of rubbish waste. Fish hooks are extracted from offal before it can be discharged. Observers report dumping of any waste in their reports.	Roberts, 2000 SGSSI Fisheries Ordinance & Individual Observer Reports		
80	Measures/facilities are in place to reduce all sources of operational waste that are known to have detrimental environmental consequences, and there is evidence they are effective.				
100	Measures/facilities are in place to minimise all sources of operational waste that are known to have detrimental environmental consequences, and there is evidence they are effective and these measures are supported by the fishers.				

3B.5 (MSC Criterion 16)		Fishing operations are conducted in compliance with the management system and legal and administrative requirements.			25.5	-
3B.5.1	Are fishers aware of management system, legal and administrative requirements?				33.3	95
60	Fishers are aware of key management and legal requirements.	Most fishers are aware of all management and legal requirements through licensing (which includes briefing of Captains/Fishing Masters in person) and inspections, reinforced by observers. These are clearly documented and communicated.		Letter to license holders		
80	Fishers are aware of management and legal requirements upon them and are kept up to date with new developments.	CCAMLR: All Conservation Measures are posted on-line on the CCAMLR website. GSGSSI: All information requirements including downloadable forms for vessel registration, licence application etc can be downloaded from the GSGSSI website. The letter informing successful applicants for licenses includes a complete list of the provisions of the management system, and provides reference to sources for further information, should it be needed. In addition the annual Science meeting with fishery operators includes opportunities for discussion of any new requirements in the fishery. These are often a main focus of the meeting		Interview with MRAG and industry. SGSSI Fishery Ordinances.		
100	All fishers are aware of management legal requirements through a clearly documented and communicated mechanism such as a code of conduct.			Observer and SCOI Reports. Observer interviews.		

3B.5.2	Do fishers comply with management system, legal and administrative requirements?			33.3	90
60	Fishers appear generally to comply with requirements, but there is incomplete information on the actual extent of compliance.	CCAMLR: Annually evaluates vessel compliance in respect to relevant management and legal requirements and documents any failures in compliance throughout CCAMLR 100% observer coverage and review of these reports ensures that the review of compliance is reliable	Interviews with MRAG and GSSGSI officers; CCAMLR operating requirements,		
80	Evidence exists to show that fishers are generally compliant with relevant management and legal requirements and there are no indications of consistent violations.	GSGSSI: A review of vessel compliance in respect to all CCAMLR and GSGSSI requirements is carried out annually post season including a comprehensive observer debrief by the observer suppliers.			
100	Fishers are demonstrably fully compliant with, and fully supportive of, legal, and administrative requirements, such as through a code of conduct.	Evidence exists to show that fishers are generally compliant with relevant management and legal requirements and there are no indications of consistent violations. Fishermen are generally supportive of management requirements.			

3B.5.3	What is the record of enforcement of regulations in the fishery: quota control, by-catch limits, MLS, mesh regulations and closed areas?			33.3	100
60	There is information on breaches of regulations and on corrective action to prevent or curtail.	CCAMLR: Annual monitoring of vessel performance using observer records, VMS data, sightings from other licensed vessels, catch-effort returns, and surveillance data from Member states is carried out. GSGSSI: No recorded breaches of quota regulations since the Ibsa Quinto was prosecuted in 2005 for exceeding her quota allocation in 2004. Bycatch limits have been observed. The renewal of a fishing license is dependent upon full compliance with the fishery management system as demonstrated in the previous seasons fishery (observers report, catch reporting, catch verification, boardings at sea etc). This provides a strong incentive for breaches to be uncommon, such that opportunities to test the willingness of the judicial process to enforce the regulations are uncommon. However the record of process when IUU fishing was occurring was quite strong. Observer data on quota control, by-catch limits, RIA closed areas in 08 season and other CCAMLR conservation measures has not reported any cases of lack of compliance in 2008. There is evidence of rigorous monitoring and control of the enforcement measures. There is strong evidence of firm and effective action being taken in the event of any breaches.	Interviews. Reports of past enforcement actions		
80	Evidence of rigorous monitoring of all the enforcement measures and evidence of effective actions taken in the event of breaches is available.				
100	Strong evidence of rigorous monitoring and control of the enforcement measures through for example satellite monitoring, shipboard observers and nominated landing ports. There is strong evidence of firm and effective action being taken in the event of any breaches.				

3B.6 (MSC Criterion 17)		The management system involves fishers in data collection.		18.1	-
3B.6.1	Do fishery operatives assist in the collection of catch, discard and other relevant data?			100	100
60	Fishery operatives are involved in the collection of some catch, discard and other information.	CCAMLR: There is an obligation on Flag states “to obtain from each of its vessels its total catch of all species, including by-catch species, and total days and hours fished for that period” on a five-day basis and on a monthly basis to “each month each Contracting Party shall obtain from each of its vessels the data required to complete the CCAMLR fine-scale catch and effort data form (trawl fisheries Form C1, longline fisheries Form C2, or pot fisheries Form C5)”. These obligations require the collection and recording of relevant catch, discard and other information by vessel crew although anecdotal information suggests that scientific observers may carry out this function on some vessels. Fishing vessels operating in South Georgia have been shown to be keen to take part in additional research work as and when required and will assist the observers in being able to conduct their required research. Daily catch records include requirements to report catch of all species taken with fishing gear. These reports are filled out by fishery operatives. 100% observer coverage gives a high likelihood that daily catch records will be completed accurately, and observer reports indicate compliance is good. Fishery operatives deeply involved in reporting catches and by-catches. (IUU fishing is clearly excluded here as this criterion applies to the management system). Fishery operatives assist significantly in the collection and recording of all appropriate catch, discard and other information. For example, reduction in macrourid by-catches, carrying tanks for skate survivorship studies, collection of eggs for larval development studies, facilitating observer activities.	Interviews with industry		
80	Fishery operatives are regularly involved in the collection and recording of relevant catch, discard and other information.		MRAG Longline Fishery Logbook Guidance Document.		
100	Fishery operatives assist significantly in the collection and recording of all appropriate catch, discard and other information.		SGSSI Fisheries Ordinance Observer reports		

11.2 Appendix B: Peer Review Reports

1. Peer Reviewer Biographies
2. Peer Review Report A
3. Peer Review Report B

Dr Michael Pawson

Mike Pawson recently retired as senior fisheries advisor at CEFAS, Lowestoft, after 39 years. Between 1990 and 2002 Mike led the Cefas Western demersal team, providing analytical assessments and management advice for 12 finfish stocks. Mike was chairman of the ICES Southern Shelf Demersal Stock Assessment Working Group (1996-98), Seabass Study Group (2000-04) and Elasmobranch Study Group (2001-02). Mike has provided scientific evaluation, quality assurance and advice to several national and EC-funded projects on fisheries biology, monitoring and assessment, and one of his major roles over the last 15 years has been peer-reviewing scientific papers. All of Mike's work has been published in refereed Journals, in ICES and EC working group reports, and in contract reports.

Indrani Lutchman

Indrani Lutchman is the Head of IEEP's Sustainable Fisheries Programme, which focuses on tracking progress on the implementation of the EU Common Fisheries Policy. She is a marine biologist and fisheries scientist with over 17 years experience in designing and managing projects relating to Europe, the Caribbean, Antarctic and the United Kingdom that have contributed to the development of a range of policies, international treaties and multilateral environmental agreements (MEAs). She has extensive knowledge of and experience of working at a diplomatic level, within regional fisheries organisations, NGO networks and with the fishing industry. She has successfully led multinational policy research and interdisciplinary teams that delivered concrete results on global and regional levels. Her expertise covers diverse aspects of fisheries and environmental policies and includes both desk-based research as well as the provision of strategic and political advice.

11.2.1 Peer Review Report A

General comments:

I believe that the report is comprehensive in its coverage of all the relevant aspects of the fishery and that the information presented in the main report and the scoring table is largely accurate and the interpretation of the information is also correct in most cases.

In most, if not all cases, the information in the main report and in the scoring table is supportive of the score applied. I have highlighted the cases where I feel that there is not enough information or the information is insufficient in support of the score, or there is misinterpretation of information (see attached).

In a number of instances there is a simple repeat of the text in the indicators and guideposts in the section on comments and this is not helpful. What is required under comments is more detailed information in support of the score applied.

MML response: This is intentional. The conclusion of the scoring comment is based upon the guidepost that nearest reflects the Assessment Team score.

I think it is important to consult the environmental NGOs as part of the stakeholder consultation process as they can provide some useful input and additional scrutiny, albeit from an environmental angle.

MML response: During the MSC fishery assessment process it is the responsibility of stakeholders, and therefore environmental NGOs, to contribute. Initially the commencement of the re assessment and call for information is published. Stakeholders can also request a meeting with the Assessment Team during the site visit or making submissions. Stakeholders can also respond to the stakeholder consultation report. These opportunities are published on the MSC website and also circulated via email from MML to stakeholders that have expressed an interest in the assessment. The environmental NGOs have not to date made a contribution.

	Reference in report or scoring comment table	Peer reviewers comments
PR1:1.	1.3.	Have there been meetings with CCAMLR (e.g., chair of Scientific Committee or the Ex Secretary) to get their perspective. Also was there a meeting with the NGOs, e.g., the coalition NGO, ASOC?
	MML and Assessment Team response:	The site visit, when stakeholders were able to meet the assessment team, was announced via www.MSC.org and via an email from MML to stakeholders that have noted their interest in the assessment. The stage after peer review is to post the draft report on the MSC website to allow stakeholders to comment. CCAMLR papers were reviewed. NGOs did not approach the Assessment Team
PR1:2.	1.3	Comment on References: There are a lot of old references listed. Very few post 2005.

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	<p>Also see response to PR2.2</p> <p>The references represent those used for this assessment. More weight was given to more recent research where relevant (e.g. stock status) and we are not aware of any important research which is missing.</p> <p>The references that are 2005 and later comprise 29 of the 85 references consulted; over a third. For an area with no major research centres and universities, and very high logistic costs for field research, 29 new papers in three years is not bad. Moreover, there was a major push to get all the information on the general population dynamics, stock structure, and descriptive ecology of the region into the literature before the first certification review. To the fullest extent possible all the background and accumulated information was therefore already in print pre 2004, and there has been no cause to repeat nor sufficient incremental information to update and reissue much of that work. The new publications are on considerations like trophic relationships, habitat features, etc – often work conducted in response to conditions issued in the first certification. This literature is covered pretty thoroughly, I think.</p>
PR1:3.	2.4	You refer to ongoing research but the reference given is 1997. Has there been more recent research in this in area. Although I accept that the report goes on to give more information on work underway. What about the work on Vulnerable Marine Ecosystems (VME)?
	MML and Assessment Team response:	<p>Additional references given as examples of the research being undertaken. This is not intended to be an exhaustive list, as the referee notes, more details are given throughout the report. Further information on VME research has been added.</p> <p>The Rogers publications are the most current information on VMEs in the area, and they are in the list of references consulted.</p>
PR1:4.		Clarification: With reference to the involvement of MRAG in relation to the fishery, I assume that you meant that MRAG is involved in the management of the fishery, not the fishery itself.
	MML and Assessment Team response:	MRAG provides scientific and technical support to the management agencies, CCAMLR (assessment body) etc. MRAG is not actually engaged in the management of the fishery, that is done by the Commissioner and the fisheries enforcement authorities.
PR1:5.	1.1.1.3	Is the major part of the geographical range of the stock which is estimated, documented and kept under review or is the complete geographical range that is estimated etc?
	MML and Assessment Team response:	The table text has been revised to better support the score.
PR1:6.	1.1.1.7	In the first sentence of the comments, there is a suggestion that there is uncertainty associated with the environmental factors affect mortality. This is contradictory to the score given and associated criterion (see the text for the indicator 80 and above).
	MML and Assessment Team response:	Text has been changed to better reflect the score.

	Reference in report or scoring comment table	Peer reviewers comments
PR1:7.	1.1.4.1.	Clarification: The TAC is set before each season by CCAMLR and is revised higher or lower depending on scientific advice of WG FSA and Scientific Committee, not necessarily, 'easily' Again the final paragraph is simply a repeat of the text under the indicators (criteria) – there should be more information supporting this score.
	MML and Assessment Team response:	It is intended that the final paragraph of the scoring commentary should reflect the scoring indicator that best matches the score given. In this case the final paragraph is the 100 scoring text but with small changes made to reflect the fact that the score was 95. Text has been changed to better reflect the score.
PR1:8.	1.1.4.2	The information provided does not support the score, specifically for this species.
	MML and Assessment Team response:	Beyond repeating the rule itself in the scoring table, it is difficult to see what more information could be provided.
PR1:9.	1.1.6.1	More information to support the score should be provided.
	MML and Assessment Team response:	Some more text has been added and the report provides more detail.
PR1:10.	1.3.11-1.3.1.2	More information needs to be provided to support the score.
	MML and Assessment Team response:	An amendment has been made to the text. There is also more information in the report. However, we are a little concerned that this repeats issues scored elsewhere (such as the SSB relative to the unexploited state). These criteria capture other issues with respect to stock structure that might arise and the score reflects that the level of research and monitoring, having uncovered no such issues, have reduce the risks with respect to these criteria.
PR1:11.	2.1.1.1`	Is there any information from the VMEs work of the Bioregionalisation work which could be added here?
	MML and Assessment Team response:	Additional text added to the scoring comment table
PR1:12.	2.1.2.2	Have the consequences of discarding and slippage been evaluated? Please provide reference and information to support this.
	MML and Assessment Team response:	As noted, effects have been examined for rays, but not for grenadiers, hence the score given. Additional text has been added to note that measurements are taken by observers as per the observer manual, thereby making it clear that some aspects of the 100 SG have been met.
PR1:13.	2.1.2.4-2.1.2.5	More information required to support the score. Or at least some further information in support of the point made in 2.1.2.4 for example which says that the 'there is sufficient information to indicate whether collection of bait causes significant conservation problems'.
	MML and Assessment Team response:	Further text has been added – catches of the species subsequently used as bait would be recorded in the target fisheries and accounted for in assessments and management. Have clarified that the final sentences within each section are a judgement based upon the text within that section, using 'therefore'.

	Reference in report or scoring comment table	Peer reviewers comments
PR1:14.	2.1.5.4	I think that the information in support of the score may be misleading, for example, 'The species brought up on the longline are noted by the observers. These data do not suggest major impacts on biodiversity'. The quantification of biodiversity and the acceptable tested limits have only been done through modelling studies!
	MML and Assessment Team response:	Further text has been added to clarify – information from observers provides information on vulnerable species, while existing modelling and the work on VMEs performed provide further support. It is noted that the second reviewer (PR2) also queried this score. Please refer to those comments and response.
PR1:15.	3A.3.3	I think that this could be misleading. CCAMLR does not make any comment on the management performance of any authority e.g. the management performance of the GSGSSI. It may do so indirectly through the support of the survey work and reflected in increases in quotas etc.
	MML and Assessment Team response:	The text has been adapted to make the nuances clearer.
PR1:16.	3A.3.5.	I think that the information is accurate about the types and levels of consultation. However, I think that the consultation at the CCAMLR level does not mean that the NGOs, for example, have scrutinised or been consulted on the South Georgia management system or subsequent implementation of the measures, so this should not be misrepresented.
	MML and Assessment Team response:	The text in 3.A.3.5 explains the process, and text added to acknowledge that Environmental NGOs (ENGOS) have trouble getting to SGSSI for the consultation meetings. ENGO satisfaction with the CCAMLR could be raised during the annual MSC surveillance audits.
PR1:17.	3A.3.6.	CCAMLR's dispute mechanism is an appropriate mechanism but there is limited evidence to support the point that this has been tested and used in dispute resolutions of varying magnitude.
	MML and Assessment Team response:	Additional text has been added.

11.2.2 Peer Review Report B

General comments:

I have no problem with the overall assessment, recommending that the South Georgia Patagonian Toothfish Longline Fishery be certified according to the Marine Stewardship Council Principles and Criteria for Sustainable Fisheries. However, I find the information presented in the report to lack detail that would help to verify some statements and claims, though more is included in the scoring comments. This may be because the current assessment follows a previous assessment, where such information is presented in greater detail, but I consider that reviewers, customers and stakeholders would benefit from a more comprehensive account here (without recourse to other material). Achieving this may entail repetition of sections from the previous assessment, but these should be updated to show improvements in knowledge and in particular to compare estimates and predictions of stock status between assessments (i.e. is there consistency, and is management working).

	Reference in report or scoring comment table	Peer reviewers comments
PR2:1.	1.1 The fishery proposed for certification: stock	It would be useful here to outline the boundaries within which the South Georgia Patagonian toothfish population is considered to be a separate stock. See point 18.
	MML and Assessment Team response:	A map is provided as Figure 1, and the caption has been amended addressing this point. The boundaries of the stock are defined as within Area 48.3. Precise distribution of the stock is unknown, but would be extrapolated from the bathymetry and experience with fishing catch rates.
PR2:2.	1.3 Information sources used. Published information and unpublished reports used during the assessment	There are many references given in the following text that are not included in the reference list. Please check that this is not a formatting problem.
	MML and Assessment Team response:	Accepted. All references made in the report have been cross checked.
PR2:3.	2.1 Biology of the Target Species:	The statement that the species' life history is reasonably well understood for a deep water species is too vague, and begs the question how much further research is necessary to improve understanding of the distribution of toothfish by sex, size and age, growth and natural mortality rates, and the position of the species in the food web and ecosystem, to the level required for robust science-based management.
	MML and Assessment Team response:	The degree to which further research is “necessary” largely depends on the fishing intensity. Research is an on going process not a fixed point to be attained. The point being made in the report is that data are being collected and this process is proceeding. The fact that the life history information is adequate for the current stock assessment model is made in the appropriate place. In the opinion of the assessment team, research is already adequate for “robust science-based management” otherwise the fishery would not have met the MSC criteria.
PR2:4.	2.1 Biology of the Target Species:	It would be useful to summarise the results of the mark-recapture experiments (where executed, recapture rates, what opportunity to recapture outside the area) that have been used to help identify stock structure. What is considered to be “significant” leakage?

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	Text in the report has been amended with a more information on the tagging programme. It is outside the scope of this report to present a technical discussion on the treatment of these data. Full information can be found in the references given
PR2:5.	2.1 Biology of the Target Species:	Why is longline CPUE more likely to remain correlated with fish density under a wide range of circumstances than with other gears (if this is what you mean)? Surely, soak time, bait removal and hook saturation can all limit cpue at higher fish densities.
	MML and Assessment Team response:	The gear is passive, but usually laid in patterns to search for fish. At least theoretically it has attributes to monitor stock abundance as long as enough hooks are set. Local saturation of hooks (i.e. fish aggregation) does not generally happen (such aggregation would encourage the fishery to use an alternative gear) and would lead to an underestimate of stock abundance (i.e. is precautionary).
PR2:6.	2.1 Biology of the Target Species:	You suggest that tagging provides information on growth, mortality and population size that can be used to improve the stock assessment. Depending on recapture rates and whether the tagged fish are representative of the stock (which are not given), there are several uncertainties associated with such quantitative estimates from tagging studies. It would be useful to have a (brief) explanation of how this is being achieved, and also how the tagging data provide a check on the CPUE abundance trends.
	MML and Assessment Team response:	A technical discussion of the tagging programme is outside the scope of this report. Information from tagging is used and appears appropriate. It is used directly in the CASAL assessment model. The use of these data is reviewed by CCAMLR. Some text has been added clarifying these issues. See comment PR2.4.
PR2:7.	2.1 Biology of the Target Species:	Given that the results of the fishery-independent surveys will in future be included (as a recruitment tuning index) in the stock assessment, it would be useful here to know what gear is used, where and when, and whether there has been continuity between the Russian etc and UK survey time series. See point PR2.20.
	MML and Assessment Team response:	This text in the report was based on discussions with the fishery scientists and followed up a minor issue from the previous MSC certification. However, while an intention to use these data was expressed, we have no real evidence that any additional survey data will be used. This information is not relevant to the scoring and is confusing, so the paragraph has been removed.
PR2:8.	2.2 History of the Fishery	I suggest including a table or graph showing historic catches in the SGSSI toothfish fishery (both legal and IUU estimates) at this stage, to better appreciate the effect that earlier catches may have had on the stock. Similarly, information about the number of vessels operating each year, and the seasonality of the fishery, is lacking (note point 28).
	MML and Assessment Team response:	Information from the last surveillance audit report has been updated and added in Section 2.2.

	Reference in report or scoring comment table	Peer reviewers comments
PR2:9.	2.3 Fishing Locations and Administrative Boundaries	You say that, previously, catch rates were lower in the fishery outside the SGSSI MZ, but still within sub-area 48.3, and effort there recently declined to near zero. Was this in response to management, or to falling CPUE? Does it indicate a contracting stock (in which case, CPUE within the SGSSI MZ might suggest a higher than actual stock abundance)?
	MML and Assessment Team response:	There was no information on why effort has decreased. The reasons for fishing effort changes in the Southern Ocean are often logistical and taken for commercial reasons. If the stock was contracting so that CPUE would not reflect stock abundance, there would be expected to see a contraction in effort within as well as outside the SGSSI MZ, which as far as we are aware has not been observed.
PR2:10.	2.4 Ecosystem Characteristics:	If not earlier, a glossary of abbreviations and acronyms, and who they are, is required here.
	MML and Assessment Team response:	Accepted and glossary added to report
PR2:11.	3.2 Management Responsibilities and Interactions	You note that the same experts from MRAG and BAS provide scientific advice to SGSSI officers and the Polar region Section of the Overseas Territories and are active in CCAMLR and its expert groups. This is a strength, but also raises the question of where peer review of assessments etc is coming from? See point PR2.33.

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	<p>This is a common concern in any institutional peer review and advisory process. The experts doing the assessment essentially always participate in whatever expert group does the peer review and provides the scientific advice. This is true for assessments in Europe (ICES assessment WGs), the US (SSCs of the Regional Management Panels), Canada (CSAS), and RFMOs like NAFO, ICCAT, etc. The process could be criticised as this arrangement lacks independence, but all these bodies have developed protocols for ensuring that every assessment is examined in detail by experts who had no involvement in the conduct and interpretation of the analyses. Moreover, everyone I know who participates in such processes considers the collective and challenge-format review of assessments and advice in the WG settings to be far more rigorous (and exhausting) than the journal practice of looking for 2 or 3 anonymous experts to provide written comments with no dialogue between reviewer and author. I suppose if you wish a sentence could be added to the section saying that the CCAMLR practices are best practices for assessments, but it hardly seems necessary.</p> <p>Technical issues (of which there are many, such as that raised in PR 2.9) are discussed at the various CCAMLR scientific meetings. The discussion is documented and made available as the various CCAMLR reports. Within the context the MSC certification this is at least an internal review process. Clearly, the assessment and review will tend to draw predominantly on the knowledge of a few experts, although the numbers at these and other CCAMLR meetings are highly diverse. This should avoid gross errors of judgement or prejudice should be prevented, or at least attention would be drawn to them through the process. This level of review, while not necessarily at the very highest, probably exceeds most fisheries.</p>
PR2:12.	4.1 Monitoring of Stock Status	Since various assessment models have been used to assess the SGSSI toothfish stock, it would be instructive to know whether the stock profile (at least in terms of SSB and F trends) has changed over the last few years depending on the assessment model used, i.e. was advice 4-5 years ago given on the same basis as currently using a single CASAL assessment model?
	MML and Assessment Team response:	The assessment approach has changed from what was essentially a potential yield estimate to an age structured stock assessment. Primarily this has become possible due to the availability of age data. The management advice (i.e. the TAC) has not changed much, but real time monitoring has improved as the stock size approaches its target reference point. Now that a stock assessment is being undertaken, comparisons such as that described here, and other diagnostics such as retrospective analyses, become meaningful.

	Reference in report or scoring comment table	Peer reviewers comments
PR2:13.	4.1 Monitoring of Stock Status	You note that development of the new model includes identifying suitable values of recruitment variability to be used in projections (which suggest that the model does not utilise an SSB:R relationship); and including sexual dimorphism (in growth? age at maturity?) within the model. However, the only output presented is Figure 2, showing historic and projected biomass dynamics for a constant future yield over 35 years. As suggested above, it would be informative to include a summary of the latest assessment's output in terms of historic biomass and F trends. Lacking knowledge of past catch levels, the projection suggests that the stock will show a slowing decline at a constant annual yield of 3920 t, which implies increased recruitment with lower SSBs, higher growth rates or survival or some other biological effect. Is there any basis for such a compensatory mechanism?
	MML and Assessment Team response:	The reviewer is correct that there is effectively no SSB:R function (i.e. the asymptote of the Beverton and Holt SSB:R). The slow approach to a fixed annual yield implies the stock is moving toward its fully exploited state. This does not require a compensatory mechanism, only that the stock has fewer and fewer cohorts which have experienced lower levels of fishing.
PR2:14.	4.2 Current Stock Status	You report that the latest assessment indicates that the stock is well above its biomass target reference point, but have so far failed to explain what this is or how it was set. Under 4.3 Management Advice, you state that the general strategy is to allow the exploitation rate to increase slowly over time towards a precautionary spawning biomass of 50% of the unexploited level, but how is this estimated? To claim that the strategy should guarantee that the fishery is sustainable, as long as there is no fishing beyond the TAC (probably OK) and the stock assessment is accurate, rather overlooks the implausibility of the latter (and no validation thereof to date).
	MML and Assessment Team response:	The reference points defined a separate points estimates by CCAMLR, but form part of a decision rule. The assessment team were required to apply a re-interpretation of this so that the fishery can be score using the MSC methodology. "50% of the unexploited level" is estimated as in all stock assessments from fitting an appropriate model to the available data. Some data are more critical than others, for example it usually needs to be assumed that the state of the stock at the beginning of the time series is known (e.g. it is unexploited as in this case), but can also be inferred from growth and mortality models. The key issue convincing the assessment team that the exploitation is sustainable is the relatively low fishing mortality resulting from the decision rule which will lead to slow decrease in stock size. Because the decrease is slow and monitoring is frequent, there should be timely and effective feedback control, which is primarily what is being sought in sustainable management.

	Reference in report or scoring comment table	Peer reviewers comments
PR2:15.	4.3 Management Advice	Since the integrity of the SGSSI stock is an important element of the MSC assessment, it would be useful if the report included a summary of the tagging and genetic evidence that it is discrete and does not mix with other populations outside the SGSSI jurisdiction and therefore can be managed separately (see point 4). This is also relevant to 1.1.1.3 Is the geographical range of the target stock known and any seasonal migration described?
	MML and Assessment Team response:	See comment PR2.4. Some more information has been added, but technical treatment is not appropriate in this report. References are provided.
PR2:16.	LIMIT OF IDENTIFICATION OF LANDINGS	If the fishery lands toothfish as trunks, cheeks and collars, are yields calculated as live weight?
	MML and Assessment Team response:	Correct; each fishing vessel has a conversion value as determined by the observer.
PR2:17.	1.1.1.2 Is the life history of the species understood and the spawning and nursery areas described?	<p>If there is good information on the species' life history and on the parameters needed for population models and stock assessment, why is this not presented in the report? Information on juvenile abundance and distribution from surveys would be also useful.</p> <p>You say that the extent of predation on toothfish is taken into account in modelling. Do you mean in the assessment or Ecopath, and is the latter used in giving management advice?</p> <p>If spawning behaviour is known and nursery areas sufficiently well described to support spatial and management measures, this information should be presented in the report.</p>
	MML and Assessment Team response:	<p>This information is available in succinct form in the references provided. It is not appropriate to repeat this information in this report, as this report is not a technical review. While information on juvenile abundance and distribution is of interest, it is not directly relevant to scoring. Additional information on issues which are not critical to the management of this stock.</p> <p>The language used indicates that the scoring guidelines have been met. "Sufficient" implies more is not required. No special predation issues are identified for toothfish, and predation is taken into account through the natural mortality estimate. Similarly, no special issues arise between the distribution of fishing effort and stock structure (which is closely monitored), again implying that knowledge, while incomplete is sufficient.</p>
PR2:18.	1.1.1.5 Is there an understanding of the relationship of recruitment to parental stock?	You suggest that determination of the stock recruitment relationship is precluded by the high biomass of the stock, but Fig. 2 shows biomass declining by 40% since late 1980s. It would be useful to see the time series of stock size and recruitment, and to know how indices of recruitment and spawning stock have been validated as "adequate".

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	The time series of actual data is still very short. The biomass was back calculated to provide a best guess. This requires an estimate of average recruitment rather than actual annual recruitments. It is unlikely that recruitment will be accurate, but this is offset by the precautionary management for which the current assessment, in the opinion of the team, is adequate.
PR2:19.	1.1.1.6 Is information collected on the abundance/density of the stock?	It would be nice to be able to judge the utility of data collected by research surveys in providing a recruitment index (though I can't see any use for the index of adult stock at depths <400 m). It's good to know that biomass results are generally consistent between surveys and are considered statistically rigorous and robust. See comments at PR2.7.
	MML and Assessment Team response:	The surveys are not used, based on the judgement of the fisheries scientists. Looking at the survey data ourselves would be beyond the scope of this report. No technical review or data analysis was undertaken. The MSC assessment team did not attend any CCAMLR scientific meetings which would seem to be the best place to raise this issue.
PR2:20.	1.1.1.7 Is information available on environmental influences on the stock dynamics?	You state that there is knowledge of biological (prey and predators) and physical factors affecting distribution, survival and year class strength, and that factors causing natural mortality are determined and included in ecosystem modelling. But this is not presented in the report, nor is it explained how it is used to inform the stock assessment process, particularly with respect to recruitment information. Based on information provided, therefore, it is difficult to agree that much of the information is sufficiently robust for use in the stock assessment process and in the interpretation of results of assessment models.
	MML and Assessment Team response:	<p>We agree that the report does not itself contain enough information to support this conclusion in detail, but this would require reproducing a large amount of text from a number of diffuse references. The report does outline the main pertinent information on this stock.</p> <p>Environmental influences on this stock are not strong, and therefore this is not a critical issue compared to other species (Antarctic krill for example). Research here requires proving a negative however, and the interpretation is that the current level of monitoring would pick up significant influence if it existed. However, there could be issues in the future with climate change.</p>
PR2:21.	1.1.2.2. Are fleet descriptions, fishing methods and gear types known throughout the fishery under assessment?	If “Comprehensive knowledge is recorded and regularly updated on the size and composition of the fleets during each season” why is this not presented (briefly) in the report? See point PR2.8.
	MML and Assessment Team response:	References to all information are provided, but not repeated in this report. What the size and composition of the fleets actually are is not directly relevant to the MSC assessment, whereas the fact that they are monitored is.

	Reference in report or scoring comment table	Peer reviewers comments
PR2:22.	1.1.3.1 Are there appropriate limit and target reference points based on stock biomass and/or fishing mortality?	You say that appropriate limit and target biomass reference points are used, which are justified based on biology, but that is not the case (they are generic). A mark of 85% is probably too high, since the 80% probability limit is at 20% unexploited biomass which seems rather risky. It would also be useful is to see how the stock has responded to exploitation since certification in 2004. However, comments against 1.1.4.2 deal with this well.
	MML and Assessment Team response:	The reference points are used in the context of the decision rule which simulates the population in a projection. The parameters of the population model are entirely justified based on biology. The text has been amended.
PR2:23.	1.1.5.2 Does the assessment take into account major uncertainties in data and have assumptions been evaluated?	I'm surprised that uncertainties about population age structure are not taken into account in the assessment, since this seems to be well sampled and is an important element of sustainability.
	MML and Assessment Team response:	This is referring to the assumption that uncertainty stems mainly from recruitment. As is common in statistical age structured models, there is a mismatch between all data sources (age and length composition and abundance information). These other sources of error, understandably, are not accounted for in projections, but are during the model fitting.
PR2:24.	1.3.1.2 Does information indicate any changes in structure that would alter reproductive capacity?	If there are strong indications of a robust age, sex and genetic structure in the stock, such as would maintain reproductive capacity, why are these not presented as evidence in the report?
	MML and Assessment Team response:	This information has been presented, albeit superficially, in terms of SSB estimates and descriptions in the text. There is no evidence of sharp declines in females, males of older fish (SSB). The available information suggests that it is a single stock and as long as SSB is maintained relatively high, genetic structure should remain unaffected.
PR2:25.	2.1.1.1 Are the nature, sensitivity and distribution of habitats relevant to the fishing operations known?	In view of the comments against this criterion, a mark of 85 seems rather low.
	MML and Assessment Team response:	The score of 85 is justified, since detailed information of 'all habitats' is not available yet. The fishery fully meets the 80 criterion, and goes further in terms of the time series of VMS data. Further text has been added to provide clarity.
PR2:26.	2.1.1.2. Is information available on the trophic position, status and relationships of the target species within the food web?	However, a mark of 85, supported by the claim that appropriate information is available on the position, relationships and importance of target species in the food web at key life stages, including quantitative modelling outputs, seems too high here, given the uncertainties mentioned, and in view of the perceived need for ongoing research .

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	The score of 85 appears justified, since appropriate information is available on the position, relationships and importance of target species in the food web at key life stages (both juveniles and adults), as detailed in the text. To justify this further, text has been added on the CEMP program which provides information on predator-prey interactions. This fulfils the SG80 requirements. As some of this information is quantitative (but as the reviewer notes, not all), elements of the SG100 text is achieved.
PR2:27.	2.1.2.4 Are the effects of supply and use of bait known?	Is Namibian hake or horse mackerel used as bait?
	MML and Assessment Team response:	It is Namibian horse mackerel – this error has been changed in the text.
PR2:28.	2.1.3.1 Is there adequate knowledge of the physical impacts on the habitat due to use of gear?	This is the first mention of “a typical season in which 14 vessels fished for 100 days each”, see point PR2.8.
	MML and Assessment Team response:	Dealt with in PR2.8
PR2:29.	2.1.3.2 Is any gear lost during fishing operations and can ‘ghost fishing’ occur?	If “all gear losses are recorded by observers and their location noted”, why are no data on loss rates presented (in answer to this question)?
	MML and Assessment Team response:	The certification report is not intended to present all information on the fishery, but to set out the essential features. The assessment team are assured on the recording of information and the evaluation of its consequence.
PR2:30.	2.1.5.2 Does the mortality of non-target stocks have unacceptable impacts on the populations concerned and/or ecosystem structure and function?	Given the criteria, I suggest that a mark < 80, is indicated, since mortality levels of most by-catch species are not known in relation to population abundance - just catch.
	MML and Assessment Team response:	We felt that the score of 80 was justified, given that assessments of the key bycatch species of concern – rays – have been performed, and the level of catch of grenadiers would require a biologically unrealistic vulnerability level to prove an issue for the population. This is noted in the text, along with the fact that additional research is already underway and will be reviewed (and the score potentially adjusted) in future audits. The information available therefore meets the SG80 requirements, but no more.
PR2:31.	2.1.5.4 Are associated biological diversity, community structure and productivity affected to unacceptable levels?	Given the uncertainties expressed in 2.1.5.2, it is rather courageous to suggest that “the effects of the fishery on biological diversity, community structure and productivity have been quantified. Though the TAC is probably sufficiently precautionary to prevent any unacceptable impacts, a mark of 90 seems too high in light of the scoring criteria.

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	This was also commented upon by the other peer reviewer. Uncertainties in the Ecopath modelling and ecosystem knowledge are noted, although quantification has been performed through this and related modelling. The rationale for scoring 90 was that this modelling met half of the SG100 requirements (limits not having been instigated). However, while modelling has been performed, given the uncertainties the score has been reduced to 85 to reflect this.
PR2:32.	2.2.1.1. Is there information on the presence and populations of protected, endangered or threatened (PET) species?	It is not my area of expertise, but was there really no cetacean and only one seal mortality in the <u>whole of the southern ocean</u> (in which year? due to what?)?
	MML and Assessment Team response:	Text has been modified to clarify – no mortalities have been noted in subarea 48.3, and one mortality of a cetacean and seal have been noted in toothfish longline fisheries as a whole across the southern ocean. Further reference added.
PR2:33.	3A.1.4 Is the management system subject to external review?	There may be proposals for an external review, but you note that GSGSSI has no external review system, and a mark of <80 is therefore indicated.
	MML and Assessment Team response:	<p>The external review is of the assessment and the scientific basis for the management strategy and harvest rules, not for the management system itself. I don't know of any jurisdictions where the government that conducts the fishery management has to submit itself to external review.</p> <p>It is possible that the peer reviewer is referring to an external review of CCAMLR that had not yet happened. However, the entire process for conducting the external review was in place and reviewed by the assessment team. The funding was secure and there indications that qualified experts are willing to do the review under the revised conditions and were planning to bid. The schedule for the review was such that before the certification came into force, the review would have been done. The scoring is appropriate/</p>
PR2:34.	3A.3.4 Do procedures enable a precautionary approach in the absence of sufficient information?	Though the South Georgia toothfish fishery is now classed as an “assessed” fishery, it should not be inferred that to retain a precautionary approach to management is a bonus. Even when assessments are robust, it is important to avoid with a high probability exploitation levels that may put the stock at risk, as you say below.

	Reference in report or scoring comment table	Peer reviewers comments
	MML and Assessment Team response:	The assessment team concluded that it is not just that the fishery assessment was shown to be “robust” – in the sense that the assessment is unlikely to be biased or substantially less precise than expected by CCAMLR (and GSGSSI). It is that the harvest control rule being used by CCAMLR in its advice to GSGSSI that was shown to be robust along with likely levels of variation in recruitment and somatic growth, uncertainty about plausible future states of nature, and plausible management errors. The level of risk aversion being exercised in management is considered appropriately precautionary, as long as the harvest control rule producing the current, sustainable exploitations is maintained. Any departure from the use of the harvest control rule would be detected in the annual surveillance audit of the fishery.
PR2:35.	3A.7.1 Are measures in place to address (avoid or minimise) significant environmental impacts?	You state here that toothfish are a major predator in the Southern Oceans , whereas in 2.1.5.1. you said that “toothfish are not considered to be a key component of the South Georgia ecosystem”. Are these statements compatible?
	MML and Assessment Team response:	The reviewer is correct that the statements are difficult to reconcile. The difficulty is a result of each one being possibly too terse. I have proposed expanded wording for 2.1.5.1 and an additional phrase to 3A.7.1 as well. The additional wording should remove the apparent inconsistency, and make the assessment teams intended meanings in both generalizations clearer to readers/ No revision is scoring is needed.
PR2:36.	3A.8.1 Are information, instruction and/or training provided to fishery operatives in the aims and methods of the management system?	Given the scoring criteria, without evidence of training, even a mark of 80 seems generous
	MML and Assessment Team response:	The information given to skippers, in both paper format and a verbal briefing during the pre licensing inspection, is extensive and detailed. Skippers are responsible for the behaviours of the crew under their command. Observers are able to witness these behaviours although their role is not one of enforcement. There is also the annual meeting where fishing companies can meet with GSGSSI. Text has been added (and expanded very slightly 3A,8,1
PR2:37.	3B.3.1 Does the fishery employ destructive fishing practices (such as poisons or explosives)?	You state that the fishery does not employ destructive fishing practices; enforcement is considered sufficient to prevent their use; there is a code of conduct for responsible fishing prohibiting these, and this is supported by fishers. So why a mark of 90, and not 100?
	MML and Assessment Team response:	The peer reviewer comments are accepted and the score raised to 100

	Reference in report or scoring comment table	Peer reviewers comments
PR2:38.	7.1 Certification recommendation	Thought there could be small changes to marks in response to peer review comments, the result is unlikely to undermine the recommendation that the South Georgia Patagonian Toothfish Longline Fishery be certified according to the MSC Principles and Criteria for Sustainable Fisheries. However, there are a number of research initiatives (toothfish biology, ecosystem and stock assessment modelling, etc) that are relevant to the scientific advice given for management. Their progress should be kept under review, and reported (if briefly) within a timescale that is commensurate with possible exploitation impacts of the SGSSI fishery.
	MML and Assessment Team response:	The annual surveillance audits, a component of MSC certification, will review the progress made in toothfish biology, ecosystem and stock assessment modelling, etc.

11.3 Appendix C: Client Action Plan – Not Applicable

The fishery did not receive any conditions. None the less GSGSSI asked for the opportunity to pledge a continued commitment to the fishery. The following was received by Moody Marine:

MSC Certification: South Georgia Client Action Plan

The Government of South Georgia and South Sandwich Islands welcome that there are no conditions associated with the certification of the Toothfish fishery at South Georgia and therefore no requirement for a Client Action Plan.

GSGSSI remains committed to improving all aspects of the toothfish fishery and will continue with an extensive programme of scientific work in order to support management of the fishery over the next 5 years. Some of the key areas include:

- updates of the toothfish assessment
- toothfish ecology
- impacts of longlines on by-catch
- impacts of longlines on benthic habitats

In addition to continued research, GSGSSI will continue to patrol the SGMZ at regular intervals. We will continue to report on the progress of this work at our surveillance visits.

Dr Martin Collins
Director of Fisheries
June 9th 2009

11.4 Appendix D: Stakeholder Comments

No comments were received from stakeholders during the 30 consultation period.

11.5 Appendix E: Client Group

The Government of South Georgia and South Sandwich Islands are the client for the South Georgia Patagonian Toothfish longline fishery. GSGSSI issue fishing licences on an annual basis to allow fishing for that annual campaign. At the time of the site visit in July 2008 the following fishing vessels were licensed for the 08/09 campaign.

1. Argos Helena
2. Argos Georgia
3. Argos Froyanes
4. Jacqueline
5. San Aspiring
6. Antarctic Bay
7. Insung 22
8. Koryo Maru 11
9. Viking Bay
10. Ross Star
11. Tronio.