REPORT OF THE MARINE STEWARDSHIP COUNCIL (MSC) OBJECTIONS PANEL ON THE GULF OF ALASKA POLLOCK FISHERY

MSC Objections Panel:

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1. INTRODUCTION

1.1 This Objections Panel has been convened pursuant to MSC objections procedures to consider an objection to a determination made by the independent certification body, Scientific Certification Systems Inc. (SCS) (referred to herein as "the Certification Body") to certify the Gulf of Alaska Pollock Fishery against the MSC Principles and Criteria for Sustainable Fishing. Details of the objections are set out below.

1.2 The certification process for the GOA Pollock Fishery commenced in 2001. In accordance with MSC certification procedures, a draft determination was issued by the Certification Body in November 2003. The final determination was issued on 2 July 2004. An initial objection to this determination was submitted on 4 August 2004 on behalf of three non-governmental organizations: Alaska Oceans Program, Greenpeace International and National Environmental Trust ("the Objectors"). The Certification Body responded to that objection on 24 September 2004. On 16 October 2004, the Objectors submitted a further objection to MSC, which duly considered the further objection and issued a decision on 22 October 2004. In its decision, MSC dismissed the further objection on all but two grounds, which are now referred to this Objections Panel for consideration.

Membership of Objections Panel

1.3 The Objections Panel was constituted by the MSC Board as follows: Dr Keith Sainsbury (an MSC Board member), Dr John Caddy and Mr Michael Lodge. Details of the qualifications and experience of the members of the Objections Panel appear in Annex I.

Conduct of deliberations

1.4 The Objections Panel conducted its deliberations by telephone and email during December 2004 and January 2005. The Panel did not consider it necessary to call on the Certification Body, the Objectors or the subject fishery to make oral representations; nor did any party request an oral hearing.

Scope of Objections Panel

1.5 The scope and powers of the Objections Panel are set out in the MSC Objections Procedure (dated 12 July 2004) and the MSC Terms of Reference for Objections Panels.[1] The intent of the objections procedure is to provide an orderly and structured process by which concerns about certain aspects of the assessment and the Certification Body's determination can be transparently addressed and resolved. The Objections Panel is not entitled to conduct a full reassessment of the fishery against the MSC Principles and Criteria; nor is the Objections Panel entitled to substitute its own views and opinions for that of the Certification Body. The purpose of the Objections Panel is solely to examine the claims made by the Objectors and determine whether the responses by the Certification Body to those claims are consistent with the MSC Principles and Criteria and the MSC process.

1.6 The Objections Panel may either allow the determination to stand or may remand the determination to the Certification Body with instructions to reconsider significant procedural issues or information omitted or inadequately considered. A determination may be remanded only on the grounds that it is arbitrary or unreasonable or that there has been a violation of MSC procedures and it is probable that the violation changed the outcome of the determination.

1.7 In accordance with well-established legal principles, we interpret this test as meaning that the Objections Panel is entitled first to investigate the action of the Certification Body with a view to seeing whether it has taken into account matters which it ought not to take into account, or,

[1] Terms of Reference for MSC Objections Panels (Version 2, July 2004), MSC.

conversely, has failed or refused to take into account or neglected to take into account matters which it ought to have taken into account. Even if that question can be answered in favour of the Certification Body, it may be still possible to say that it has nevertheless come to a conclusion so unreasonable that no reasonable certification body could ever have come to such a conclusion.

1.8 The MSC Procedures further require that the Objections Panel shall base its evaluation solely on the basis of the record submitted by the certification body, subject fishery and the objecting party. That is:

(a) the final determination by the certification body;
(b) the initial objection;
(c) the response to the initial objection;
(d) the further objection;
(e) any further input from the subject fishery that was made available to the certification body during the original assessment, provided that the subject fishery is not the objecting party.

1.9 The Panel may also seek external advice when deliberating.

1.10 In our deliberations we have considered the key source documents used by the Certification Body in its assessment, the Certification Body assessment report, the Certification Body response to the Objection, the key source documents used by the Objectors, and both the Objection and the Further Objection lodged by the Objectors. The source documents examined included:

(a) the North Pacific Fishery Management Council (NPFMC) Stock Assessment and Fishery Evaluation (SAFE) report for the groundfish resources of the Gulf of Alaska (2002 and 2003);

(b) the NPFMC SAFE report for Walleye Pollock in the Gulf of Alaska (2002 and 2003);

(c) "Decline of the Steller sea lion in Alaskan Waters – Untangling food webs and fishing nets", Report of the Committee on the Alaska Groundfish Fishery and Steller Sea Lions, National Research Council (2003), (hereinafter "the 2003 NRC Report"); and

(d) the Regulatory Assessment/Regulatory Impact Review, Proposed Amendment to the Regulations Implementing the Fishery Management Plan for Groundfish of the Gulf of Alaska;

1.11 In addition, we have drawn upon other information and reports relevant to the issues before us (referred to as necessary in this report) and have also briefly examined the 2004 NPFMC SAFE report for GOP pollock that was not available at the time of the Certification Body assessment and determination.

2. GROUNDS FOR OBJECTION

2.1 Objections to the Final Determination were filed on a number of grounds, which we do not need to set out in full here. The MSC Board decided to dismiss all the grounds of objection except for two. The reference to this Objections Panel relates only to the objections made on these following two grounds.

Low stock size of GOA pollock

2.2 The Objectors contend that the fishery should have failed its assessment against MSC Principle 1, Criterion 1, i.e. that 'the fishery shall be conducted at catch levels that continuously maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity.' Specifically, the Objectors argue that the Certification Body should not have considered the fishery to pass the minimum Scoring Guidepost (60) under performance indicator 1.1.2.1, which requires that "stock assessments show that there is a reasonable chance that the stock is at or above B_{MSY} or its equivalent."

2.3 In the initial objection the Objectors asserted that the GOA pollock stock has been in continuous decline for over two decades. They also said that there is no question that the GOA pollock stock is significantly below MSY. The fishery should fail under performance indicator 1.1.2.1, the overall score for MSC Principle 1 should be lowered, and until the stock recovers, the fishery should not be certified. The Objectors questioned the reliance by the Certification Body on a particular interpretation (Dorn 2003 and Dorn, *et al.* 2003) of the limit reference point for stock size, the interpretation of which they also questioned. The Objectors also asserted that management has been unable to rebuild the stock, which continues to decline.

2.4 The Certification Body reviewed the Objectors' concerns, but found no reason to alter its determination. The Certification Body argued that the fishery apparently fails the benchmark because of the rules under which the stock assessment analysis was conducted, but that a separate analysis in the same assessment report accounts for the variable nature of the ecological system in which the stock is found. It stated that in its assessment of the fishery against the performance indicator, its team was mindful of its own statement of intent for the indicator, which, it asserts, the Objectors failed to take into consideration.

2.5 In answer to this response to the initial objection, the Further Objection states that "the SCS team recognized the low stock size … but scored the fishery too generously given the serious decline. The team justifies its high scoring on the notion that the low stock size is a natural fluctuation." The Objectors dispute the rationale and assumptions upon which the justification is based. The Objectors also question whether the management response is sufficiently precautionary and state that the team failed to attach conditions that require more precautionary actions.

2.6 In deciding to refer the matter to the Panel, the MSC Board noted that this is a complex set of arguments relating to the appropriate benchmark for fluctuating stocks. An important observation by the Certification Body in its response to the initial objection seemed particularly relevant to the Board: "which interpretation of B_{MSY} is the more appropriate for this stock?" No operational interpretation of the MSC standard exists to provide clarity on benchmarks for fluctuating stocks.

Catch inside Steller sea lion critical habitat

2.7 The second ground for objection questions whether, in the light of its findings in relation to the impacts of the GOA pollock fishery on Steller sea lions, the measures and conditions proposed by the Certification Body are sufficiently precautionary when measured against the standards set by MSC Principle 2.

2.8 In the initial objection, the Objectors stated that "despite the SCS team's concern about the ecosystem impacts of the GOA pollock fishery,… alarmingly low abundance level and declines of more than 80% in Steller sea lions in the last thirty years…, the Final Determination fails to include conditions that require precautionary action". The Objectors asserted that conditions under MSC Principle 2 do not go far enough to address serious concerns that the Certification Body's report reflected. They stated that conditions should require precautionary management actions such as significantly reducing TAC levels or curtailing fishing in critical habitat and instituting pollock spawning reserves. Further that while the Certification Body's report recognized the issue, it failed to take the next step and require stringent conditions to ensure the certification meets the MSC standard.

2.9 The Certification Body's response to the initial objection stated that no new evidence was presented by the Objectors that current harvest rates from Steller sea lion critical habitat are causing significant impacts on Steller sea lions, nor do the Objectors claim that any such evidence exists. The Certification Body considered that instead the Objectors argued that in the absence of clear scientific evidence, a particular kind of precautionary approach should be adopted, i.e., those actions listed in the paragraph above. It was acknowledged that the "essence of the objection is what properly constitutes a precautionary approach." The Certification Body asserted that the balance of scientific opinion indicates that factors other than pollock fishing are likely to be the cause of Steller sea lion decline. It reiterated its conclusion that, after examining the evidence, the appropriate precautionary measures are to require additional research to determine whether the fishery impacts Steller sea lions, that the research should be carried out as a matter of urgency and that the management system will be required to be responsive to the research findings. The Certification Body took the view that it was not defensible to require "draconian constraints on the fishery just in the unlikely event that the experts may be wrong." Further, that any limits to fishing added as a further condition would be "arbitrary, unscientific and of unknown efficacy……impossible to justify any particular figure as a limit, except as a precautionary response to a concern that is based on feelings and not on objective underpinning science."

2.10 The Objectors in their further objection disagreed that the conditions they suggested are draconian and reaffirmed their belief that these actions are necessary responses to the identified problems facing Steller sea lions. The Objectors also assert that despite millions of dollars being spent, research has been unable to answer definitively the main questions regarding Steller sea lion declines and that research is not a panacea and scientific uncertainty about marine ecosystems will not be resolved by more research in many cases. The Objectors argue that the need for more information should not be used as an excuse to delay precautionary measures while research continues – scientific uncertainty about the effects of fishing on ecosystems is not a reason to delay environmental protection or ecosystem-based management, rather it is a reason to increase it. The Objectors invoke the Certification Body's own report where it states that "… on the limited understanding of functional relationships between pollock and other important components of the food web, the evaluation team would expect the harvest of pollock to be taken in a precautionary manner that ensured that impacts on the food web would be restrained." The Objectors further state that it is unfortunate that "the SCS team fails to hold the fishery to the very standard that it professes to recognize."

2.11 The MSC Board noted that the essence of this argument is about the interpretation and application of the precautionary approach, i.e., what is the most appropriate management response given the uncertainty surrounding the issues.

3. FIRST GROUND FOR OBJECTION: THE APPROPRIATE BENCHMARK FOR STOCK SIZE OF GOA POLLOCK

Background and issues for determination

3.1 The first ground for objection relates to the interpretation of MSC Principle 1, Criterion 1. That is "the fishery shall be conducted at catch levels that continuously maintain the high productivity of the target population(s) and associated ecological community relative to its potential productivity." The Certification Body identified 23 measurable indicators to provide an operational interpretation of this criterion. With the exception of indicator 1.1.2.1 these all focus on testing and improving the fishery assessment and harvest control rule. The harvest control rule is used to calculate the appropriate exploitation rate based on the estimated stock condition. It is intended to prevent both too high an exploitation rate (i.e. overfishing) and over-depletion of the stock (i.e. overfished stocks). Indicator 1.1.2.1 establishes a limit to the stock size, below which the stock is regarded as overfished and not certifiable by MSC. It is the Certification Body's identification and use of this limit that is challenged by the Objectors and that is reviewed here.

3.2 The Certification Body adopted the following statement of intent and Scoring Guideposts for assessing the performance of the GOA pollock fishery against indicator 1.1.2.1:

> *"The intent is to assess whether the stock is currently "overfished". There is no internationally agreed standard to define this. A recent FAO view (based on an interpretation of the UN Fish Stocks Agreement) is that target stocks should generally be maintained above B_{MSY}, which should be used as a limit reference point. An alternative (but not generally accepted) view is that explicit allowance should be made for predators by increasing target and limit levels well above B_{MSY} (e.g. the "CCAMLR" strategy). Stock levels can also fluctuate due to natural environmental variability, and this needs to be taken into account. In this regard, B_{MSY} is an equilibrium concept and is not easily defined for a naturally fluctuating stock. In the absence of precise or agreed definitions or standards, expert judgments will be made based on the following guideposts:*
>
> *100 Scoring Guidepost*
>
> > *Stock assessments show the stock to be above the reference biomass with greater than 90% probability.*
> > *The reference biomass is above B_{MSY} and takes into account the needs of predators.*
>
> *80 Scoring Guidepost*
>
> > *Stock assessments show the stock to be above the reference biomass with greater than 70% probability.*
> > *The reference biomass is B_{MSY} or its equivalent and takes into account the natural variability of the stock.*
>
> *60 Scoring Guidepost*
>
> > *Stock assessments show that there is a reasonable chance that the stock is at or above B_{MSY} or its equivalent."*

The Certification Body awarded the fishery a score of 70 against this performance indicator and identified three specific conditions for continued MSC certification. These were:

> *"The requirement for testing alternative harvest strategies (condition attached to scoring indicator 1.1.1.5) needs to take account of the considerations discussed in the evaluation for this indicator. In particular, harvest strategies should be tested for robustness against a variety of assumptions about the role of natural environmental variability on GOA stock dynamics, and performance measures should include the impacts of low stock sizes on predators of pollock. Alternative harvest strategies*

(harvest control rules) should be considered that provide a better balance between stock protection, minimizing impacts on predators, and exploitation.

The SCS (or a suitable independent expert) should review and comment on the estimates of stock depletion in Appendix C of Dorn et al (2003) in relation to the relative impacts of fishing on recruitment variability and stock abundance.

The GOA plan team should recommend strategies to improve the reliability of the annual abundance surveys, particularly in and around Shelikov Strait, to better understand the interannual variability in spawning location and stock behaviour, also noting the recommendations in Godo (2003)."

3.3 The Certification Body's interpretation of "B_{MSY} or its equivalent" accepted the now well established evidence for long term fluctuations in population size and productivity of pollock and other fishery resources of the North Pacific– fluctuations that broadly correlate with variations in the oceanographic environment of the North Pacific. The pollock population size was small but slowly increased between 1960 and 1975. There was relatively little fishing during this period and weak year-classes were recruited to the population during the 1960s. The population rapidly increased after 1975, reaching a peak in abundance between 1982 and 1985, following recruitment of several very strong year-classes during the 1970s and early 1980s. The fishery catch also increased during the late 1970s and early 1980s, reaching peak catches between 1982 and 1985. Since about 1985 the population has steadily decreased, with both recruitment strength and catches at intermediate levels relative to historical values. The GOA pollock spawning biomass in 2002 was similar to that during 1965-1975.

3.4 $B_{35\%}$ is used as a proxy for B_{MSY} in the pollock stock assessments and the harvest control rule used by the fishery regulators. $B_{35\%}$ is the long term average biomass that would be expected by applying a fishing mortality ($F_{35\%}$) that reduces the 'spawners per recruit' to 35% of the 'spawners per recruit' in the absence of fishing ($B_{100\%}$). The stock assessments estimate recruitment and biomass in the population each year by fitting a population model to research and commercial fishery data. $B_{35\%}$ and $B_{100\%}$ were then calculated as the product of the average recruitment between 1977 and 1999 and, respectively, the 'spawners per recruit' under $F_{35\%}$ and F=0. A single constant recruitment is used to represent average conditions and so this results in a single constant, $B_{35\%,}$ as a proxy for a single constant, $B_{MSY,}$ and similarly a single constant level of $B_{100\%}$ to act as a reference for depletion of the stock by fishing. These single constant values relate to the situation of constant recruitment equivalent to the average of the observed recruitment between 1977 and 1999 and so they relate to a period of relatively high pollock productivity. This results in the conclusion that the population was below the $B_{35\%}$ reference level for overfishing prior to about 1975, was above the reference level between about 1975 and 1998, and has been below the reference level since about 1998. Using the constant reference point for $B_{100\%}$ the pollock biomass was estimated to be about 24 – 28% of the unfished biomass in 2002 and about 27 – 31% in 2003; below the 35% limit implied by this constant average interpretation of $B_{35\%}$ and B_{MSY}.

3.5 This average or constant approach is a classical application of fishery reference points, and is the basis of the harvest control rule used by the fishery regulators in the GOA. However the Certification Body also considered an alternative method of calculating the effects of fishing on the stock that recognised that the productivity of the stock varied through time. The Certification Body used the population assessment models to calculate the biomass that would have been in the population each year in the absence of fishing (${}_{unfished}B$). This is a dynamic approach to the reference points, with ${}_{unfished}B$ being a dynamic version of $B_{100\%}$. The estimated ${}_{unfished}B$ varies through time as productivity (e.g. recruitment) varies, and so does B_{MSY}. With this approach, and maintaining the intent and background logic of $B_{35\%}$, the surrogate for the dynamic interpretation of B_{MSY} is 35% of ${}_{unfished}B$ in any year. This is the interpretation of B_{MSY} and its surrogate that was used by the Certification Body in scoring the 60 Scoring Guidepost.

3.6 A potential problem with this dynamic approach to ${}_{unfished}B$ and B_{MSY} is that the recruitment strengths needed in the calculations are those that would have applied in the absence of fishing, and these can never be known definitively because the GOA population was fished. To address this potential problem the fishery assessment used a range of assumptions intended to encompass possible effects of fishing on recruitment. The range of assumptions included no fishing effect on recruitment (i.e. the actual historical recruitments were used directly) and two different models of how recruitment might be affected by changed spawning stock abundance. All three recruitment assumptions gave very similar results (see Figures 31 to 41 and associated text in the 2003 NPFMC SAFE report). They all predict that in the absence of fishing the GOA pollock population (i.e. $_{\text{unfished}}B$) would have increased about tenfold between 1960 and the mid 1980s, then declined to about 40% of that peak abundance by 2002. And under this dynamic interpretation the fished population, as a percentage of the predicted unfished population, was estimated to have steadily decreased from 100% (i.e. no fishery depletion) in the early 1960s, to 40 – 46% in 2002. Under this dynamic interpretation, the population has not been reduced below 35% of $_{\text{unfished}}B$, the dynamic equivalent of the $B_{35\%}$ proxy for B_{MSY}, at any time in the history of the fishery. However under the combination of fishing and natural recruitment variability the population has been decreasing steadily since the mid 1980s. On this interpretation it is natural recruitment variation that has been responsible for much of the historical variability observed in population size, especially the low level population sizes prior to the early 1970s and the high population levels of the 1980s. The fishery has also had a significant effect and has caused the population in 2002 to be less than half (i.e. 40 – 46%) of what it would have been in the absence of fishing.

3.7 In awarding a score of 70 on this indicator the Certification Body considered both the constant and dynamic interpretations of B_{MSY} (i.e. $B_{35\%}$ and 35% of $_{\text{unfished}}B$) and measures of fishery-induced depletion of the pollock population. They concluded that for GOA pollock changes in productivity were such a significant feature of the population that the dynamic interpretation of B_{MSY} and fishery-induced depletion was the most appropriate one, and based their conclusions on this. The Certification Body also recognised that this dynamic interpretation of B_{MSY} would imply that a small sustainable yield was possible even when the population was at low abundance, which if taken would cause the population to be even lower than it would be in the absence of fishing. Although they considered that the ecosystem was presumably adapted to periods of low pollock abundance they also concluded that it was reasonable to have a minimum level below which it was undesirable to fall because of potential ecological impacts. They noted that the current GOA harvest strategy set this ‘bottom line’ at $B_{20\%}$ calculated using the constant recruitment methodology. This single constant value of $B_{20\%}$ provides a fixed minimum biomass below which catches would not be taken, even if such catches were in principle sustainable under the dynamic MSY interpretation. On the basis of this combination of considerations the Certification Body concluded that the stock passes the 60 Scoring Guidepost and arguably some elements of the 80 Guidepost. The Certification Body also considered that the population abundance, while not below the B_{MSY} reference level, was low and for this reason did not consider a score above 80 to be appropriate.

3.8 The Objectors raise several grounds for concern, most of which result from not accepting the dynamic interpretation of B_{MSY} and its proxy calculated as 35% of $_{\text{unfished}}B$. Specifically:

- That the abundance of the GOA pollock stock has been decreasing almost continuously for two decades, and that fishing has contributed to that decline and has perhaps been the major contributor. They do not agree that natural causes account for the decline.
- The Certification Body has not established a reference point other than B_{MSY}, whose proxy is $B_{35\%}$.
- The shifting baseline for B_{MSY} is likely more realistic but has not been used.
- The 2002 spawning biomass is below the $B_{35\%}$ level if that level is calculated as a constant based on recruitment between 1979 and 2002 (a different range of years than those used in the fishery assessments).
- The NPFMC fishery assessments, based on a constant interpretation of $B_{35\%}$, show that the spawning biomass has been below the $B_{35\%}$ level since 1999.
- The fishery should not be certified because of the low present stock size (below the constant interpretation of $B_{35\%}$).
- If the fishery is certified then conditions should be applied to reduce TAC levels, to create protected spawning reserves, and to prohibit fishing if $B_{20\%}$ is reached. In relation to prohibiting fishing below $B_{20\%}$ the Objectors suggest that while this condition is currently in the Fishery Management Plan it is *ad hoc* and could be changed in future.

3.9 There are three main questions we need to consider

(1) Is B_{MSY}, and the non-equilibrium shifting baseline interpretation of it and its proxy, an appropriate interpretation of the MSC Principle and relevant Criterion for use in setting the performance indicator and scoring guideposts?
(2) Is the score actually assigned to performance indicator 1.1.2.1. (i.e. 70) a reasonable reflection of the situation based on the information available? This includes the evidence for a prolonged decline in stock abundance in the past 20 years.
(3) Are the conditions for continued certification adequate?

Panel consideration

3.10 Our consideration of each of the three questions raised by the first ground for objection are set out below.

Question (1): Is B_{MSY}, and the interpretation of it that was used, an appropriate interpretation of the MSC Principle and Criterion for use in the Scoring Guideposts?

3.11 Current fisheries practice suggests that B_{MSY} is a suitable limit reference point for biomass.

3.12 There is no internationally agreed standard or guidance on limit reference points for biomass. However use of B_{MSY} is not inconsistent with the widely accepted use of F_{MSY} as a limit reference point for fishing mortality, although it is recognised that these are different reference points and that a low chance of exceeding F_{MSY} does not necessarily result in a low chance of dropping below B_{MSY}. Fishery-specific circumstances still need to be considered in choosing a biomass limit reference point, but in the case of GOA pollock the Certification Body's use of this reference point is in our view well justified.

3.13 The use of $B_{35\%}$ as a proxy for B_{MSY} (both as constant or dynamic interpretations) is well established and justified in the GOA pollock fishery assessment literature (i.e. SAFE and associated reports), and we agree with the Certification Body's decision to use this proxy. The Panel also recognised that the conditions for continued certification set by the Certification Body under Principle 1, performance indicators 1.1.1.5. and 1.1.2.1. will provide opportunities for further review and formal testing of the adequacy of the $B_{35\%}$ as a proxy for B_{MSY} in this fishery.

3.14 The Panel considered at length the constant and dynamic interpretations of B_{MSY} , and the constant and dynamic interpretations of its proxy $B_{35\%}$ and 35% of $_{unfished}B$ respectively. There is little doubt that the ecosystem of the north Pacific, including the GOA Pollock and its predators, is subject to periodic changes in environmental forcing as well as the effects of fishing. (see Annex II for a discussion of this). For pollock assessment as for other stocks in the region with significant natural variability, this poses a serious problem of interpretation and is somewhat inconsistent with the common view of sustainability as a situation of stable catch or stock size. (This is the view that is apparent in the preamble on sustainability in the MSC Principles and Criteria, which refers to a sustainable fishery as capable of being "continued indefinitely at a reasonable level"). The classical concept of MSY is an equilibrium concept, and so B_{MSY}, F_{MSY} and related reference points derived from this classical interpretation are also equilibrium concepts. But constant equilibrium reference points are of limited value where stocks are subject to significant natural variability on productivity – and particularly where long-term 'regime shifts' occur.

3.15 We find the dynamic approach to B_{MSY}, and the dynamic equivalent of its proxy, taken by the Certification Body to be innovative and appropriate to the situation. This dynamic interpretation provides an intuitively reasonable approach and shows a progressively greater impact of the fishery on the stock through the history of the fishery. The weaknesses of the dynamic approach to B_{MSY} and its proxy are recognised by the Certification Body and reasonably addressed. In particular:

(a) The possibility that different treatments of the effects of fishing on recruitment could lead to very different interpretations of the relative effects of fishing and the environment was examined by the Certification Body. We agree that a wide range of different treatments all gave very similar interpretations.

(b) The possibility that the dynamic interpretation of B_{MSY} and its proxy could result in very low biomass levels during prolonged periods of low productivity was explicitly considered by the

Certification Body. It concluded that reasonable protection was provided by stopping fishing if the biomass was below the constant interpretation of $B_{20\%}$ (using the average recruitment 1977 – 1999). We agree that conservation needs must intensify at low stock abundance, including periods of naturally low abundance to meet the needs of population and ecosystem continuity. For this reason we agree that additional restrictions on use of the dynamic interpretation of B_{MSY} its proxy are appropriate at low stock sizes. We agree with both the Certification Body and the Objectors that a cessation of fishing if the biomass falls below the constant interpretation of $B_{20\%}$ is a reasonable additional constraint on the dynamic interpretation of B_{MSY} in the context of the GOA pollock fishery.

3.16 In summary the Panel accepts that the dynamic interpretation of B_{MSY} (i.e. 35% of the dynamically calculated $_{unfished}B$ each year), combined with the additional constraint that the stock biomass should be above the constant interpretation of $B_{20\%}$, provide a realistic and reasonable limit reference point for GOA pollock. And the Panel agrees that this combination provides a reasonable interpretation of the 60 Scoring Guidepost requirement that "the reference biomass is B_{MSY} or its equivalent, and takes into account the natural variability of the stock". However the Panel noted that in its assessment report the Certification Body did not provide a single and succinct statement of the dual condition that comprises the 60 Scoring Guidepost, although its intent and interpretation was clear in the discussion and justification of the score it gave. The lack of a single and succinct statement of the 60 Guidepost could cause misunderstanding. The lack of clarity that the Guidepost requires the stock to be above the static interpretation of $B_{20\%}$ for continued certification appears to have been one element in the concerns of the Objectors.

3.17 The Panel noted that the indicator of stock depletion using the dynamic interpretation (i.e. current biomass divided by $_{unfished}B$ each year) shows that fishery depletion of the stock increased from 65% to 44% between 1995 and 2002, the last year for which these calculations have been reported. If depletion continues at that rate it will breach the dynamic limit of 35% $_{unfished}B$, and possibly also the constant $B_{20\%}$ limit, within a few years. Further decrease in pollock productivity over the next approximately ten years is also expected by some scientists on the basis of some hypotheses linking pollock productivity and oceanographic fluctuations (see Annex II), which if borne out will also contribute to downward trends in the pollock population toward and possibly below the 60 Scoring Guidepost. The panel noted that the current management arrangements anticipate a cessation of pollock fishing if the stock drops below the constant $B_{20\%}$ level. In any event continued MSC Certification requires that the fishery continues to score above the 60 Scoring Guidepost.

Question (2): Is the score assigned to this performance indicator (70) a reasonable reflection of the situation and information available?

3.18 Subject to the qualifications given in the paragraph 3.17, the Panel found the score given by the Certification Body to be reasonable. The Panel accepts the dynamic interpretation of B_{MSY} (i.e. 35% of the dynamically calculated $_{unfished}B$), with the additional constraint of no fishing below the constant interpretation of $B_{20\%}$, as being a realistic and reasonable 60 Scoring Guidepost for GOA pollock. Under this interpretation the GOA pollock stock passes the 60 Scoring Guidepost.

3.19 The dynamic B_{MSY} interpretation and the current GOA pollock stock condition also seems to meet one of the requirements of the 80 Scoring Guideposts – i.e. that the reference biomass, B_{MSY} or its equivalent, takes into account the natural variability of the stock. A case was not made with regard to the other 80 Guidepost requirement however – i.e. that the stock is above the reference biomass with greater than 70% probability. From our reading of the 2002 NPFMC fishery assessment this case could perhaps have been made successfully. However the Certification Body did not score this indicator at 80 or more because of concern that the population was approaching the lowest biomass level ever recorded. We agree that a score of 80 or more is not justified.

3.20 The Panel accepts the interpretation that natural variability in productivity has been responsible for most of the decline in absolute abundance of GOA pollock since the mid 1980s, but that by 2002 the fishery had caused stock size to be somewhat less than 50% of what it would have been in the absence of fishing. This level of fishery-induced reduction is within the limit set by B_{MSY} for GOA pollock. So the fact of a continuous decline in GOA pollock from the mid 1980s to 2002 is not considered by the Panel to be grounds for scoring the fishery below 60 at the present time. However the Panel re-emphasises that under MSC procedures a score lower than 60 would result in loss of certification, and that would happen if the stock biomass dropped below either 35% of $_{unfished}B$

(dynamic interpretation or $B_{20\%}$ (static interpretation). In this connection we reiterate that there is a particular urgency for conservation of a periodically fluctuating stock as it approaches the low point in its production ‘cycle’, and there are reasons to expect that a low point in pollock production might occur between 2010 and 2020 (see Annex II). At that time the top priority should be to ensure an adequate spawning stock survives until a more favourable environment returns. The proposed cessation of fishing if the stock drops below $B_{20\%}$ (static interpretation) in the present fishery management arrangements and inclusion of that same limit in the 60 Scoring Guidepost provides a reasonable response to the circumstance and provides an incentive to avoid stock depletion of that magnitude.

Question (3): Are the conditions for continued certification adequate?

3.21 The three conditions for continued certification that were identified for performance indicator 1.1.2.1., and the related condition for performance indicator 1.1.1.5., are sensible and reasonable steps to support improved understanding and application of these indicators during the period of certification. The conditions are aimed at testing the harvest strategy, assessment methods and reference points to ensure that they perform as intended. The Panel supports these conditions.

3.22 However the Panel discussed at length the adequacy of these conditions for continued certification. In particular, the Panel shared the concern of the Objectors that the constant $B_{20\%}$ limit to fishing, which was core to the Certification Body’s interpretation of the Scoring Guideposts, in combination with the dynamic interpretation of B_{MSY}, was not sufficiently clearly articulated in the conditions.

3.23 The Panel also was concerned about the lack of a well articulated recovery plan in the event that the stock closely approaches the dynamic B_{MSY} or constant $B_{20\%}$ limits. The catch control rule in the present harvest strategy provides some reduction in exploitation rate as the population decreases, but it is not clear that this is sufficient to avoid the limits set by the 60 Scoring Guidepost and the present fishery management arrangements. The Panel considered specific conditions that might be used to address this point. But the Panel ultimately concluded that the overall package of conditions already identified by the Certification Body, which were designed to further test and refine the harvesting strategy, are adequate for the present. Ongoing audits of the fishery and the results of the tests required as conditions of certification, will give the Certification Body the ability to respond to changed circumstances – such as deteriorating stock condition or lack of progress on appropriately refining the harvest strategy.

Objection Panel Decision for Issue 1

3.24 Notwithstanding our findings that the justifications, interpretations and conclusions made by the Certification Body in relation to the 60 Scoring Guidepost are reasonable, we do consider that the Certification Body erred in failing to give sufficient clarity in its statement of the 60 Scoring Guidepost. Specifically, we consider that the Certification Body should have made it clear that the 60 Scoring Guidepost requires that the biomass be both greater than the dynamic interpretation of B_{MSY} and greater than the static interpretation of $B_{20\%}$. This is a material error in the determination not only because specification of the relevant guideposts is required by the MSC Fishery Certification Methodology, but also because lack of clarity could result in unnecessary ambiguity in future audits. We have therefore decided to remand the determination to the Certification Body only for the purpose of providing greater clarity in the specification of the 60 Scoring Guidepost.

4. SECOND GROUND FOR OBJECTION: THE INTERPRETATION AND APPLICATION OF THE PRECAUTIONARY APPROACH AND THE APPROPRIATE MANAGEMENT RESPONSE TO POLLOCK CATCHES IN STELLER SEA LION CRITICAL HABITAT.

Background and issues for determination

4.1 The first ground for objection related to the correct interpretation of a specific performance indicator that reflected an MSC Criterion. In contrast, given uncertain information, the second ground for objection raises broad questions about the appropriate interpretation of and management response to the impact of pollock stock condition on endangered Steller sea lions. The finding of the Certification Body was that the management system has kept the impact of the fishery on a protected, threatened or endangered species within agreed and reasonable bounds. The key issue under the second ground of objection, however, is whether the measures and conditions proposed by the Certification Body are sufficiently precautionary in relation to the impacts of the pollock fishery on Steller Sea Lions when measured against the standards set by MSC Principle 2.

4.2 This requires consideration of the findings of, and measures proposed by, the Certification Body and consideration of the interpretation to be given to the precautionary approach in the context of MSC Principle 2.

4.3 MSC Principle 2 provides that:

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

Reference to the precautionary approach appears in Criterion 3 of MSC Principle 2. In a passage that is worded in almost identical terms to Criterion 2 of MSC Principle 1 (which deals with the target species of the fishery) it provides that:

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

4.4 The wording of the relevant Criteria in Principles 1 and 2 are almost identical and both are focused on exploited populations. However, Principle 2, is aimed at "maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species)". The use of precaution specified in Criterion 3 of Principle 2 has a strangely narrow focus on depleted populations but the stated intent of Principle 2 is to encourage "the management of fisheries from an ecosystem perspective under a system designed to assess and restrain the impacts of the fishery on the ecosystem". The Certification Body interpreted Criterion 3 of Principle 2 as addressing the question of whether populations of animals that have been reduced in abundance by past actions of the fishery are now being enabled to recover through alterations in the management of the fishery. The reference in Criterion 3 to 'exploited populations' was taken to mean 'impacted populations of species other than the fishery target species', on the basis that MSC Principle 2 is directed at ecosystem management. We find this to be a reasonable interpretation of the criterion in the context in which it appears. We also consider that the level of depletion in this context is correctly taken to mean depletion that is not consistent with maintaining the structure, productivity, function and diversity of the ecosystem (including impacts on critical habitats and associated dependent and ecologically-related species). The requirement then is to ensure that a well-defined and effective strategy is in place to restrain the fishery so as to permit recovery and rebuilding of populations that have been depleted by the fishery. This would also include preventing the depletion of populations in future if they had not already been depleted. This was the approach taken by the Certification Body and we find it to be a reasonable one.

4.5 Management measures to protect Steller sea lions include monitoring, limiting direct mortality, and establishing specific operational conditions for the fishery in identified Steller sea lion critical habitat (SSLCH). SSLCH has been defined as 20 nautical miles around all major haul-outs and rookeries and three large offshore foraging areas. The fishery conditions that apply inside SSLCH vary and can be altered through the fishery management decision processes. The conditions that apply involve excluding pollock fishing within 3 nautical miles of rookeries, excluding pollock fishing within 10 or 20 nautical miles of selected haul-outs and rookeries, excluding or restricting pollock fishing within the three offshore foraging areas, and constraining the seasonal timing of the pollock catch. These measures are designed to protect sea lions from disturbance and to protect sea lion prey resources inside SSLCH.

4.6 The Certification Body noted correctly that the definition of SSLCH is based on very limited information about the amount and type of foraging done inside and outside designated SSLCH, including the different areas within designated SSLCH that are subjected to different fishery restrictions. There is considerable uncertainty whether the designated SSLCH and the different fishery management measures within SSLCH are appropriate or adequate to provide the intended protection. The Certification Body also noted that despite the constraints on fishing in designated SSLCH, a large quantity of the GOA pollock catch is taken from these areas: about 55% of the total GOA catch was taken from designated SSLCH in 2002. This proportion has not greatly changed since 1990 when the Steller sea lion was listed as endangered and fishery controls in SSLCH were introduced. The Certification Body considered that this raised uncertainty about the effectiveness of the management measures in preventing localized depletion of pollock and other potential prey of sea lions inside designated SSLCH, and that in the absence of direct evidence to the contrary, uncertainty remained as to whether the fishery was indirectly impacting the Steller sea lion population growth rate.

4.7 The GOA fishery received a relatively high score – between 75 and 80 – on the performance indicators relating to MSC Principle 2 and the Certification Body recognised that the GOA pollock fishery provides “world’s best practice” in most aspects of MSC Principle 2. A great deal is known and monitored about the ecosystem and the ecological impacts of the fishery and this information is well communicated and utilized in management decision-making.[2] This includes information showing that the direct impact of fishing on Steller sea lions is known and low compared to its population size. Repeatedly, however, the Certification Body’s score for these indicators was reduced from what it would otherwise have been by the existence of a common set of concerns relating to the possible indirect impacts of the pollock fishery on the Steller sea lion and the other ‘top predators’ in the ecosystem. Specifically these concerns included:

(a) The high and unchanging proportion of the catch from SSLCH, indicating the possibility that management measures within SSLCH were not effective in reducing fishery impacts there, and that this had the potential to cause localized depletion of Steller sea lion prey. Under the circumstances the Certification Body regarded this as not representing a precautionary approach to management.

(b) The weak scientific basis for the definition of SSLCH and the subdivisions of the nominated SSLCH within which different management measures are applied.

(c) The very weak understanding of the effect of localized fishing on Steller sea lion population growth rate and foraging success, despite this having been an issue for a considerable period of time. The Certification Body repeatedly described this as effectively unknown.

(d) Poor monitoring and evaluation of previous fishery closures, especially in SSLCH, from which the effectiveness of these management measures and the effect of local fishing on sea lions and their prey could be examined.

4.8 In essence, the findings of the Certification Body were that in the absence of a better understanding of the effects of the fishery on Steller Sea Lions, a more precautionary approach to constraining harvest from critical habitats would appear warranted. It also found that management is

[2] The most thorough and authoritative review of the evidence and interpretations is that conducted in 2003 by the National Research Council of the U.S. National Academy of Sciences. This review identified eight major hypotheses to explain the sea lion decline, while recognising that a combination of these was also possible, and used the available data and understanding to assess the credibility of each. Among other things they conclude that that “no hypothesis can be excluded based on existing data” and that food and foraging related hypotheses are unlikely to represent the primary threat to recovery.

not taking a systematic approach to being precautionary, notwithstanding the specific protection measures taken pursuant to the U.S. Endangered Species Act.

4.9 In the light of these findings a number of conditions were specified for continued certification. All of these conditions involve research and analysis, and one would involve modification and monitoring of the fishery management arrangements in SSLCH starting no later than 2006. The conditions include:

(a) Requirements aimed at improving specific research projects, analysis and reporting (Principle 2, Indicators 1.2.1., 1.3.3., 2.1. and 2.2.1.).

(b) Use of existing information available in the ecosystem considerations chapter of the NPFMC stock assessment and fishery evaluation reports to bring ecosystem considerations into limit-setting of an Acceptable Biological Catch. (Principle 2, Indicator 1.1).

(c) A requirement to design and undertake, by 2006, experiment(s) to directly test and measure the effect of the fishery on Steller sea lions (Principle 2, Indicators 2.3.1 and 2.3.3). In setting this condition, the Certification Body was taking up and elaborating one of the recommendations in the 2003 NRC report. The condition is stated as follows

> "To improve the deficiencies in performance for this indicator, the fishery must design and carry out experiment(s) to test the possible impact of the pollock fishery on Steller sea lions by comparing outcomes of regulated levels of fishing in experimental and control areas on SSL behaviour, breeding and population trends. The NRC report (Committee on the Alaska Groundfish Fishery and Steller sea lions, 2003) recommends that the fishery should design and carry out an experimental test of the hypothesis that fishing influences SSL population dynamics. We support the goals and objectives of the NRC's prescribed action, but appreciate that it would be inappropriate to suggest increasing pollock fishing intensity to levels that increase jeopardy (in the legal sense) to SSL populations and that there are complex scientific and legal issues involved. Therefore, it will be necessary to design this experiment in such a way that comparison can be made between areas where fishing intensity is reduced with areas where it is maintained at levels comparable to those in the recent past (but perhaps within this limit still increased by as much as the decrease in harvest lost to industry from reduced fishing areas). The hypothesis to test would then be that SSL numbers or productivity in reduced fishing areas would show a positive deviation relative to values in fished areas, and the null hypothesis that performance of SSL would be no different between areas. Such an experiment should be underway no later than 2006."

4.10 There is common ground between the Certification Body and the Objectors that current management measures in SSLCH are not sufficiently precautionary in some respects. The Objectors assert that the further conditions set out above do not go far enough to address the serious concerns that the Certification Body's report reflected. They propose that conditions should require additional precautionary management actions such as significantly reducing TAC levels or curtailing fishing in critical habitat and instituting pollock spawning reserves. In the Further Objection, it is argued that research is not a panacea and scientific uncertainty about marine ecosystems will not be resolved by more research in many cases. The Objectors argue that the need for more information should not be used as an excuse to delay precautionary measures while research continues – scientific uncertainty about the effects of fishing on ecosystems is not a reason to delay environmental protection or ecosystem-based management, rather it is a reason to increase it. They consider that the Certification Body has not required sufficiently precautionary actions, and particularly actions on the water, to immediately modify fishing so as to avoid potential risk.

Panel Consideration

4.11 Against this background, the real issue for our consideration is not whether the situation warrants the application of a precautionary approach, but whether the conditions applied to the fishery as a condition of certification are consistent with the precautionary approach as that term is used in the context of MSC Principle 2.

The precautionary approach

4.12 The MSC Principles and Criteria contain three references to the precautionary approach, one relating to each of the three Principles. The intent is presumably to require that the precautionary approach be applied during consideration of the target species, the broader ecosystem and the fishery management system.

4.13 In the context of fisheries management, the precautionary approach is really an application of the precautionary principle. It stems from Principle 15 of the Rio Declaration,[3] which states that:

> *In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.*

4.14 Rio Principle 15 is a statement of general principle. By itself it simply states the general proposition that lack of full scientific certainty should not be used as an excuse for postponing regulatory action; the point being that it is virtually impossible to have full scientific certainty, particularly with respect to complex ecological processes. Practical formulations of the precautionary approach (for example, in legislation) vary widely across existing precedents. The particular formulation used can render the principle weaker or stronger as a tool for environmental protection; an apparently small difference in wording may have large implications for the parties subscribing to the principle. The degree of (pre)caution to be exercised in any particular circumstance is usually related in some way to the degree of risk of some threshold of harm or actual damage occurring should precautionary measures not be applied to prevent that harm or damage from taking place. Risk is a product both of the probability of occurrence of an event and of the magnitude of the impact of such an event were it to occur. Thus an unlikely event with a high impact would potentially pose the same risk of harm to the environment as a likely event with a low impact. Management of environmental risk includes deciding whether the risk must be reduced, if so how this may be achieved, and whether the action should be aimed at reducing the probability of occurrence, or focused on reducing the magnitude of its impact.

4.15 A key component of the precautionary approach to fisheries management is that the decision-maker should not use the existence of scientific uncertainty to justify lack of action. Action taken under the precautionary principle is a type of preventative measure. However, it is the existence of scientific uncertainty that renders any such action “precautionary” rather than simply “preventative”. Such uncertainty may take several forms, principally a lack of data, or a lack of understanding of the processes and interactions between species in the ecosystem. Probably the second of these components is the more important with respect to the relationship between Steller sea lions and GOA pollock.

4.16 The particular invocation of the precautionary approach used by the MSC in relation to Principle 2 is quite specific, although it is also to some extent ambiguous. The precautionary approach is to be invoked whenever “exploited populations are depleted.” Its specificity implies an objective finding (with no room for uncertainty) that the stock is depleted, although not necessarily depleted by fishing. This is not necessarily consistent with the way in which the precautionary approach is described in Rio Principle 15 where “lack of full scientific certainty” as to either cause or effect is not to be treated as an impediment to regulatory action. Under Rio Principle 15, and in many other precedents,[4] precautionary measures would need to be applied where there are “threats of serious or irreversible damage,” rather than when the situation to be prevented has already arisen and the stock is depleted. This difference in the threshold is not particularly relevant to the GOA pollock situation,

[3] UN Conference on Environment and Development, Rio de Janeiro, 3 – 14 June 1991, Vol. I: Resolution adopted by the Conference, resolution I, Annex I.

[4] For example, according to the European Commission Communication on the precautionary principle (issued in 2000) if there is no evidence that something is harmful, but there are 'reasonable grounds for concern' that it might be, then experimentation should not proceed. The Communication states: “Whether or not to invoke the precautionary principle is a decision exercised where scientific information is insufficient, inconclusive, or uncertain and where there are indications that the possible effects on the environment, or human, animal or plant health may be potentially dangerous and inconsistent with the chosen level of protection.”

where all parties are agreed that the Steller sea lion population is already depleted, although the implications of such a strict test may cause difficulties in other contexts. We would simply note here that a formulation such as "indications through preliminary objective scientific evaluation that the stock is depleted … " is considerably more precautionary than "where the stock is depleted." The broader problem with the MSC formulation is that, although it clearly defines a very high threshold of harm at which precautionary action is to be taken (i.e. "where exploited populations are depleted"), it provides little guidance as to the nature of the regulatory action that is required to give effect to the precautionary approach. Two readings are possible. On one reading, "where the stock is depleted … the fishery will be executed … consistent with the precautionary approach …" (i.e. action aimed at reducing the magnitude of the impact of the harm to be avoided). Adopting a different interpretation, it could be argued that it is the "recovery and rebuilding" of the stock that is to be permitted to occur to a level and at a rate consistent with the precautionary approach, thus implying that the objective is stock recovery to a level commensurate with precautionary management (i.e. action aimed at reducing the future probability of occurrence of the harm to be avoided).

4.17 In looking for guidance as to how the precautionary approach should be applied under MSC Principle 2, it is logical to examine how the precautionary approach has been applied in a number of international fisheries instruments, including the FAO Code of Conduct and the 1995 UN Fish Stocks Agreement. As expressed in the Code of Conduct, and elaborated in FAO Technical Guidelines (FAO 1996), the application of the precautionary approach requires the establishment of target and limit reference points (on the basis of the best available scientific evidence) and the action to be taken if reference points are exceeded. It also requires that uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities, including discards, on non-target and associated or dependent species as well as environmental and socio-economic conditions, be taken into account. The Code provides:

> ***7.5 Precautionary approach***
> *7.5.1 States should apply the precautionary approach widely to conservation, management and exploitation of living aquatic resources in order to protect them and preserve the aquatic environment. The absence of adequate scientific information should not be used as a reason for postponing or failing to take conservation and management measures.*
>
> *7.5.2 In implementing the precautionary approach, States should take into account, inter alia, uncertainties relating to the size and productivity of the stocks, reference points, stock condition in relation to such reference points, levels and distribution of fishing mortality and the impact of fishing activities, including discards, on non-target and associated or dependent species as well as environmental and socio-economic conditions.*
>
> *7.5.3 States and subregional or regional fisheries management organizations and arrangements should, on the basis of the best scientific evidence available, inter alia, determine:*
>
> *(a) stock specific target reference points, and, at the same time, the action to be taken if they are exceeded; and*
>
> *(b) stock specific limit reference points and, at the same time, the action to be taken if they are exceeded; when a limit reference point is approached, measures should be taken to ensure that it will not be exceeded.*

4.18 A similar approach is taken by the UN Fish Stocks Agreement, article 6(3)(b) of which requires that States "in implementing the precautionary approach" are to "apply the Guidelines set out in Annex II of the Agreement and determine, on the basis of the best scientific information available, stock-specific reference points and the action to be taken if they are exceeded". Annex II of the Agreement provides Guidelines for the application of "precautionary reference points". While those Guidelines are mostly worded with a focus on target species the following elements of Annex II of the Fish Stocks Agreement are particularly relevant to application to non-target species:

Management strategies shall seek to maintain or restore populations of harvested stocks, and where necessary associated or dependent species, at levels consistent with previously agreed precautionary reference points.

Fishery management strategies shall ensure that the risk of exceeding limit reference points is very low. If a stock falls below a limit reference point, or is at risk of falling below such a reference point, conservation and management action should be initiated to facilitate stock recovery.

4.19 The wording of Annex II of the UN Fish Stocks Agreement is particularly useful because it establishes a clear link with the need to conduct the fishery as a whole at levels consistent with previously agreed precautionary reference points. Overall we understand the intention of MSC Principle 2 and its associated Criteria as an attempt to apply the precautionary approach to recovery of elements of the ecosystem that have been depleted by fishing, or risk being so depleted, to an extent that is not consistent with maintaining the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species). We note that such an interpretation of MSC Principle 2 necessarily implies that there be some causal link between fishing of the target stock and the associated or dependent species (although clearly that link need not be the only or even the most proximate cause of depletion). The risk, in the present case, is further depletion or non-recovery of the already depleted Steller sea lion stock. Clearly, the risk is non-negligible, even though we note (as did the Certification Body) that of the various hypotheses advanced for the decline of the stock by the NRC, the risk of fishing alone causing further stock depletion is relatively low. In the absence of any specific guidance in the MSC Criteria our understanding is that regulatory action should be consistent with that proposed in the operational statement of the precautionary approach to fisheries in the FAO Code of Conduct and elaborated in the FAO Technical Guidelines. This strongly suggests to the Panel that a precautionary response would imply, as well as appropriate regulatory action, the establishment of precautionary reference points for the target species such as would have the effect of reducing the magnitude of the present stock depletion and reducing the likelihood of further depletion. The question is to determine a "proportionality of response" to ensure that "the selected degree of restraint is not unduly costly." [5]

4.20 We have considered the question of the appropriate reference point for the fishery in connection with Issue 1. What we did not specifically consider in light of our findings on Issue 1 is the way in which the precautionary approach might properly be applied in situations where productivity is subject to changes in environmental regime. The proper application of the precautionary approach is one of the objectives of the MSC approach to resource certification, but the reality that productivity for some resources is subject to changes in environmental regime, is only becoming evident as time series of the level of fisheries production exceed a half century or so. Hence the precautionary approach is required if regime-linked resources are to continue to be productive into the future. Evidence in the North Pacific from longer histories of fisheries production for some species, is that biomass and landings have been linked to the prevailing environmental regimes (a selection of evidence from the literature that supports this point of view is given in Annex II). Physical evidence from much longer environmental series revealed through ice cores and other records also confirm a scenario of past environmental fluctuations over a time frame exceeding a thousand years or more. Such environmental scenarios are apparently common to the global oceans, and to northern hemisphere environments in particular. This basic scenario has not been specifically taken into account in deciding on a precautionary approach to managing northern Pacific fishery resources, even though the FAO Code of Conduct for Responsible Fisheries states that management measures should respond to declines in abundance, irrespective of whether these are caused by overfishing or natural declines in productivity.

4.21 Some suggested considerations for a precautionary approach that takes this scenario into account are suggested as follows.

(a) If consistent declines are occurring in fisheries productivity despite low levels of exploitation, and these can be linked to poor environmental conditions whether ambient temperature

[5] James Cameron and Tim O'Riordan (eds.) *Interpreting the Precautionary Principle*, Earthscan Publications, 1994.

or a change in current regimes leading to poor recruitment, it may be supposed that a regime change is underway. This situation should be taken into account in deciding on harvesting policy.

(b) If there is evidence from the same species in adjacent stocks with a longer history of exploitation, or species related to the target species in the local food web which show evidence of quasi-cyclic production in the past, this suggests that regime changes affect production. If so, the following considerations should be given due weight in the management framework:

- Recognize that the natural low point in resource abundance, even in the absence of fishing, constitutes a period of stress for the target species and for other species dependent on it in partly or wholly for their trophic requirements.
- This situation may be recognized by a consistent reduction in recruitment over time, a decline in stock distribution area, and/or a change in age composition of survivors showing that recruitment is not occurring at the same level as in the past
- If resource productivity continues to decline despite a reduction of the exploitation rate to below that due to natural causes such as predation, it is important to ensure that a lower limit to biomass be decided upon. If there is a high probability that this has been reached, a moratorium on fishing or equivalent emergency measure protecting the source population should be applied.
- This last-mentioned measure has the objective of ensuring that the spawning potential of the resource remains adequate to avoid depensatory effects, and ensures that stock rebuilding will be possible when environmental conditions improve.
- Management measures during the nadir in the production cycle should allow for the dietary requirements of dependent and charismatic species, or those that are of particular ecological importance, and will depend on protection of source populations of the target species.
- As it becomes evident that a consistent decline in abundance is occurring despite significant constraints on fishing exploitation, a recovery plan should be agreed upon with stakeholders, and introduced into the fisheries legislation in advance.

(c) With respect to the reference points to be applied to resources subject to regime shifts, while these should be similar in form and objective to those for more 'stable' resources, the management framework should incorporate tiered provisions for management that reflect the current status of the resource, such that management provisions are more stringent as the resource approaches its nadir.

(d) The application of reference points for biomass in the control rule may be adjusted to take into the current level of productivity as measured by recruitment trends, and should vary with resource productivity. However, there will be a risk in allowing a constant proportion of the biomass to be harvested throughout the production cycle. It would be preferable to set a minimum biomass level as a fraction of the overall average productivity, below which a moratorium on fishing should be introduced.

Application of the precautionary approach to the GOA pollock fishery

4.22 We consider that the Certification Body reasonably interpreted the precautionary approach in its assessment of the fishery (including Principle 2). Overall the approach taken by the Certification Body is consistent with our interpretation of the precautionary approach as expressed in the MSC Principles and Criteria. Where the Certification Body has taken note of areas where the precautionary approach was not being applied, they clearly and explicitly considered the uncertainty and risks involved in making their scoring judgements. We consider these judgements to have been reasonable and consistent with the precautionary approach. For example the tier-based assessment methodology used in the fishery is an example of the requirements set out by section 7.5.2 of the FAO Code of Conduct. Yet the Certification Body determined that the ABC methodology does not sufficiently incorporate ecosystem considerations to be considered precautionary. In particular, the methodology does not reflect the uncertainty about the impact of the fishery on the stock, and especially the impact of the fishery inside SSLCH (See Final Determination, pages 110 – 112). Accordingly, measures were proposed that were designed to improve monitoring of the fishery and provide better scientific information on which to base future decisions.

4.23 The second part of the question we need to answer therefore (and the crux of the objection) is whether the management action proposed represents a reasonable response to the need to apply the precautionary approach. We emphasize that what is required is a proportionate response, judged according to the level of risk.

Whether management action is a sufficiently precautionary response

4.24 The uncertainties associated with understanding the impact of the GOA pollock fishery on Steller sea lions and their recovery are well recognised and are reflected in the considerations of both the Certification Body and the submission by the Objectors. Both recognise that a range of interpretations are possible from existing data and that scientific uncertainty will not be totally eliminated. Our view of the present uncertainties and hypotheses about the risk to recovery of the western Steller sea lion stock is that while the pollock fishery in not likely to be the main source of risk it is nonetheless a feasible risk that requires consideration. And that consideration especially relates to fishing in areas used by the sea lions for breeding and foraging by pups. We note that this concern was taken account of by the Certification Body and conditions applied to improve identified deficiencies in performance indicators 2.3.1 and 2.3.3. Specifically, the Certification Body required the fishery to design and carry out experiment(s) to test the possible impact of the pollock fishery on Steller sea lions by comparing outcomes of regulated levels of fishing in experimental and control areas on sea lion behaviour, breeding and population trends. Significantly, the Certification Body did not endorse the suggestion made by NRC to test the hypothesis that fishing influences Steller sea lion population dynamics by increasing fishing intensity, on the basis that it would be inappropriate to increase fishing intensity to levels that increase the risk to Steller sea lion populations.

4.25 The Objectors did not challenge the need for the additional research identified by the Certification Body, including the experiment(s) to directly test the effect of fishing on Steller sea lions. Rather they questioned whether, under the present uncertainties, those conditions should require additional constraints on the fishery in SSLCH while the research is being conducted. The Objectors suggest that:

> Until the questions are definitively answered about the relationship between the fisheries and Steller sea lion declines, the sea lions' foraging needs and critical habitat requirements, considering the low pollock abundance the certification should require precautionary management actions such as significantly reducing TAC levels or curtailing all fishing in critical habitat and instituting pollock spawning reserves.

4.26 We could agree with this point if the evidence were such as to suggest a reasonable likelihood that additional constraints, beyond those used already by the regulators or identified by the experiments proposed as a condition of certification, would have a significant prospect of achieving improved performance against MSC Principle 2. On balance, however, we consider that the level of risk involved does not warrant such additional constraints at this time. In reaching this view we have considered the range of uncertainties and risks and the likely consequences of requiring or not requiring additional constraints as a condition of certification. We also recognise that the existing constraints in SSLCH are a precautionary management response, based on possible but uncertain mechanisms of interaction, with no scientific certainty that they are necessary. And we further recognise that the status of the western stock of the Steller sea lion population is closely monitored and linked to strong legal obligations supporting recovery, so there is a high chance that any further deterioration of the stock would be detected and acted upon (including by the Certification Body in subsequent audits). Furthermore, the experimental approach to measuring the effects of the fishery on sea lions is widely considered to be the only way to definitively address the key questions and will require planned changes to the operation of the pollock fishery inside SSLCH. The conditions placed on the experiments ensure that at worst there will be no increase in the overall catch of pollock in SSLCH and that they should start quickly. These experiments are a significant condition on continued certification of the fishery. We conclude that additional constraints on fishing in SSLCH are not warranted at this time under the precautionary approach expressed in MSC Principle 2.

4.27 There are three further observations we make about the application of the precautionary approach in this case. First, we took into account the fact that the Objectors are unclear about exactly what additional measures should be applied in order to satisfy the requirement of a precautionary approach. We can accept as a general proposition that the burden of proving that the consequences of a proposed activity fall below the relevant threshold of harm lies on the party proposing to carry out that activity. But just as lack of scientific certainty cannot be used as an excuse for regulatory inaction, so lack of scientific certainty cannot be used as a justification for the imposition of additional constraints without showing some nexus between the additional constraints proposed and a reduction in the likelihood of harm that is proportionate to the degree of risk. This can only be determined on the basis of findings of fact or probability as to the likely consequences of the proposed additional constraints. We have considered what additional constraints might be reasonably applied. We do not regard it to be justifiable to require reduction (or no further increase) in the percentage of the pollock catch taken in SSLCH over the period of the certification with the present uncertainties. Without the additional information to be generated by the conditions set by the Certification Body (especially the experimental observations in SSLCH under different fishery management situations) there would be no reasonable basis to set or justify additional conditions. In considering the desirability of additional seasonal closure during the period when pup rearing is underway we recognise that there are already closures, some seasonal and some year-round, in SSLCH and that these could be changed under existing management measures as new information becomes available. We do not consider that a specific condition of certification relating to this is justified at present.

4.28 The second general point we would make is that the application of the precautionary approach under MSC Principles in this assessment is focused narrowly on pollock, when there seems to be evidence that species other than pollock might be critical to successful lactation and rearing of pups and that all these species are likely to be subject to the long-term environmental fluctuations prevalent in the north Pacific. A decrease in pollock, due to a combination of fishery and natural environmental factors, may cause critical trophic pressures on sea lions if other appropriate prey are low in abundance as a result of the same fishery and natural environmental factors that affect pollock – potentially including ineffective or inadequately precautionary management measures. This must be addressed at the higher level of ecosystem linkages between multiple ecosystem components including the fishery, and not addressed only during the certification of a single species in the ecosystem. Several conditions of certification, including exploration of alternative coordinated harvest strategies for the entire suite of living resources of the GOA, could take better account of these issues. We consider that the response of the Certification Body to this situation was adequate. This is not to say that other actions might not be considered by fisheries management at the ecosystem, as opposed to the single species level, as appropriate.

4.29 Thirdly, we note that the use of B_{MSY} as a limit reference point is more restrictive on the fishery than most limit reference points usually applied in fisheries management. This reference point was selected by the Certification Body in part to reflect the uncertainties about the effect of low pollock abundance on predator populations (including Steller sea lions), and so is a precautionary element in the Certification Body's assessment of the fishery. Furthermore the use of $B_{20\%}$ as an additional fixed limit to the level of biomass reduction, with that limit based in the recruitment seen during a relatively productive period for pollock (1977-1999) and applied even if B_{MSY} is less than $B_{20\%}$, introduces another element of precaution. It also sets a much higher biomass limit that would result from using the average recruitment over both productive and unproductive periods combined, or the average of unproductive periods alone, although either of these approaches could be argued to be reasonable on some grounds. A practical consequence of this additional precaution in the 60 Scoring Guidepost is that if the recent downward trends in productivity of the GOA pollock stock continue, then it is likely that additional catch constraints will be needed to maintain the stock above the limit reference point in order to maintain certification. This in our view (and subject to our findings with respect to Issue 1) provides the critical link between the application of the precautionary approach in the context of MSC Principle 1, Criterion 2 and subsequent management action designed to achieve the objectives of MSC Principle 2, Criterion 3.

4.30 We consider that in the conditions for continued certification that have been identified by the Certification Body, this suite of measures represents a reasonable interpretation and application of the precautionary approach. We find that the decision of the Certification Body to focus the conditions on direct experimental testing of the effects of fishing is a reasonable one.

Objection Panel Decision for Issue 2

4.31 We allow the Determination to stand in relation to the second ground for objection.

5. SUMMARY OF PANEL FINDINGS AND CONCLUSIONS

5.1 In relation to the first ground for objection, we find that the Certification Body fell into error in the way in which it specified the 60 Scoring Guidepost for stock size of GOA pollock under performance indicator 1.1.2.1. In our view, the Certification Body should have made it clear that the 60 Scoring Guidepost requires that the biomass be both greater than the dynamic interpretation of B_{MSY} and greater than the static interpretation of $B_{20\%}$. This is a material error in the determination not only because specification of the relevant guideposts is required by the MSC Fishery Certification Methodology, but also because lack of clarity could result in unnecessary ambiguity in future audits.

5.2 Notwithstanding our findings that the justifications, interpretations and conclusions made by the Certification Body in relation to the 60 Scoring Guidepost are reasonable, **we have decided to remand the determination to the Certification Body only for the purpose of providing greater clarity in the specification of the 60 Scoring Guidepost for indicator 1.1.2.1.**

5.3 In relation to the second ground for objection, we consider that the conditions for continued certification under MSC Principle 2 identified by the Certification Body represent a reasonable interpretation and application of the precautionary approach in the circumstances of this particular fishery. We do not find that the determination was arbitrary or unreasonable or that it was vitiated by any violation of MSC procedures. **We therefore allow the Final Determination to stand in relation to the second ground for objection.**

5.4 Throughout the Panel's deliberations we have been especially conscious of the need to remain within the scope and powers set for us by MSC procedures and our terms of reference. In particular, we have refrained from substituting our own views and opinions for those of the Certification Body. The GOA pollock fishery is a complex and controversial fishery and many different interpretations of the available data and evidence are possible. The mere fact that the Certification Body and the Objectors were able to come to different views faced with the same body of material does not necessarily undermine the legitimacy of either point of view; rather it demonstrates the complexity of the issues under consideration.

5.5 Our deliberations have been confined to the two grounds of objection before us. In accordance with MSC procedures our function has been to determine whether the responses by the Certification Body to the grounds for objection were consistent with the MSC Principles and Criteria and to determine whether the assessments by the Certification Body were in any way arbitrary or unreasonable or violated MSC procedures. The distinction is between the situation where the Panel might prefer a different view (perhaps on marginal grounds) and one where it concludes that deficiencies in the process of reasoning and the application of the relevant principles by the Certification Body require it to adopt a different view. This process necessarily required us to provide our own interpretation of the relevant MSC Principles and Criteria and to apply this interpretation to the circumstances of the subject fishery. We have considered the Certification Body's assessment in the light of that interpretation and the Panel's judgments and interpretations are based on the existing MSC requirements and procedures.

5.6 A key feature of the GOA pollock fishery is the episodic change in productivity and ecosystem structure affecting the target species, food chains and top predators, that has now been well demonstrated to occur in this and other arcto-boreal ecosystems. These are natural 'regime shifts' but they interact with fishery productivity and the effects of the fishery on the ecosystem. They must be taken into account in assessing the status of the target species, in assessing the effects of the fishery on the ecosystem, and in deciding on management measures. The Certification Body's assessment of the fishery recognized the regime shift phenomenon, recognized the need for its consideration in setting the Scoring Guideposts, and provided a useful approach to dealing with the problem. Fisheries science and management however have lagged behind our growing understanding of the reality of long-term changes in physical climatic regimes. Management strategies for resources inhabiting environments where regime shifts occur are not fully developed. Sustainable yield almost certainly will vary dramatically over a production 'cycle' for this type of fishery, and so criteria or approaches based on assumptions of a constant 'maximum sustainable yield' are not appropriate. We are of the view that the MSC Principles and Criteria may not have completely taken into account regime shift phenomena. However, subject to our decision to make a limited remand on

Issue 1, we consider that the Certification Body has adequately interpreted these Principles and Criteria in assessing GOA pollock in a regime shift situation.

5.7 While we agreed with the Certification Body that the fishery meets the MSC Principles and Criteria at present, we consider that there is a significant probability that the fishery might not continue to meet them in future because of regime shifts. Currently the pollock stock may be in or entering a regime of low productivity. Natural periods of low productivity could conceivably result in the pollock stock failing to meet some of the minimum thresholds identified for continued MSC certification even in the absence of a fishery. Although not inevitable, it should not come as a total surprise if the fishery fails to continue to meet the MSC Principles and Criteria for certification at some time during periods of low productivity. Whether the fishery will continue to meet the MSC Principles and Criteria throughout periods of low pollock productivity will depend to a great extent on the adequacy of the harvest strategy, including spatial controls on fishing, to deliver the required performance for the target species and ecologically dependent species despite regime shifts. This is correctly the subject of several Conditions of Continued Certification set by the Certification Body. The continued audits against the Scoring Guideposts and Conditions for Continued Certification are particularly important in this fishery because of the possibility of reduced pollock productivity, with flow-on effects in the fishery and ecosystem, over the next about decade.

Annex I

Members of the Objections Panel

Dr Keith Sainsbury

Dr Keith Sainsbury has a PhD in marine ecology and mathematical modeling. He has conducted research on the assessment, ecology, exploitation and conservation of marine resources and ecosystems for over 25 years. This has included fishery assessment of resources that range from abalone to tuna and from Sub-Antarctic toothfish to tropical snappers. He was responsible for one of the first applications of actively adaptive management to a large-scale trawl fishery, which demonstrated the effects trawling on seabed habitats and introduced spatial zoning of trawling in the region. Dr Sainsbury led a research team to develop and apply scientific approaches to support integrated, regional and ecosystem-based management of marine ecosystems in Australia. This research team was also responsible for the scientific support for declaration of large marine protected areas around Macquarie Island, sea-mounts off southern Tasmania and the regional network of MPAs in SE Australia.

Dr Sainsbury is a Senior Principal Research Scientist with CSIRO, a Board member of the Australian Fishery Management Authority, a Board Member of the MSC and chair of the MSC's Technical Advisory Board.

Dr John Caddy

Dr Caddy is a scientist with long experience on a wide range of national and international issues related to marine fishery resources and their sustainable management, with various arms of government, research institutes, universities, and the private sector. He worked at FAO occupying the post of Chief of Marine Resources. Prior to working at FAO he held positions of increasing seniority in the Canadian Department of Fisheries and Oceans. He has published more than 100 papers and reports on a wide variety of technical issues related to fisheries, including population dynamics, sustainable fisheries management and the impacts of fishing on the marine environment. His interests include issues related to ecology in a broader sense, with a strong commitment to promoting strategies that allow sustainable development, but not at the expense of biodiversity and long-term impacts on the ecosystem.

Dr Caddy has previously been a peer reviewer of a fishery certification report, and so meets the requirement for at least one member of the panel to have previously been on an assessment team, a peer reviewer or on an Objections Panel.

Mr Michael Lodge

Michael Lodge is a barrister (Gray's Inn, London). He also has an MSc in Marine Policy from the London School of Economics. He is currently based in Paris on assignment to the OECD as part of the Secretariat of a Ministerial Task Force on IUU fishing on the high seas. From 1996 to 2004 he was Legal Counsel for the International Seabed Authority. Prior to joining ISA, Michael Lodge was Legal Counsel to the South Pacific Forum Fisheries Agency. From 1997 to 2000 he served as Executive Secretary of the Conference for Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific, which concluded with the adoption of the Honolulu Convention in 2000 and, in addition to his work at OECD, continues to serve as the Head of the Interim Secretariat for the Preparatory Conference for the Western and Central Pacific Fisheries Commission. He is also a part-time Immigration Judge in the United Kingdom, dealing with appeals on immigration, asylum and human rights matters. He has worked as a consultant on fisheries and international law in Europe, Asia, Eastern Europe, the South Pacific and Africa and has written widely on fisheries, the marine environment and deep seabed mining. He is associate editor of Volume VI of the prestigious University of Virginia Commentary on the UN Convention on the Law of the Sea, which covers the deep seabed mining provisions of the Convention and the 1994 Agreement relating to the Implementation of Part XI of the Convention.

Annex II

Environmental fluctuations and 'regime change' and some implications for management and assessment of GOA Pollock

One of the key issues faced by a certification body with respect to stocks in the North Pacific (and elsewhere), must be the observation that fishery productivity of this region appears to go through pronounced long term fluctuations. Whether these are considered regular or not, the question must be faced squarely of how a management body will deal with this situation, especially with respect to defining control laws and their components, the reference points. An important observation by the Certification Body in its response to the initial objection seems particularly relevant:

Which interpretation of B_{MSY} is the more appropriate for this stock?

They note that no operational interpretation of the MSC standard exists which provides clarity on benchmarks for fluctuating stocks. The report of the Objection Panel team addresses this last statement, using the Gulf of Alaska pollock fishery as an example.

Regime shifts in the North Pacific – what the literature says

It seems important to first address the question of long term fluctuations in environmental conditions in the GOA. A large body of literature now exists on this subject, whose reality cannot be doubted. We do not attempt an exhaustive review, but the few quotes which follow provide some understanding of a phenomenon which cannot be disregarded for long-term planning of fisheries of the region:

(1) The winters of 1999-2002 were characterised by pressure and temperature anomalies atypical of the N. Pacific. It is suggested that there was a similarity to the situation before the major regime shift of 1976-7. (Bond et al. 2003).

(2) Following a strong 'el Nino', the climate of the North Pacific underwent a rapid and striking transition in late 1998. Winds weakened in the G. of Alaska, and surface temperatures cooled by several degrees. It is suggested that a climate shift has occurred similar to that in 1947, and opposite to that which occurred in 1925-76. Ecosystem changes paralleled this. (Peterson and Schwing 2003).

(3) Halibut otolith oxygen isotopes support a 1977 regime shift in the North Pacific with a warming impact. A possible regime shift around 1990 coincided with a decrease in bottom temperature of about 2°C – suggesting a decadal scale of ocean environment (20-30 yr). (Gao and Beamish 2003)

(4) Large scale shifts in climatic/oceanic conditions occurred in 1925, 1947, 1977, 1989 and possibly 1998. Shifts occurred abruptly. Data from the N Pacific show that regime shifts have opposite effects on species living in different domains. Taking the natural variability of stocks in association with regime shifts requires new approaches to managing fisheries that incorporate climatic as well as fishery effects (Benson and Trites 2002).

(5) In the early-mid 1980s: strong increases in stock size of walleye pollock and other fish occurred. There was a much higher biomass of groundfish in 1980-2000 than in 1960-85 (Conners et al. 2002).

(6) In relation to environmental impacts on pollock recruitment, Dorn et al. (2003) mention the use of rainfall data and wind strength and its impact on recruitment and feeding processes: 'Following the decadal trend established in the late 1990s, wind mixing at the southern end of Shelikov Strait was again below the long-term average for the winter and spring months of 2004. Strong mixing in winter helps transport nutrients into the upper ocean layer to provide a basis for the spring phytoplankton bloom. Weak spring mixing is thought to better enable first feeding pollock larvae to locate and capture

food. Weak mixing in winter is not conducive to high survival rates, while weak mixing in spring favours recruitment. This year's scenario produces a wind mixing score of 1.99, which equates to "average".

It is clear that pollock recruitment is heavily influenced by environmental factors which change over time. From the Dorn *et al*. report we have the following statement:

"Hollowed et al. (2001) found similarities in the recruitment patterns of the dominant gadoids in the North Pacific. In general, gadoids exhibited low autocorrelation in recruitment, with most of the variability occurring at the inter-annual level. Pollock and Pacific cod in the Gulf of Alaska and Pacific hake off the US West Coast showed a higher incidence of strong year classes in those El Niño years when anomalous conditions propagated to northern latitudes ("Niño North" conditions)."

These changes were consistent through the Northeast Pacific:

"Brodeur and Ware (1995) provide evidence that biomass of zooplankton in the centre of the Alaska Gyre was twice as high in the 1980s than in the 1950s and 1960s, consistent with a shift to positive values of the PDO since 1977."

From this selection of a much larger literature, we can safely base our view that regime shifts regularly occur in the North Pacific and have major effects on many fisheries and marine populations there. Also these shifts occur at fairly regular intervals which are estimated to correspond on average to intervals of 20-30 yr. From analysis of Greenland ice cores dating back thousands of years, Klyashtorin (2001) suggests that at least in the northern Hemisphere and probably globally, we are dealing with a climatic oscillation having an approximately 55-60 yr periodicity (i.e. successive shifts from good to poor regime and back again occur approximately every 25-30 yr). MacCall (2002) tends to confirm these intervals for east Pacific resources and draws attention to the problem of attempting to manage a food web complex which is subject to such low-amplitude, long-term fluctuations. Dorn *et al*. (2003) also provides some indication that despite the fairly recent data series for this species, the recent peak in pollock abundance does not represent a level of high stock sizes over the medium to long term:

"Questions concerning the comparability of pollock CPUE data from historical trawl surveys with later surveys probably can never be fully resolved. However, because of the large magnitude of the change in CPUE between the surveys in the 1960s and the early 1970s using similar trawling gear, the conclusion that there was a large increase pollock biomass seems robust.

"Model results suggest that population biomass in 1961, prior to large-scale commercial exploitation of the stock, may have been the lowest observed. Early speculation about the rise of pollock in the Gulf of Alaska in the early 1970s implicated the large biomass removals of Pacific Ocean perch, a potential competitor for euphausid prey (Somerton et al. 1979, Alton et al. 1987). More recent work has focused on role of climate change (Anderson and Piatt 1999, Bailey 2000). The occurrence of large fluctuations in pollock abundance without large changes in direct fishing impacts suggests a need for conservative management."

With respect to Alaska pollock the above statement suggests that biomass was much lower in the 1960-85 period than subsequently, and the implication is that this was not just (or even mainly) due to overfishing at that time. This raises the critical question of the stability of stock size for GOA pollock, and suggests that its distribution (in space, but also in relation to SSL colonies) prior to the international fishery was different from the current situation.

In conclusion on this point, evidence from time series analysis suggests that the groundfish, salmon and pelagic fish stocks for which fisheries have been ongoing for half a century or more have shown major order of magnitude changes in abundance in the North Pacific. Klyashtorin is more ambitious than most researchers in projecting production cycles into the future assuming the 55-60 year periodicity he found from Greenland ice cores. He goes as far as to provide these predictions, including that Alaskan pollock will go through a low levels of fishery landing between about 2010 and

2020. Although there are differing interpretations as to the reliability of forecasts of landings as opposed to biomass (given that landings are also determined by fishing effort and are influenced by management measures), this certainly raises the spectre that any certification provided to this fishery risks being reversed in the not too distant future.

Given that the quasi-cyclic phenomena discussed earlier lead to periodicities in the productivity of specific resources, it seems highly likely that the current decline in both Steller sea lions and GOA Pollock fall into the category of regime-influenced resources. Hence they may both be declining for reasons that are not entirely due to fishing of pollock. To assume that there is a direct cause-effect relationship between only two food web components, namely pollock abundance and reproductive success of Steller sea lions, does not consider the possibility that both are being affected by similar environmental changes, and that these may be acting more directly on Steller sea lion stock abundance. For example some hypotheses link the decrease in Steller sea lions to a current low availability of high-lipid food species, with the same oceanographic regime changes that increased pollock production having decreased the production of these high lipid species.

Setting reference points where fluctuations in productivity prevail

We now return to the questions mentioned earlier: the Certification Body Scoring Guidepost that there should be:

> ***"a reasonable chance that the stock is at or above B_{MSY} or its equivalent",*** and the Objectors rebuttal that***: "there is no question that the GOA stock is significantly below MSY"*** and hence that ***"the fishery should fail this performance indicator".***

One initial comment relates to the use of MSY as a limit reference point. The 1995 UN Fish Stocks Agreement appears to have effectively ruled against F_{MSY} as a target reference point, and there is a significant body of recent literature addressing the lack of precaution which results if this reference point is used as a target for management. Rather F_{MSY} is regarded as a limit reference point.

Following production model theory, the MSY is the level of harvest providing the highest long-term yield from the resource. In its conventional theoretical development it is considered to be a fraction of the virgin population size B_0, and for a population existing in a steady state with constant food resources and environmental conditions, B_0 (and hence MSY) were usually regarded as constants. But this perception is now changing since it has been recognized for some time, both in the N. Pacific and elsewhere, that recruitment is often either irregular or shows quasi-cyclic fluctuations (see e.g., Caddy and Gulland 1983 and Spencer and Collie 1997). The exploitation strategy adopted in most managed fisheries is to aim for a constant exploitation rate and variable yields rather than a reference point set specifically in terms of yield (e.g. Walters and Parma 1996). Subsequently, while discussing the North Pacific halibut fishery where similar environmentally-linked stock fluctuations have been documented, Parma (2002) argued that a robust fisheries control rule is what is needed to manage this type of fishery. Such a control rule seems to be in place in the form of the tiered control rule introduced by NMFS in the northern Pacific.

We agree therefore with the Certification Body when they state:

> *B_{MSY} is inherently an equilibrium concept, and as far as pollock is concerned, the GOA is not an equilibrium system. All this implies that evaluation of the fishery against this scoring indicator is not straightforward.*

If we assume that B_{MSY} is some fixed proportion of B_0, and that the unexploited stock also shows major fluctuations in biomass over time, then we have to reach the conclusion that MSY should vary in tune with the environmentally-determined virgin stock size that would have applied if there were no fishery operating. On this point the Certification Body report states in discussion of indicator 1.1.2.1 that:

> *If environmental variability is ignored and B_{MSY} is viewed as a fixed average quantity over the period since 1977 (as in the current SAFE report), then the current stock size is well below B_{MSY}, and the stock is overfished based on the standard suggested for this scoring indicator.*

The production conditions in 1977 are different from those today, therefore MSY should not be regarded as a constant proportion of the 1970's estimate of virgin population size, or be derived from productivity conditions that are not currently relevant. We see however that a limit reference point, namely that at which the fishery should be closed to fishing, could usefully be defined as a proportion of the average production over a period regarded in some way as appropriate – in the case of pollock the period 1977-1999 was selected and is a period of reasonably high productivity. In relation to the objector's comment therefore, and assuming that it should read *"there is no question therefore that the GOA stock is significantly below B_{MSY}*," we could probably agree that the GOA stock is below the B_{MSY} as defined as a proportion of the constant stock size implied by the average recruitment between 1977 and 1999. Appendix 3 in the Certification Body assessment report provides an explicit discussion of this issue. The conclusion, which we find reasonable, was that the stock in 2002 was 40 – 46% of the size it would have been in the absence of fishing but in the presence of recruitment fluctuations. This is a robust conclusion across three assumptions about the stock and recruitment relationship. That level of depletion is less than the depletion to 35% of the unfished stock which for pollock is regarded as the level of depletion at B_{MSY}, and so in this dynamic interpretation of MSY the pollock stock has not been below B_{MSY} in the history of the fishery.

On this point, we therefore agree with the assessment team when it states:

> *The results in Appendix 3 suggest that the stock has been responsibly managed (generally low exploitation rates) and that the current stock level relative to where it would have been now if the stock had never been fished is relatively high (44% for female spawning biomass and 75% for exploitable biomass – Table 1, Appendix 3). Both these levels are well above the proxy $B_{35\%}$ level for B_{MSY} if the latter is viewed as a potentially dynamic quantity.*

A general comment is that since stock replenishment is the main concern of stock management, %SPR criteria have been widely adopted as substitute criteria for B_{MSY} or F_{MSY}. These criteria are adjusted to reflect a minimum allowable egg production per recruit. Because %SPR criterion are expressed 'per recruit' it remains to a degree independent of the virgin stock size estimate. However fishing at a given F(%SPR) does not assure a constant number of fertilized eggs in successive years if stock size is fluctuating, nor does adherence to this criterion ensure that a constant number of recruits survive through varying oceanic conditions each year. That is %SPR criteria do not guarantee the number of 'recruits per recruit' across generations, and hence that the population is sustained, without knowledge or assumption about the relationships between stock size, environmental conditions and subsequent recruitment. As shown by the literature, survival of pollock eggs to recruitment fluctuates depending on environmental state, temperature and currents, all of which are involved in the regime shift phenomenon. Thus, population fecundity as given per recruit by the %SPR criterion, says little or nothing concerning the success or otherwise of spawning, which is probably as much a function of environmental conditions as spawning stock size. The history of GOA pollock has shown that small spawning stocks have given rise to large recruitment and conversely large spawning stocks have given rise to weak recruitment. It also seems likely that spawning in some locations is more successful than in others; this issue is mentioned in several papers and is touched on in the following section.

Sources and sinks

A quote from the Dorn *et al*. report suggests that some components of the pollock stock area are in more urgent need of conservation than others:

> *"Olsen et al. (2002) suggest that interannual genetic variation may be due to variable reproductive success, adult philopatry, source-sink population structure, or utilization of the same spawning areas by genetically distinct stocks with different spawning timing. Peak spawning at the two major spawning areas in the Gulf of Alaska occurs at different times. In the Shumagin Island area, peak spawning occurs between February 15- March 1, while in Shelikov Strait peak spawning occurs between March 15 and April 1."*

What seems implied by this statement is that the GOA pollock have one or possibly two preferred spawning locations, and that the stock may be operating under a 'source and sink' modality. In this the stock boundaries would shrink under unfavourable conditions to encompass the likely narrower stock distribution boundaries, such as Shumagin Island and Shelikov Strait, at the low point of the production cycle but occupy a much larger foraging area when conditions are suitable (so long as the stock was not excessively depleted by fishing). One feature of source and sink populations, especially when stocks are at their low point, is that the main recruitment comes from the source area or areas. A safety margin would therefore be provided by placing part of this area within a Marine Protected Area or similar management arrangement that provides spatial protection to ensure a significant stock component survives the low point in the production cycle (which Klyashtorin implies will occur some time around 2010). It is not clear to what extent the existing protected areas achieve this, although the GOA pollock fishery has significant areas closed or with limited access by fishing.

What do international fisheries agreements say about what to do during regime shifts?

Article 7.5.3 of the FAO Code of Conduct for Responsible Fisheries states that management authorities

> *should use the best scientific advice available in order to set target and limit reference points for the fishery, and that as limit reference points are approached, measures should be taken to ensure that the limit reference point is not exceeded.*

However, marked fluctuations in stock size may be caused by natural phenomena and on this point, Article 7.5.5 of the Code states:

> *If a natural phenomenon has a significant adverse impact on the status of living aquatic resources, States should adopt conservation and management measures on an emergency basis to ensure that fishing activity does not exacerbate such adverse impact. States should also adopt such measures on an emergency basis where fishing activity presents a serious threat to the sustainability of such resources. Measures taken on an emergency basis should be temporary and should be based on the best scientific evidence available.*

Article 6.7 of the UN Fish Stocks Agreement uses much the same wording as the Code with respect to natural phenomena affecting productivity: i.e. steps should be taken to ensure that fishing does not exacerbate an already negative natural effect.

In conclusion on this point, as the nadir of the production cycle in GOA Pollock is approached, the sustainable yield will have to be curtailed if ensuring that the food requirements of Steller sea lions are met is a key consideration.

Conclusions

1. There is good evidence that the North Pacific is subject to environmentally-driven 'regime shifts' that affect (positively and negatively) whole groups of species on a multi-decadal scale.

2. The pollock appears to be one of a suite of species that increased greatly in biomass during the most recent regime shift, following several years of very strong recruitment in the 1970s (and sporadically about every 5 years since). There is some indication that the regime reversed again in the late 1990s.

3. The question of just what reference point is appropriate for a species where productivity is fluctuating has been discussed. Clearly, assessing the present status of the population against a static virgin stock size, estimated during earlier high productivity conditions, must be misleading. If MSY conditions are the criterion, this should be related to the standing stock which would be in place if the stock were currently unexploited. It is not possible to estimate this quantity exactly, but using a fixed B_{MSY} level as a standard of comparison is misleading. However we find the use of a fixed biomass minimum below which fishing should cease can usefully be defined by a static model. We need other criteria and conceptual models that take variation more explicitly into account.

4. The varying productivity of many marine resources, here and elsewhere, and the demands being made on them both by marine mammals and man at different stages of the production cycle are clearly threats to sustainability, unless the periodic nature of production cycles is taken into account. The negative experience of East coast Canadian groundfish fisheries which have been at all-time lows for a decade or more, in part due perhaps to past overfishing, but also due to currently poor environmental conditions, needs taking into account. As does the East Atlantic cod story. Nonetheless, evidence to date suggests that the situation with respect to GOA pollock is not yet at a critical point, but it would seem timely at this point to develop a strategy for preventing stock size declining too low, or even to begin planning for stock recovery should events later in this decade prove unfavourable, as at least one prediction in the literature suggests.

5. That the biomass in 2003-4 was below the predicted B_{MSY} calculated with data from when the stock was higher (in the 1970's), may be formally correct. This does not take into account the reality that the fishery is being managed in an attempt to take into account natural stock declines. Whether this attempt will be successful as and if stocks continue to decline, and what additional measures should be taken, and in response to which biomass reference points, is the key question discussed in the main body of the report.

6. Taking a 'traditional' approach and considering B_{MSY} to be a constant, as mentioned, is misleading in the case of GOA pollock. This is the reason why %SPR criteria were used in the development of alternative reference points - explicitly in $B_{35\%}$ and implicitly $35\%_{unfished}B$. It has to be stressed however that the 'per recruit' approach does not guarantee either a specific population fecundity or a given number of new recruits. It even seems likely that oceanic conditions for survival of eggs and larvae to recruitment will deteriorate during the low point of the production cycle.

7. The recent decline in GOA pollock was caused by both fishery removals and reduced recruitment, with reduced recruitment being environmentally forced and to be expected even in the absence of a fishery. This does not mean that the decline in environmental conditions should not be taken into account in setting quotas, and the tier approach is obviously attempting to do this. The FAO Code of Conduct and 1995 UN Fish Stocks Agreement both require that action be taken whether the decline is due to overfishing or natural causes.

8. Given that major fluctuations in many Gulf of Alaska resources seem to be a reality, it is almost certain that the abundance of predators will also have shown periodic declines in the past in response to changed densities of food organisms, and to changes in the location of preferred food organisms in relation to their home ranges. A die off of certain predators, and competition between sea lions and other unexploited predators would have been expected even if pollock were not exploited. Possibly the stock size of sea lions and other apical predators prior to commercial fishing was controlled by the low point in the production cycle of GOA Pollock and other food resources. And this low point will inevitably be more stressful for dependent species if human harvest continues through the low points of fish abundance. Ultimately the food requirements of dependent species will have to be taken into account through a multispecies, diet-related approach.

9. Under some hypotheses declines in predator populations are to be expected as pollock stocks decline, and the impact of the fishery on predator food availability is going to be highest at the low point in the pollock production cycle. The question is left unresolved as to whether under these hypotheses the tier approach to setting harvest strategies will ensure an adequate food ration during the low point of the pollock cycle. Instituting a closure at $B_{20\%}$ of pollock biomass based on a period of moderate to high pollock productivity is an attempt to leave an adequate biomass for recovery of the stock and survival of the top predators. While it is not clear that this will achieve the two objectives of this measure, it appears to be a useful step in that direction, especially when combined with measures already taken to institute closures around sea lion colonies and other designated critical foraging areas and habitats.

10. For a fluctuating meta-population a safety measure both for sea lions and pollock would have to incorporate a spatial or geographical component. The approach taken of 'spreading' the quota over seasons and sub-areas helps in this respect, but may not be adequate on its own. Accepting that a source-sink scenario may apply would suggest making provisions whereby areas close to sea lion rookeries are closed to fishing. For example, the supposed source population in Shelikov

Strait or in other spawning areas might be protected by a fishery closure of some fraction of the Strait, especially during years when the biomass falls below some pre-established minimum. Such measures would seem to provide an important safety margin in case errors in stock surveys lead to quotas being overestimated. This might be especially likely to occur with a fixed stratification scheme if the stock range of the organism being surveyed is shrinking or expanding. Some such spatial protection is provided by the existing management arrangements, but it is unclear whether they are adequate.

11. Although some provisions have been made for the food requirements of top predators in current regulations, it remains to be seen if the measures incorporated into the management rule and the quota splitting provisions by area and season will be adequate to ensure survival of top predators through a low point in the pollock production cycle. It has been suggested that such regime shifts will be associated with natural declines in predator populations, and in fact function as overall constraints on their stock size. Adding a further depletion to pollock stock sizes when they are at a natural low point would seem to increase the risk to top predators, since at this time alternative food species will be less available, given that other important species seem to decline in synchrony with pollock stocks.

References:

Benson, A.J. and A.W. Trites. (2002). Ecological effects of regime shifts in the Bering Sea and eastern North Pacific Ocean. Fish and Fisheries, Vol 3(2), pp95-113.

Bond, N.A., J.E. Overland, M. Spillane and P. Stabeno. 2003. Recent shifts in the state of the North Pacific. Geophys. Res. Lett. 30(23),

Caddy, J.F. and J.A. Gulland (1983). Historical patterns of fish stocks. Mar. Policy, 7(4): p 267-78.

Conners, M.E., A.B. Hollowed, and E. Brown. (2002).Retrospective analysis of Bering Sea bottom trawl surveys: regime shift and ecosystem reorganization. Prog. Oceanogr. Vol 55(1-2), p 209-222.

Dorn, M. (2003) Document provided by Martin Dorn (ACF, Seattle) to the SCS Evaluation Team on 20 March 2003. Appendix 3 of the MSC Assessment Report, The United States Gulf of Alaska Pollock Fishery. Scientific Certification Systems, July 2004.

Dorn, M., S. Barbeaux, M. Guttormsen, B. Megrey, A. Hollowed, M. Wilkins and K. Spalinger. (2003) Assessment of Walleye Pollock in the Gulf of Alaska. Stock Assessment and Fishery Evaluation Report, Northern Pacific Fishery Management Council.
www.afsc.noaa.gov/refm/docs/2003/GOApollock.pdf

Gao, Y. and R.J. Beamish (2003).Sable isotope variations in otoliths of Pacific halibut (*Hippoglossus stenolepis*) and indications of the possible 1990 regime shift. Fish. Res. 60(2-3), pp393-404.

Goodman, D., M. Mangel, G. Parkes, T. Quinn, V. Restrepo, T. Smith and K. Stoles. (2002). Scientific review of the harvest strategy currently used in the BSAI and GOA groundfish management plans. Report prepared for the Northern Pacific Fishery Management Council.
www.fakr.noaa.gov/npfmc/misc_pub/f40review1102.pdf

Klyashtorin, L.B. (2001). Climate change and long-term fluctuations of commercial catches. FAO Tech. Pap. 410: 86p.

MacCall, A.D. (2002). Fishery management and stock rebuilding prospects under conditions of low frequency environmental variability and species interactions. Bull. Mar. Sci. 70(2), pp 613-628.

Parma, A.M. (2002). In search of robust harvest rules for Pacific halibut in the face of uncertain assessments and decadal changes in productivity. Bull. Mar. Sci. 70(2), pp 423-453.

Peterson, W.T., and F.B. Schwing. (2003). A new climate regime in northeast Pacific ecosystems. Geophys. Res. Lett. 30(17).

Spencer, D.D. and J.S. Collie (1997).Patterns of population variability in marine fish stocks. Fish. Oceanogr. 6: pp 188-204.

Steele J.S. (1996) Regime shifts in fisheries management. Fish. Res. 25: pp 19-23

Walters, C.J. and A. Parma. (1996). Fixed exploitation rate strategies for coping with effects of climate change. Can. J. Fish. Aquat. Sci. 53, p 148-158.