

Review of Certification Report for South Georgia Patagonian Toothfish Long-line Fishery

Prepared for Moody Marine Ltd

By

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19th July 2002

INTRODUCTION

This is a review of the Certification Report for the South Georgia Patagonian Toothfish Long-line Fishery prepared by Moody Marine Ltd for their client, the Government of South Georgia and the South Sandwich Islands. The Certification Report considers the degree of compliance of the toothfish long-line fishery with the Marine Stewardship Council (MSC) Principles and Criteria for Sustainable Fishing.

This review is limited to a consideration of the process, factual basis, sufficiency, rigour and conclusions of the Certification report; it does not consider anew the issues, nor does it seek to provide an alternative assessment. Similarly, the review is restricted to the toothfish stock and management system in question. I am aware of widely held concerns about toothfish fisheries and long-line incidental mortalities in general. Those are beyond the scope of the original Certification report and hence also of this review.

The primary materials available for this review are the Assessment Report and the associated Scoring Table. The Assessment Report sets out the background to the fishery, the assessment process, stakeholder comments, the MSC Standard, the scoring methodology, and the results and conditions required to maintain certification. The Scoring Table explicitly sets out the scoring indicators and guidelines, together with the assessment team's interpretation of how well the fishery conforms to the guidelines, and the score and weight assigned by the team to each indicator.

In addition to these primary materials, I have also been supplied with a confidential report prepared on behalf of the Government of South Georgia and the South Sandwich Islands, which develops a new approach to evaluating IUU fishing. Two papers based on that report, soon to be submitted to CCAMLR, have also been made available to me.

This review considers the following aspects of the Certification Report and Scoring Table:

1. The factual basis of the main report
2. How well stakeholder concerns are addressed
3. The sufficiency of scope and rigour of the scoring indicators and guidelines used, in relation to the MSC standard and the fishery in question
4. The appropriateness of weightings and scores allocated
5. The suitability of the conditions attached to certification.

1. THE FACTUAL BASIS OF THE REPORT

I have no concerns on this issue. The assessment team has clearly had good access to materials and expertise. The main Assessment Report appears knowledgeable and correct, whilst the Scoring Table commentary is succinct, informed and accurate. Good references are provided.

2. STAKEHOLDER CONCERNS

I do not have access to the Appendix X referred to in the Assessment Report (section 7, p 36). Therefore, the only indication of stakeholder views, and how well the assessment team/process has addressed concerns is that presented in the Assessment Report itself.

Incidental mortality of seabirds (or seabird by-catch)

This is clearly the issue that raises most ire amongst a number of stakeholders. The approach adopted by the assessment team (as outlined in the final paragraph on p 33) is sensible. The consideration of seabird populations, by-catch estimation and IUU fishing (controls and by-catch estimates) have been a major part of the review, as reflected in the confidential paper from MRAG and in the Scoring Table. Whilst recognising the **overall views** the assessment team have tried, in my view successfully, to steer an objective course and to relate information solely to the MSC Principles and Criteria.

Other by-catch (skates and rays)

This has been properly attended to in the Indicators and scoring for Principle 2. As with seabirds, the team has kept carefully to scoring the fishery in relation to the Principles and Criteria.

The discrete nature of the stock; Other factors relevant to the composition of the SGSSI stock

Considerable information was available to the team. The comments and references for Principle 1 reflect this.

Control of IUU fishing; The CCAMLR CDS; Chain of custody certification; Geopolitical considerations

No comment.

Overall Views

No Appendix X available.

Scoring Indicators and Guideposts

The team appears to have addressed the views of ASOC, at least as expressed in the Assessment Report.

3. SCORING INDICATORS AND GUIDELINES

The assessment team has been careful to develop Indicators and Guidelines relating to the Principles and Criteria of the MSC Standard (as provided in section 5 of the Certification report), but which also are relevant to the toothfish long-line fishery.

The Indicators adopted for Principle 1 are comprehensive except, arguably, in relation to Criterion 1. No Indicators are included under Principle 1 that relate to the “associated ecological community”. This, however, is attended to in Indicators developed under Principles 2 and 3. The 23 Indicators developed to assess the performance of the fishery in relation to Principle 1 are quite detailed. This, of course, is a direct consequence of the large amount of monitoring, data gathering, and research conducted on the fishery and on toothfish more generally. In detail, Indicator 1D.1 seems misplaced (and similar to 3A.3), and would perhaps be more relevant to Principle 3. Given the category 1D scores, this has no implications for the Principle 1 overall score. The scores in related Indicators for Principle 3 are also such that inclusion of this Indicator there would make no effective difference.

Principle 2 is easy to state, and the Criteria seem simple when written. Developing Indicators for any fishery that can also be readily and objectively weighted and scored, however, is a far more difficult task. In truth, little is known about many of the attributes of ecological systems, or how to monitor or interpret signals, that are so readily bandied. In the CCAMLR region considerable effort has been expended on understanding ecological processes and to dealing with specific issues such as seabird by-catch. The 22 Indicators developed by the assessment team capture the range of issues relevant to the fishery whilst also attending to the MSC Criteria.

The assessment team has developed 32 Indicators to cover the numerous Criteria under Principle 3. Some of the Indicators relate to Criteria that have little relevance in the context of the Patagonian toothfish fishery at South Georgia (but this is appropriately reflected in the adopted weightings). For all of the Indicators, but most especially those for Principle 3, it would have been useful if the team had explicitly linked the Indicators developed with specific Criteria. Working through the Indicators, I can find no Criteria that are not considered.

Indicators 3G.5 and 3G.6 ask whether the management system is subject to internal and external review. Although these are clearly reasonable questions and perhaps indicative of a good and transparent management system, they are not explicitly called for in the MSC Principles and Criteria.

4. WEIGHTINGS AND SCORES ALLOCATED

WEIGHTS

The assessment team has done a good job of explaining its methodology. The Scoring Table is simply laid out and is easy to read and interpret. The explicit statement of scoring guidelines, weights and scores is clear except the statement in the final paragraph

of 8.1 referring to the weighting of indicators within Principle 2. For completeness, I checked all derived Indicator scores with the weights and scores presented in Section 10, and everything checked. I also checked the derived overall scores using the simple average of the Indicator scores and everything checked except for the overall score on principle 2. As stated in 8.1, however, the Principle 2 overall score is a weighted average of the Indicator scores, not a simple average as for Principles 1 and 3. The weighted average for Principle 2, using the weights given in the Scoring Table, also checks. Given the closeness of the Principle 2 Indicator scores the weighted versus the simple averaging makes very little difference, and certainly does not change the conclusion (PASS). Nevertheless, a more explicit explanation of the weighting applied to the Principle 2 overall score would be useful.

For some Indicator categories (e.g. 1A or 1D), the weights are evenly distributed across Indicators. This is straightforward. For other categories, however, weights are not evenly distributed. In category 1B, for example, the weights used for the five Indicators are 43.7%, 6.8%, 6.1%, 23.1% and 20.3%. It is not at all clear how the assessment team derived such weighting structures. No explanation is given in either the Assessment Report or in the Scoring Table. The numbers appear to be derived using some scheme, rather than being arbitrary (for which I would expect round numbers); if this is the case, it would be useful for that scheme to be explained.

In terms of sensitivity of the overall conclusion to the weights chosen, the only concern is if a low score is unjustifiably given a low weight, to the extent that the PASS mark for the Principle would be compromised if a greater weight had been assigned. For Principle 1 this is not an issue, as no Indicator scores fall below 80%.

For Principle 2, Indicator A.1, the score is 70% and the weight 7%. The other 2A Indicators score 80% or 85% with the highest weight of 60% being assigned to Indicator A.2 with a score of 85%. In this case, the weighting/score mix does potentially affect the Indicator overall score. The same issue occurs in other Principle 2 Indicators. It should be noted, however, that the majority of scores less than 80% in Principle 2 Indicators are given a high weight and are thus reflected in the overall scores. Only at 2A and 2D is there any potential concern. What is not clear for Principle 2, is how the Indicator weights were assigned.

The two Indicators with low weight and low score (2A.1 and 2D.1) both relate to physical impacts on habitat. Given the nature of the long-line fishery, this is probably not a matter of major concern (justifying a low weight) and is, in any case, addressed by the assessment team in Recommendation 3.

For Principle 3, three scores are less than 80%. Indicator 3E.5 scores 75% with a weight of 16.6%; in the context of the 6 E category indicators, and given the other high scores, this is not an influential weight. Indicators 3G.2 and 3G.6 are also not influential, because of their high weight or balance with other weights and scores. Where scores are below 80%, the assessment team has also applied relevant Certification Conditions that are detailed in the Certification Report.

Overall, although it would be preferable to have a fuller explanation for the weights adopted, the weights as chosen (for the scores provided) do not raise any concerns. There are no low score-low weight combinations that influence the overall Principle scores, and where low scores are used, Conditions and Recommendations are made.

Of course, weights alone do not define the overall scores and conclusions. The Indicator scores themselves need also to be considered.

SCORES

The assessment team has presented an excellent background in the Assessment Report. The report is transparent as to the scoring process and the explicit descriptions of the scoring guidelines in the Scoring Table.

Only one Indicator score (1E.3 – 77.5%) hints at a difficulty in reaching consensus. In this case, given the other 1E Indicator scores, the precise value of 1E.3 has no significant influence on the combined Indicator score, nor on the overall Principle 1 score. In general, the Principle 1 Indicator scores are high. None is below 80% and a number are at 100%. In all cases, these scores seem to be well founded and the Scoring Table provides concise but informative annotation and references.

At 1B, the issue of IUU catches is addressed in the context of catches used for stock assessment purposes. The commissioned paper by MRAG Ltd appears to be sound and should provide a basis for improved IUU catch estimation. At 1E.3 a score of less than 80% is given because IUU catches are taken account of in the assessment but not in projections that underlie the risk based catch calculation (essentially an MCY strategy). This is also picked up in Condition 6. As discussed in section 5 in consideration of Condition 6, I do not regard this to be problematic. Consequently, I consider this score to be too low and would suggest 80% to be reasonable. At 1E.5, I have no quibble with the score, but am not sure what the assessment team expects by way of retrospective analyses to test the efficacy of harvest strategies. This point will be picked up below (section 5, Conditions).

As for Principle 1, the Principle 2 Indicator scores are generally sound, well annotated and argued, and well referenced. For category A, the one score that falls below 80% is 2A.1, relating to knowledge of habitats. The nature of the fishery (long-lining) is such that habitat interaction (including damage) is unlikely (although it is noted at 2D.1 that some entanglement in coral has occurred). It is not surprising therefore that there is also little information on habitat despite the fact that targeting on hard substrates has been described. The low score (70%) is probably reasonable, but only in conjunction with the low weight (as used). It is notable that the habitat factor enters in at 2A.1, 2D.1, 2E.1 and 2E.4; as such, the real weight given to this issue is greater than would appear from any one Indicator.

At 2C it is notable that in this area and fishery so much is known about protected species and their interaction with fishing operations. Equally, it is clear that the major problem is with IUU fishing. This is properly reflected in 2C.3. The assessment team has apparently chosen to give a highly weighted score of just below 80% to reflect current efforts and improvements in by-catch estimation in and control of IUU fishing. As such, the score is somewhat more subjective than many others, and will no doubt be controversial. It does essentially strike at the centre of the widely held view that no toothfish/long-line fisheries should be certified. My own judgement is in line with the assessment team – that threats do exist, but that improvements in the legal fishery have reduced them substantially and efforts to control IUU fishing are such that further improvements are likely.

Overall for Principle 2, it is notable that although more research has taken place in this region than most others, that more is known, that fisheries are more recent and by global standards are well managed, what really is known about ecosystem structure and function is still slight. This is no doubt reflected by the fact that where the assessment team have scored Indicators less than 80%, the result has often been a Recommendation rather than a Condition.

The Principle 3 scores are generally high and well founded. Where scores are less than 80% (3E.5, 3G.2), the issues raised essentially repeat concerns expressed through other Indicators and scoring below 80% elsewhere. This is not a problem given the generally high scores on all Principle 3 Indicators, but care is needed in general, as in Principle 2 and the issue of habitat impacts, not to inadvertently give weight to an issue by repeating it in many forms in different Indicators.

Indicator 3G.5 receives a high score for internal review provided through many mechanisms. Indicator 3G.6 receives a score of less than 80% for external review and leads to two Conditions (4 and 5) being raised. As noted at section 3, above, the MSC Principles and Criteria do not demand such reviews. Given the high scores given overall in this section, it seems slightly odd that a low score would be given for an Indicator that is arguably superfluous. In its own right, this does not matter. But the Conditions raised (see below) do.

5. CONDITIONS

Condition 1: No comment.

Condition 2: It is clear that control of IUU fishing, and better estimation of the effects of IUU fishing should it occur, are important issues that should receive priority. The Condition is appropriate.

Condition 3: This Condition is in line with 2E.5. The time scale for initially responding to the Condition is reasonable, but it may not be possible fully to comply within the three years specified. A five-year compliance period would be more reasonable.

Condition 4: This Condition derives entirely from Indicator 3G.6, where no justification is provided. To the extent that the MSC Principles and Criteria derive from the FAO Code of Conduct for Responsible Fisheries, which itself calls for the development of fishery management plans, the Condition is not unreasonable. Given, however, that the assessment team has successfully worked through documentation sufficient to comment on all aspects of management that might be contained in a fishery management plan, it is strange to call for a plan as a Condition. The first three elements of the plan noted in the Condition also touch on issues not brought out in the certification process, whilst the fourth is contained as a separate Condition (5). It seems unreasonable, and beyond the scope of certification, to create a Condition calling for actions not required for the certification. I therefore suggest the removal of this Condition.

Condition 5: This also derives from Indicator 3G.6. In terms of MSC principles and Criteria this Condition seems superfluous, as it does also given the generally high scores on Indicators for Principles 1 and 3 that an external review would primarily address. The Condition is also ambiguous in that it is unclear if it applies to a need for the UK (or EC) to **request** CCAMLR to organise an external review within twelve months, or for a review **to have taken place** within twelve months. If the former, it is a light Condition indeed. If the latter, account needs to be taken of the CCAMLR schedule and whether or not a twelve-month deadline is feasible. Given that Condition 1 is in any case a *sine qua non* of certification, I suggest the removal of this Condition (5).

Condition 6: It would appear that IUU catches are estimated and accounted for in the assessments that lead to estimates of current stock status, but are not used in projections. The projections, with zero IUU catch, are used for the risk-based calculation of catches (the constant catch that would not allow biomass to fall below 20% of unexploited biomass, more than 10% of the time, over a 35 year period). This is standard practice and requires only that an allowance be made for IUU catch when the TAC is set each year. Incorporating the IUU catch in to the projections would require either the assumption of a constant IUU catch, a constant IUU exploitation rate, or the use of a model to describe the IUU activity. None of these options is satisfactory. It is not clear why the assessment team has called for a “more specific method to take account of IUU activity”. Nor is it clear what precisely the team is suggesting. Given that increasingly effective IUU controls are being put in place, and that IUU catches are declining, I suggest this Condition be removed but that a Recommendation be added that the UK (or EC) ask CCAMLR to consider whether alternative catch calculation methodology might be appropriate.

Condition 7: In line with comments at 3G.2 and elsewhere. Appropriate.

Recommendation 1: I don't understand what is being recommended. There is no explicit reference to this Recommendation in the Scoring Table, but it seems to derive from comments in 1E.5. “Retrospective analyses” refer to diagnostic tests of assessments, repeated with exactly the same assumptions and configuration but with progressively reducing time-series of inputs, to investigate the sensitivity and reactivity of estimates of “current” status. “Quality control” refers not to the reactivity of the assessment

methodology to changing data, but to the year-on-year consistency and efficacy of the assessment process. Both fundamentally deal with assessments and current status estimation. At 1E.5, a further issue is intimated – the testing of harvest strategies. This requires a different approach altogether. Without fuller understanding of what the Certification Report is recommending, I can not comment further.

Recommendation 2: My understanding is that within CCAMLR, already, ecosystem models of various types are used. What the assessment team is recommending in addition to what is already done is not clear. Is the recommendation for trophic interaction models (that perhaps already exist?), a food-web model, a tropho-dynamic model, or what? Unless the recommendation derives clearly from the comments in the Scoring Table, and clearly sets out the purpose and intent of any modelling exercise, it is a hostage to fortune. From experience in dealing with similar Conditions for other fisheries, I would strongly suggest either a clear refinement of the recommendation , relating to the MSC Standard, or it's removal.

Recommendation 3: This recommendation seems to state that there are benthic impacts associated with long-lines. As such, it is at odds with the sentiments expressed in the comments of the Scoring Table. The logic seems to be that complex benthic areas within fished areas should be identified so that they shouldn't be fished, and that any interaction is bad. It is surely a matter of fact that observers will record any evidence of biogenic features retrieved by gear. If a problem is found then it should be addressed, but this recommendation is essentially an attempt to predetermine a management response – and that is the job of managers, not of the assessment team.

The assessment team has done a methodical, logical and fair job of scoring the Indicators used to test whether the fishery meets the MSC Standard as embodied in the Principles and Criteria. My overall reaction to the Recommendations and some of the Conditions, however, is that the team has then somewhat overstepped its remit in imposing unnecessary requirements that go beyond the Standard and which may in some cases be unhelpful. Just as I would have liked to see a clear and noted relationship between each Indicator and the Criteria, I would also like to have seen a clear and noted correspondence between the Conditions and Recommendations and the Indicators/Criteria. This would perhaps have helped to identify and clarify what are necessary Conditions to ensure compliance with the MSC Standard, and what are constructive Recommendations.

**COMMENTS ON THE
CERTIFICATION REPORT FOR
SOUTH GEORGIA PATAGONIAN TOOTHFISH LONGLINE FISHERY**

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1. The Report is comprehensive and includes all the requirements of the CCAMLR criteria for a sustainable longline fishery on the Patagonian Toothfish in the Southern Ocean, in particular in sub-area 48.3, around the South Georgia and the Shag Rocks.
2. The list of stakeholders is quite impressive, and fortunately, includes some names that are well respected in Antarctic science and in environmental management under a precautionary approach.
3. It is said that fishery tended to concentrate in waters less than 1500 m. However, it is known that younger fish live in shallower waters than adults. The decrease in the average length that is fished, is caused by fishery in shallower water. This will affect younger individuals, perhaps even before they are able to spawn for the first time. This should be checked by sampling and studying these fish. Care should be taken to avoid this, in order to guarantee future stocks.
4. The report considered only the longline fishery of Patagonian Toothfish. However, pot fishery captures the same species, even if in smaller amounts. Therefore, it should be included in the calculations of the TAC, for management purposes.
5. Both fishing methods capture incidentally other species. Pots capture considerable amounts of crabs, and longline, skates and rays, besides birds. All these should be taken into consideration when defining the TAC.
6. The South Georgia stock of Patagonian Toothfish being considered as a separate stock was discussed at CCAMLR. It is based on the best scientific advice and on research data. One has to rely on scientific information, while there is no better result available. Molecular genetics would possibly solve this problem.
7. IUU fishing is a worldwide problem in fisheries, and very serious in Antarctic waters. It causes damage to all efforts to manage the fishery of *Dissostichus eleginoides* in such a way that the sustainability is at risk. It seems that a relatively good system is in place around the South Georgia Islands, but still not enough to avoid this kind of activity.

8. It seems that the conservation measures of CCAMLR are all adopted around South Georgia, and that control of fishing vessels and activities is done. Vessels are inspected at sea and in port, and fishing is daily reported, VMS is on board, and Scientific Observers are active on board all fishing vessels, with the exception of krill fishing vessels. Training of observers, and inspectors improve the control over the compliance with CCAMLR conservation measures, and seems to be effective.
9. A TAC for each fishing vessel makes the control over the fishery easier, and avoids that the catch is higher than the allowed one.
10. IUU fishing is still active in that region. Therefore, there is a risk that more birds are captured than permissible, causing risk to some species. The models proposed to assess the IUU bird catch, and to calculate the possible IUU catch, seem to have improved from the model used until now by CCAMLR. Possibly these calculations could be checked against models developed by other groups from countries acting in the area.
11. The mentioned random inspections by Fishery Patrol Vessels have caused diminishment of the IUU fishery. However, there is a need for a higher level of inspections and random patrols, mainly in those months of more intensive fishery. The patrols should be more frequent than in monthly intervals, mainly in the region 6 where illegal fishing seems to be more intense. This, together with satellite surveillance, and improved radar systems, would possibly diminish the IUU fishery.
12. The TAC calculated by CCAMLR is for the entire 48.3 region. How is the proportion allowed to be captured for the South Georgia region derived from that?
13. The bycatch of rays should be subject to conservation measure, since it is quite significant, even being only in a small proportion of hooks, as was discussed at the CCAMLR meeting.
14. The problem of the size of the population and its status is derived from fishing data and survey data. The only problem is, again, the IUU. This raises the uncertainties about the stock, and its status year after year. It would be important to detect if the stock is year after year the same, or if it is decreasing because of intensive fishery. It would be important to invite some external groups to calculate the stocks and the bird bycatch, so that the different methods could be checked against each other.
15. The catch documentation scheme for Toothfish is appropriate when it is used. However, as it has to be internalized in the national laws of the different port states, it will take some time before it is of general use. Attention to fake documents must be intensified.

16. A moratorium has been often suggested. The precedent of what happened with *Notothenia rossii* is very serious. However, from my point of view this is not a solution, as than the illegal fishery will be the only one. One has to consider that, in the surroundings of South Georgia, IUU fishery has diminished as the result of a higher level of regional control.

17. It is almost impossible to allow the fishery only if the score is 100 in all items. Very often, realistically, there is not a full score for many items. However, lower scores may have different importances, and therefore, not the same weight in the decisions.

The document annexed to this report, the **Toothfish Scoring Table**, is very well done, and this type of analysis should be made in all CCAMLR areas where there is a fishery. There are some scores that, to me, should be slightly different:

1A.2- The score should be 60 because there are still gaps in the knowledge of the biology of this species.

1A.3- For the moment the score should be 80, unless DNA techniques would prove that these are definitively different stocks, as says the theoretical approach to this conclusion.

1B.1- The score could be 100 if it was no IUU fishing.

1B.2 and **1B.4-** why not a score of 100?

1D.1- The score cannot be 100, because there is IUU fishing.

1E.3- IUU should be taken into account.

2A.3- The score seems to be more 60 than 80, because there is little information available on prey species targeted by fish below the size at which toothfish are recruited to the fishery, and there is no quantitative estimation of the role of toothfish in the overall energy flow of the shelf seas ecosystem. Only information on these two items will make sure the impact of *D. eleginoides* on the foodweb.

2B.5- The score could be 100 if only frozen bait is used. Is there no record about that?

2C.3- The score should be less than 60, if we consider all countries, including the pirate ones, involved in *Dissostichus* fisheries. As in the South Georgia fishery there is, unfortunately, still IUU fishing, there is still no control over bird by catch. It is certainly not zero. Considering the risk for the species of birds that are captured, this incidental bird catch is not within acceptable limits, because some species are in the IUCN list of Threatened species. However, I believe that, as soon as the South Georgia Government has total control over the fishery in the region, and no more IUU fishing occurs, the problem will be totally reversible. I believe that, if the methods that are recommended by the CCAMLR conservation measures are fully applied, the incidental capture of birds will be totally, or close to totally avoided.

2D.1- The score should be 60. There is effectively not a study on the impact of bottom long lines on the seabed fauna and flora. One knows that, considering the extension of the area, this impact is, possibly, negligible. However, depending on the intensity of fishing effort in small fishing units, the frequency of fishing, the extension of lines, this may reduce the local biota considerably. This may imply in reduction or effects on those organisms that depend on this biota for feeding, and have secondary or tertiary consequences to the other links of the food chain.

2E.1- The score should be 60. Main impacts of the fishery are known, but the evaluation is still not comprehensive, if we consider the whole of the ecosystem. We have to consider that there is IUU fishery and that this may impact the environment in an uncontrollable way, and also that there is poor information on the impact of such fishery on the benthic fauna and flora.

2E.5- The score should be 60. This is because there is no assessment of the impact of *D. eleginoides* fishery on Rajiidae, neither in the regulated nor in the IUU fishery.

2F.2- The score should be 80. Key aspects of the ecosystem are protected if we are talking about the regulated fishery and do not take into consideration the skates and rays bycatch. However, the last is important because they might be vulnerable to extensive fishing activities, by both, the regulated and the unregulated fishery. The last one impacts also on birds. This is why I believe that there are management objectives set to reduce in part, but not to avoid the impacts.

2F.3- The score is not 100 only because of IUU. With IUU it drops to 80. Besides that, there is also the problem of the development of some new practices in order to avoid the possibly significant by catch of Rajiidae.

3C.3- Why is the score not 80? there is IUU fishing still present.

3D.3- So here there is stated that the risk of stock depletion exists? so even if the revenue is lower, the stock should be protected, and the harvest decreased. 3D.3 : I have no problems with the score of this item.

What I do not understand is why here it says that there is a stock reduction, or even depletion, and in the main text this is not discussed. In the main text it seems that there is not a problem, as far as this is a separate stock, and in no danger if there is compliance with the established TAC values. I believe that these are calculated based on the best scientific knowledge, and by competent scientists. Thus, again it is probably the problem of excessive fishing by some pirate vessels. What I have noticed along several years in CCAMLR is that some Members suggest that other calculation methods should be used, to evaluate the stocks in this region. However, as far as I know, no other concrete suggestions were made. So, I believe that controlling the amount that each vessel can capture, is a good method to get better control over the TAC for the region. And a better control over IUU fishing will be essential to keep the sustainable catch every year.

3E.1- Is that true for all other organisms that may be affected? It is true for birds, but not for environmental impacts in general.

3E.5- The score should be 60. Even in responsible fishery the loss of line with hooks can happen. Of course in IUU fishery, carelessness and lack of responsibility is high, and so, probably the release of all types of waste. This interferes with birds and mammals that may ingest artifacts or become entangled. Therefore, even if measures exist to reduce operational waste, it shall be possible to reduce the waste even more.

3F.2- The score should be 60. I believe that there is still lack of knowledge on basic aspects of the biology of the target species, mainly sites of reproduction, first spawning size, development sites of eggs, larvae and juveniles. Besides that, there are many other aspects of the ecosystem that are yet not well known. I recognise the scientific effort of BAS scientists for so many years, but there are still gaps that remain.

From the text of the report, the annex on scoring of the Toothfish fishery, the annexes about the rate of incidental mortality of birds in IUU longline fishery in subarea 48.3, and the analysis of IUU fishing, my appreciation is that the permitted fishery is conducted in a responsible way, and under the CCAMLR conservation measures. Only few items could be improved, as for example the depth of

fishery, the size of captured fishes, the care with fishing methods in order to avoid incidental capture of birds, the consideration with skates and rays incidentally captured by the longliners.

IUU fishing has diminished but is still a problem, that can be minimised with more frequent random patrols, and more general implementation of the catch documentation scheme.

Curitiba, 20 August 2002

Amended at the 27th of August 2002

A handwritten signature in blue ink, appearing to read "Edith Fanta". The signature is written in a cursive style with a long, sweeping underline that extends to the left.

Dr. Edith Fanta

South Georgia Toothfish Fishery: MSC Assessment

Peer Review Comments by Dr Euan Dunn, August 2002

General

I have been asked to address the bird by-catch aspects of the assessment although inevitably this has involved an evaluation of, especially, the level of IUU fishing.

Although the legal fishery is not fully compliant with CCAMLR conservation measures, BAS is satisfied (p. 33) that, in terms of the legal GSGSSI fishery, “*current mortality rates of seabirds are recognised... to be of negligible concern for the species concerned.*”

In accepting this, the focus therefore switches to IUU fishing. As p. 21 of this report acknowledges, “*IUU fishing remains a significant source of uncertainty for the management of this stock.*” One of the key concerns of the earlier Evaluation Process (pp 29-36, this paper) was that IUU fishing should not undermine the legal fishery and – by not using mitigation measures – threaten globally endangered bird populations. If that were the case, then certification of the legal fishery would represent endorsement of the fishery as whole – legal and illegal. As Falklands Conservation put it, “*the burden of proof should be on the SG Government to demonstrate that illegal fishing in the SG fishery is not significant*” and, as a number of consultees pointed out, the earlier Evaluation Report presented insufficient information to arrive at a balanced judgement on this.

Much therefore hinges on the robustness of the new methodology developed by Agnew and colleagues for estimating IUU catches of fish and birds and thus for removing the uncertainty surrounding current IUU effort and impact. I will therefore address this methodology to answer the critical question: “Does this new approach give confidence that IUU catches of birds can be properly estimated, and that the levels derived are not significantly impacting on seabird populations?”

Having established the level of IUU fishing, if it remains significant, the second key question concerns the ability of the GSGSSI to monitor and curb IUU activity.

Much of this paper is a synopsis of (and often repeats verbatim parts of) the two papers by Agnew and colleagues, nearly all the comments made here also apply to one or both of those papers.

As it is important to establish the gains inherent in the new model developed by those authors for estimating IUU catches of fish, and to establish how well it meets its objectives, a detailed analysis of the model is appended, below, in the **Annex**.

Apart from the Annex, my evaluation of the assessment is in 4 parts:

- 1) Factual basis of the Certification Report
- 2) Addressing stakeholder concerns in the assessment
- 3) Suitability of ‘conditions for continuing certification’
- 4) The SG Toothfish Scoring Table

Some of the key points arising from my evaluation are as follows:

1. The Certification Report gives inadequate information on bird by-catch rates and the issue of hooks discarded in fish heads. Relevant CCAMLR information is not presented.
2. Undue emphasis is put on the fact that the FPV lifted ~30,500 IUU hooks and found no birds and the tacit support this gives for IUU by-catch being low. The highly non-random nature of by-catch incidence makes it quite feasible that no birds would have been caught on this many hooks. The most conservative interpretation is that this sampling is not sufficiently representative to speculate on the level of incidental mortality.
3. By token of the same episodic incidence of by-catch, rates can occasionally be unexpectedly high. While cruise 11 of the *Isla Isabel* did yield an exceptionally high rate, and this is considered anomalous, there are precedents from other studies of equally high rates. However it is accepted that the *Isla Isabel* rate may have been subject to sampling error.
4. It is significant that negligible IUU activity has been detected from December 2000 to date and the evidence points to surveillance having a deterrent effect.
5. The new model for estimating IUU catches of fish and birds yields values lower than the CCAMLR estimates for all years, though to a lesser degree in 2000 than in 1999 and 2001. Including the ‘anomalous’ by-catch data from *Isla Isabel* increased bird catch by a factor of 3.5 but even this is lower than the CCAMLR estimate for all years except 2000. In summary, modelling IUU vessel activity more realistically does not demonstrate that seabird by-catch is being seriously underestimated by CCAMLR, in fact rather the opposite.
6. The model is far more rigorous than anything that has been done for this type of fishery anywhere, including within the CCAMLR area. However, further development is possible and recommendations are offered (see Annex to this evaluation) for parameter estimation and structure that could refine the model and make its predictions more robust. None of the refinements, however, suggest that the model underestimates IUU catches.
7. The need to refine the model further should be added to Condition 2 for continuing certification (which deals with further development of verifiable indicators of IUU effort estimates).
8. Condition 2 for continuing certification is that the current level of surveillance should be ‘*maintained or improved*’. This condition should be changed to ‘maintained and preferably improved’, given the priority attached elsewhere to keeping ahead in technological detection of IUU.
9. I welcome condition 7 to estimate, for each vessel, hooks discarded as part of fishery waste available to birds, primarily in fish heads. However, it is important to avoid this condition becoming a mere monitoring exercise for observers, and to endorse the proposal of WG-IMALF for a new conservation measure (that fish hooks be removed from heads prior to discarding), as integral to the condition for continuing certification.
10. Some of the scoring indicators and guideposts are not regarded as coherent with the MSC Standard. Certain weightings and scores are questioned, with a number of scores allocated judged to be too high (with none detected in the opposite direction). Certain inconsistencies and concerns about the supporting ‘Comments’ are identified. These issues should be considered in recalibrating the Table.

1. Factual basis of the Certification Report

p. 14, 3.2.1, §1: “*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.*” This is an unnecessarily imprecise description. Is the assumption that no arrests were made after 1996? (the text might imply that the data after 1996 are not known or not cited for whatever reason). Also “illegal fishing is reported to have

declined rapidly thereafter” could be stated less ambiguously. At worst “is reported to have” is universal speak for second-hand, unverified information or even speculation.

p. 14, 3.2.1, §2, also p. 16, 3.3.3.2 (Seabirds): While not factually wrong, the report does not help its own case by not giving a more quantitative account of the incidental mortality of seabirds. E.g. there is no mention of the particular species affected, nor the relation to globally threatened status. The report could usefully have included, e.g.:

According to the Intersessional 2000/01 Work of Ad HOC WG-IMALF on ‘Incidental mortality arising from longline fishing’, the overall rate of birds killed in the licensed fishery in Subarea 48.3 in 2000/01 was 0.002 birds/1000 hooks, essentially the same as in 1999/00. Compared with 21 birds in 1999/00, the total estimated mortality in 2000/01 was 30 birds (26 of them by only two vessels), of which the six observed comprised three southern giant petrels, two black-browed albatrosses and one cape petrel. 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.

These figures compare with the significant incidental mortality earlier in the 1990s, e.g. 0.66 birds/1000 hooks in 1993.

Threat to birds from discarded hooks

A second key omission here is any mention of the potential threat to albatrosses and their chicks from ingesting the hooks discarded with fishery waste, primarily in fish heads. This issue is sufficiently important to feature a number of times in the SG Toothfish Scoring Table, and also in Condition 7 (p. 41 of Certification Report) for continuing certification of the fishery. That condition requires an estimate of the number of hooks discarded per vessel and, if it proves to be a significant issue, a CCAMLR regulation be put in place as soon as feasible.

SC-CAMLR-XX/BG/7 reported the incidence of hooks and associated lines found in regurgitates, diet samples and around nests of several albatross and other species at Bird Island, and noted that the numbers of hooks had steadily increased to an all-time high in 2000/01. Hooks were chiefly from the toothfish fishery, thought mainly to be from discarded fish heads, including from vessels operating in the regulated fishery in Subarea 48.3. The growth of this same hazard has been reported from the Prince Edward Islands.

The report on *Incidental Mortality Arising from Longline Fishing* from the 2000/2001 Intersessional Work of Ad Hoc WG-IMALF concluded that “Such potential hazards to albatrosses could easily be avoided by the removal of hooks from the fish heads prior to their discard” and WG-IMALF therefore proposed that such a recommendation be added to existing conservation measures. This does not, of course, render the monitoring recommendation in Condition 7 redundant, but condition 7 only suggests that a regulation should be put in place *if the problem proves serious*, whereas WG-IMALF has already proposed a new conservation measure to remove hooks, irrespective of the outcome of further monitoring. Condition 7 should not be weaker than the WG-IMALF recommendation (see also specific comments, below, on (3) **Suitability of conditions for continuing certification**).

p. 14, 3.2.2, §1: “Some small amounts of fishing takes[sic] place within international waters in subarea 48., but outside the Maritime Zone.” Also (§2): “The amount of fishing outside the SGMZ but still within

sub-area 48.3 appears small. This area can probably sustain very few commercial vessels that cannot access the SG zone, making this area a minor issue in the management regime.”

The strength of these apparently reassuring statements needs to be judged against the Table 3.1 (pp 17-19) in Agnew, Kirkwood and Pearce which show that, of the 16 possible IUU incidents listed in 1999/00, no fewer than 6 were outside the SGMZ. This conforms with their statement in 3.2.1.15 (p. 23 of Agnew et al) explaining the lack of recent arrests on the grounds that “*much of the activity was observed in Area 6, outside the SGMZ, where the FPV has no jurisdiction.*”

So can the authors quantify the actual amount of fishing outside the SGMZ and could they be underestimating it, particularly as IUU vessels are likely to seek Area 6 (and the outer fringe of Area 1) precisely because they are within the toothfish-rich subarea 48.3 but beyond the jurisdiction of the GSGSSI and its FPVs? Clearly, a non-CCAMLR flagged vessel fishing just outside the GSGSSI EEZ can basically do as it pleases without fear of inspection or arrest.

p. 20, 3.5.3, § 4: “*These [observer reports] are distributed to the flag states involved (observer and vessel countries), presumably under the assumption that CCAMLR provides the management authority with all the information it requires. Although the connection between the GSGSSI and CCAMLR appears tenuous... etc.*” I feel we should be reassured more positively that CCAMLR does indeed provide the GSGSSI with all the information it requires and that GSGSSI avails itself of CCAMLR information ‘passively’ available on the web. It is an important point and we should know unequivocally from GSGSSI if they are lacking any essential and timely feedback from CCAMLR.

p. 22, §3.7: Note that the data presented on Current and Projected Harvest are less comprehensive than those on p. 19 (3.4.2.3).

p. 23, 3.8, §3: “*GSGSSI contracts the Falklands Islands Government to provide fishery protection vessels, and has the capability of undertaking a patrol for two weeks out of every month.*” As the actual could fall short of the ‘capability’, this statement leaves some latitude. In fact, it is expected that FPV coverage for the SGMZ in 2002-03 will remain around the current level (approx 180 days/yr) (Ben Sullivan, pers comm).

p. 23, 3.8, §3: “*The use of satellite monitoring systems is being tested, although it is not yet possible to evaluate their effectiveness.*” Fast-tracking this should be regarded as a priority issue for certification of the fishery, and certainly a *sine qua non* for certification should be that the current level of surveillance is at least maintained and preferably improved.

p. 23, 3.9: “*Current stock status and stock projections were not available to the review team.*” This appears inconsistent with the estimations in 3.4.2.3 (p. 19) of current spawning and virgin biomasses, respectively.

2. Addressing stakeholder concerns in the assessment

2.1 **Incidental mortality of seabirds**

As pointed out in the Certification Report, this issue was of concern to a significant number of stakeholders: ASOC, National Audubon Society, BirdLife International and WWF.

There is wide acceptance that this is not a significant problem for the legal fishery. By-catch levels have been reduced to negligible levels (see reference, above, to Intersessional 2000/01 Work of Ad HOC WG-IMALF on 'Incidental mortality arising from longline fishing').

The view of BAS is certainly to be supported that, given the proximity of the fishery to internationally important breeding concentrations of albatrosses and petrels, any future extension of the fishing season should only be contingent on demonstrably fully adequate mitigation and monitoring measures being in place. That said, the assessment here under review needs to be judged on the current regime and provisions.

The chief area of concern raised by the stakeholders is in relation to IUU fishing. The particular concerns, and my response to them in the light of the Certification Report, may be summarised as follows:

2.1.1 **In the worst case scenario, IUU fishers will not implement any of the CCAMLR measures designed to minimise bird by-catch**

In their supporting paper, Agnew and Kirkwood argue that the worse case scenario of total non-compliance with conservation measures is unlikely to obtain, and I can agree with this, if not by all the arguments they invoke in support of it.

They rightly point out that IUU vessels have some incentive to reduce bird catch levels and cite the case of such a vessel found in December 1999 to be using a streamer line (albeit not to CCAMLR specifications) and other mitigation measures.

As a cautionary note, however, just having mitigation measures on board is no proof of use. IUU vessels are known to alternate between sanctioned and IUU fishing, respectively, depending on who they are fishing for, where they are fishing, and the level of enforcement in the particular fishing grounds, etc. Thus, several vessels that have fished legally around Marion, for example, have subsequently been caught fishing illegally.

The authors also argue that IUU vessels may favour night-setting to reduce detection by FPVs although the growing pressure of surveillance may actually be reducing the capacity of IUU vessels to confine their activities to night-time. In any case, as they say, the cycle of setting and hauling makes exclusive night-setting virtually impossible.

2.1.2 **There is a lack of good data on seabird by-catch rates in the IUU fishery**

The authors present the available CCAMLR data, and while it is not as comprehensive as we would like, it is the best available and better than for most CCAMLR areas. The data are of two kinds: (1) FPV sampling of IUU lines; (2) Observer data for bird by-catch rates from the 1997 season when the majority of the licensed fleet was using inadequate or no mitigation measures, and thus thought indicative of current IUU fishing impacts.

Given the variability and risk of sampling bias, I have concern about the reliance the authors put on the first of these sources. The FPV lifted an estimated 30,500 hooks from Subarea 48.3 during the summers of 1998-2001 and found no birds on them. Based on this, Agnew and Kirkwood argue (p. 2, §4) that at least for IUU fishing around South Georgia in 1998/99-2000/01, "*catches of birds may have been low.*"

However, I would contend that, while indicative, the FPV data do not represent strong evidence for a low by-catch from IUU fishing. A normal toothfish line carries ca 3000-4000 hooks, so the ~30,5000 hooks

lifted by the FPV represent only around 10 lines maximum. It is well known from numerous studies that the spatial and temporal incidence of seabird by-catch in longline fisheries is highly non-random, e.g. around Marion, 1996-2000, about 95% of birds were caught on about 5% of lines set (D. Nel, pers comm.).

It is not reasonable, therefore, to assume that ~30,500 hooks might necessarily have caught birds at the average rate (2.608 birds/1000 hooks: CCAMLR FSA-2000), amounting to 90 birds in total. On the contrary, to find 10 lines with no birds caught is statistically *highly probable*, even if the vessels that set these lines incurred very high average rates of bird by-catch.

In conclusion, this particular source of evidence does not strongly justify Agnew and Kirkwood's speculation that "*at least for IUU vessels operating around South Georgia and for the period analysed (1998/1999-2000/2001), catches of birds may have been low.*" Rather, the most conservative interpretation is that this particular sampling of bird by-catch in IUU fishing is not sufficiently representative to speculate on the level of incidental mortality.

Nor do the FPV data therefore provide reliable independent evidence for the high by-catch rate of cruise 11 of the *Isla Isabel* being abnormally high. These data are presented as part of the authors' second source of estimating by-catch rates, based on the 1997 fishing season.

There are precedents in other longline fisheries for by-catch rates as high as that apparently incurred by cruise 11 of the *Isla Isabel* so I am less sanguine than the authors that they are necessarily abnormally high. However, I can broadly agree with the treatment of those data as an "*outlier*", in keeping with the doubts expressed by CCAMLR that they represent an observation rate of only 10% of the hooks set (FSA-97, §7.55).

The recommendation to calculate the summer rate of by-catch using data only up to 1 April, and winter from 15 April onwards, is well argued, and omitting the *Isla Isabel* cruise 11 data, this yields a winter by-catch rate of $0.058 \pm SD0.118$ birds/1000 hooks, and a summer rate of 0.792 ± 0.523 .

In summary, I am a less sanguine than Agnew and Kirkwood about the evidence that the by-catch rate from IUU fishing is as low as they contend. Having said that, they place priority on running their model of IUU catches of toothfish and birds against the most conservative parameters, including running the *Isla Isabel* cruise 11 data as a sensitivity test.

2.1.3 The IUU fishery may undermine the best efforts of the legal fishery and thus discredit the certification

The key concern behind this is the lack of knowledge of the IUU fishery and its impacts on the toothfish stock and the birds. Particular concern attaches to the unrecorded mortality that may accrue if IUU fishing is high during the birds' summer breeding season, even more so if IUU vessels routinely set lines in daylight hours. Unacceptable uncertainty applies to CCAMLR's estimations of such potential mortality.

Some of the aspects of this are addressed in answers to the concerns, above, but the key issue hitherto has been the lack of a quantitative approach to the estimation of IUU fishing levels and its impacts.

The first point to make here is the strict observational data. As the authors point out, the FPV has not encountered any IUU fishing activity in Subarea 48.3, including the SGMZ, since December 2000, with no reported IUU incidents in 2001/02 up to January 2002 (cf April 2002 in 'Comments' column on Scoring Indicator 1D.1 in Toothfish Scoring Table), despite the coverage continuing at the same level in 20001/2002 as in 2000/2001. This is encouraging and indicates that the relatively high and consistent level of surveillance around South Georgia is acting as a deterrent. The authors conclude that "*the decline in IUU activity seen in 2000/2001 and reflected in declining estimates of IUU catch has continued and that IUU catch in Subarea 48.3 is now at very low levels.*"

It is acknowledged, however, that the existing CCAMLR method of estimating IUU catches of fish and birds is fairly simplistic and the authors develop an elaborate simulation model to remedy this. Previous IUU catches have been estimated simply from sightings data and “estimates” of the amount of fishing by these vessels. As Agnew et al. say in their analysis of the extent of IUU fishing in Subarea 48.3, “*the method we have developed does not rely on the anecdotal sightings that CCAMLR has previously relied upon, and can therefore be considered to be independent of the problems that CCAMLR has faced in deriving its estimates of IUU catch.*”

CCAMLR’s calculations are also less robust in not giving 95% confidence limits, only a mean figure and a maximum. CCAMLR’s estimates of IUU bird catch are made from by estimating total days fishing and the proportion of summer: winter fishing, then applying (from 1997 observer data, when fishing by licensed vessels was largely unmitigated) a mean estimate of 2.608 birds/1000 hooks, maximum 9.31 (summer); and mean 0.07(max 0.51) in winter (FSA-2001, §7.108). The CCAMLR maximum is based on the *Isla Isabel* cruise 11 up to 15 April. The authors’ maximum, based on the same 1997 data up to 1 April, is 11.64 birds/1000 hooks, higher than CCAMLR’s.

The new approach for estimating IUU catches is based on a statistical simulation model of IUU vessel activity. Agnew and colleagues use FPV cruise data and take explicit account of both “seen” and “unseen” IUU fishing (estimating the probability of encounter) in all 6 areas of the SGMZ. The simulation model combines this with by-catch rates to generate “statistically rigorous estimates and confidence intervals of fish and bird catch by IUU vessels.” Four different scenarios are simulated, three of which assume different durations of IUU fishing, while the fourth assumes that the by-catch rate encountered in cruise 11 of the *Isla Isabel* was not exceptional and therefore includes it in the run. The authors have generally erred on the side of being conservative in their assumptions, e.g. tending towards higher rather than lower bird catch rates.

Three years were analysed, 1998/99, 1999/2000 and 2000/2001, giving (scenario 1) bird by-catches of 574, 2200, and 5444 respectively. **These are lower than the CCAMLR estimates for all years, though to a lesser degree in 2000 than in 1999 and 2001. Varying the assumed length of an IUU cruise made little difference to the result. Including the “anomalous” by-catch data from *Isla Isabel* increased bird catch by a factor of 3.5 but even this is lower than the CCAMLR estimate for all years except 2000.**

It is important that the model itself does not contain any significant flaws in its method of estimating IUU catches of fish and birds. The model is analysed and evaluated in the **Annex**, below. A number of issues are raised and recommendations for refinements made. If these were incorporated, some of and the estimates and precision could change quite considerably. In pursuit of providing more reliable estimates of IUU catches, the model is a major step in the right direction but it requires development before the accuracy and precision of the estimates can be regarded as robust.

Summary:

- Current levels of IUU fishing in the SGMZ, and therefore its impacts on birds, are believed to be low in the SGMZ and should remain so providing surveillance is increased and improved.
- Concern that the level of IUU is insufficiently quantified is addressed by the welcome new modelling approach developed by Agnew and colleagues is welcome. It is certainly a significant move in the right direction, and superior to the approach currently employed by CCAMLR.
- The model is a major step in the right direction but would benefit from refinement before the accuracy and precision of the estimates can be regarded as robust.
- The model generally predicts lower bird by-catch rates than does CCAMLR (none of the refinements suggested in the Annex, below, are thought likely to change that overall outcome). This is gratifying - in short, modelling IUU vessel activity more realistically, as here, does not

demonstrate that seabird by-catch is being seriously underestimated by CCAMLR, in fact rather the opposite.

These developments help to allay fears that certifying a legal fishery in which the extent of the IUU fishery was unknown and significant would effectively discredit certification (and allow the latter to create a protective cover for IUU fishing). The empirical evidence is that the IUU fishery in the SGMZ is not significant and, such as it is, is likely to be increasingly tractable in terms of quantification, surveillance and enforcement.

Obviously IUU (and regulated) fishing outside the SGMZ catches South Georgia birds and is almost certainly the major contributory factor to the continuing chronic population declines witnessed at the colonies on South Georgia. However, the overall populations from which these birds come are still arguably better off with a well managed regime at South Georgia than without one.

3. Suitability of ‘conditions for continuing certification’

Only those conditions on which I have any comments are cited:

3.1 Condition 1. The fishery shall be subject to annual surveillance visits. As the fishery is seasonal (austral winter only), twelve monthly surveillance is considered sufficient.

It is not clear what ‘annual surveillance’ and ‘twelve monthly surveillance’ actually mean. It could be interpreted as meaning that surveillance takes place once a year but that is obviously inconsistent with the fishery lasting throughout the austral winter. In fact, it is expected that FPV coverage for SG in 2002-03 will remain around the current level, i.e. approx 180 days/yr (Ben Sullivan, pers comm), in keeping with the statement on p. 23 of the Certification Report that the FPV “has the capability of undertaking a patrol for two weeks out of every month.”

3.2 Condition 2. The level of surveillance, monitoring and associated measures required to achieve certification should be maintained or improved (e.g. through improved/increased surveillance or proven effects of the Catch Documentation Scheme). Improvement should concentrate on development of verifiable indicators of IUU effort estimates.

3.2.1 By the use of the word “or”, the requirement to “improve” is not accorded the same sense of priority as Agnew et al. in their Conclusions and Recommendations to the analysis of the extent of IUU fishing in Subarea 48.3. Given the growing sophistication of technology aboard IUU vessels, Agnew et al state categorically that “*Continuing development of surveillance methods, such as scanning VHF and satellite detection is therefore a priority for GSGSSI.*” I can only agree with them and recommend therefore that this condition should be more forcibly put.

3.2.2 I also consider that specific mention should be made of satellite surveillance in the condition. Essentially there should be two minimum specific requirements in this condition:

- the status quo of monthly FPV inspections be maintained and preferably improved
- satellite surveillance be further developed and refined

Both of these, should be – as stated in the closing text of Condition 2 – “*an ongoing requirement for the fishery*”.

3.2.3 Lastly, Condition 2 states that *Improvement should concentrate on development of verifiable indicators of IUU effort estimates.* In my view, this should also extend to refinement of the new model for

estimating IUU catches of fish and birds. The Annex (below) draws attention to a number of areas where the model could be further developed and hopefully improved. If at least some of the suggested refinements were accepted and incorporated, some of the model's estimates and precision could change quite considerably. So in pursuit of providing more reliable estimates of IUU catches, the model is a major step in the right direction but it requires development before the accuracy and precision of the estimates can be regarded as robust. This ongoing development should also be specifically cited as part of Condition 2, or else made the subject of a separate, new condition.

3.3 Condition 6. *“At present, in allocating future harvests, IUU fishing is assumed to be zero. Although IUU fishing is taken into account in determining stock status retrospectively, this is seen as a weakness of the current system. A more specific method is required to take account of likely IUU fishing in determining future TACs. This should take account of new, and more comprehensive means of estimating IUU fishing (MRAG 2002).”*

I regard this as one of the most progressive conditions identified. It would serve as an added incentive to legal fishers to participate in surveillance and reporting of IUU fishing.

3.4 Condition 7. *“An estimate should be provided for each vessel, of hooks discarded as part of fishery waste available to birds, primarily in fish heads.”*

The intention behind this condition is welcome, not least as it is an oversight that the issue was not identified in the evaluation report by any of the stakeholders. As noted above, however, it is important to avoid this condition becoming a mere monitoring exercise for observers, and to endorse the proposal of WG-IMALF for a new conservation measure (that fish hooks be removed from heads prior to discarding), as integral to the condition for continuing certification.

4. The SG Toothfish Scoring Table

Although my main interest is bird by-catch, I will attend to issues and concerns that apply to the target stock, insofar as IUU fishing is likely to be the main driver of incidental mortality.

Only those features on which I have any concerns are cited. My response falls into three categories:

- a) The sufficiency of the scoring indicators and guideposts used in the assessment, in relation to the MSC Standard and the fishery in question (see below on 1A.5, 1F.2, Principle 2, 2A.2, 2C.3, 2E.5).
- b) The appropriateness of weightings and scores allocated (see below on 1B, 1B.2, 2C.1, 2C.2, 2D.2, 2E.1, 2E.3, 2E.5, 3E.5).
- c) The Comments by the assessors for indicators/scoring indicators (see below on 1B, 1B.2, 1F.2, 2A.2, 2C.2, 2D.2, 2E.3, 2E.5, 3A.5, 3D.3).

PRINCIPLE 1

Indicator 1A.5: Is the age and structure of the stock known?

No mention is made in **Comments** of the genetic structure of the stock, as required by **criterion 3 of Principle 1**.

Indicator 1B: Is fishery related mortality recorded/estimated (including landings, discards and incidental mortality)?

Given the uncertainty in IUU catches (including of birds), 60% would be a more appropriate **guidepost** than 80% for the scoring indicator.

However, the high **weighting** (43.7%) given to this scoring indicator is appropriate.

Comments note that the MRAG model '*gives quantitative estimates of the IUU catches using a statistically rigorous method*' which is acceptable. But note that this model is capable of refinement (see Annex, this response) which could improve the robustness of the model.

Indicator 1B.2: Is fishing effort recorded/estimated?

Comments only refer to the legal fishery and do not make reference to IUU effort. This is not covered by **1B.5**, which only refers to 'fisheries' in general and not to 'fishing effort'. Reference should therefore be made to the CCAMLR and MRAG estimates of IUU. This omission implies that the title of **1B.2** should be explicit about including IUU effort.

The **weighting** (6.8%) is too low for such a significant scoring indicator.

Indicator 1F.2: If the stock is below the precautionary reference point, is rebuilding specified in the decision rule being implemented?

Even if the stock is presently not depleted, it would be appropriate here to mention that there is currently no recovery plan (and make X-reference to **condition 4** which remedies this). This approach would be in keeping with **criterion 2** of **Principle 1** (likewise **criterion 3** for **Principle 2**) which requires that a recovery plan be in place in the event of stock depletion.

PRINCIPLE 2

None of the scoring indicators refer to MSC **criterion 3** which addresses recovery and rebuilding the stock to specified levels within specified timeframes in the event of the exploited population being depleted. Judging by the **Comment** in **1F.2** (see my response, above), this would have merited a N/A entry from the assessors but the omission of any reference to this criterion may imply downplaying of the role of the toothfish stock in the ecosystem, maintenance of which is the issue under **Principle 2**.

Indicator 2A.2: Is information available on non-target species affected by the fishery?

The **scoring guidelines** highlight 'distribution and ecology' but do not make any specific mention of *population/stock size* as a key element of the 'information available', and I would regard this as a serious omission (although it is alluded to in the **Comments** on rajids).

Comments should make reference to **condition 3** which requires reference points to interpret the effects of by-catch on rajid populations, and to establish the biological basis of mitigation measures for rajids.

Indicator 2C.1: Is there information on the presence and populations of protected species?

Comments note that BAS collects various data for SG birds affected by longlining but, as **Indicator 2A.2** points out, the 'Populations from which the [caught] birds come is not fully known...'. Given this hiatus, the score of 95% is excessive.

Indicator 2C.2: Are interactions of the fishery with such [protected] species adequately determined?

Comments note that recent work in relation to Area 48.3 has expanded on previous CCAMLR estimates of IUU fishing and considerably reduced uncertainty on the extent of IUU. This is true but it is important not to run too far ahead and we must attach proportionate weight to the new model of IUU catches. My evaluation indicates that the model is indeed a step in the right direction but the robustness of estimates and precision could improve quite considerably with further development of the model. In addition, we do not know the level of hook discarding with fish heads nor adequately understand the impact of this on seabird populations. Taking these factors into account, 80% is an over-generous score.

Indicator 2C.3: Do interactions pose an unacceptable risk to such species?

The 100% scoring guideline is that 'It is known that the direct and indirect effects of fishing on threatened and endangered species are within acceptable limits', which assumes quantitative knowledge. However this is at odds with the 100% scoring guideline for Indicator 2C.2 whose criteria require only 'qualitative information' to be 'available on indirect impacts'.

Indicator 2D.2: Is there adequate knowledge of gear lost during fishing operations?

The score (85%) is very high considering that hooks lost in cut-away entanglements and discarded fish heads is 'rarely quantified' by observers and is likely to have a higher impact on seabirds (though this is impact is not adequately known) than loss of lines from the legal fishery. Moreover, the score is higher than the 80% scoring guideline which requires 'Estimates made show that losses [of gear] do not cause unacceptable effects on the ecosystem.' I suggest that this score should reflect the 60% guidepost (= 'Some recording of gear losses takes place') until such time as (1) the incidence of hooks discarded in this way is properly monitored, and (2) removal of hooks from fish heads prior to discarding becomes a CCAMLR conservation measure (as recommended by WG-IMALF 2000-2001).

Two related points in *Comments*, namely (1) these should refer to **condition 7** for continuing certification which calls for such hook loss to be estimated and regulated if found to be a conservation threat; (2) the assertion that 'the same degree of loss [of hooks] would be expected from the IUU fishery' is challengable – if anything, discharge of such debris is likely to be higher from IUU vessels.

Indicator 2E.1: Have all the significant effects of the fishery on the ecosystem been identified?

The score allocated (75%) is close to the 80% scoring guideline that 'There is a comprehensive evaluation of the effects of the fishery on the ecosystem'. This is ambitious, given that an ecosystem model for the fishery has not been developed (Recommendation 2 for certification is designed to remedy this). Given this, and that the impact of (notably) discharging fish heads with hooks remains to be evaluated, I would regard 60% as a more appropriate guidepost (= 'Main impacts of the fishery on the ecosystem are known'.)

Indicator 2E.3: Does the removal of non-target species have unacceptable impacts on ecosystem structure and function?

Comments state (1) that the extent of hook discarding in fish heads is now [my italics] being determined. Is this true, given that CCAMLR observers rarely quantify this and that **condition 7** proposes monitoring precisely this as a condition for continuing certification? (2) 'Fish by-catch is recorded but the effects on ecosystem structure and function are unlikely to be important'. This appears at odds with *Comments* in 2E.5, namely that 'rays are known to be susceptible even in productive ecosystems. The fragility of this

ecosystem... makes this a considerable concern.' Given these queries, the score of 80% is generous and the current state of play more closely reflects the 60% guidepost.

Indicator 2E.5: Is associated biological diversity and productivity affected to unacceptable levels?

The **scoring guidelines** do not fully describe the breadth of options in the actual situation. The existing guidelines assume that all the potential effects have been studied/quantified. In the case of this fishery, however, not all of the impacts have been fully studied (i.e. the impact on rajids needs to be evaluated, likewise the impact of jettisoning fish heads containing embedded hooks). This being so, the allocated score (75%) is inevitably subjective and does not necessarily reflect reality.

Comments: (1) begin with the statement that 'reductions in population sizes of affected seabirds at SG reported by BAS, in some cases, are unacceptably great.' It is confusing to have comments in some cases confined to interactions between seabirds and the toothfish fishery in the SGMZ alone (which is the correct terms of reference for this evaluation), and in others (as here) the presumed effects mainly of longline fisheries outside the SGMZ and Subarea 48.3;

(2) state that 'studies are now underway' to address the issue of hooks lost in offal. Is this true? – if so, this initiative is not mentioned in the Certification Report;

(3) third para which begins 'Despite confirmatory information from an ecosystem model...' should presumably read 'Despite lack of confirmatory information from an ecosystem model... '.

PRINCIPLE 3

Indicator 3A.5: Do objectives and operational procedures follow the precautionary approach?

Comments: I welcome that better/realistic estimates of IUU should be included in TAC recommendations. If this is equivalent to **condition 6** for continuing certification, then that should be X-referenced here. It would also be appropriate here to mention that there is currently no recovery plan for the stock in event of depletion (and make X-reference to **condition 4** which remedies this).

Indicator 3D.3: Do procedures exist for reductions of harvest in light of monitoring results?

Comments: (1) 'There is no practical procedure to reduce harvest if stock, and hence revenue, decrease such that surveillance and enforcement costs cannot be met.' *Shouldn't there be such a contingency plan?*
(2) *The recommendation for development of a stock recovery plan should be X-referenced to **condition 4**.*

Indicator 3E.5: Do measures exist to reduce operational waste?

The score is 75%. Given the uncertainty over levels and impacts of hook loss in discarded fish heads, and the lack of operational procedures at present to prevent this, 60% seems more appropriate as a guidepost.

ANNEX

Detailed comments on “*Statistical method for analysing the extent of IUU fishing in CCAMLR waters: application to Subarea 4.83*” and the companion document “*The rate of incidental mortality of birds in the IUU longline fishery in Subarea 48.3*” by D.J. Agnew and G.P. Kirkwood.

General comments

These documents outline a method of determining the catch of toothfish and birds by IUU longline fisheries in the South Georgia area using a combination of simulation modelling of fishing effort and deterministic calculation of catches. This approach probably provides the best means of assessing the catches by IUU longliners, since it will be almost impossible to quantify empirically without huge monitoring effort that would undoubtedly affect the behaviour of the IUU fishery. The analysis is far more rigorous than anything that has been done for this type of fishery anywhere, including within the CCAMLR area. The authors therefore deserve to be congratulated on the work conducted so far but be encouraged to develop the method further. Recommendations for parameter estimation and model structure are made below that will hopefully be useful in refining the models and making their predictions more robust.

It is not possible to work out the relative effects of the refinements suggested below without running the model. However, none of them suggest that the model as presented underestimates IUU fishing and if anything it may tend to do the opposite. The comments on model structure will tend to increase the breadth of the confidence levels rather than affect the estimate.

Parameters used

Models are only as good as the parameter estimates used in the simulations and calculations, and the assumptions made when these are unavailable. The lack of available data on IUU fisheries mean most of the estimates are derived from legal longliners or research vessels, and these may not be representative of IUU vessels. This will lead to inaccuracies of the model predictions. There is very little that can be done about this, and we have to accept the data as the best available. However, the analysis of the available data could be improved to estimate the parameters and their confidence intervals more robustly.

By-catch rate

The analysis of rates of bird by-catch outlined in document WG-FSA-02/5 uses summed rates of catch per 1000 hooks on each cruise, and takes the average of these as the estimate of catch rate per 1000 hooks with bootstrapped confidence intervals. The problem with this method is that the number hooks set per cruise varies enormously, but the analysis does not weight the estimate correctly to allow for this. For example, if 1000 hooks were set and one bird was caught this would get the same weighting as if 100,000 hooks were set and 100 birds caught.

To obtain more accurate estimates of by-catch rate, it would be preferable to define the number of birds caught as the response variable, specify the number of hooks set as the binomial denominator and run a GLM with a logit link and binomial error distribution (Crawley 1993). This would estimate the correctly weighted probability of a hook catching a bird, and will certainly reduce the weighting of the *Isla Isabel* cruise on the overall data set. Variations among seasons and area could be explored by fitting these as factors. The errors are likely to be overdispersed compared to a binomial distribution owing to the small proportion of hooks that caught birds. As such, the scale parameter in the analysis may need to be adjusted (Crawley 1993) to obtain appropriate confidence limits for the estimates and avoid Type I errors in statistical testing.

Encounter rate

The definitions of encounter rate and sightings rate are confusing in the report and need to be made more clear. The estimation of sightings rate also needs to be improved and variation in this incorporated into the model.

Presence or absence of the IUU in each sub-area is dealt with by the simulation model of fishing effort. Therefore, the estimate of encounter rate should be estimated as the likelihood of a FPV sighting a IUU that is in the same sub-area as it is searching on that day. This likelihood is currently inferred from the rate at which FPVs encountered legal longliners fishing in the entire Sub-area 48.3 during the entire period the FPV was present. However, legal vessels themselves may not have been present for the entire period of the FPV cruise, and may have been in different regions of the sub-area during the time they overlapped. These are variables accounted for in the simulation model, and so these components of encounter rate are paid twice in the model. As such, the estimate of P will be reduced, and fishing effort over-estimated.

The lack of temporal overlap is partially accounted for by regressing the mean time overlap of FPV and legal cruises the likelihood of them being sighted (Fig. 4). The estimate of sightings rate when temporal overlap is 100% is taken as the sightings rate for the model. However, the regression has error associated with the slope and intercept, and these are furthermore questionable since the overlap time is based on mean summary statistics that also have sampling error associated with them. The estimate of sightings rate is therefore not a measure, and confidence limits should be presented.

A better way to estimate sightings rate would be to analyse the proportion of times that the FPV sighted a legal vessel on days when they shared the same region of Sub-area 48.3. This removes the variance of time overlap and space overlap that is accounted for in the simulation model. Again, a GLM with binomial errors and a logit link would be most appropriate for producing confidence limits of this parameter. The binomial denominator in this analysis should be specified as 1.

I can't see the benefit in excluding data from other vessels provided the periods of presence within each region of the Sub-area is known. Encounters with IUU vessels by FPVs are scarce, so any further data that help build up a picture of activity patterns of IUU vessels is valuable. The only difference between these and FPV sightings is that reporting rate is another factor in the encounter rate estimate. The sightings rate for such vessels could be determined as described above for FPVs. Use of satellite data could be explored too. The fact that this will not allow identification of individual vessels in most cases does not lessen the value of the data because it is the total fishing effort, rather than number of vessels, that is the important parameter.

Number of vessels

In this model, it is assumed that any IUU fishing in the sub-area will be encountered at least once, but we are not given any information to support this. Since the number of encounters was low, and some of the vessels were encountered only once, it is perfectly plausible that other vessels were involved in fishing activity in the area but were never detected. This problem would be particularly acute in regions where FPV effort was low, and IUU operations were transient and/or cruises were short.

Use of D

I think the use of the value D in the equation is suspect and imposes many unnecessary assumptions. I would be inclined to simulate various IUU scenarios by varying number of vessels, duration of cruises and duration of breaks between cruises and record simulated encounters with FPV and other vessels. These could be simulated iteratively and the encounter pattern that best fitted to observed pattern of encounters could be selected as the estimate of fishing effort.

Model structure

The model uses a stochastic model to determine fishing effort and rates of by-catch or target catch, but then uses deterministic calculations to link these and estimate the totals of fish and birds captured. A more elegant approach would be to combine all these into a single stochastic model of effort and catch rates. Furthermore, some parameters in the deterministic model are estimates rather than measures (e.g. mean hooks set per vessel per day) and should be modelled stochastically as well to account variation in these. Due to this omission, the confidence intervals of the model predictions will be too narrow.

It would be preferable to produce a single stochastic simulation model for the entire fishing process. The number of vessels in the fishery, the mean date they make their first cruise of the year, the mean duration of

cruises, and the inter-cruise duration and the number of hooks they set per day (with standard deviations for each) could be defined. You would then draw values of each vessel cruise randomly from a frequency distribution with these means and SDs. This is preferable to placing cruises randomly in the year (as at present), as the inter-cruise duration is more likely to be of a length dictated by vessels operational schedule than completely random.

For each cruise, the vessel would be allocated a region that it would fish in and on each day it would set it's allocated number of hooks and catch fish and birds. The rates at which this occurred could be selected from the mean and SD of the rate of these being caught per hook by the GLM analysis (note: the logit estimate would need to be used to maintain symmetry of the SDs and then back-transformed using the equation ($P = \exp(x)/(1+\exp(x))$) where P is the likelihood of a bird being caught on a hook and x is the logit estimate of catch rate). The value of P could be dependent on area or time of year the vessel was fishing in. For each hook you'd generate a random probability and if this was lower than P , a bird would be caught and one would be added to the total number of birds caught in that year.

You'd repeat this for fish, only with the value of P being the likelihood of a fish being caught. Since hooks catching birds can't catch fish, it would be necessary to make these inter-dependent. As such, the estimated parameter for fish catch used in the model would have to be expressed as a proportion of hooks set that didn't catch birds in order to be completely accurate, although the bird catch rate is so low as to make this bias negligible.

Cruises could be simulated for the vessel until the end of the year arrived, and then the next vessel could be simulated. Once all vessels had been simulated you'd have a summed estimate of the total number of birds and fish caught in that year. This process would be repeated 999 times. The mean and 2.5 and 97.5 percentiles would then be taken to represent the mean and 95% CIs of catch and by-catch.

References

CRAWLEY, M.J. 1993. *GLIM for ecologists*. Blackwell, London.

1. South Georgia Patagonian Toothfish Longline Fishery.

1) The factual basis of the main report.

General comments: The physical location of the fishery is adequately described and appears to be physically isolated by deep water from other shallow areas which might be toothfish habitat. Based on its physical isolation it appears to me that the fishery can be treated as a discrete fishery. A case is made for a separate stock as required by MSC principles, however as pointed out the eggs of this species are buoyant and the larva planktonic. Thus this stock may not be genetically isolated because of dispersal of eggs and larva in the circum polar current. Dispersal of the eggs and larva may result in gene flow throughout the sub-Antarctic waters, a desirable process because it helps maintain genetic variability within the toothfish species as a whole. The document deals extensively with the definition of a separate stock in 3.3.2. I strongly agree with the practical definition of the SG toothfish stock. The claim of a defined isolated population of adults is supported by tagging studies, molecular genetic (mitochondria DNA marker) studies and physiological (growth rate differences between SG and South American population studies. The possibility that there may be larval recruitment from other sub-Antarctic stocks would be important for maintaining genetic variability within the species and in my view does not preclude treating the SG area population as a defined stock for management purposes.

3.3.3 By-Catch and Discards

It appears that discards resulting from loss from hooks during line retrieval is not a problem assuming that the toothfish are alive when brought to the surface. Studies with the sister species *D. mawsoni* in McMurdo Sound indicate that specimens recover from rather severe hook wounds and large scars on the trunk of mature fish are not uncommon. The wounds most likely result from encounters with Weddell seals and killer whales. With ray and grenadier, it would be informative to know the condition of these specimens when they are pulled to the surface and what their chances of survival are when released (knocked off the snood). If in reasonable shape, removal of the hook and release should not result in death. This aspect of by-catch should be addressed.

3.3.4 Externalities –IUU Fishing. As the authors of this fishery assessment point out, Illegal, Unregulated and Unreported Fishing is an extremely important consideration in the management of the fishery, because of its negative impact on other members of the southern ocean ecosystem (birds and fish by-catch) and as well for making accurate determinations of the yearly harvest. The impact on the long-lived birds may be especially severe. It appears that the parties involved (SCSS, CAMLAR and NGOs) are well aware of this problem, which is aggravated by IUU fishing. Procedures have been put in place to mitigate sea bird by-catch and are clearly laid out. It also appears that relatively accurate estimates of IUU catch can be obtained which will be considered in the management of the fishery.

ii) Stakeholders concerns in the assessment

7.4 Stakeholders Issues

Much of the concern of the NGOs appears to be centered on seabird by-catch. It appears to me that CCAMLR measures now being implemented are effective in reducing by-catch to acceptable levels in that as far as the research indicates, the bird by-catch is not threatening the existence of the long-lived species. However, any ornithologist would like to see a by-catch of zero, as would I, however unrealistic that may be.

I do take issue with some of the NGOs positions on the fishery and its certification. I fail to understand how certification of the legal fishery would represent certification of the fishery as a whole (including the illegal fishery). It is my view that a well-managed fishery as laid out in this document and especially the procedures laid out to reduce IUU fishing is the only way to effectively manage the fishery.

A moratorium on all toothfish fishing is in my view unrealistic as it is likely that a market for illegal fish will always exist in some measure. Without a legal fishery there would be few resources for enforcement to deter illegal fishing. I strongly agree with the assessment that the control of IUU fishing is part of the overall fishery management responsibility. With the legal fishery comes revenue that can be used to effectively manage the fishery and curtail IUU fishing.

iii & iv) MSC principles, scope and scoring.

In general the replies to the queries associated with the three Principles are adequately addressed and as well documented largely by literature published in reviewed journals.

Principle 1: I feel most comfortable supporting the scoring of principle 1 as there are similarities between the Patagonian toothfish and the Antarctic toothfish in terms of life histories, reproduction and perhaps patterns of distribution around the Antarctic continent.

Principle 2: I also support the scoring of the queries associated with this principle, but would like to point out that as also mentioned in the assessment our knowledge of the deep water habitat is relatively limited. As well, there is little knowledge as to where the toothfish fits into the big picture, especially in a quantitative way. I agree with the assessment that the long line fishing method probably has the least effective on the deep-water benthos relative to other methods.

Principle 3: I also support the scoring of the queries associated with this principle but have limited knowledge of management of fisheries and thus leave specific comments to specialists in this area. A general comment regarding the relationship with CAMLAR and this fishery is that there appears to be oversight at several levels with expert opinion provided by working committees whose vested interests appear to be the welfare of the toothfish and the southern ocean ecosystem. Thus I think the prognosis is excellent for a well-managed fishery where toothfish can be harvested but not over fished. To this end management appears to have built in margins of safety for error in estimating catch as well as for our lack of knowledge of the complete life history and biology of the toothfish.

v. Suitability of conditions attached to certification

The requirements set forth in the seven conditions are reasonable and necessary for good management of the fishery. As indicated the need for surveillance is a given in order to control IUU fishing and obtain accurate data on catch and by-catch.

Condition 4 requires codifying management measures and includes a contingency plan for future funding should revenues from operating the fishery produce insufficient funds for monitoring and enforcement. I strongly recommend such a plan because without enforcement surely IUU fishing would again increase.

I am a bit puzzled by Condition 7 with regards to hooks discarded as part of fishery waste, specifically heads. It would appear to me that any hook is easily removed from a head either with a knife or gripper as the lower jaw and head are poorly mineralized being mostly cartilage. Hook removal should be an enforceable requirement. An alternate might be to require installation of a waste grinder with a discharge below the water line that would ensure removal and sinking and as well may reduce the amount of particulate waste available for the sea birds.

I hope you find my comments useful and if any questions please do not hesitate to contact me.

Sincerely,

Arthur L. DeVries
Professor of Animal Biology &
Molecular and Integrative Physiology