Surveillance Report
South Georgia Patagonian Toothfish Longline Fishery

Certificate No.: **MML-FC-003**

Moody Marine Ltd.
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Author(s): J Rice, J Cooper, P Medley, A Hough

Moody Marine Ltd.
Moody International Certification
Salisbury House
Stephenson's Way
Wyvern Business Park
Derby. DE 21 6LY
UK
Tel: +44 (0) 870 7529002
Fax: +44 (0) 1332 675152

1.0 GENERAL INFORMATION

Scope against which the surveillance is undertaken:

MSC Principles and Criteria for Sustainable Fishing as applied to South Georgia Patagonian Toothfish Longline Fishery

Species: Patagonian Toothfish *Dissostichus eleginoides*

Area: 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) 200 nm Maritime Zone. The fishery falls within CCAMLR sub-area 48.3

Method of capture: Bottom-set longlines.

Date of Surveillance Visit:	**GSGSSI: 18-22 September 2006** **MRAG: 23 August 2006** **Additional Information required for audit: Supplied 17 January 2007**			
Initial Certification	**Date: 22 March 04**		**Certificate Ref: MML-FC-003**	
Surveillance stage	**1st**	**2nd**	**3rd**	**4th**
Surveillance team:	**Lead Assessor:** **A Hough** **Assessor(s):** **J Rice, J Cooper, P Medley**			
Company Name: **Address:**	Government of South Georgia and the South Sandwich Islands Government House Stanley Falkland Islands FIQQ 1ZZ			
Contact	**Director of Fisheries**			
Tel No: **Fax No:** **E-mail address:**	+500 27433 + 500 27434 Harriet.Hall@fco.gov.uk			

2.0 RESULTS, CONCLUSIONS AND RECOMMENDATIONS

This report contains the findings of the third surveillance cycle in relation to this fishery. Many findings relate to compliance with the Conditions of Certification set out in the certification report. This evaluation includes, where conditions are judged to be met, a re-evaluation of the scoring allocated to the relevant Performance Indicators in the original MSC assessment.

This report also addresses the overall ongoing operation of the fishery in relation to the MSC Principles and Criteria. As conditions are closed out (i.e. actions are completed), the assessment focus will concentrate on the overall ongoing operation of the fishery in relation to the MSC Principles and Criteria.

The status of the Conditions of Certification as of May 2006 was as below.

Condition 1: Annual surveillance to continue. The first aspect of this condition, reviewing assessment methodologies, catch limits and catches in relation to sustainability of the population to continue (as for all certified fisheries). Second aspect is being or has been addressed through other conditions below.
Condition 2: The initial requirements of this condition are met. However, tagging studies continue and the results of these studies will continue to be monitored and reported.
Condition 3: This is an ongoing requirement to maintain Monitoring, Control and Surveillance at levels established in 2002/03. This condition will therefore not be closed out.
Condition 4: This will continue to be monitored as the study progresses, expected to be closed out in 2008.
Condition 5: This condition was met and closed out in 2005. Monitoring of compliance with, and updating of, the plan will now form part of the review of the overall management system.
Condition 6: This condition was met and closed out in 2005
Condition 7: This condition was met and closed out in 2005
Condition 8: This condition was met and closed out in 2006.
Condition 9: This Condition is not completed and is to be the subject of development of a research plan and the implementation thereof.
Condition 10: This Condition has a longer-term timescale. Work is ongoing in meeting the requirements of this Condition.

Following the previous annual surveillance audits, Conditions 5, 6, 7 and 8 have been closed. Where appropriate, issues associated with these are now considered as a part of the overall fishery management.

For each remaining condition, the report sets out the requirements of the original condition ('Activity assessed'), the most recent information provided by the fishery (the 'GSGSSI Progress Report') and the evaluation of this by the assessment team ('Observations' and 'Conclusion'). This evaluation includes a re-evaluation of the scoring allocated to the relevant Performance Indicators in the original MSC assessment. Where the requirements of a condition are met, the Performance Indicators are re-scored and if the score is 80 or more, then the condition is closed.

Information has been collected principally from the Government of South Georgia and the South Sandwich Islands (GSGSSI), their consultants, MRAG and industry representatives.

1	**Condition of Certification 1: Ongoing Surveillance**
Activity assessed	The fishery shall be subject to annual surveillance visits by Moody Marine. This surveillance will specifically include the following issues: • determining that catch limits for sub-area 48.3 continue to be set to achieve long-term management objectives that are at least as precautionary as those that are currently used when determining catch limits and that catches do not exceed catch limits by an extent that would have a long-term negative impact on the probability of sustaining the population • the planning and execution of research focussed on achieving a better understanding of the impacts of the toothfish fishery. The initial focus of this research should be as set out in the following conditions. As research into the impacts of toothfish fishing are discussed in specific detail below, this section deals with catch limits, catches and effects upon the sustainability of the affected population.
GSGSSI Progress Report	Table 1 shows the catch history for sub-area 48.3, catch levels have remained fairly stable since 2004. 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.

Season	Regulated fishery			Estimated IUU catch (tonnes)	Total removals (tonnes)	
	Reported effort (no. vessels)	*D. eleginoides*			48.3 west[1]	48.3 SGSR stock
		Catch limit (tonnes)	Reported catch (tonnes)			
1984/85	1		521	0	4	517
1985/86	1		733	0	1	732
1986/87	1		1954	0	0	1954
1987/88	2		876	0	0	876
1988/89	3		7060	144	242	6962
1989/90	1		6785	437	394	6828
1990/91	1	2500	1756	1775	0	3531
1991/92	19	3500	3809	3066	11	6864
1992/93	18	3350	3020	4019	0	7039
1993/94	4	1300	658	4780	193	5245
1994/95	13	2800	3371	1674	74	4971
1995/96	13	4000	3602	0	66	3536
1996/97	10	5000	3812	0	0	3812
1997/98	9	3300	3201	146	4	3343
1998/99	12	3500	3636	667	2	4301
1999/00	17	5310	4904	1015	9	5910
2000/01	16	4500	4047	196	12	4231
2001/02	17	5820	5742	3	29	5716
2002/03	19	7810	7528	0	17	7511
2003/04	16	4420	4497	0	37	4460
2004/05	8	3050	3039	23	0	3062
2005/06	10	3556	3534	0	0	3534

[1] Subarea 48.3 outside the SGSR stock area, i.e. to the west and north of the SGSR stock area.

There is some evidence that the re-direction of effort away from Shag Rocks in 2005 and 2006, together with the return to normal catch levels in 2004 after the unusual 2003 fishing season, has contributed to a slight recovery of the Shag Rocks part of the population and a stabilisation of CPUE around South Georgia.

We and CCAMLR have increasing confidence in the reliability of the toothfish assessment. Full results of the assessment for 48.3 were presented to CCAMLR in October at the WG-FSA (WG-FSA 06/53). The final assessment used a revised maturity ogive, low natural mortality (supported by analyses of the tagging data in WG-FSA-06/54) and low growth rate. The latter is supported by age determination of fish taken from the fishery, of which about 350 have been aged from each year 1999 – 2006 (WG-FSA-2006 Appendix L). The results suggested lower initial and current biomass than the assessment conducted in 2005, primarily due to a lower estimate of current population size from the tagging data (Table 2). However, sustainable catch levels were virtually unchanged. The working group undertook some analyses assuming higher levels of IUU catch in 1995 than were previously reported. These had virtually no effect on the assessment. Likelihood profiles show that the tagging data are most informative, but fits to the length frequency data and CPUE data are also good if the CPUE data are interpreted as two series (pre- and post- 1997).

Table 2 Results of the 2006 assessments.

Model	Pre-exploitation spawning stock biomass	Current spawning stock biomass	Vulnerable biomass current
2005 assessment	109	63 (B_{2005})	52 (B_{2005})
Simple update including 2006 data	97	50 (B_{2006})	45 (B_{2006})
New assessment with revised maturity ogive	103 (95% CI 96-109)	58 (B_{2006}) (95% CI 51-64)	44 (B_{2006}) (95% CI 39-51)

Results from the 2006 assessments (Table 2) also show that show that the current SSB (Bo) is now on or close to the target of 50% its unexploited level, as shown by the stock trajectories in Figure 1.

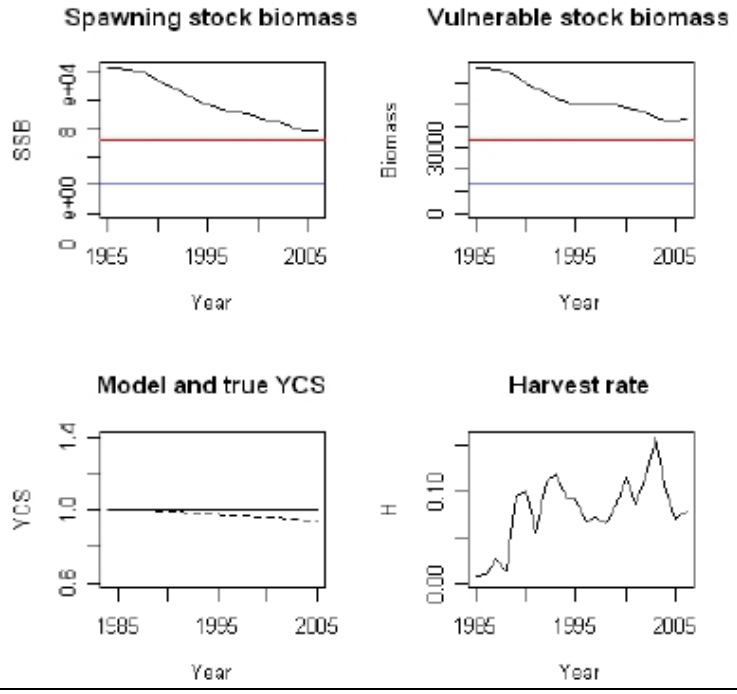


Figure 1Stock trajectories

The long term yield from this assessment was 3,554 tonnes, selected on the basis that by using this long term yield 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. Figure 2 shows a plot of the probability of depletion of the SSB below 50% using 3,554 as a long term yield between 2007 and 2042.

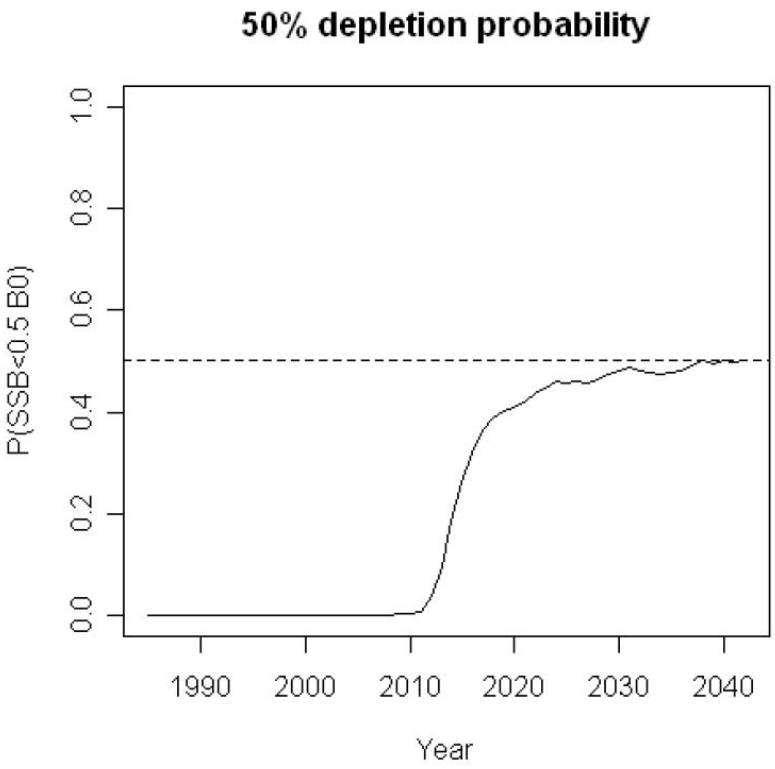


Figure 2Probability that future SSB is less than 50% of the initial unfished SSB using the long term yield of 3,554 tonnes.

Bycatch status

Catches of all bycatch species were within the TAC.

Table 3 By-catch (tonnes) reported from longline fisheries in Subarea 48.3. GRV – *Macrourus* spp., SRX – rajids.

Fishing season	GRV		SRX		Others	
	Removals	Limit	Removals	Limit	Removals	Limit
1988/89	2	*	22	*	0	*
1989/90	0	*	0	*	0	*
1990/91	9	*	26	*	0	*
1991/92	1	*	2	*	0	*
1992/93	2	*	0	*	0	*
1993/94	0	*	12	*	0	*
1994/95	13	*	98	*	11	*
1995/96	40	*	58	*	0	*
1996/97	34	*	44	*	4	*
1997/98	24	*	15	*	2	*
1998/99	21	*	19	*	1	*

1999/00	18	*	12	*	5	*
2000/01	22	*	28	*	3	*
2001/02	53	291	26	291	13	*
2002/03	75	390	38	390	19	*
2003/04	30	221	6	221	4	*
2004/05	112	152	9	152	19	*
2005/06	136	177	7	177	44	*

* None specified

The fishery caught no birds. This continues a very successful run of effective implementation of mitigation measures at South Georgia.

Table 4 Estimated by-catch of seabirds in Subarea 48.3

Fishing season	By-catch rate (birds/thousand hooks)	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

* Excluding *Argos Helena* line-weighting experiment cruise

The only vessel to discard any hooks in 48.3 in 2006 was the Protegat (FSA-2006 paragraph 7.16). This incident has been raised by GSGSSI with the vessel operators.

The amount of fishing gear in black browed albatross nests continued to decline this year, although that in wandering albatross nests did not (SC-CAMLR-XXV-BG/11). We concluded last year that there was some evidence that the declines to date had been caused by reductions in the number of hooks being discarded at South Georgia, particularly from summer IUU fishing in the early 2000s but also as a result of efforts to retain hooks in the licensed winter fishery. The hooks now being observed in nests are almost certainly being picked up by birds outside Subarea 48.3, around both South America and South Africa where there are bottom and surface longline fisheries.

An additional piece of information that has been produced on this subject in the last year is a survey of the interaction of birds and the MSC certified hake fishery in South African waters which indicated that about 5000 black browed albatross, originating mostly from South Georgia, may be killed in this fishery each year (FSA-2006 paragraph 7.30 and Appendix D paragraphs 68). The CCAMLR Fish Stock Working Group concluded that

1. the levels of incidental mortality of birds at South Georgia arising from the South Georgia longline fishery were negligible (paragraph 7.2)
2. in general terms and for all fisheries, the levels of mortality of Convention Area birds outside the Convention Area are much greater in magnitude than those reported within the Convention Area (paragraph 7.30)

This is an issue of continuing concern to South Georgia. However, to focus on the compliance with one conservation measure in 48.3 (i.e. hook discard) is clearly not be best use of research

	resources considering it's likely impact on the birds compared to other sources of mortality.
Observations	The previous Surveillance Report concluded that "*The assessment scientists have a model that is consistent with the data they believe is most reliable. The model indicates the stock is close to the target reference point. The catch quota is being set consistently with the model, taking into account the uncertainties.* *It may prove impossible to find a way to explain all observations in every time series of data. However, the work demonstrates active research and improvements in the integrated assessment proposed by CCAMLR, and increasing confidence that the stock is in a good state.* *Ongoing surveillance audits shall, of course, continue through the duration of the current certification*." The latest assessment was reviewed by the WG-FSA. The CASAL assessment, although designated as preliminary, is still used for scientific advice. There was an observed trend in residuals when fitting tagging data in the CASAL model. The alternative Argentine ASPM assessment (WG-FSA-06/59) does not use mark-recapture data, therefore was not used for management advice. It is not currently possible to assess the degree to which these assessments agree. Although the CASAL assessment method has been subject to testing and sensitivity analyses, uncertainties continue to exist. The assessment model is most sensitive to the growth curve and level of natural mortality assumed. Given a reasonable way of determining size at age, natural mortality can be estimated from the mark–recapture data being collected. This will rely on the continued collection of size and age data. The species is also significantly sexually dimorphic, demonstrated by different lengths at sexual maturity and growth parameters for males and females. It is noted that the accuracy of the assessment would improve if the model was able to take this into account. The reports indicate that the tagging model assumptions and estimated parameters are being tested. Notably, the tagging induced death rate was estimated from observations on tagged fish held in tanks. The results suggest that the assumed death rate due to tagging is reasonable and precautionary. Assessment of the sampling bias of the tagging estimate suggests that although bias is likely, it would probably lead to a greater underestimate of the stock size. Therefore as the bias is not taken into account, the scientific advice will tend to be precautionary. The development of a marine protected area system should provide further protection to the target stock and other by-catch species should it go ahead. Area closures also might also prove useful as a experimental control for monitoring ecosystem and indirect impacts on the stock. In addition, information on hook discards and fishing gear found in association with South Georgia albatrosses and giant petrels are informative and should continue to be summarized. It is also suggested that the British Antarctic Survey should include in its annual reports to CCAMLR information on recovered hook type and attachment methods, most helpfully with the inclusion of photographs of examples. Additionally, SGSSI fishing licensed vessels could deposit examples of hook type(s) and attachment method(s) to aid BAS with any analysis. As South Georgia-recovered hooks are ingested primarily in either or both South American or South African waters, then BAS could analyse its collection of hooks in an attempt to see what side of the Atlantic they mainly come from. The first question might then be to ask does the South African hake longline fishery use recognizably different hooks/attachments to the South American toothfish longline fishery.
Conclusion	The assessment scientists have a model that is consistent with the data they believe is most reliable. The model indicates the stock is close to the target reference point. The catch quota continues to be set consistently with the model, taking into account the uncertainties. There are a number of significant uncertainties, but this is normal with stock assessment. The reports demonstrate active research and improvements in the integrated assessment proposed by CCAMLR, and increasing confidence that the stock is in a healthy condition.

	Ongoing surveillance audits shall, of course, continue through the duration of the current certification.

2	**Condition of Certification 2: Confirmation of Stock Identity**
Activity assessed	Existing studies shall be reviewed and, where necessary, extended in order to demonstrate that the toothfish stock at South Georgia is sufficiently discrete that locally implemented management measures alone should be sufficient to ensure the sustainability of this stock. This is to include the following: • To review existing studies and where necessary commission supplementary new studies, on genetic characteristics of toothfish populations • To review existing studies and where necessary commission supplementary new studies, involving the tagging of toothfish to determine movement out of South Georgia into adjacent areas. Similar studies involving toothfish populations in neighbouring areas of the South Atlantic should be initiated so as to provide information on any migration into South Georgian waters On the basis of genetic and tagging studies, to examine various scenarios of mixing of adult and/or juvenile toothfish and the implications of this for the sustainability of the stock **Timescale**: Existing studies should be fully reviewed, supplementary studies identified and scheduled, and an estimation of the implications for stock sustainability carried out within 12 months of certification. Additional studies to address any areas of uncertainty should be carried out over appropriate timescales as agreed with the assessment team. The assessment of the implications of such studies for the sustainability of the stock should be reviewed as information becomes available. This will be a subject addressed during annual surveillance audits. **Relevant Performance Indicators**: 1A.3 **Note**: The words "to demonstrate" in the first sentence of Condition 2 shall be interpreted to mean that stock identification studies will be reviewed and, where necessary, extended in order to determine the degree of stock discreteness and level(s) of mixing with other populations. Ongoing certification will be considered in light of the results of these studies.
GSGSSI Progress Report	Research on the population genetic of toothfish from the Atlantic sector of the Southern ocean has continued at the BAS ANGEL (Antarctic genomics laboratory) throughout 2006. A NERC funded PhD student has continued to examine mitochondrial (12s) and micro-satellite DNA markers from toothfish obtained from both the South Georgia/Shag Rocks region (CCAMLR sub Area 48.3) and from the South Sandwich Islands (CCAMLR sub area 48.4). The results of the broad scale analysis of population structure in the Atlantic sector have now been published (Rogers *et al* 2006). The current work is addressing two areas relating the population structure of toothfish at South Georgia. Firstly the temporal stability of the genetic identity has been examined by comparing toothfish caught over a number of years in both the fishery and groundfish surveys. Secondly, a limited analysis of specimens of toothfish caught at the South Sandwich Islands has been carried out to assess the provenance of this small population. Preliminary results strongly suggest that there is no discernable inter-annual variability in the genetic identity of toothfish at South Georgia, a result that is consistent with the previous findings of both the genetics and tagging studies. Data obtained from a relatively small sample of specimens obtained from the South Sandwich Islands (<70 individuals) have indicted that the population structure is similar to but not the same as that found at South Georgia. Further specimens collected during the 2006 fishing season are yet to be analysed but results are expected by the summer of 2007. In total some 13 162 fish have been tagged in Subarea 48.3 since the program started in 2000. To date there has still been only one record of a South Georgia tagged animal being caught outside of the South Georgia management area. Fish have now mixed fairly well between all areas of South Georgia.

Table 5 Movement of animals between areas

		recapture area				
release area	Release number (2000 – 2006)	Egeorgia	NWgeorgia	Sgeorgia	shag	Wshag
Egeorgia	3144	148	6	6	1	
NWgeorgia	2129	8	75	3	4	
Sgeorgia	3145	12	6	156	1	
shag	4522	7	9	2	217	2
Wshag	222				4	1

A complete description of the tagging programme is given in Appendix L of WG-FSA-2006. This tagging programme is now an important part of the data used in the toothfish assessment.

Additionally, GSGSSI initiated a tagging programme in the South Sandwich Islands in 2006 (see WG-FSA-05/57). 2700 *D. eleginoides* were caught, 134 of which were tagged, and 10 *D. mawsoni* were caught. This programme will continue for the next two years. It will establish the extent of exchange of individuals between populations around South Georgia and the South Sandwich Islands, if any, and enable the scientific development of a sustainable management policy for the South Sandwich Islands. Note that we have not yet recovered any South Georgia tagged fish at the South Sandwich islands after two years of fishing there, and there have now been over 6000 tags released into East and South South Georgia. However, we will continue to monitor this issue.

It is hoped that the ongoing development of a fine scale ocean circulation model for the Scotia Sea and the South Georgia shelf region, currently under development at BAS as part of the Antarctic Funding Initiative (AFI) will provide a better understanding of the underlying mechanisms driving the observed patterns of population structure in the region. It is anticipated that a validated oceanographic model will be available by the end of 2007.

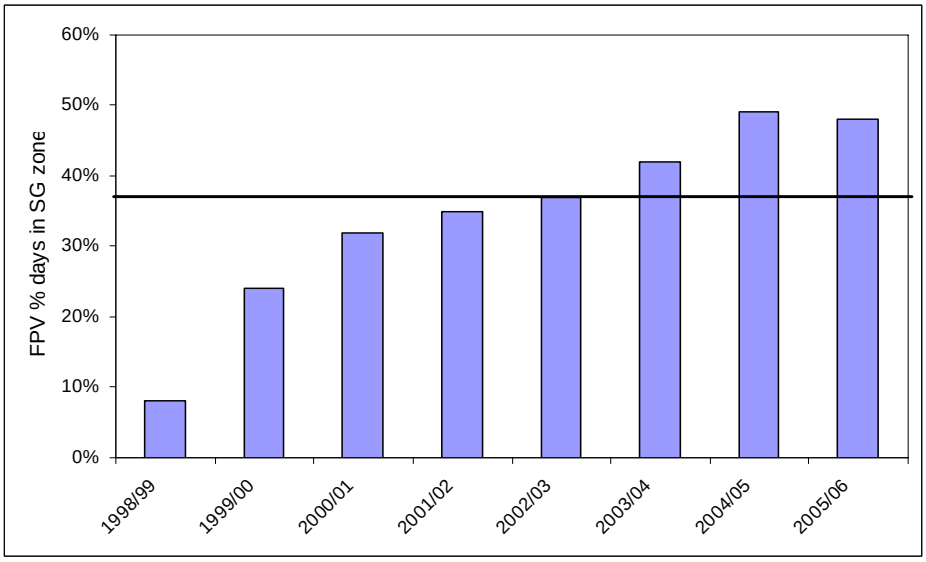
Observations

The previous Surveillance Report concluded that "*Results are excellent both in relevance to the Condition and in scientific quality. The suggestion by the fishery & scientific advisors that it may be time to consider this Condition fulfilled is noted. However, it is also noted that there is a PhD student currently engaged in research on genetics of at least the SGSSI toothfish stock, and possibly some adjacent ones as well. Results of this student's progress seem to comprise part of this Progress Report, and confirm the current approach to stock management. However, given that this student is still collecting and analyzing information, is seems strategically unsound to drop the condition when a major research project is still in progress. Moreover, the tagging has to continue because of the role of mark-recapture estimates in the assessment, not just as a tool to shed light on mixing.*

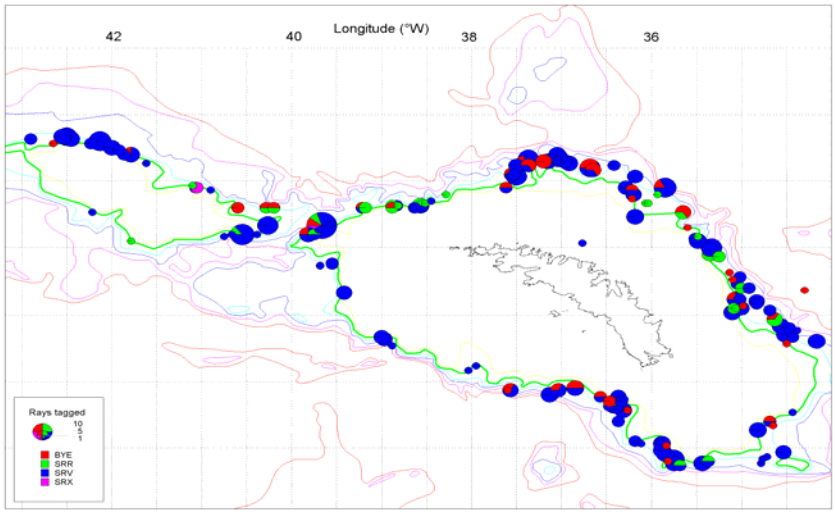
It would be undesirable for the Condition to be closed now, and then later results of the PhD research raise new questions about the stock identity, that we would all have to reconsider. It is agreed that surprises which undermine current management are unlikely, given progress to date. However, future progress reports will report on progress of the PhD student, and summarize tag returns, until the PhD student has completed work. Once all those results are in, pending no major changes in findings, the Condition can be considered closed."

Even at the time that this Condition was issued, the concern was lack of information about the integrity of the SGSSI stock as a single management unit. It was not the case that some evidence suggested that the SGSSI fishery exploited a toothfish stock that depended on external immigration to sustain recruitment or was itself a source for spawners to other toothfish population units outside the SGSSI area. The work completed on this condition since that time all strengthens the weight of evidence that SGSSI toothfish are a functional stock for the purposes of fisheries management.

	The DNA work is not yet complete, but significant new information has already been analyzed and reported. All results, including the results of the graduate student focusing on this question, do not suggest either significant immigration into this stock from other discrete populations, nor significant loss of genetic material. Nor do the results suggest significant fragmentation of the SGSSI stock in subunits that are largely independent in their population dynamics and reproduction. The tagging work also shows no evidence of significant leakage of individuals from the SGSSI stock to exploited populations in other areas of the south Atlantic. The number of tags that have been applied is now large enough, and at liberty long enough, that inferences about movement can begin to be drawn. There has been only one extra-area tag recapture, indicating a level of emigration low enough that the SGSSI can be considered a stock for management (and analytical population dynamics) purposes. Moreover, 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, implying that mixing of fish is a consistent process within SGSSI. Both of these again support strongly treating SGSSI toothfish as a single stock for management purposes, maintaining itself (or not) through local population dynamics processes. Finally, analyses of population dynamics trends using the tagging data both lead to plausible and coherent population reconstructions, and suggest a natural mortality that is even lower than assumed in previous assessment models, including the one(s) being used at the time of the certification review. This could not occur if there was a large directional emigration of individuals from SGSSI stock to areas outside the area of tagging and the fishery, nor a significant immigration of at least juvenile and adult toothfish into the area. The body of evidence is now strong enough that the MSC criterion scored by this feature would receive a satisfactory grade, and therefore the condition can be closed. It is important that the annual report on events in this stock and fishery continue to include results of the DNA and tagging work, so the knowledge base on which the fishery is audited is as complete as possible. Likewise, as the oceanographic model develops, it will be useful to consider the possibility of transport of toothfish eggs, larvae and small juveniles into the area. However, as there is no apparent "upstream" source population on which the SGSSI stock could depend for recruits, there is no justification for keeping this condition open awaiting results of the oceanographic modelling.
Conclusion	This requirements of this condition have been met according to the target timescale. The score associated with the relevant Performance Indicator 1A.3 are, on the basis of the commentary above, adjusted as follows: **Scoring Guideposts**: 80: A reliable estimate of the geographic range of the target stock is available including seasonal patterns of movement/availability. Scientific research is used to support the stock identification. 100: The complete geographic range of the stock, including seasonal patterns of movement/availability, is estimated and documented each year. Extensive scientific research is used to justify stock identification. The performance of the fishery now clearly lies between 80 and 100; there is extensive research used to justify that the stock identification and the geographical range of the stock is currently being estimated and documented on an annual (continuing) basis, although it is not established whether this estimation will be a routine ongoing aspect of the fishery management. The score allocated to this Performance Indicator is now raised to 90. This condition has now been closed and the outcomes of ongoing associated work will be reviewed as a function of annual surveillance audits.

3	**Condition of Certification 3: Continuing Monitoring, Control and Surveillance**
Activity assessed	The surveillance, monitoring and associated measures required to achieve certification should be maintained or improved (e.g. through improved/increased surveillance or proven effects of Catch Documentation Scheme). Improvement should include for the development of verifiable indicators of IUU activity in order to provide data for modelling of the extent and effect of IUU fishing. Timescale: This is an ongoing requirement for the fishery Relevant Performance Indicators: 2C.3, 2E.5, 2G.2
GSGSSI Progress Report	Compliance by licensed vessels this year was generally found to be good. Of the 9 longliners inspected at sea, no problems were identified. CCAMLR detected only minor incidences of non-compliance with the seabird measures 25-01 and 25-02 on a few vessels in 2006 in its analysis of observer reports (WG-FSA paragraph 7.16). Surveillance continues to be at a higher rate than in 2002 and 2003, which was set as the basic minimum rate for certification (Figure 3).  **Figure 3FPV surveillance levels: % of available days (i.e. 365 for a year) that the FPV spent on surveillance inside the SG maritime zone. Years run October – September (this year is coincident with the toothfish fishing season and captures a full summer and winter, and is also consistent with our IUU analysis.** GSGSSI have recently chartered a new vessel from Byron Marine, the Pharos SG, which took over from the Sigma in November. It is a more modern vessel with greater manoeuvrability and logistical capability. This will increase the patrolling capacity within the SGMZ.
Observations	The previous Surveillance Report concluded that "*The observed catch by the unlicensed vessel Elqui appears to have been accommodated correctly in the overall management of toothfish in 48.3. The value was used directly in adjusting the quota available to licensed vessels, to keep the total catch below the estimated sustainable level. The observation was uninformative about the accuracy of the model, as the conditions under which it was taken are not the conditions for which the model was designed. However, the observation was not inconsistent with the types of assumptions structured into the model, suggesting that although there may be room to improve the model, this observation does not suggest that model structure or parameters are seriously in*

	error. Moreover, given the level of surveillance in SGSSI, if the model is basically correct, the actually IUU catch other than that taken by the Elqui and accommodated in management would have to be quite small. In a worst case scenario given the level of surveillance, only very short visits to the area by unlicensed vessels would be missed by the fisheries patrol vessels, and these would result in low catches. *The level of surveillance is sufficient to meet the conditions for continued certification. The outline information presented on sea and air patrols should continue to be provided in future annual reports to confirm conditions for continued certification are being met or exceeded. Information should also be provided on any interactions with IUU vessels and/or with IUU lines found at sea.*" The conclusions of the previous report apply again here - the level of surveillance continues to be sufficient to meet the conditions for continued certification. It is also noted that the estimated IUU catch in 2005/06 is zero. It is also noted that a new patrol vessel, MV Pharos IX has replaced the MV Sigma as Fishery Patrol Ship for South Georgia and the South Sandwich Islands. The MV Pharos IX has been purchased by Byron Marine Ltd. from the Commissioners of the Northern Lighthouses in Scotland and will be operated under a long term charter agreement with the GSGSSI. The Pharos IX is a more modern vessel than the Sigma and has a greatly increased logistical capability, including the ability to carry shipping containers. She will therefore be able to complement her prime role of fisheries patrol vessel with other important tasks for the Government.
Conclusion	The requirements of this condition have been consistently met according to the target timescale. Three Performance Indicators related to this condition, 2C.3, 2E.5, 2G.2. However, this Condition was established to assure an ongoing level of monitoring, control and surveillance to deter IUU fishing and ensure compliance within the licensed fishery. According to the original wording, this condition will be maintained until such time as the fishery is subject to an MSC re-assessment.

4	**Condition of Certification 4: Impacts of fishing on rajid populations**
Activity assessed	A strategy (or research plan) should be developed to obtain reliable information on fishery-related impacts on rajid populations. The outcomes of this strategy should be sufficient to determine whether, and to what degree, populations are being maintained, depleted, or placed at risk of extinction and to provide points of reference to interpret the effects of by-catches on populations of these species. The strategy should include, but not be limited to, population estimates of rajids from by-catch and ongoing surveys and may require further research on the biology of the species concerned. Interpretation should include information from IUU effort estimates. Mitigation measures should be developed as part of, or in advance of, the strategy, as appropriate, and the biological basis of mitigation measures should be established. **Timescale**: A suitable strategy/research plan should be developed within 12 months of certification and the strategy fully implemented within three years of certification
GSGSSI Progress Report	To provide a better assessment of the population size of rajids, a rajid tagging programme was initiated last season resulting in just under 400 animals being tagged. The condition of all the animals was assessed before they were double tagged and returned to the water. Although this takes more time and means fewer animals can be tagged it does ensure the highest possible survival rate. One ray was recovered after a month from a depth of 1,300m, reportedly in good condition. The majority of animals tagged were the *Raja variant* which make up the majority of the species caught.  **Figure 4 The distribution of rajid tagging effort** In addition to tagging, all the animals were injected with OTC, which will allow validation of age determination of returned animals. The tagging will continue at the same rate next season over an even depth distribution, but in order to maximise the potential for making robust estimates of population size we have decided to concentrate effort in the areas of highest rajid density along the north shelf from the western end of Shag Rocks to about halfway along the north west of South Georgia. It is anticipated that preliminary advice on assessments may begin in 2008.

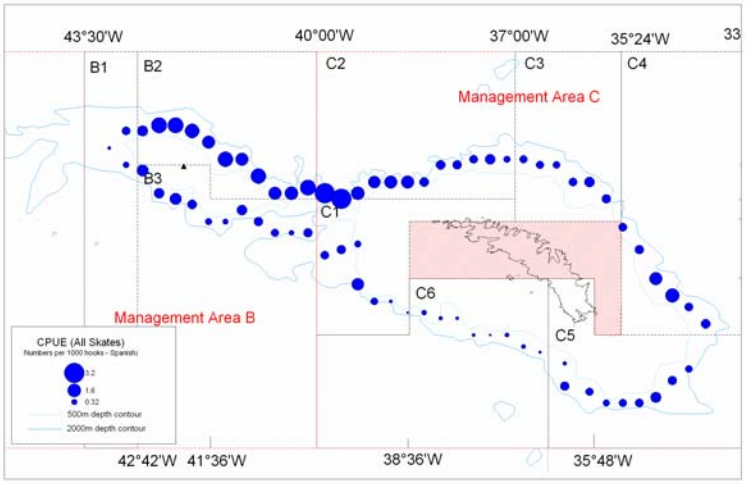


Figure 5 Distribution of rays, determined from CPUE of all Spanish gear type vessels 2002 – 2005.

Analysis has also continued on observer tally data looking at CPUE trends. These data suggest that the policy of cutting off rays introduced in 2004 may be having its desired effect of reducing mortality.

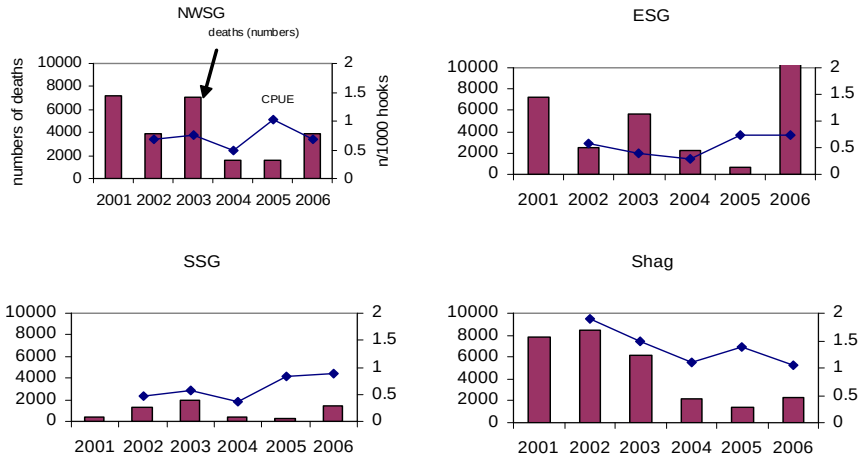


Figure 6 Standardised CPUE for rays from Spanish vessels only, for four areas around South Georgia, plus (as bars) an estimate of the total number of rays killed (taking into account the observed estimate of numbers caught, numbers cut off and the depth at which animals were caught and returned to the sea, applying the survivorship relationship between cut-offs and depth derived by Endicott & Agnew).

Observations	The previous Surveillance Report concluded that "*The research plan previously approved remains in place. The plan for the mark-recapture experiment should start this year (2006). The CPUE data should prove more useful when used in combination with the mark-recapture, as the mark-recapture should provide good information over the coming years on the population size and composition.* *Achievement of the research programme will be monitored during future MSC certification surveillance audits in relation to the time table. The main milestone will be implementation of mitigation measures in the 2008 season. This target remains as originally proposed.*"

	The rajid tagging programme was initiated in 2006 as originally planned. With only one return, information is inadequate to provide an assessment at this stage. Significant future tagging returns should provide information on mortality and growth, although the accuracy of the results will necessarily depend on the number of returns. The management plan currently includes exploring the use of MPA's. Given that it is planned to implement mitigation measures in 2008 and the fact that mark recapture data will likely comprise of few observations at this time, advice is likely to be uncertain. However, MPA's are likely to provide an important precautionary tool to limit impacts on the ray populations while research continues.
Conclusion	The research plan previously approved remains in place and information has continued to be added to improve the scientific advice available. The mark-recapture experiment has been initiated. The management should continue to explore risk-averse management strategies to cover the eventuality of limited scientific information availability when measures are drawn up in 2008. Achievement of the research programme will be monitored during future MSC certification surveillance audits in relation to the time table. The main milestone will be implementation of mitigation measures in the 2008 season. This target remains as originally proposed. Two Performance Indicators relate to this condition, 2A.1 and 2E.5. Indicator 2A.1 is addressed in this regard principally through Condition 10, and so is considered in that Section of this report. Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

6	**Condition of Certification 9: Research into the ecosystem relations of toothfish**
Activity assessed	To direct specific research into the ecosystem relations of toothfish. This condition may be regarded as a sub-section of Recommendation 4. As stated in Recommendation 4, the assessment team recognise that resource requirements to implement a full ecosystem model would be high and the other conditions outlined here are of much greater significance for the fishery. This research should therefore specifically include, but not be limited to, identification of predators of toothfish at various life stages and prey of toothfish prior to recruitment into the fishery. This research should be carried out with development of a quantitative ecosystem model in mind, although production of such a model is not part of this condition at this time. **Timescale**: A research programme should be developed and implementation begun within 12 months of certification
GSGSSI Progress Report	The 2006 Surveillance Report by Moody's had this to say about Condition 9. *Progress is steady and supplemented significantly by the BAS Discovery 2010 programme. …There appear no major trophodynamic threats currently suspected to be associated with this fishery, great problems with the feasibility of rigorously quantitative diet studies on potential predators, and noteworthy cost to achieve major increases in knowledge of predator diets. It may be appropriate to focus attention on steady improvement of knowledge of size-specific diets of toothfish of all ages, and on the modelling work to integrate such information as does exist. Further detail on the BAS 2010 programme and the means and focus of interaction with MRAG and GSGSSI could meet the requirements of this condition. The outputs of further research would then be reported as a component of the overall fishery management.* Work by BAS, in the Core Programme and in the South Georgia Project (the laboratory at KEP), and through sampling at sea by MRAG, has helped define the role of toothfish as a predator and prey (see previous surveillance reports). To supplement this information MRAG will continue to acquire information on diet through occasional monitoring studies on both the surveys and the fishery, sampling a range of ages of toothfish every 2 or 3 years. The British Antarctic Survey's core funded Discovery 2010 programme aims to improve understanding of the structure and functioning of Southern Ocean foodwebs. The Discovery 2010 programme is currently developing a range of foodweb and ecosystem dynamic models for the South Georgia area. These include mass-balanced models using Ecopath with Ecosim which are intended to give a coherent view of the whole foodweb. Other models will focus on specific parts of the foodweb, with more detailed representation of population structure, to investigate dynamic responses to harvesting and other drivers. These models will be used to investigate the potential effects of toothfish and other fishery harvesting on the rest of the foodweb. These studies will address uncertainty about predation on toothfish through considering a range of predation intensity scenarios. The models will be developed in consultation with, and the results will be reported to, MRAG and GSGSSI.
Observations	The previous Surveillance Report concluded that "*Steady ongoing work has been completed in this area. No results suggest that natural mortality due to predation is substantially higher than assumed in the assessment model, or that there are dependent predators whose productivity is likely to be diminished by the SGSSI toothfish, as currently managed. In summary, there appear no major trophodynamic threats currently suspected to be associated with this fishery, great problems with the feasibility of rigorously quantitative diet studies on potential predators, and noteworthy cost to achieve major increases in knowledge of predator diets. It may be appropriate to focus attention on steady improvement of knowledge of size-specific diets of toothfish of all ages, and on the modelling work to integrate such information as does exist.*

	Progress is steady and supplemented significantly by the BAS Discovery 2010 programme. Further detail on the BAS 2010 programme and the means and focus of interaction with MRAG and GSGSSI could meet the requirements of this condition. The outputs of further research would then be reported as a component of the overall fishery management." The comments in the previous Surveillance Report continue to be appropriate. Progress is fully satisfactory. With current knowledge there is no evidence that the SGSSI toothfish fishery is placing structural or functional components of the wider ecosystem at risk of major disturbance, let alone serious harm. However, the acquisition of knowledge on "ecosystem relations" is inherently incremental, and the important work of BSA 2010 is still in progress. The nature of modelling that is planned, and particularly the acknowledgement that multiple different trophodynamic models would be the most effective and robust way to explore the impact of the fishery on the SGSSI food web, indicates that a sound and practical approach has been adopted to make progress on this complex issue. If the different modelling approaches produce comparable results, and if the results suggest either there are no substantial food web impacts of the fishery as currently conducted, or any noteworthy impacts/risks that do emerge from the modelling are addressed through appropriate adjustments to the management of the fishery, then this condition can be considered to be met. The information available is a bit vague about when the ecosystem modelling results will be considered mature enough to bring forward to CCAMLR and the Surveillance Panel (which may be quite reasonable if the models are still under development). However, it appears it may be possible to provide results as soon as 2008 or 2009, at which time they would be considered by this assessment team.
Conclusion	Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

7	**Condition of Certification 10: Determination of significant interactions with benthic habitat.**
Activity assessed	The potential for longline fishing activity to significantly impact upon benthic habitats is generally regarded as being low. However, research should be directed at locating areas of complex benthic habitat, particularly biogenic features, within the areas exploited by fishers. This may be addressed through observer recording of evidence of biogenic features through retrieval in long-lines. If such areas are found, efforts to protect these from gear impacts, including those associated with long-lines should be considered and results documented. **Timescale**: Collection of suitable information takes place at present and should be continued. Initial mapping of fishing activities and areas of complex benthic habitat should be carried out within three years following certification (or earlier if sufficient information is collected) and further developed thereafter as more information is collected.
GSGSSI Progress Report	The condition calls for > Research should be directed at locating areas of complex benthic habitat, particularly biogenic features, within the areas exploited by fishers. This may be addressed through (a) observer recording of evidence of biogenic features through retrieval in long-lines. If such areas are found, (b) efforts to protect these from gear impacts, including those associated with long-lines should be considered and results documented. Timescale: Collection of suitable information takes place at present and should be continued. (a) Initial mapping of fishing activities and areas of complex benthic habitat should be carried out within three years following certification (or earlier if sufficient information is collected) and (c) further developed thereafter as more information is collected [our labels] The 2006 surveillance report recognised significant progress in this area. We have continued to make progress, further analysing the data in the context of potential areas closed to bottom trawling (Roberts, 2006). We have now completed, in our view, (a) (within 3 years of certification) and are moving on to (b) and (c). We have suggested that some sort of restricted fishing area would be an appropriate response to (b) and the Roberts (2006) study considered the impacts of such closures. The conclusions were 1. If benthos alone was considered, only relatively small closed areas would be required to protect the areas of highest coral density. 2. An approach based on large-scale MPAs would involve having to make significant choices between conservation objectives, particularly between different bycatch species, but there are some sensible candidate areas; 3. Any closed area system would have implications for toothfish fishing, which might change significantly the way in which mark-recapture data need to be interpreted within the toothfish assessment. Clearly, we need to be particularly careful that the toothfish fishery is not inappropriately adversely impacted by any attempts to protect benthos. These considerations are now taking the issue into (c), and the discussion is focussing particularly on the best mitigation measures for each type of bycatch problem. An MPA system may not be the best solution, given the wide set of objectives. Some alternative ways of meeting conservation objectives for fish bycatch have already been identified or are under investigation, and include, for instance, vessel specific quotas, time/area/depth restrictions etc. Further research is required before a conclusive policy on benthos/bycatch can be developed. In terms of condition 10, this will focus on validation of the conservation value of small benthos protection areas. We intent to do an ROV (or similar) video survey of key areas identified from the observer data sometime in late 2007 or 2008, depending upon equipment

	availability and cost. Simultaneously, we are embarking on a research project with Alex Rogers of the Zoological Society to correctly identify all the specimens collected by observers and accurately document the diversity of benthos being recovered by longlines. In terms of furthering this issue we will be developing a series of policy options this year for dealing with all bycatch, including benthos. In addition to the specific issue of benthic interactions at South Georgia, this work will take note of the wider Antarctic work on MPAs and bioregionalisation[1]. GSGSSI will consider these options before introducing appropriate specific measures to protect benthic habitat.
Observations	The previous Surveillance Report concluded that "*Important work has commenced in the past two years. The plans for 2006 and 2007 are sound and appropriate, signifying important progress on this condition. Provision should be made to ensure timely analysis and interpretation of the information from observers, research surveys, and underwater observations, so the results of these studies can be made available as rapidly as possible.* *This condition will continue to be monitored in future surveillance reports*." The accumulated information from observers regarding corals and benthos captured by or entangled in the long-lines, and the dissertation by J Roberts, represent major steps forward on our knowledge of the interactions of the fishery with the benthic habitat. The information from observers does indicate that there is some entanglement of benthic habitat features, particularly deep/cold-water corals but the rate of occurrence is low and the scale of each event quite local. Work with underwater towed cameras is far from complete, but thus far results are consistent with the inferences from the observer data. Importantly, the dissertation by Roberts provides a comprehensive analyses of the spatial information on both habitat features and benthic (and other) bycatches, relative to the spatial operation of the fishery. The opening sections of the dissertation provide a commentary on marine protected areas that critics might challenge as overly optimistic, but the data and analytical sections of the thesis are sound and thorough. In particular, the dissertation not just considers application of spatial management to protect benthic habitat features and vulnerable bycatch species, it does consider how reallocation of fishing effort in space would affect the toothfish fishery itself, in terms of impacts on catch rates and effort needed to take full allocations of the TAC. The dissertation does document that even as currently conducted the fishery is unlikely to pose a risk of serious and large-scale damage to benthic habitats. However, the dissertation provides several management options to further reduce the "footprint" of the toothfish longline fishery on benthic habitats and bycatch species, depending on the specific objectives that managers may have for this fishery. Together these two information sources provide a biological basis for ensuring that the fishery is conducting in a manner that does not have a significant negative interaction with benthic habitats. Hence progress on this condition is excellent. It seems appropriate to await decisions by CCAMLR and the SGSSI Management Authority with regard to what actions, if any, to take on the basis the options provided in the thesis and the additional information from the ongoing observer and underwater camera studies. Assuming reasonable management actions

[1] Bioregionalisation is a process that aims to partition a broad spatial area into distinct regions, using a range of biological and physical information. In 2005, CCAMLR considered that a bioregionalisation of the Southern Ocean was needed to underpin the development of a representative system of MPAs in the Convention Area. An independent experts workshop in 2006 established a "proof of concept" for a broad-scale regionalisation of the Southern Ocean using physical datasets. The UK is involved in current efforts within the context of CCAMLR to further develop methods and approaches to bioregionalisation. Initial work by the UK will focus on a fine-scale bioregionalisation for the southwest Atlantic sector, including the islands of the Scotia Arc.

CCAMLR will hold an experts workshop in August 2007 with the aim of advising on a bioregionalisation of the Southern Ocean. The outcomes of this analysis will be specifically applied in the selection of candidate marine protected areas in the Convention Area.

	based on this knowledge, to ensure protection of the vulnerable and sensitive components of the benthic habitat while prosecuting an efficient and viable fishery, this condition could be closed in the year following implementation of any such management measures.
Conclusion	Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

15	**Any complaints against the certified operation; recorded, reviewed and actioned**
	No direct complaints in relation to the fishery management system are noted. As of 31 July 2006, the fishing company, Isla Alegranza SA, of Uruguay, applied for judicial review of the GSGSSI decision not to award a licence. Applications for judicial review were made on similar grounds in 2005 also. Reasons for licence allocation include issues such as UK Foreign Office policy as well as previous track record of compliance/research and ability to take part in experimental fishing/research activities. This matter may be carried forward to the European Court, Strasbourg. This application is, however, not seen as significant in relation to the current MSC certification – this relating entirely as to who is licensed, not the total quota or competence/adequacy of skippers or vessels. A previous and separate appeal has been brought by the Fishing companies Quark/Freiremar – operators of the vessel Ibsa Quinto. This vessel had been fined for landing fish above quota in the 2004 season. Following previous reviews and upholding of fines, the leave to appeal was refused by the Supreme Court of the Falklands Islands on 1 August 2006.
16	**Any relevant changes to legislation or management regime.**
	GSGSSI continues to license vessels for experimental pot fishing, but this (together with longline catches) is strictly within the overall TAC for the stock. Operations manager Gordon Liddle has left GSGSSI in March 2007, although not directly involved in the fishery he provided *ad-hoc* advice and support. Other rlelevant staff remain in position, however, together with contracted support services and so this is not expected to present undue difficulties to the toothfish fishery. A revised document of information for Applicants for licenses was introduced with a revision of the application form. Both are available on the Government of South Georgia official website (www.sgisland.org) and have been sent to potential applicants. This is seen as an appropriate development of the management system.
17	**Overall Conclusions**
	The overall management of the fishery through CCAMLR and the GSGSSI continues to at least the level as during the main assessment. Systems developed to allow tracking of fish, necessary for toothfish product to enter into future Chain of Custody assessment (and so to carry the MSC logo) continue with improvement as appropriate. GSGSSI have taken appropriate measures to address the conditions of certification raised during the MSC certification assessment. This can be summarised as follows: 1. Conditions where specific requirements are deemed to have been fully met and which will be considered in future surveillance reports, as required, as part of overall fishery management: • Condition 2 2. Conditions which will be subject to ongoing review throughout the current surveillance programme: • Conditions 1 and 3 3. Conditions which will be subject to ongoing monitoring to achieve closure, or significant progress to an appropriate level, over the lifetime of the current MSC certificate: • Conditions 4, 9 and 10 MSC Certification should therefore continue and surveillance audits continue to the same schedule.

Information Sources:

Meetings

1. MRAG. 23 August 2006

2. GSGSSI. H Hall, R McKee. 18 and 22 September 2006
3. Falklands Conservation. G Munro. 18 September 2006
4. Beauchene Fishing. C Roberts. 19 September 2006
5. Argos Pereira Ltd. S Stewart. 19 September 2006
6. RBC Ltd (Galfishing). T Blake. 19 September 2006
7. Polar Ltd. D Sawle, A Reid. 19 September 2006
8. South Georgia Fisheries Science Meeting. GSGSSI, MRAG, BAS, Industry representatives. 26 September 2006

Reports etc

1. GSGSSI Case File – Ibsa Quinto
2. GSGSSI Case File – Isla Alegranza
3. GSGSSI File. Pre-season Licensing Inspection Reports 2006
4. GSGSSI File. Post-season vessel inspections 2006.
5. J. Roberts 2006. Designing Marine Protected Areas for the South Georgian Longline Fishery Area. MSc Thesis, Imperial College.
6. Collins, M.A., Ross, K.A., Belchier, M., Reid, K. (submitted) Distribution and ecology of juvenile Patagonian toothfish on the South Georgia and Shag Rocks shelves (Southern Ocean)
7. Payne and D.J. Agnew 2006. Results of the tagging experiment for *D. eleginoides* in Subarea 48.4. WG-FSA-06/56
8. CCAMLR Fish Stock Assessment report
9. CCAMLR FSA Appendix L: Fishery report *Dissostichus eleginoides* South Georgia
10. CCAMLR Fish Stock Assessment report
11. CCAMLR Fish Stock Assessment report Appendix D
12. CCAMLR FSA Appendix L: Fishery report *Dissostichus eleginoides* South Georgia
13. D.J. Agnew, R. Hillary, M. Belchier, J. Clark and J. Pearce 2006. Assessment of toothfish in Subarea 48.3, 2006. WG-FSA-06/53
14. R.M. Hillary and D.J. Agnew 2006. Estimates of natural and fishing mortality from toothfish mark–recapture and catch-at-age data at South Georgia. WG-FSA-06/54
15. 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.
16. UK, 2006. Fishing equipment, marine debris and hydrocarbon soiling associated with seabirds at Bird Island, South Georgia, 2005/06, SC-CAMLR-XXV/BG/11

Guidelines used:

1. MSC Principles and Criteria for Sustainable Fishing
2. MSC Fishery Certification Methodology Version 6 (in part; otherwise v5)
3. TAB Directives (All)