Surveillance Report
Gulf of Alaska Pollock Fishery

Certificate No.: **MML-FC-007**

Moody Marine Ltd.
May 2007

Author(s): J Rice, D Bowen, S Hanna, A Hough

Moody Marine Ltd.
Moody International Certification
Merlin House
Stanier Way
Wyvern Business Park
Derby. DE 21 6BF
UK
Tel: +44 (0) 1332 544663
Fax: +44 (0) 1332 675020

1.0 GENERAL INFORMATION

Scope against which the surveillance is undertaken: MSC Principles and Criteria for Sustainable Fishing as applied to the Gulf of Alaska Pollock Fishery

Species: Pollock (*Theragra chalcogramma*)

Area: Gulf of Alaska

Method of capture: Pelagic trawl fishery

Date of Surveillance Visit:	**1-4th May 2007**			
Initial Certification	**Date: 27 April 2005**		**Certificate Ref: MM-FC-007**	
Surveillance stage	**1st**	**2nd**	**3rd**	**4th**
Surveillance team:	**Lead Assessor:** Andrew Hough **Assessor(s):** J Rice, D Bowen, S Hanna			
Company Name: **Address:**	At-Sea Processors Association 4039 21st West, Suite 400 Seattle, WA 98199 USA			
Contact 1	J Gilmore			
Tel No: **Fax No:** **E-mail address:**	+1 202 661 3975 +1 202 661 3979 jgilmore@atsea.org			

2.0 RESULTS, CONCLUSIONS AND RECOMMENDATIONS

This report contains the findings of the second surveillance cycle in relation to this fishery. As for the first surveillance report, much of the discussion below relates to compliance with the Conditions of Certification set out in the certification report. As conditions are closed out (i.e. actions are completed), the assessment focus will concentrate more and more on the overall ongoing operation of the fishery in relation to the MSC Principles and Criteria.

Information has been collected principally from reports provided by the client and directly from NOAA Fisheries (NMFS). Consultations have been undertaken with At-Sea Processors Association (APA), NOAA Fisheries and other Stakeholders.

For each condition, the report sets out the following. Firstly, the original assessment scoring guideposts and scoring commentary and the requirements of the original Condition (‘Activity assessed’). These identify the areas in which the fishery was determined to perform below the level required by the MSC standard during the initial assessment, and the required actions to address these issues. As required by the MSC assessment methodology, APA produced an Action Plan setting out the stages involved in addressing the Conditions raised (‘APA Action’). This Action Plan was deemed to be adequate by the original main assessment team. According to the terms of the Action Plan, the client has provided information on the work undertaken to date (the ‘APA Progress Report’). This progress report has now been evaluated by the Moody Marine assessment team (‘Observations’ and ‘Conclusion’) against a) the commitments made in the Action Plan, b) the intent of the original Condition and c) the original scoring indicator, guideposts and commentary. The influence of any overall legislative and management changes in the fishery are also taken into consideration.

Where conditions are judged to have been met, a re-evaluation of the scoring allocated to the relevant Performance Indicators in the original MSC assessment is included within the evaluation.

Also, in accordance with the MSC Fisheries Certification Manual (FCM v6) clear measurable outcome with timelines are specified.

The APA Action Plan is preceded by the following commentary, which is repeated here for completeness.

“The At-sea Processors Association (APA) submits this Action Plan for Meeting the Conditions for Continued Certification of the Gulf of Alaska (GOA) pollock fishery. APA agrees to make a good faith effort to meet the intent of the Conditions set forth in the certifier’s July 2004 Final Report determining that the GOA Alaska pollock fishery is sustainably managed under the MSC Principles and Criteria. Furthermore, APA recognizes its responsibility as the Applicant/Licensee in the certified fishery to comply with annual surveillance audits by an accredited MSC certification body. APA has entered into a written agreement with Moody Marine Ltd. to perform the required audits, including monitoring implementation of Conditions set forth in this Action Plan.

Pursuant to an understanding between APA and the certification body, Scientific Certification Systems, Inc., and consistent with MSC policy, APA is willing to assign MSC logo and labeling rights to non-APA GOA pollock producers who agree to share the cost of maintaining the certification and to join in good faith efforts to meet the Conditions.

While APA agrees to undertake good faith efforts to meet the Conditions, the association is on record challenging the basis for certain Conditions, questioning the feasibility of the management authority to undertake certain actions, and asserting that some Conditions exceed the scope of the assessment process. Such concerns were transmitted to the certification body in writing by the

Applicant, by participants in the GOA pollock fishery and by the National Marine Fisheries Service (NMFS). APA appreciates the consideration provided by the assessment team and certifier to issues raised by all stakeholders in the process. However, we note that a number of concerns raised by Alaska pollock producers and NMFS with regard to the Conditions remain. In fulfilling our obligations, we intend to provide to the appropriate certification body relevant information developed subsequent to the drafting of Conditions. We seek a flexible and adaptive program that will permit us to meet the intent of the Conditions based on the best information available.

Some of the concerns expressed by APA relate to shortcomings in the structure and administration of the MSC program. On July 8, 2004, APA co-signed a letter to the MSC suggesting needed improvements in the program. At least two of the issues raised in that letter pertain to the development of Conditions for the BS/AI and GOA pollock fisheries. The first issue is that the MSC must establish consistency among assessments. In APA's view, both the BS/AI and GOA pollock fisheries were held to a different and much higher standard than any other Applicant fishery, creating competitive disadvantages that should not be present in either a science-based or market-based program.

A second issue is that APA, as a private sector Applicant, is not always in a position to effectuate the changes in management that the certification body may seek. Under such circumstances, the MSC certification methodology should require certification bodies to consult and cooperate fully with both the Applicant and the affected management authorities in drafting Conditions. Without such collaboration the assessment team is deprived of insight and expertise needed to propose improvements in candidate fisheries that best achieve conservation and management objectives in domestic law as well as the MSC's sustainability standard.

APA's Approach to Meeting the Conditions for Continued Certification.

APA will establish the Alaska Pollock MSC Certification Committee to develop and direct a program to give effect to this Action Plan for meeting the Conditions for the BS/AI and GOA pollock fisheries. The Alaska Pollock MSC Certification Committee is composed of participants in the BS/AI and GOA pollock fishery, their representatives and APA staff. The Committee could also enlist outside experts to assist with tasks needed to meet obligations under the Action Plan.

The Alaska Pollock MSC Certification Committee will consider the range of resources available to assist in the task of responding to Conditions, including possible collaboration with the Pollock Conservation Cooperative's (PCC's) Research Committee. The PCC's membership is substantially the same as the membership of APA. Among other responsibilities, the PCC Research Committee is the principal conduit between the PCC and the University of Alaska/Fairbanks (UAF), both of which entered into a partnership in 2000 to support a comprehensive marine research grants program. The UAF/PCC Research Center is funded by APA/PCC member companies and is reportedly the largest private sector marine research program in Alaska. To the extent that certain Conditions can be achieved through private sector initiatives, the UAF/PCC Research Center could be an important partner.

APA also works closely with other North Pacific marine research organizations, including the North Pacific Research Consortium, the North Pacific Research Board, the Alaska SeaLife Center and various other organizations committed to improving understanding of the GOA ecosystem. Many of the issues raised in the Conditions are being addressed by work conducted by, or sponsored by, the organizations identified above. APA will provide to the certifier information and findings developed by these respected organizations relevant to Conditions established for the GOA Alaska pollock fishery.

Most importantly, the Alaska Pollock MSC Certification Committee will coordinate with the NMFS Alaska Region office and Alaska Fisheries Science Center (AFSC), the North Pacific

Fishery Management Council (the Council), and other participants in the management process, as necessary, in an effort to meet the Conditions established by the certification body.

Proposed APA Activities in Achieving the Conditions.

There is necessarily overlap among Performance Indicators, resulting in duplication of Conditions as well. After considering redundancies, the Final Report essentially sets out 14 Conditions. The following details how APA will address each of these 14 Conditions. In the majority of instances, the conditions for the GOA pollock fishery are the same as those for the BSAI pollock fishery. In each of these cases where the conditions are the same, APA will follow the same action plan as produced for the BSAI fishery. For the few conditions that are different, APA has proposed additional steps to complete the GOA Pollock Action Plan.

Item	Comments
0	**Update on Stock Status**
Activity Assessed	The original data-gathering phase of the MSC assessment of the Gulf of Alaska (GoA) Pollock Fishery took place in 2002. As the progress of an MSC assessment is usually entirely based on the data available at the time of this data gathering, changes in stock status are likely to have occurred since which will not have been reported in MSC-related documentation. Moody Marine have therefore asked APA to prepare an update on GoA pollock stock status over the period between the original assessment and this, the first annual surveillance report. The intent of this section is to bring background information up to date and so to allow subsequent condition information to be evaluated in light of this.
APA Progress Report	The At-sea Processors Association (APA) provided a summary of the status of Alaska pollock stocks over the period 2002-2005 in our 2006 surveillance report. That summary reviewed in some detail the structure of the assessment models, the nature and timing of input-data updates, the stock harvest control rules, the methods used to estimate stock recruitments, and the ecosystem features considered in the assessments. This updated summary focuses on the most recent assessments and omits much of the detail provided previously. (The tables in this summary have been modified to ensure that year labels refer to quantities that apply to the resource-survey (assessment) year and not to projections for the upcoming fishing year. This changed the year labels for some quantities tabulated last year. In addition, some erroneous values tabulated for the AI management area were corrected.) In November of 2006, Alaska Fisheries Science Center (AFSC) scientists updated the assessments for eastern Bering Sea (EBS), Aleutian Islands (AI), and Gulf of Alaska (GOA) pollock, and presented them to the Bering Sea and Aleutian Islands (BSAI) and GOA Plan Teams for review and comment. The North Pacific Fishery Management Council (NPFMC) assembles the groundfish plan teams. In December the NPFMC Science and Statistical Committee (SSC) considered the assessments and Plan-Team comments and recommendations. The SSC then provided recommendations to the NPFMC for overfishing (OFL) and acceptable biological catch (ABC) amounts for the 2007 fishing year. The text below summarizes the important issues considered and the results obtained for Alaska pollock during this annual "harvest specifications" process. A detailed description of the entire NPFMC harvest specifications process as well as a summary of the results for 2007 are provided by the NPFMC (2006a,b). See also the AFSC summary at: http://www.afsc.noaa.gov/Quarterly/ond2006/divrptsREFM6.htm **Gulf of Alaska Pollock Fishery** **Assessment Structure and Input Data** All of the "standard" assessment input data updates were included in the revised assessment model for 2006. These include: (1) an annual, summer bottom-trawl survey of near-shore areas of the GOA conducted by the Alaska Department of Fish and Game (ADF&G); (2) a NMFS acoustic, water-column (EIT) survey of the Shelikof Strait spawning grounds, and (3) total catches and age compositions from the 2005 fishery. In addition, age compositions from the 2005 NMFS summer bottom-trawl survey of the GOA shelf were added to the assessment model. As in recent years, the EIT survey was carried out during the spawning period (late winter-early spring), and was expanded to investigate known spawning aggregations north of the Shumagin Islands, in Sanak Island gully, and along the Chirikof-area shelf break. Samples from all of these surveys are used to provide estimates of pollock biomass and its distribution over the GOA shelf as well as the expected length and age composition of the biomass during the fishery. The same assessment model used for the 1999-2005 assessments was used to produce the 2006 assessment. The reference model for GOA pollock does not estimate the NMFS bottom-trawl survey catchability endogenously, but rather fixes this parameter at one (1.0). A likelihood profile for the survey catchability developed from the alternative model runs with catchability estimated endogenously shows that a survey catchability of 0.81 yields the highest likelihood value.

Model estimation with survey catchability less than one results in higher estimated stock sizes and thus higher $F_{40\%}$ ABC tonnages (Dorn *et al*. 2006, Figure 1.18). As such, the fixing of the bottom-trawl survey catchability at 1.0 in the "standard" GOA assessment model represents a "hidden" element of conservatism in the assessment, since estimates of stock biomass and yield are lower when catchability is fixed at 1.0.

Stock Status

Both the Shelikof Strait echo-integration trawl and ADF&G bottom-trawl surveys were down by about 13 percent in 2006 when compared to 2005. In Shelikof Strait, pollock larger than 43 cm, a proxy for spawning biomass, decreased by ten percent compared to 2005 due to the ageing of the relatively strong 1999 and 2000 year classes. However, the estimate of age-two abundance was 0.8 billion fish, which suggests that the 2004 year class may be above average. These results contributed to a model-estimated stock status showing a 16 percent decline in spawning biomass projected for 2007 when compared to that projected for 2006 in the 2005 assessment. The projected dip in spawning biomass is expected to be short lived, as projections indicate an increase in spawning biomass after 2007. But these results depend on the strength of the 2004 year class, which as noted above, now appears to be above average.

Results from the 2006 winter EIT survey outside of Shelikof Strait were somewhat variable, with biomass estimates lower in the Shumagin and Chirikof Island area by 28 and 10 percent, respectively, but up by 200 percent in the Sanak trough. Total survey spawning biomass from all GOA areas, at about 450,000 tons, was comparable to the model estimate of spawning biomass. Large changes in spawning aggregation estimates from one year to the next likely indicate between-year differences in the timing of spawning, or that pollock are spawning in different locations (Dorn *et al*. 2006).

Table 1 summarizes the evolution of the status of the GOA pollock stock since 2002 when the APA submitted its application for MSC certification of the GOA pollock fishery. GOA pollock is managed using the Tier 3 harvest control rules. The over-fishing mortality rate is set as the $F_{35\%}$ fishing rate, and this rate combined with an estimate of exploitable (age 3+) biomass provides an OFL tonnage. The maximum target-fishing rate is determined as the $F_{40\%}$ fishing rate and, when combined with an estimate of exploitable biomass, provides the max ABC. The reproductive biomass associated with $F_{40\%}$ fishing is the stock-status benchmark for GOA pollock: should stock reproductive biomass drop below this benchmark, then target fishing mortality rates are reduced via the "automatic rebuilding" algorithm that forms part of the harvest control rule. The $B_{35\%}$ biomass, a commonly used proxy for the B_{MSY} stock-status benchmark where knowledge of stock-recruitment relationships is uncertain, is included in Table 1 for comparison.

Table 1. Gulf of Alaska Pollock Stock Status, 2002-2006.

Item	2002	2003	2004	2005	2006
	- - - - - - - - Thousands of Metric Tons - - - - - - - -				
Exploitation Benchmarks [a]					
ABC	51.8	47.9	64.7	85.2	80.4
OFL	75.5	69.4	91.1	144.3	110.1
B_{35} [b]	420	434	400	392	384
B_{40} [b]	480	496	458	448	440

Item	2002	2003	2004	2005	2006
Stock Status					
Begin-Year Biomass (Age 3+)	1,130	993	841	709	543
Spawning Biomass [c]	284	280	336	416	424
TAC	51.8	47.9	64.7	85.2	80.4
Total Catch	51.9	50.7	63.9	80.2	70.5

Source: Chapter 1, GOA SAFE Reports 2002-2006.
[a] Includes the western, central, and west Yakutat portions of the GOA.
[b] Equilibrium estimate under average recruitment.
[c] Includes males and females.

Since 2002, the status of the GOA pollock stock has remained relatively stable although the begin-year age 3+ biomass has continued to slowly decline. During this time the exploitable biomass has been supported by the recruitment of the 1999 and 2000 year classes. With the ageing of these year classes, stock spawning biomass now approximates the $B_{40\%}$ benchmark, and the stock assessment model continues to track well the evolution of the spawning biomass (Dorn *et al*. 2006, Figure 1.21). Because the stock is above one-half of its $B_{35\%}$ stock size, it is not considered to be overfished. In addition, future projections of stock reproductive biomass indicate that the stock is not approaching an overfished condition.

Harvest Specifications for 2007

As described above, the Tier 3 harvest control rules provide a tonnage "buffer" between the max ABC and the proxy MSY harvest (OFL), as required by the 1996 US Sustainable Fisheries Act. The purpose of the buffer is to provide a margin of safety so that assessment errors will not result in the OFL being inadvertently exceeded. In 2002, new resource-survey information suggested that GOA pollock abundance was lower than projected in the 2001 assessment. However, in 2001, a relatively high GOA pollock ABC based on the maximum allowed by the Tier 3 rules was established, although it was not entirely harvested. In retrospect, had the entire ABC been taken the OFL would have been slightly exceeded (Dorn *et al*. 2001).

Analysis of the structure of the Tier 3 rules showed that the size of the tonnage buffer decreased as stock reproductive biomass dropped below the $B_{50\%}$ benchmark, and that below the $B_{40\%}$ benchmark, true spawning biomass cannot be more than about eight percent lower than estimated biomass to avoid overfishing (Dorn *et al*. 2001). Because there will always be some probability of exceeding the $F_{40\%}$ rate due to imprecise stock assessments, and because the GOA pollock biomass has steadily declined since the mid-1980s for reasons that remain unknown, the authors of the GOA pollock assessment developed an alternate "constant-buffer" or "author's F" harvest control rule that essentially increases the "spawning-biomass space" between the maximum ABC and OFL fishing rates (Dorn *et al*. 2006, Figure 1.23). Since 2002 the recommended ABCs in the GOA pollock assessments have used the "constant-buffer" harvest control rule as a further measure to establish a precautionary GOA pollock harvest.

For 2007, the model estimate of spawning biomass is 321,340 tons, which is 29 percent of the unfished biomass. Because this estimate is less than the $B_{40\%}$ benchmark of 440,000 tons, the GOA pollock stock qualifies for management under the Tier 3b harvest control rules, and the max F_{ABC} fishing rate must be reduced according to the automatic rebuilding schedule. With

	automatic rebuilding, the Tier 3 rules provide an OFL of 87,220 tons and a max ABC of 75,150 tons for 2007. Applying the "constant buffer" calculation to the Tier 3b rules yields a recommended "author's ABC" of 63,800 tons, a decrease of 15 percent from the 2007 max ABC, and a decrease of 22 percent from the 2006 ABC. Both the GOA Plan Team and the SSC agreed with the OFL and ABC recommended for 2007 in the 2006 assessment (NPFMC 2006b). The NPFMC adopted the SSC recommendations, and set the 2007 pollock TAC at 62,150 tons for the combined GOA areas to the west of east Yakutat (the reduction from 63,800 tons is due to the allocation of 1,650 tons to the Alaska-waters pollock fishery in Prince William Sound). **Assessment Ecosystem Considerations** Prior to 2004, the ecosystem considerations that routinely influenced the setting of the ABCs for GOA pollock were not listed explicitly in the stock assessment under an ecosystem considerations heading. However, in 2004 a standard format for considering the linkages between the pollock fishery and the GOA ecosystem was adopted, and an ecosystem-level trophic map is now included in the assessment. The trophic map is developed from summer food habits data collected from NMFS bottom-trawl surveys during 1990-2005 and includes both adult and juvenile pollock biomass components. The largest consumers of adult GOA pollock are arrowtooth flounder, Pacific halibut and Pacific cod, Steller sea lions, and the pollock trawl fishery, with consumption by arrowtooth, halibut and cod making up about 72 percent of total adult pollock mortality. Other significant adult pollock consumers include sablefish, other adult pollock, and pinnipeds other than SSLs. These second-tier pollock consumers account for an estimated 11 percent of total adult mortality. For juvenile pollock, the largest consumers are arrowtooth flounder, adult pollock, and pisciverous birds, which together account for about 70 percent of estimated total juvenile mortality. As for the diet of GOA pollock, all ages are primarily zooplanktivorous during the summer growing season (more than 80 percent of the diet by weight for both adults and juveniles). By far the largest components are copepods and euphausiids, but for adults, in some years, gelatinous zooplankton and shrimp also make up a large fraction of the diet (Dorn *et al*. 2006, Figure 1.28).

<table>
<tr><th>Item</th><th>Comments</th></tr>
<tr><td>1</td><td>Condition of Certification 1: The harvest strategy can be shown to be precautionary.</td></tr>
<tr><td>Activity assessed</td><td>This Condition relates principally to Indicator 1.1.1.5, but Indicator 2.1.1, Principle 3 Indicator 4.1.6 and, in part, Principle 3 Indicator 4.1 also relate

100 Scoring Guidepost

• The harvest strategy or management procedure has been formally evaluated and demonstrated to be robust to known sources of uncertainty in data and model assumptions.

80 Scoring Guidepost

• The harvest strategy has been demonstrated to be precautionary, based on past management decisions and responses to uncertainty.

60 Scoring Guidepost

• While including some elements of precaution, the harvest strategy has not proved to be sufficiently precautionary.

SCORE: 75

The score for this indicator reflects an evaluation for the whole Tier system as applied to pollock. Despite an analytical study to show that Tier 1 is precautionary and Tiers 1 to 3 ought to be precautionary (Thompson, 1997), that study was based on a relatively simple model of Pollock dynamics, which fails to account for some important complexities and uncertainties in stock dynamics (such as spatial structure in populations, and temporal changes in productivity due to regime shifts). Surprisingly, there has been no comprehensive simulation testing of the harvest strategies used for pollock management, nor attempts to test their robustness to a wide range of uncertainties and assumptions inherent in stock assessment and management (Goodman et al, 2002). Such methods are now widely used in developing and testing both generic and fishery-specific harvest strategies (Butterworth and Punt, 1999; Smith et al., 1999), and have even been proposed, and are starting to be implemented, to test broader ecosystem based management strategies (Sainsbury et al., 2000). Hilborn and Walters (1992) have argued that all harvest strategies should be tested in this way. The methods involved (management strategy evaluation or evaluation of management procedures) are well known and documented. Goodman et al (2002) recommend adoption of this approach to test the robustness of the NPFMC harvest strategies in general.

The 80 scoring guidepost for this indicator is not met. The harvest strategy has not been demonstrated to be precautionary because the stock has been in nearly continuous decline for over fifteen years. It is noted elsewhere in this report that a substantial part of that decline may be attributable to environmental conditions, and as there are a number of precautionary features of the harvest strategy, the score does not fall below the 60 level. However the current harvest strategy has not been shown to be robust to environmentally driven changes in productivity (or to several other sources of uncertainty identified later in this report). The following condition is therefore set to bring the score for this indicator to at least the 80 level.

CONDITION: To improve the deficiencies in performance for this indicator, SCS requires that formal evaluation and testing of the robustness of current and any proposed new harvest strategies used to manage EBS and AI pollock be undertaken, using methods similar to those recommended by Goodman et al. (2002). The SCS evaluation team requires that any plans to correct this deficiency lay out a step-wise plan with timelines such that at least three stages of work would be available for evaluation:

1. Prepare detailed specifications for the evaluation.
2. Undertake the evaluations.
3. Modify harvest strategies as appropriate from the results of the evaluations. (Uptake</td></tr>
</table>

	to follow NPFMC due process). **Notes related to tasks**: Designing and implementing a management strategy evaluation study is a complex task, and the SCS evaluation team does not seek to prescribe precisely how it should be done. Nevertheless, the SCS team sees this condition as the key one that will help overcome most of their concerns with regard to Principle 1, and wishes to maintain an active involvement in monitoring progress in meeting the condition. The SCS team also considers it prudent that there be suitable opportunity for input from key stakeholders in the fishery. (Where there is substantial disagreement between stakeholders, the SCS team will be the final arbiters). Whoever is contracted to undertake the task would do well to consult and be guided by the fairly detailed proposal in sections 3.10 and 3.11 of Goodman *et al* (2002) as this will be used by the SCS team as a benchmark, noting that those specifications are for testing generic NPFMC harvest strategies, and will need to be adapted for the specific circumstances of EBS and AI pollock. In general, task 1 will involve specifying the set of performance measures against which the harvest strategies will be judged, the set of robustness tests to be undertaken, the detailed specifications of the operating models to be used, and the range of harvest strategies to be evaluated. The latter should include monitoring and assessment models as well as harvest control laws, noting that some simplification of detailed assessment models may be required for computational efficiency in testing harvest strategies. The robustness tests should include, at a minimum, alternative but credible assumptions about spatial dynamics of pollock in the Bering Sea (including overlaps into the Russian fishing zone), and the impacts of regime shifts. They should deal explicitly with key issues and uncertainties identified elsewhere in this report and cross referenced to this condition. Consideration should be given to including operating models that go beyond single species dynamics, where these are available or can be developed in suitable timeframes, and performance measures should include consideration of impacts on predators. The detailed specifications and proposal for work should be presented and discussed at an open workshop as soon as practical following certification. The proposal should specify who will undertake the work, the timelines involved, and the resources allocated to the task. At least one member of the SCS evaluation team should attend the workshop. The work program is to be agreed by the SCS evaluation team and the group undertaking the evaluations. The timelines cannot be pre-specified, but will depend on the nature and complexity of the agreed work program. To maintain certification, progress on agreed tasks will be checked during surveillance visits at the specified time frames, or at the annual audits required by MSC if the time frames coincide. The results of the evaluations will be made available to NPFMC, and will be presented at a second open workshop. Appropriate responses to the evaluations, including suggested changes to current harvest strategies, will be discussed and agreed in principle. Uptake of changes will follow through the due process of NPFMC decision-making.

APA Action	*This Condition and the Action Plan response are similar to Principle 1; Indicator 1.1.1.5 in the BS/AI pollock fishery report. The assessment of the Alaska pollock fisheries began in January 2001. The GOA fishery was "scored" by the assessment team in 2002, and a comprehensive Draft Report recommending certification of the GOA pollock fishery was completed in October 2003. A Final Report was published in July 2004, and the Objections process continued into 2005. Necessarily, the assessment team had to conclude its consideration of new information pertaining to this dynamic and ever-improving fishery and make its determination about the fishery's compliance with the MSC's sustainability standard. With some exceptions, the certification is based on information available to the assessment team when the GOA fishery was scored in 2002. As a result, there is considerable new information to provide to the certification body on changes and improvements in fishery management practices. Condition #1 is a good example of where substantial new information exists and should be considered by the certification body during the first annual audit.* *APA will provide the contracted certification body with the final AFSC report relating to issues identified in the Goodman report immediately after issuance of the certificate or within 1 month of its availability if it is not immediately available. If the AFSC report is not available within 6 months of the issuance of the MSC certificate, APA will request a meeting between APA, NMFS, and the certification body to discuss the status and progress of the AFSC report.* *If the AFSC report is available within 6 months of the issuance of the certificate, APA will request a meeting between APA, NMFS, and the certification body no later than six months after issuance of the certificate to discuss what actions will be taken in follow-up to the AFSC report and whether these actions will correspond to the requirements of the condition.* *Within three months after the meeting between APA, NMFS, and the certification body (nine months after issuance of the certificate), APA will provide the certification body with a revised action plan for meeting the remaining objectives of this condition. The revised action plan should show how the condition will be met within six months after the meeting (15 months after the date of issue for the certificate).*
Conclusion of Surveillance Report 1	The frustration of APA with this condition is apparent in some of their response, and it is certainly true that, even at the time of the initial certification assessment, many robustness tests of the harvest control rules had been undertaken. It is important to bear in mind that evaluation of the robustness of management strategies to various sources of uncertainty can be a task without an end - imaginative critics can always raise new uncertainties. However, completion of this PhD work would comprise a substantial and coherent body of work on this theme. Progress to date is therefore considered to be wholly satisfactory. Completion of the studentship and concomitant progress with other initiatives outlined above and appropriate modifications to harvest strategies would provide a level of analysis and response that would meet this Condition. Ongoing development will be monitored in future surveillance audits with reporting on the stages outlined above in annual surveillance reports. The next annual report is expected to indicate clear timeframes for completion of the requirements of this condition. This condition is expected to be adequately closed within the timescale of the current certificate.
APA Progress Report	The evaluation of fishery management strategies has been an ongoing research activity of the Alaska Fishery Science Center (AFSC) for years. For example, the recently completed Programmatic Supplemental Environmental Impact Statement (PSEIS) for the BS/AI and GOA Fishery Management Plans devotes thousands of pages to the evaluation of both current and alternative fishery management strategies. More recently, in response to the Goodman Report (Goodman *et al*. 2002), the AFSC established a Management Strategy Evaluation Working Group (MSE WG), which met for the first time on August 17, 2004 at the AFSC (eleven scientists). At the meeting presentations occurred on the performance of the current management strategy in the presence of regime shifts, and on use of an "operational" management strategy (current catch limit is a linear function of a prior catch limit and a current estimate of biomass). Research about the consequences of biological interactions on single-species management models was also presented. The group acknowledged that major advances in MSE research will take a number of years to complete, and that the job of MSE

will never truly be finished. Follow-on meetings were proposed.

Goodman Report Recommendations for MSE

The AFSC presented a written response to the Goodman report in October 2003. Briefly, that response noted that many of the MSE-related suggestions made in the Goodman report had already been addressed in the PSEIS or other documents, including use of a wide set of performance measures involving both utilization and conservation objectives, use of a public process to develop alternatives, use of species-specific harvest strategies for certain species, use of group-specific harvest strategies for certain groups of species, use of alternatives to the $F_{40\%}$ fishing strategy, use of a utility function approach to choose reference points, and examination of multi-annual catch limits. Furthermore, in some instances the MSE contained in the PSEIS went beyond the suggestions made in the Goodman report by using, for example, a state-of-the-art technical interactions model that facilitates simulation of the effects of the optimum yield caps in the BSAI and GOA groundfish fisheries.

However, the Goodman report also contained several suggestions pertaining to MSE that have yet to be implemented on a major scale, including: 1) use of parallel "operating" and "assessment" models to facilitate simulation of the feedback nature of the management process; 2) use of ecosystem models; 3) use of multi-attribute control rules in the lower Tiers; 4) use of constraints to limit the extent to which total allowable catch (TAC) can change year to year; and 5) a re-examination of the extent to which the current Tier system correlates information quality with management precaution. The Goodman report also suggested that alternative management strategies be tested with respect to the effects of regime shifts, spatial structure, depensation, inter-specific differences in life history, and imprecision in estimates of selectivity and survey catchability.

Use of Ecosystem Modelling in MSE

During the past several years the development of ecosystem mass-balance and simulation models has been a focus of the Resource Ecology and Ecosystem Modelling (REEM) task at the Alaska Fisheries Science Center. There now exist up-to-date, mass-balance food-web (ECOPATH) models for the eastern Bering Sea and the Gulf of Alaska (Aydin *et al*. 2002, Gaichas 2006). The data foundation for these models is the REEM fish food habits database, which consists of diet data collected from groundfish throughout the northeast Pacific. Stomach samples are collected from trawl-caught groundfish by NMFS scientists aboard research surveys and by fishery observers from regions and seasons outside of the Alaska survey areas.

A recent focus of the MSE WG has been how to use these food-web models to enhance interpretation of single-species population dynamics models. Because the ecosystem models can be described using biomass estimates from the single-species models used to supply assessment advise, there is interest in using the ecosystem models to estimate the possible natural ranges of fluctuations for assessment parameters. An obvious candidate is stock natural mortality and the strategic assumption of whether an ecosystem "surplus" can be verified (see e.g., Boldt 2006, pp. 35-37 and Figure 7). There is interest also in using the ecosystem models to understand the nature of the trophic linkages that surround the assessment species in the ecosystem (e.g., see Boldt 2006, pp. 166-172 which reports on initiatives to develop indices of juvenile pollock condition). Once the nature of the linkages is defined, simulation exercises can be used to understand the trophic dynamics that are likely to influence the assessment species, as well as the pathways the interactions take. Interesting examples of initial attempts at such analyses are provided in Figures 1.37-1.41 of Dorn *et al*. (2005).

Risk Analysis as MSE

Traditional risk analysis (tables showing probabilities associated with various possible outcomes on biomasses and catches of target and non-target stocks) can be considered a form of MSE. The EBS, AI, and GOA pollock stock assessments all contain stochastic projections of future stock trajectories under alternative fishing scenarios, and the status-determination results developed from these projections can be considered a form of MSE. Another form of

	risk analysis measures the costs and benefits of the possible outcomes associated with alternative fishing scenarios as well as their anticipated effects on other ecosystem components. To the extent that such estimates can be produced, they are available in the annual environmental assessments of the BSAI and GOA total allowable groundfish catches (e.g., NMFS 2007). **MSE for EBS Pollock Stock Management** Mueter *et al*. (2006) conducted a comprehensive analysis of climatic variables and evaluated mechanisms that affect pollock recruitment. The research investigated four hypotheses concerning the factors controlling pollock recruitment: 1) the "cold-pool" hypothesis (the extent of winter ice and subsequent cold pool formation); 2) the "oscillating control hypothesis" (relating pollock survival to characteristic spring blooms and predator abundance; 3) the "stability hypothesis" (related to water column stratification and wind stress); and 4) the "larval transport hypothesis" (related to surface-water advection influencing the degree of spatial separation between juveniles and cannibalistic adults). Evaluating these hypotheses will provide important information for developing operating models for MSEs (Ianelli *et al*. 2004). During 2006 Dr. Ianelli devoted a significant amount of effort to the development of a suite of sensitivity analyses intended to support on-going Alaska pollock MSE initiatives at the AFSC. These included the development of a "replay" algorithm to estimate stock biomass in the absence of fishing, an algorithm to characterize two-year-ahead model projections using historic data, and a series of retrospective analyses which tracked the evolution of the model year-class size estimates over time (see, e.g., Figures 1.24-1.28, Ianelli *et al*. 2006). Papers from this and related research were presented at the 24th Lowell Wakefield Fisheries Symposium "Resiliency of Gadid Stocks to Fishing and Climate Change", at the Hotel Captain Cook, October 31-November 3, 2006: • Dr Ianelli presented, "Retrospective Analyses of Eastern Bering Sea Pollock for Efficient Design of Management Strategy Evaluations." • Ms. Sara Miller presented, "Feasibility of Estimating Movement within a Spatially Explicit Stock Assessment Model of Eastern Bering Sea Walleye Pollock (*Theragra chalcogramma*)." **MSE for GOA Pollock Stock Management** AFSC assessment scientists have begun to implement MSE for GOA-area pollock using methods similar to those recommended by Goodman *et al*. (2002). To accomplish this, the AFSC funded Ms. Teresa A'mar, a Ph.D. candidate in the Department of Quantitative Ecology and Resource Management at the University of Washington, under the supervision of Dr. Andre Punt, School of Aquatic and Fishery Sciences, to carry out a MSE for GOA pollock. Dr. Martin Dorn, lead scientist on the GOA pollock assessment, has provided advice and guidance concerning the evaluation approach as well as the alternative management strategies and ecosystem interactions to be considered. In October 2006, Ms. A'mar presented "The Management Strategy Evaluation Approach and the Fishery for Walleye Pollock in the Gulf of Alaska" with co-authors Drs. André Punt and Martin Dorn, at the 24th Lowell Wakefield Fisheries Symposium "Resiliency of Gadid Stocks to Fishing and Climate Change", at the Hotel Captain Cook, October 31-November 3, 2006.
Observations	This Condition is identical with Condition 2 for BS/AI, and most of the comments from that Evaluation are relevant here. It should be noted that the original client action plan stated that within 15 months after the date of issue of the certificate a revised client action plan would indicate how the condition would be met. This approach was superseded by modification work undertaken by NMFS and the creation of Teresa A'mar's PhD. The results of the simulation tests should be consolidated for the Gulf of Alaska stock separately from the BS/IA stock for several reasons:

	• The design of the surveys and the presentation of assessment results to the Surveillance Panel both suggest that the spatial structure of spawning units of this stock unit are complex and may be important for stock dynamics and management. It will be important to be able to have evidence transparent to critics that the harvest strategy of the stock is indeed robust to uncertainties about spatial aspects of stock dynamics, assessment structure, and distribution of harvests. Going back to the original commentary on the Condition it was noted that "For the surveys, this includes sensitivity to changes in spatial distribution (perhaps reflecting changes in the ecosystem)", so this is not a new concern. • The recent dynamics of this stock have seen the SSB and Fishable Biomass drop to at or below some of the reference points used in management by some jurisdictions. All experts do not accept the 50% of B35% as a fully precautionary limit reference point, so it will have to be clear to all critics why the harvest strategy is in fact precautionary given the productivity dynamics of this particular stock. In discussion with the NMFS staff, it was stated that the way the control rule is applied means that the stock might actually have to reach 5% of B_0 before scientific advice was certain to recommend zero harvest. If that is the case, then it will require some very convincing and clearly presented results to support a conclusion that the harvest control rule really is precautionary. If that statement misrepresents actual practice, then it will be particularly important that the actual practices involved in applying the control rule be documented.
Conclusion	Progress on this Condition is on target. Assuming that the examination of the dissertation by Ms. A'mar, expected in Fall of 2007, finds the work to be of acceptable quality, and that the practices in applying the control rule are fully codified, then this Condition will have been met. With regards to the anticipated timeline for achieving this condition, it is expected that the Performance Indicators relevant to this condition will be re-scored, and this condition closed, at the next annual surveillance audit.

<table>
<tr><td>2</td><td>Condition of Certification 2: Current stock sizes are assessed to be above the appropriate limit reference point.</td></tr>
<tr><td>Activity assessed</td><td>This Condition relates principally to Indicator 1.1.2.1, but Indicator 3.1.3 and, in part, Principle 3 Indicator 4.1 also relate.

The intent is to assess whether the stock is currently “overfished”. There is no internationally agreed standard to define this. A recent FAO view 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.

SCORE: 70

This scoring indicator was the subject of considerable debate during the course of the SCS evaluation process. The main point of contention was the choice in the scoring guideposts of B_{MSY} as a limit reference point, since it is used more as a target reference point in the NPFMC Tier system, with half B_{MSY} being regarded as the limit reference point in the US National Standard Guidelines (MSST – see discussion for indicator 1.1.1.1). It was also argued by some staff at AFSC, by other staff in NMFS (Dr Pamela Mace), and by Dr Rick Deriso of the IATTC, that B_{MSY} is in fact not an agreed limit reference point for the FAO or an internationally agreed limit reference point, as stated in the “intent” section of this scoring indicator. While it is agreed that this latter point is substantially correct, this does not in fact seem entirely consistent with the general agreement, including in the NPFMC harvest strategies, that F_{MSY} is a limit reference point for fishing mortality (it is hard to see how B_{MSY} can be a target if F_{MSY} is a limit). The SCS team also noted that there are references in the international literature to B_{MSY} as a limit reference point (e.g. Jennings et al., 2001).

Notwithstanding the academic debate, the intent in choosing B_{MSY} as a limit reference point for Pollock was to ensure that a fishery for a species such as Pollock, which appears to be a key prey species in its ecosystem, should maintain the stocks at levels that would not jeopardize the productivity of key predator species (such as Steller sea lions). The issue of course is that there is no general agreement on what such levels should be (see detailed discussion of this issue in the preamble to the report on Principle 2).

Another complication in scoring this indicator is that, especially for a naturally fluctuating population, B_{MSY} is not a fixed entity, nor indeed is $B_{100\%}$ (unfished population level) nor any fraction of this (such as $B_{X\%}$). It has already been noted, and is discussed in detail under Principle 2, that the Gulf of Alaska appears to be subject to decadal or longer time scale shifts in productivity (“regime shifts”), and that Pollock productivity and abundance is influenced by such changes. Stakeholders point to several concerns with regard to using B_{MSY}. Bernstein et al</td></tr>
</table>

	(2002) point to the importance of trying to distinguish and account for the relative impacts of fishing and environmental influences on abundance, and Marz and Stump (2002) point to the problem of the "shifting baseline" in calculating B_{MSY} in practice. For GOA Pollock, the issue of changes in productivity and non-stationarity in parameters such as B_{MSY}, needs to be addressed explicitly. Pollock recruitment is highly variable, and pollock dynamics, especially in the GOA, is driven by the frequency of strong year classes (see Dorn *et al*, 2002, Figure 21). Pollock recruitment was low in the 1960s, high in the late 1970s and early 1980s, and has been episodic but generally since then. As noted below, these changes in recruitment appear to be unrelated to levels of spawning stock, and result in very large changes in stock size even in the absence of fishing. (Recent CIE reviews of the fishery by Godo (2003) and Haddon (2003) also emphasize this feature). As noted above, 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. The 2002 assessment for the GOA stock (Dorn *et al*, 2002) shows the population to be at 28% of unfished spawning biomass, or at 24% if the risk averse assumption is made that the 1999 year class is of only average abundance (the assessment suggests it is stronger, but uncertainty in the estimate of year class strength is high as it is not fully recruited to the fishery as yet). Both these levels (28% and 24%) are well below the B_{MSY} proxy of $B_{35\%}$, which is based in turn on average recruitment levels over the period from 1979 to 1999. On this analysis, the GOA stock would fail this scoring indicator (score less than 60). (The corresponding levels for the 2003 assessment are 31% and 27% of unfished levels (Dorn *et al*, 2003), still below the reference level, though indicating a partial recovery in the stock levels). Noting the scientific evidence for regime shifts in the GOA, and also that there does not appear to be any relationship between spawning stock levels and subsequent recruitment for this stock (Dorn *et al*, 2002), the SCS evaluation team requested some further analyses from Martin Dorn (AFSC, Seattle – leader of the assessment team for GOA pollock), using the existing base case assessment model, to calculate the following: 1. Projections for stock size (3+ biomass and female spawning biomass) in the absence of fishing. These would be based on the assumption that the same recruitments would have occurred in the absence of fishing as have occurred with fishing taking place. These provide an alternative baseline time series for "unfished biomass". 2. A time series of relative depletion estimates for the GOA stock (biomass in a given year divided by unfished biomass in the same year, as calculated in 1 above). 3. A time series of exploitation rates for the GOA stock (catch divided by 3+ biomass). Because of its importance to consideration of an appropriate evaluation against this scoring indicator, Martin Dorn's response to this request is included as Appendix 3 to this report. In brief, and allowing for the assumption that unfished biomass can be calculated in the manner suggested, the key results are as follows: 1. Stock size for GOA pollock would have varied almost tenfold since 1960, even in the absence of fishing (Figure 1, Appendix 3). 2. The declining trend in abundance since the early 1980s (Dorn *et al*, 2002) is also evident for the unfished stock (Figure 1, Appendix 3). 3. The lowest relative depletion level in the time series is 59% of the corresponding unfished level for 3+ biomass, and 44% of the unfished level for female spawning biomass (Table 1 and Figure 4, Appendix 3). Both are well above the $B_{35\%}$ proxy for B_{MSY}. 4. Exploitation rates for GOA Pollock have generally been low, although there is an overall increasing trend to the time series (Figure 3, Appendix 3), and a tendency to higher exploitation rates at lower stock sizes. It is also interesting to note that the exploitation rate for GOA Pollock has been less than the exploitation rate for EBS (Eastern Bering Sea) Pollock in most years, although the latter is generally regarded as being in a healthier state, being at much higher stock size relative to

	average unfished levels (Ianelli *et al*, 2002). (However the comparison needs to be viewed with caution. The assumption of no relationship between spawning stock size and subsequent year class strength does not appear to hold as well for the EBS stock as it does for the GOA stock). Nevertheless, the poor status of GOA Pollock seems to be due to a long period of generally poor recruitment, rather than to exploitation rates having been too high. Before discussing the relevance of these results to this scoring indicator, it is worth discussing the key assumption that recruitment would have been the same for an unexploited stock. Of course this is an assumption that can never be tested. However for GOA Pollock, it seems as though it may be a not unreasonable assumption, given the lack of a clear relationship between spawning stock size and subsequent recruitment (Dorn *et al*, 2002). Martin Dorn discusses this point in Appendix 3: "The depletion estimate obtained by taking the ratio of the model estimate of current biomass to virtual unfished biomass implicitly takes into account environmental trends that affect stock productivity. Both the conventional estimate of depletion and this new estimator do not take into account the indirect impacts of fishing due to changes in stock biomass (fewer recruits at low stock size, more cannibalism at high stock size). For example, the decline in mean recruitment in the 1980s and 1990s could be argued to be the result of lower spawning biomass, not environmental change. This line of argument is countered by noting that low stock sizes in the 1970s produced strong year classes, and that there isn't a clear pattern of declining recruitment in a plot of recruitment against spawning biomass. Many fisheries debates revolve around the relative importance of fishing versus the environment. Perhaps a stronger case can be made for the environment in this instance because harvest rates for GOA pollock have been demonstrably conservative for a gadid (Fig. 3)." Allowing that much of the decline in the GOA stock over the past 20 years is environmentally driven puts a different emphasis on the exploitation history and current status of this stock. 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. 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. Dorn *et al* (2003) have updated the analysis described in Appendix 3 to include consideration of the impacts of spawning stock size on recruitment, as well as the (unknown) environmental drivers. Depending on the form assumed for the stock recruitment relationship, the estimates of spawning stock depletion in 2002 range between 40% and 46% of unfished levels. They conclude, "These results suggest that environmental variability is the most likely explanation for current low levels of stock abundance". Which of these two views of stock status (relative to static or dynamic estimates of B_{MSY}) should the SCS evaluation team use to judge performance against this indicator? Neither is "correct" - they just represent different ways of viewing stock status. In considering this question, the evaluation team went back to their original rationale for choosing this indicator and selecting the reference level chosen (B_{MSY} bearing in mind that its proxy for pollock is $B_{35\%}$). The rationale stemmed in large part from concerns about the ecological impacts of low stock levels on predators of Pollock. The "intent" description for this scoring indicator refers both to this issue, and also to a need to take into account the effects of environmental variability. How might these two issues be reconciled? There is strong evidence that the GOA ecosystem is highly variable and that this in turn impacts on population levels of individual species, and may also affect community structure (see discussion in preamble to Principle 2). The results in Appendix 3 and in Dorn *et al* (2003) suggest that this variability is an important feature of the dynamics of Pollock in the GOA, with population levels potentially fluctuating tenfold even in the absence of fishing. Although

the system has only been observed through one of these cycles, it seems reasonable to suppose that such variability is a natural feature of this ecosystem. If so, then predators of species such as Pollock must also have had to cope with such variability in the past. They may well be adapted to such variability, and have a variety of mechanisms (such as prey switching) to deal with it. The results in Appendix 3 (Figure 1) suggest that fishing has served to accentuate rather than fundamentally change the nature of that variability. That in itself may be of concern – with a constant exploitation rate, the low points in the cycle would be lower with fishing than without it. On the other hand, the fact that stock level falls below an average $B_{35\%}$ level may not be of substantial concern, if such events are commonplace even in the absence of fishing. However it seems reasonable to suppose that there ought to be a "bottom line", a level below which it is undesirable for the stock to fall on the grounds of ecological impacts on the ecosystem, and hence below which exploitation should cease. Under the current GOA harvest strategy for Pollock, that level is 20% of average unfished levels. Given the apparent level of natural variability in the stock, and the calculation that, even with a maximum exploitation rate of $F_{75\%}$ (i.e. a target stock size of $B_{75\%}$) the stock would still fall below $B_{35\%}$ almost 20% of the time (Martin Dorn, unpublished data), a 20% bottom line seems not unreasonable.

Based on all the complex arguments presented above, the SCS evaluation team concludes that the fishery fails to achieve a passing 80 score for this indicator, due to the current low level of absolute abundance and its possible wider ecological impacts (especially for predators). However the evaluation team takes note of the possibility that much of the decline in abundance may be due to environmental factors, and that the stock appears in general to have been responsibly managed as far as exploitation rates are concerned. The team is therefore of the view that the score for this indicator does not fall below the 60 scoring level.

Two responses to the evaluation of this indicator in the draft evaluation report are worth recording here. Marz (2003) states:

> "We strongly disagree with the team's analysis under this PI. The GOA stock should fall below the 60 SG level because its abundance estimates are dangerously low and below MSY. Your analysis involves gross speculation. The issue is not whether variability is a natural feature of the ecosystem, but how much has fishing changed the nature of that variability. This is impossible to assess definitively. As such, it is imperative to manage the fisheries in as precautionary a manner as possible regardless of what has caused the low stock size. This involves lowering TAC levels, if fishing is permitted at all. However, the Council recently *increased* the harvest level 31 percent despite the fact the GOA pollock biomass is low and below MSY. Further, relying on the strength of the 1999 year class is dangerous as many of the assumptions in calculating the stock estimate may be overestimated. Given the low biomass estimate, it would be more precautionary to leave more of the 1999 year class in the water to mature and grow.
>
> As noted by Dayton *et al*. (2000), without reliable baseline data to compare the current state of the ecosystem to an unfished environment, the causes of ecosystem changes in a complex system can always be argued. Undoubtedly environmental forces play a large (though not well understood) role in determining the population dynamics of fish species, particularly on a year-to-year basis in a variable high-latitude marine environment, as do ecological interactions between species in the marine food web. But it must be said that no theory of "regime shifts" has shown an effect on any fish population as profound as that which is *assumed* in the stock assessment models and theory of MSY, which approximately doubles the estimated annual mortality on stocks such as pollock, by design (Field 2002)."

In response to several of the points raised by Marz, it seems to the evaluation team that Dorn's analyses do in fact address (if not definitively, but that is never possible) the extent to which fishing has changed the nature and extent of the natural variability in abundance. The recommended increase in the TAC levels reflects a more optimistic assessment, and discounts (rather than relying on) the strength of the 1999 year class. The increase comes about from proper application of the existing harvest strategy. It has already been noted that this has not been demonstrated to be robust to the type of variability in productivity evident in GOA pollock, but the condition at indicator 1.1.1.5 is designed to address this issue directly (and

	result in a more conservative harvest strategy if the evaluations indicate that is called for). Pope (2003), one of the external reviewers of the report, made the following comment with regard to this scoring indicator: "The assessment team clearly had problems with this indicator. Personally I would prefer it to refer to the limit reference point as specified by the Tier rules rather than at an absolute level. Whether the Tier rules (or for that matter B_{msy} based rules) are precautionary will be decided under the condition to 1.1.1.5. Similarly I would exclude predators' needs here but deal with them robustly in the appropriate place. This interpretation would lead to a passing score here. However, using the scoring guideposts as written I think the assessment team is correct to give no more than 70. Indeed the wording of 60 might suggest a still lower score but I think this might be unjust. The problem here underlines the difficulty of biomass limits with stocks subject to large natural fluctuations. The conditions specified seem reasonable." Mindful of these views, and of the additional assessment reported in Dorn *et al* (2003), the SCS evaluation team stands by its original scoring for this indicator. **CONDITION:** To improve the deficiencies in performance for this indicator, SCS requires that: 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. Specifically, the testing of alternative harvest strategies should evaluate whether the criterion that the stock should remain above the static version of B20% provides sufficient protection for predators of Pollock. **1.** The SSC (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 impacts of fishing on recruitment variability and stock abundance. **2.** The GOA plan team should recommend strategies to improve reliability of the annual abundance surveys, particularly in and around Shelikof Strait, to understand the inter-annual variability in spawning location and stock behaviour, also noting the recommendations in Godo (2003).

APA Action	*APA maintains its long-standing objection to thePrinciple One Performance Indicator (PI) 1.1.2.1 and the associated Scoring Guideposts.* *Our objection centers squarely on the stock-biomass-based nature of both the PI and its Scoring Guideposts. The MSC certification is intended as an independent benchmark for best practices in fisheries management and not a measure of fish-stock biomass at any particular moment in time. In our view, it is the management actions that remain under the control of the fishery management system, and so it is the management actions based on a given level of stock biomass and associated ecosystem conditions that should be the subject of MSC standards and evaluation (i.e., the fishery assessment, including the research tasks on which it must rest, and the harvest control rule).* *We note that PI 1.1.2.1 is the only Principle One indicator that is not focused on management actions, an observation also made by the MSC Objections Panel in their recent review of stakeholder objections concerning the low stock size for GOA pollock (paragraph 3.1). Furthermore, we note the applicability of MSC Principle One, Criterion One, as referenced in the MSC Objections Panel Report. Twenty-two performance indicators were developed to provide an operational interpretation of Criterion One, and they appropriately focused "on testing and improving the fishery assessment and harvest control rule."* *"(T)he 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 focus in this Criterion is on the conduct of a fishery "at catch levels" — not at stock biomass levels. While we disagree with the Objections Panel that BMSY is a suitable limit reference point for biomass in interpreting MSC Principle One, we agree with the Panel that constant B20% was considered by the certification team in their scoring of MSC Principle One. In fact, this single constant value for B20%, which provides a fixed minimum biomass below which no directed fishing is allowed, was considered explicitly in the scoring of PI 1.1.1.3 by the certification team. (The harvest control rule results in appropriate reductions in exploitation rate at low stock sizes.)* *As such it seems incongruous that the Objections Panel would remand the certification report back to the certification team, essentially to add an additional component to the 60 Scoring Guidepost of PI 1.1.2.1 which was plainly considered in the scoring of PI 1.1.1.3. In our opinion, this situation results from the flaw in the rational basis for the PI 1.1.2.1 described above, and the resulting confusion in the interpretation of Principle One Criterion One that it generated, and which formed the basis of the Objection Panel's consideration of the low stock biomass issue* *We raise this issue to continue the dialogue with the certification body about our concerns during the annual surveillance audits and to address comments of the MSC Objections Panel Report for the GOA pollock fishery. With respect to the latter, paragraphs 3.20 and 5.7 of the Objections Panel report advises that under current MSC procedures there is reason to believe that the GOA fishery could be de-certified if the stock biomass drops below the constant B20% threshold "as it approaches the low point in the production cycle."* *Given the current harvest control rule, which under PI 1.1.1.3 received a score of 85, directed fishery would be suspended if the biomass drops below such a threshold. The industry is on record supporting the current harvest control rule as a means to protect other ecosystem consumers of pollock. We do not agree that having the management system take the appropriate, precautionary action, however, should result in de-certification of the fishery. Such action is fundamentally at odds with the stated purpose of the MSC program, which is to recognize precautionary, ecosystem-based management systems. In sum, because PI 1.1.2.1 is focused on stock biomass and not catch levels, implementing the appropriate management action could be welcomed by loss of MSC certification.*

	With that background, the following is APA's planned course of action. *Condition #2 (provision #1) will be met under the GOA Action Plan response to Condition #1 (see above).* *Condition #2 (provision #2) recommends that the SSC review Appendix C of the 2003 GOA pollock assessment found in the 2003 GOA SAFE report. Within one month of issuance of the certificate, APA will provide the contracted certification body with the SSC minutes from the December 2003 meeting for review and consideration of whether the information provided meets this provision of the condition. The information provided should contain not only the final determination by the SSC, but as stated in the condition a review of the information such that the certification body can determine if the review satisfied the provision in this condition.* *APA believes that the minutes of the meeting go a long way to meeting provision #2 under condition 1.1.2.1. The SSC mentioned the many aspects of conservatism built into the 2003 assessment, in particular, an even more risk-averse harvest policy mandated by the 2001 Steller sea lion reasonable and prudent alternative management (protection) measures. The SSC agreed with the extremely conservative approach recommended by the authors of the SAFE report and the GOA Plan Team given concerns over the low level of the pollock stock, and the NPFMC subsequently adopted the SSC recommendation.* *With regard to that part of Condition #2 (provision 3) for improving the reliability of the annual pollock acoustic abundance survey, during 2004 the assessment authors and the AFSC Midwater Assessment and Conservation Engineering (MACE) staff collaborated on the drafting of a five-year plan to investigate alternative strategies to improve the reliability of the GOA acoustic survey. The draft strategy was motivated by the 2003 GOA pollock assessment review of Godo (2003), and was presented to the GOA Plan Team at its September, 2004 meeting.* *In brief, the strategy developed will provide for an evaluation of the strengths and weaknesses of a more expansive spawning seasonsurvey versus the implementation of a summer survey that would cover most if not all of the western, central, and eastern GOA management areas. Within one month of the issuance of the GOA pollock certificate, APA will provide to the certification body the strategy developed by the AFSC MACE Program to improve the reliability of the GOA acoustic survey*
Conclusion of Surveillance Report 1	There is reasonable work being done on this Condition. Progress on this condition should be fully reported prior to the second surveillance audit.
APA Progress Report	Modelling the effects of environmental variation on Gulf of Alaska (GOA) pollock has been an active area of research at the Alaska Fisheries Science Center (AFSC) for the past 20 years. One focus of efforts to assess the effects of environmental variation on the GOA pollock stock concerned employing the GOA mass-balance food-web model to assess forage and predation in the GOA by evaluating "bottom-up" and "top-down" forcing mechanisms (Boldt 2006, pp. 31-45). One purpose of this effort was to explore the development of indices and thresholds of "surplus" production and predation for Alaska pollock stocks. A second area of focus concerned a extensive evaluation of the environmental measurements employed to forecast pollock recruitment in the GOA (the program is called FOCI - Fisheries-Oceanography Coordinated Investigations). These measurements are summarized by Boldt (2006, pp. 101-12), and an unpublished "white paper" has been developed which reviews the history behind the current forecast, the efficacy of the forecast, and current research to improve the forecast. Some of this material is included in Dorn *et al*. (2006). Finally, an on-going study of the links between ichthyoplankton dynamics and the GOA pelagic environment was updated (Boldt 2006, pp. 158-166). **Estimates of Stock Depletion** The 2006 GOA pollock assessment shows the estimate of begin-year age 3+ biomass for 2006

is 543,000 tons and the spawning-stock size close to (just below) the $B_{40\%}$ benchmark. For 2007, projected age 3+ biomass is 834,000 tons and the spawning stock is projected to drop to 29 percent of the unfished biomass estimate. The dip in spawning biomass is expected to be short-lived, as projections indicate an increase in spawning biomass after 2007. These results depend critically on the magnitude of the 2004 year class, which appears to be above average, but is still uncertain (Dorn *et al*. 2006). Most recently, spawning stock size has increased slightly while age 3+ biomass has declined over the period 2002-2006.

Recruitment of GOA pollock is more variable than eastern Bering Sea pollock, and among North Pacific groundfish stocks with age-structured assessments, GOA pollock ranks third in recruitment variability after sablefish and Pacific Ocean perch. However, unlike sablefish and Pacific Ocean perch, pollock have a short generation time (less than ten years), so that large year classes do not persist in the population long enough to have a buffering effect on population variability. Because of these intrinsic population characteristics, the typical pattern of biomass variability for GOA pollock will be sharp increases due to strong recruitment, followed by periods of gradual decline until the next strong year class recruits to the population. GOA pollock is more likely to show this pattern than any other groundfish stock in the North Pacific due to the combination of a short generation time and high recruitment variability (Dorn *et al*. 2006)

Alternative Harvest Strategies Adjust the Balance Between Stock Protection, Impacts on Pollock Predators, and Fishery Yields

The Tier 3 harvest control rules provide a tonnage “buffer” between the maximum target fishing rate and the proxy maximum sustainable yield (MSY) fishing rate ($F_{35\%}$), as required by the 1996 US Sustainable Fisheries Act. The purpose of the buffer is to provide a margin of safety so that assessment errors will not result in the overfishing tonnage (OFL) being inadvertently exceeded. Analysis of the structure of the Tier 3 control rules showed that the size of the tonnage buffer decreased as stock reproductive biomass dropped below the $B_{50\%}$ benchmark, and that below the $B_{40\%}$ benchmark, true spawning biomass cannot be more than about eight percent lower than estimated biomass to avoid overfishing (Dorn *et al*. 2001).

Because there will always be some probability of exceeding the $F_{40\%}$ rate due to imprecise stock assessments, and because the GOA pollock biomass has steadily declined since the mid-1980s (for reasons that remain unknown), the authors of the GOA pollock assessment developed a “constant-buffer” or “author’s F” harvest control rule. The purpose of the new rule was to adjust the balance between stock protection, potential impacts on pollock predators, and fishery yields in a manner that increased stock protection. Essentially, the rule increases the “spawning-biomass space” between the maximum acceptable biological catch (max ABC) and OFL fishing rates (Dorn *et al*. 2006, Figure 1.23). Since 2002 the recommended ABCs in the GOA pollock assessments have adopted the “constant-buffer” harvest control rule as a further measure to achieve a precautionary GOA pollock harvest. The 2007 TAC for GOA pollock was set equal to the author’s F recommendation, a decrease of 15 percent from the 2007 max ABC, and a decrease of 22 percent from the 2006 ABC.

Improving the Reliability of Pollock Abundance Surveys

During 2004 the assessment authors and the AFSC Midwater Assessment and Conservation Engineering staff collaborated on the drafting of a five-year plan to investigate alternative strategies to improve the reliability of the GOA acoustic (EIT -echo integration trawl) survey. The draft strategy was motivated by the 2003 GOA pollock assessment review of Godo (2003), and was presented to the GOA Plan Team in 2004. In brief, the strategy is intended to provide for an evaluation of the strengths and weaknesses of a more expansive spawning-season survey verses the implementation of a summer survey that would cover most if not all of the western, central, and eastern GOA management areas. Additional EIT surveys in winter 2003, 2005 and 2006 covered the Shumagin Islands spawning area, Sanak Gully, and an area along the shelf break east of the entrance to the Shelikof sea valley. Compared with 2005, the 2006 estimates were lower in the Shumagin area (28 percent decrease), Shelikof Strait (13 percent decrease), and Chirikof Island (10 percent decrease), but more than two times higher in the Sanak Trough/Morzhovoi Bay area. The total biomass larger than 43 cm, a proxy for spawning biomass, is comparable to the assessment model estimate of spawning biomass of 424,000 tons in 2006. Although only results from the Shelikof Strait portion of the surveys are used in the stock assessment, the results provide some independent support for the assessment results. Large biomass changes from one year to the next in a spawning aggregation suggest that either pollock are spawning in different locations, or inter-annual differences in the timing of spawning (Dorn *et al*. 2006). The first Gulf-wide EIT survey is scheduled for summer, 2007.

Effects of Environmental Variation on Stock Dynamics and Yields

Modelling the effects of environmental variation on Gulf of Alaska (GOA) pollock has been an active area of research at the Alaska Fisheries Science Center for the past 20 years. Recent efforts to assess the effects of environmental variation on the effectiveness of management strategies are described in the response to GOA Condition 1, which concerns requirements to conduct a management strategy evaluation (MSE) for the GOA pollock fishery. As now structured, the bulk of the MSE effort for GOA pollock will concern testing the existing harvest strategies for robustness against a variety of assumptions about the role of natural environmental variability on GOA pollock stock dynamics. The “raw material” for hypothesis testing and assessing ecosystem features likely to be important for MSE will come from recent advances in predictive multi-species models, including (1) multi-species stock population-dynamics models, and (2) ecosystem mass-balance, food-web models.

An example of new modelling concepts developed to address the need for MSE based on the role of natural environmental variability is provided in the “Models with changing juvenile mortality” section of Appendix C of the 2003 assessment (Dorn *et al*. 2003). The goal of this initial analysis was to model the impact of ecosystem changes, primarily changes in predator abundance, while avoiding the model complexities of splitting out individual predator populations, or modelling the details of age-specific predation. Additional work in this area is documented on pages 26-38 of the 2005 Ecosystem Considerations portion of the GOA Stock Assessment and Fishery Evaluation report (NMFS 2005).

Estimates of Stock Depletion

The North Pacific Fishery Management Council’s Scientific and Statistical Committee (SSC) reviewed Appendix C of the 2003 GOA pollock assessment at its December, 2003 meeting. A review of the SSC minutes from this meeting confirms that the SSC found nothing in the “Estimates of stock depletion” section of Appendix C that warranted criticism or comment. However, the SSC did mention the many aspects of conservatism built into the 2003 assessment, and in particular, noted that an even more risk-averse harvest policy (see below) was recommended than that mandated by the 2001 Steller sea lion reasonable and prudent alternative management (protection) measures.

Alternative Harvest Strategies Adjust the Balance Between Stock Protection, Impacts on Pollock Predators, and Fishery Yields

The Tier 3 harvest control rules provide a tonnage “buffer” between the maximum target fishing rate and the proxy maximum sustainable yield (MSY) fishing rate ($F_{35\%}$), as required by the 1996 US Sustainable Fisheries Act. The purpose of the buffer is to provide a margin of safety so that assessment errors will not result in the overfishing tonnage (OFL) being inadvertently exceeded. In 2002, new resource-survey information suggested that GOA pollock abundance was lower than projected in the 2001 assessment. However, in 2001, a relatively high GOA pollock ABC based on the maximum allowed by the Tier 3 rules was established, although it was not entirely harvested. In retrospect, had the entire ABC been taken, the OFL would have been slightly exceeded (Dorn *et al*. 2001).

Analysis of the structure of the Tier 3 control rules showed that the size of the tonnage buffer decreased as stock reproductive biomass dropped below the $B_{50\%}$ benchmark, and that below the $B_{40\%}$ benchmark, true spawning biomass cannot be more than about eight percent lower than estimated biomass to avoid overfishing (Dorn *et al*. 2001). Because there will always be some probability of exceeding the $F_{40\%}$ rate due to imprecise stock assessments, and because

	the GOA pollock biomass has steadily declined since the mid-1980s (for reasons that remain unknown), the authors of the GOA pollock assessment developed a “constant-buffer” or “author’s F” harvest control rule. The purpose of the new rule was to adjust the balance between stock protection, potential impacts on pollock predators, and fishery yields in a manner that increased stock protection. Essentially, the rule increases the “spawning-biomass space” between the maximum ABC and OFL fishing rates (Dorn *et al*. 2005, Figure 1.27). Since 2002 the recommended ABCs in the GOA pollock assessments have adopted the “constant-buffer” harvest control rule as a further measure to achieve a precautionary GOA pollock harvest. **Improving the Reliability of Pollock Abundance Surveys** During 2004 the assessment authors and the AFSC Midwater Assessment and Conservation Engineering staff collaborated on the drafting of a five-year plan to investigate alternative strategies to improve the reliability of the GOA acoustic (EIT -echo integration trawl) survey. The draft strategy was motivated by the 2003 GOA pollock assessment review of Godo (2003), and was presented to the GOA Plan Team at its September, 2004 meeting. In brief, the strategy developed will provide for an evaluation of the strengths and weaknesses of a more expansive spawning-season survey verses the implementation of a summer survey that would cover most if not all of the western, central, and eastern GOA management areas. Additional EIT surveys in winter 2003 and 2005 covered the Shumagin Islands spawning area, Sanak Gully, and an area along the shelf break east of the entrance to the Shelikof sea valley. Although only results from the Shelikof Strait portion of the surveys are used in the stock assessment, the results provide some independent support for the assessment results (Dorn *et al*. 2005). In particular, they suggest that GOA pollock are not spawning in significant quantities outside of known spawning areas. **Biomass-Based Performance Indicators Not Consistent With MSC Objectives** As stated in the Action Plan for meeting the conditions for continued certification of the GOA pollock fishery, APA continues to maintain its long-standing objection to the Principle One Performance Indicator 1.1.2.1 and its associated Scoring Guideposts. Our objection centres squarely on the stock-biomass-based nature of both the PI and its Scoring Guideposts. In the simplest of terms, the Marine Stewardship Council (MSC) certification has always been intended to provide an independent benchmark for a “quality-level” of fishery management actions, and not a level of fish-stock biomass at any particular moment in time. In our view, it’s the management actions that remain under the complete control of the fishery management system, and so it’s the management actions that accompany any given level of stock biomass and associated ecosystem conditions that should legitimately form the subject of MSC standards and evaluation (i.e., the fishery assessment, including the research tasks on which it must rest, and the harvest control rule). Performance Indicator 1.1.2.1 is the only Principle-One indicator that is not focused on management actions, an observation also made by the MSC Objections Panel in their recent review of stakeholder objections concerning the low stock size for GOA pollock (Sainsbury *et al*. 2005, paragraph 3.1). Below is the MSC Principle One, Criterion One, as quoted in the same MSC Objections Panel Report, and for which 22 measurable indicators were developed to provide an operational interpretation of the criterion but which focused exclusively “on testing and improving the fishery assessment and harvest control rule.” “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.” As we endeavour to interpret this criterion, we note its focus on the conduct of a fishery “at catch levels” — not at stock biomass levels. We raise this issue here both to forewarn the certification body that we intend to press vigorously our objections to PI 1.1.2.1 as part of the process to undertake ongoing assessments of the Alaska pollock fisheries, and to address some particularly ominous statements contained

	in the MSC Objections Panel Report for the GOA fishery. In particular, in paragraphs 3.20 and 5.7 the Objections Panel advises that under current MSC procedures there is reason to believe that the GOA fishery should be prepared to hand back its certification if the stock biomass drops below the $B_{20\%}$ threshold "as it approaches the low point in the production cycle." Given the current harvest control rule, which under PI 1.1.1.3 received a score of 85, such circumstances would result in the suspension of the directed fishery. That is to say, the appropriate management action would leave the fishery without any "green seal" pollock to sell as long as the stock biomass remained below $B_{20\%}$. And we believe this would be the appropriate management action as the industry is on record in support of the current harvest control rule as a means to protect other ecosystem consumers of pollock. But the perhaps temporary loss of "green seal" pollock to sell is entirely different from the loss of the MSC certification and the market implications such circumstances would bring. As such, because PI 1.1.2.1 is focused on stock biomass and not catches, it would create conditions where implementing the correct management action would nevertheless bring with it the loss of the MSC certification. To us, this seems entirely at odds with the fundamental purpose and intended operation of the MSC program — to motivate the market place to reward precautionary, ecosystem-based management actions, not penalize them.
Observations	All three parts of this condition have been addressed. As noted in the Observations on Condition 1, the robustness of the harvest control rules for this stock have been tested extensively by the Ph. D. Student. All results support the reliability of the control rule, with refinements made as necessary to ensure that the harvest strategy protects stock production and does not cause detrimental impacts on dependent predators. The work completed under contract by Dr. Boyd addresses the possibility of detrimental impacts on predators in depth, and will be discussed under other conditions of this Surveillance Audit. The stock depletion estimates have been examined in detail. Methods have been improved in a few details and alternatives have been explored for components of the estimation methods where questions were raised initially. The impacts of the fishery on stock abundance and recruitment variability can be considered to be quantified thoroughly and transparently, and taken into consideration in management. The expansion of the survey coverage and the current treatment of survey results in the assessment deal sufficiently with the third part of this condition
Conclusion	This Condition relates principally to Indicator 1.1.2.1, but Indicator 3.1.3 and, in part, Principle 3 Indicator 4.1 also relate. Where a Performance Indicator is addressed by multiple conditions, a notional score of 80 will be required and applied to those elements of the Performance Indicator addressed by a condition being closed. The final score for the Performance Indicator will then be determined when the last relevant condition is closed. The first part of this Condition will be met if the review of the work by Dr. Boyd concludes that the current harvest rule does not jeopardize food requirements of predators. This will be re-assessed at the next surveillance audit. The North Pacific Fishery Management Council's Scientific and Statistical Committee (SSC) have reviewed Appendix C of the 2003 GOA pollock assessment in accordance with the second part of Condition 2 , noting the many aspects of conservatism built into the 2003 assessment, and in particular, the more risk-averse harvest policy than that mandated by the 2001 Steller sea lion reasonable and prudent alternative management (protection) measures. Professor Boyd's reports on the possible impacts of the pollock fishery on regional abundance of SSL food and the consequences of such effects on SSL recovery meet the requirements of part 3 of Condition 2. The annual Surveillance Audit should continue to monitor the survey coverage and use of survey information in the assessment. As long as practices are comparable to or better than practices in 2006 onward these components of the condition can be considered closed. There appears to be some uncertainty about the long-term availability of research survey vessels.

	However, industry is aware of these issues and is prepared to cooperate with NMFS in ensuring adequate survey effort and appropriate designs continue to be implemented.

<table>
<tr><td>3</td><td>Condition of Certification 3: Stock assessments explore sensitivities to assumptions, parameters and data, and key sensitivities are taken into account in the harvest strategy.</td></tr>
<tr><td>Activity assessed</td><td>This condition relates principally to Indicator 1.1.2.3.3.

100 Scoring Guidepost

• There is a comprehensive evaluation of sensitivities to assumptions, parameters and data for key outputs of interest such as stock abundance.
• Uncertainty about key inputs to which assessments are sensitive is taken into account in the harvest strategy.

80 Scoring Guidepost

• There is a thorough evaluation of sensitivities to assumptions, parameters and data for key outputs of interest such as stock abundance.
• Uncertainty about key inputs to which assessments are sensitive is taken into account in the harvest strategy.

60 Scoring Guidepost

• Sensitivity analyses are limited or non-existent.
• Results of sensitivity analyses are not properly taken into account in the harvest strategy.

SCORE: 79

Sensitivities of the GOA assessment to model assumptions, parameters and data are undertaken and presented each year. For example, six alternative models were presented for consideration by the GOA plan team in 2002 (Dorn et al, 2002). These included sensitivity to estimating trawl survey catchability, to use of the 2002 Shelikof Strait survey results, and to use of other survey data. Different sensitivities (e.g. to parameter values such as natural mortality) had been estimated in previous assessments. To this extent the fishery appears to meet the first point in the 80 scoring guidepost. However Marz (2003), citing Godo (2003), points out that there are several key sensitivities that are not adequately tested in the assessment. For the surveys, this includes sensitivity to changes in spatial distribution (perhaps reflecting changes in the ecosystem). Godo (2003) also points to the possible impacts of regime shifts on the calculation of reference points and the estimation of stock recruitment relationships (in agreement with the points raised by the evaluation team in scoring indicator 1.1.2.1). The analysis presented in Appendix C of Dorn et al (2003) goes some way to addressing some of these concerns, as will the evaluations required in the condition attached to indicator 1.1.1.5.

Sensitivity tests are often undertaken in response to previous peer review comments by the Plan Team and the SSC. It is the role of the SCS to select the most appropriate model for application of the Tier rules to determine the ABC. The tendency is to select the “best” model recommended by the Plan Team, but there is some evidence that they err on the side of caution. Also, the authors of the SAFE reports have themselves, in recent reports, recommended ABC levels based on models and assumptions (sensitivity tests) and proposed modifications to the Tier rules that also err on the side of caution. For example in the 2003 SAFE report, the ABC recommendations are based on several risk-averse assumptions: 1) fixing bottom trawl survey catchability at 1 (higher than the estimated value), which reduces estimates of stock abundance and therefore yield estimates; 2) assuming an average 1999 year class instead of the (higher) estimated value; and 3) applying a more conservative harvest rate than the maximum allowable F_{ABC}.

While the discussion above suggests that the fishery meets both the points at the 80 scoring level, the evaluation team is concerned that some aspects of the uncertainty are still not adequately accounted for in application of the Tier rules. For example, as noted in the discussion for indicator 1.1.1.4, the “status determination” calculations to determine</td></tr>
</table>

	overfishing use the point estimates of biomass, despite the fact that Bayesian analyses for GOA pollock (Dorn *et al*, 2002, 2003; appendices) would seem to allow this stock to be managed at Tier 1, which does take explicit account of uncertainties in setting ABCs. The Tier level chosen is a decision for the SSC. While GOA pollock continues to be managed at Tier 3, the evaluation team feels that the second point at the 80 scoring level for this indicator is not adequately met (uncertainties are not properly taken into account in the harvest strategy). This indicator is therefore scored just below the 80 level. **CONDITION:** To improve the deficiencies in performance for this indicator, SCS requires that: 1. Consideration be given by the SSC to raising GOA pollock to Tier 1 so that the harvest strategy is more responsive to uncertainties in the assessment. 2. The Bayesian analyses already undertaken for GOA pollock be used to better present the uncertainties in the assessment, including confidence intervals on stock biomass trajectories, and probabilities that biomasses and exploitation rates exceed target and limit reference points.

APA Activity	*Given the developments since the assessment team's final evaluation of the GOA pollock fishery (see a brief summary below), within three months of the issuance of the GOA pollock certificate APA will provide the certification body with a written summary (along with all pertinent background documents) on the progress which has already been made in addressing this Indicator's (1.1.2.3.3) conditions. At the same time, APA will also arrange for the certification body conducting the surveillance audits to discuss with the GOA pollock assessment authors additional ongoing actions that may further work to satisfy the conditions.* *If it is determined that the information provided to the certification body does not adequately satisfy all aspects of the condition, APA will provide within 30 days of the surveillance report, which is due within 30 days of providing the information to thecertification body, a revised action plan for how and when the remaining work necessary to meet the condition will be completed. If the proposed time requirements for meeting the condition fully should exceed one year after issue of the certificate, APA will include milestones at a minimum of every six months up to the proposed completion date.* *APA Summary of Existing Information* *It is our belief that many of the activities that have occurred since the assessment of the fishery may well satisfy the requirements of this condition. With regard to giving consideration to raising the GOA pollock stock assessment to Tier 1, the Bayesian analysis included in Appendix C to the 2003 stock assessment shows estimated stockrecruitment curves for GOA pollock for the commonly used Beverton-Holt and Ricker stock-recruitment models (Figure 33). Fits of the models to the stock-recruitment estimates were similar, with estimated posterior distributions of the "steepness" parameters differing only marginally from their prior distributions. This result led the authors to conclude that the stock and recruitment estimates for GOA pollock are not very informative about the shape of the true stock-recruitment curve. The SSC reviewed this work at their December 2003 meeting.* *A second issue associated with raising GOA pollock to Tier 1 (integrating an estimate of the stock-recruitment relationship into the assessment) concerns the concomitant change of stock biomass target to B35% for Tier 1 from B40% for Tier 3. The B35% stock reproductive biomass target is smaller than the current B40% target, and all else constant, would likely allow more aggressive harvest rates than currently permitted under Tier 3.* *With regard to the provision of confidence intervals on stock biomass trajectories, the Ecosystem Considerations chapter of the 2004 AFSC SAFE includes a section on recent advances in developing predictive multi-species assessment and ecosystem models. In addition, the SSC and Groundfish Plan Team members convened a "Special Session Modeling Workshop" at the February 2005 NPFMC meeting which focused on standardized methods for predicting future stock biomass trajectories. The workshop developed in response to SSC concerns about the need to come up with a consistent set of standards to be used for projections of all stocks and areas. These concerns were motivated by NMFS' recent approval of BSAI and GOA Fishery Management Plan Amendments 48/48, which require that BSAI and GOA groundfish specifications be made for two years ahead instead of one.* *Some of the probabilities that stock biomasses and exploitation rates could exceed target and limit reference points has already been provided in the GOA pollock stock assessments. The 2004 GOA pollock SAFE included a) confidence intervals for recruitment and spawning stock biomass (Fig. 1.22), b) uncertainty in the estimates of the 1999 and 2000 year classes (Fig. 1.26), c) uncertainty in projected spawning stockbiomass and probability of the stock dropping below B20% in 2005-2008 (Fig. 1.27). Probabilities of exceeding fishing mortality limit reference points have shown in previous assessments (e.g. Fig 1.32 of the 2001 GOA pollock SAFE).*
Conclusion of Surveillance Report 1	Progress is very good and the first part of this Condition has been met. Work done under other Conditions should contribute to the remaining part of this Condition. This will be considered at the second annual surveillance.

<table>
<tr><td>Observations</td><td>This condition was considered to have been nearly met last year. Completion of the scenario exploration of the Ph.D. student conducting the management strategy evaluations and the work on model sensitivities done by the assessment staff of NMFS have brought together a sufficient body of testing to support a conclusion that this condition has been met. As observed previously, it is always possible to imagine some sensitivity test that has not yet been conducted, but the work completed places these stocks at the leading edge of practice internationally.</td></tr>
<tr><td>Conclusion</td><td>This Condition has been met within the target timescale.

On the basis of the above commentary the score associated with the relevant Performance Indicator 1.1.2.3.3 is adjusted as follows:

80 Scoring Guideposts:
There is a thorough evaluation of sensitivities to assumptions, parameters and data for key outputs of interest such as stock abundance.
Uncertainty about key inputs to which assessments are sensitive is taken into account in the harvest strategy.
100 Scoring Guideposts:
There is a comprehensive evaluation of sensitivities to assumptions, parameters and data for key outputs of interest such as stock abundance.
Uncertainty about key inputs to which assessments are sensitive is taken into account in the harvest strategy.
The performance of the fishery now clearly lies between 80 and 100; the harvest strategy is more responsive to uncertainties in the assessment and the Ph.D student and NMFS have evaluated the modelling of sensitivities.

The score allocated to this Performance Indicator is now raised to 85.

This condition has now been closed and the outcomes of ongoing associated work will be reviewed as a function of annual surveillance audits.</td></tr>
</table>

4	**Condition of Certification 4:** There is a management plan with ecosystem considerations that identifies impacts of the fishery on the ecosystem and sets reasonable upper bounds for the identified impacts.
Activity assessed	This Condition relates principally to Indicator 1.1, but Principle 3 Indicators 1.2 and, in part, 4.1 also relate. Intent statement: Pollock has a lower caloric density than that of many other 'food fish'. As a consequence, it may be a less suitable food where animals require a high energy density diet in order to promote rapid growth of their young or to increase their own energy reserves. This has led, for example, to the 'junk food hypothesis' that suggests that pollock are nutritionally inferior to alternatives such as herring or myctophids, and that populations of top predators might increase if able to feed on large stocks of herring but may decrease if the food web is dominated by pollock (as at present). But in the Gulf of Alaska although Pollock are not as dominant a component of the fish community as in the Eastern Bering Sea, pollock still represent a high proportion of the overall food fish biomass, and form a large part of the diet of many 'top predator' marine mammals and seabirds. Given the importance of pollock as the primary food for many 'top predators' in this ecosystem, we consider that an ecosystem approach is especially important for this fishery (more so than for example in fisheries for other gadoid species that form a small part of the diet of wildlife where the 'food fish' of top predators tends to be gadoid prey rather than the gadoid stock itself). Thus despite the possible lower nutritional quality for food-stressed seabirds or marine mammals of pollock relative to herring, we consider the ecological role of pollock to be somewhat more similar to that of capelin in the Barents Sea, sandeel in the North Sea, krill in the Southern Ocean, than to the role of cod in the Barents Sea, cod, haddock, whiting and saithe in the North Sea, or hoki in New Zealand. Our aim with this indicator was therefore to identify whether management of the pollock fishery uses an ecosystem approach to management, based on a knowledge of the ecological relationships between the fishery, fish stock and other components of the ecosystem, and limits impacts of the fishery to below levels that can be identified as damaging to the wider ecosystem (as distinct from limits set on the basis of single stock management alone such as the need to maintain SSB to achieve adequate recruitment). In particular we were looking to see whether research had identified ecosystem effects of the fishery, whether these effects were taken into account in management decisions (such as setting ABCs and TACs), and whether a precautionary approach was used where information on impacts or the needs of other ecosystem components was poor. Therefore we developed the following scoring guideposts: **100 Scoring Guidepost** There is a detailed ecosystem management plan based on well-understood functional relationships between the fishery and components of the ecosystem. This forms the basis for a fishery management strategy that restrains impacts on the ecosystem within defined bounds such as using 90% confidence intervals for setting ABCs in the single species context, and establishing a decision rule in the multi-species context similar to that employed in CCAMLR for krill, which explicitly adjusts the single species fishing level downward to account for the needs of other krill consumers in the ecosystem. These bounds are set at reasonable levels and are increasingly precautionary where uncertainty is high. They address risks associated with point estimates of ABCs and/or address the needs of dependent and related species explicitly. **80 Scoring Guidepost** There is a management system with ecosystem components based on general knowledge of ecological relationships. This contains explicit management objectives to understand and control impacts on trophic relationships, community and habitat structure and biodiversity. The management system assists fishery managers in making adjustments to reduce impacts on the ecosystem. Where uncertainty is high, management to restrain impacts is precautionary. **60 Scoring Guidepost**

	Despite attempts to develop a management system that includes ecosystem considerations, impacts of the fishery on the ecosystem have not yet been constrained within agreed and reasonable bounds. **SCORE: 75** Pollock catches in the GOA are generally conservative in the context of traditional single-species management. However, for a fish that is a major component of the diet of many species of marine mammal, seabird and predatory fish, the pollock fishery management must also account for the needs of predators in the ecosystem and for changes to food web structure that may be induced by removal of large quantities of pollock. What may be conservative in terms of avoiding depletion of spawning stock biomass and impacts on future recruitment may not necessarily be conservative in ensuring adequate densities of food fish for foraging dependent predators. Single species fishery management has a long history. We recognize that ecosystem based fishery management is an emerging concept, and a highly complex issue. Stakeholders (Bernstein *et al.* 2002) provided the evaluation team with a report that highlights four aspects of pollock fishery management that currently limit the ability of managers to take ecosystem considerations into the fishery management plan. These are (1) 'incomplete knowledge of environmental influences on stock dynamics and of the effects of fishing on ecosystem structure making it difficult for managers to clearly distinguish the relative effects of natural and anthropogenic factors on pollock stock dynamics and ecosystems, or to predict how changes in ocean climate will affect stocks and ecosystems in future' (2) 'incomplete knowledge about the trophic relationships among pollock and other species in the ecosystem, making it difficult to determine management strategies that are optimal for preserving critical relationships' (3) 'uncertainties regarding the impact of the pollock fishery on the protected Steller sea lion making it difficult to implement regulatory measures that are certain to protect this listed species and hence comply with U.S. environmental laws' and (4) 'in setting objectives for the fishery, managers have not until recently incorporated ecosystem objectives that encompass species and habitats beyond the target stock'. The Ecosystem Principles Advisory Panel (1999) established by NMFS to develop concepts of ecosystem management in the context of the Alaska groundfish fisheries stated that an ecosystem-based management approach would require managers 'to consider all interactions that a target fish stock has with predators, competitors, and prey species; the effects of weather and climate on fisheries biology and ecology; the complex interactions between fishes and their habitat; and the effects of fishing on fish stocks and their habitat'. In line with these principles, the 'Ecosystem Considerations' chapter presented as an Appendix to Stock Assessment and Fishery Evaluation Report for the groundfish resources of the EBS/AI and GOA (Livingston 1999, 2000, 2001) is an extremely impressive synthesis of a huge quantity of data on components of the ecosystem that may be affected by the pollock fishery. Few major fisheries around the world (and even fewer small fisheries) have gathered such detailed reviews of possible ecosystem interactions with fisheries. Noting this excellent effort, the evaluation team felt the management of the fishery still fell slightly below the 80 scoring guidepost, as the pollock fishery has not yet used the Ecosystems Considerations chapter in determining ABCs, an important step in setting the annual catch. Efforts to avoid possible local depletion in areas of particular importance for foraging marine mammals (Steller sea lions in particular) have been of uncertain efficacy, and it appears have done rather little to reduce the very high proportion of pollock catch taken from defined 'critical habitat' of Steller sea lions. Given the potential influence of the pollock fishery on Steller sea lion prey fields, and the fact that ongoing studies have not yet provided a firm understanding, the management appears not to be as precautionary as one might expect in a position of continued uncertainty. The continued high proportion of pollock catch taken in SSL critical habitat is of concern. In the GOA the harvest rate of pollock is relatively low by comparison with that in other fisheries for large gadoids. The harvest rate has been around 13% per annum in 1997-2001 (Dorn *et al.* 2002), which is around half the target rate for Icelandic cod, for example. Thus the fishery can correctly claim to be precautionary in setting a relatively low harvest rate. Nevertheless, about

	70% of this harvest is taken from within SSL critical habitat, although the value varies considerably from year to year. For example, in 1999 harvest inside CH was 82.8% while in 2002 harvest inside CH was 54.9%, but the lowest in recent years was around 50% in 1991 and the trend in this percentage from 1991 to 2003 shows no consistent direction of change over the period (Figure 2.1.b). An unpublished analysis of NMFS data on pollock in the GOA by Martin Dorn in October 2000 completed as part of the development of the 2000 Biological Opinion estimated from acoustic survey data that about 85% of pollock in the GOA occurred within SSLCH during the winter spawning period. He also estimated from bottom trawl research survey data that in summer about 75% of the pollock biomass west of 140 long. was in SSLCH. He inferred from these estimates that throughout the year most pollock in the GOA is within SSLCH. We are aware of ongoing studies looking at the effects of fishing on Pollock distribution and density within SSL critical habitat. However, the effectiveness of constraints on fishing in areas close to Steller sea lion rookeries and haul-outs cannot yet be ascertained. Even the validity of the concept of 'critical habitat' for SSL is quite unclear. There is a lack of data on the extent to which SSL forage within 'critical habitat'. Initial radio tracking studies have provided some interesting data on this as they show where SSL may occur, but do not clearly discriminate between foraging and non-foraging distribution and behaviour. More recent studies provide more detailed information, but there still appears to be significant uncertainty about the possible effects of fishing on foraging success by SSL inside and outside 'critical habitat'. There remains an urgent need to determine whether prey abundance within SSLCH (or indeed in larger areas around rookeries and haul-outs) affects the SSL population trajectory at the level of individual rookeries/haul-outs, and if so, whether the high take of pollock within SSLCH affects prey abundance for foraging Steller sea lions. The initial draft PSEIS (now being redone) reports 'Conditionally significant adverse impacts on the primary pinniped species (Steller sea lions, harbor seals) due to harvest of prey species; Conditionally significant adverse impacts on the primary pinniped species are identified due to spatial/temporal concentration of the fishery' and 'Cumulative effects are identified for prey availability and spatial/temporal removal of prey for Steller sea lion, and harbor seal. These effects are conditionally significant adverse based primarily on competition for prey'. This is reflected in the 3 December 1998 BiOp and the November 2000 BiOp determining that the GOA pollock fisheries, as projected for 1999 through 2002, were likely to jeopardize the endangered western population of Steller sea lions and destroy or adversely modify critical habitat designated for this population (PSEIS p2.9-20). In contrast, the October 2001 BiOp using the initial telemetry data reversed the conclusion of jeopardy. Moreover, the draft addendum to the 2001 BiOp, prepared to meet the requirements cited by Judge Zilly continues to support the conclusion of no jeopardy. In the draft PSEIS the agency reports 'The 1990s may be viewed as a period of continual modification of measures to manage groundfish operations to minimize their impact on non-groundfish fisheries, on marine mammals and seabirds, and on habitat'. Even though the draft report proposes a different approach to management, Alternative 2 in the PSEIS describes a new fisheries management policy framework that emphasizes increased protection to marine mammals and seabirds, the current management emphasizes continues to maintain a stable high annual harvest rather than protection of the wider ecosystem. Rather than the current emphasis in stock assessment and TAC setting on predicting the most likely outcome, management might incorporate ecosystem considerations more readily by adapting a scenario planning approach, in order to seek management strategies that would provide suitable yields of pollock without major impacts on the wider ecosystem under a diverse range of assumptions regarding relationships between the fishery and ecosystem components and functions. Regarding specific points in the 80 Guidepost, we accept that the management system could assist fishery managers in making adjustments to reduce impacts on the ecosystem, through the qualitative approach of annual 'Ecosystem considerations' chapters and that aspects of management are precautionary. However, we feel that the fishery falls below the 80 guidepost

	for the variety of broad reasons outlined in the paragraphs above, and specifically because it remains unclear whether a lower limit reference point of B_{20} provides an adequate limit to stock exploitation to ensure an adequate biomass of pollock for natural predators, and because the high level of exploitation of pollock within SSLCH is of concern (and especially at a time when the stock biomass is at such a low level relative to predicted unfished biomass). **CONDITION:** To improve the deficiencies in performance for this indicator, the fishery is required to specifically and explicitly develop and implement a plan for using the information contained in the Ecosystem Chapter of the SAFE document to develop ABCs for the pollock fisheries. Fisheries science is still developing methodologies for introducing environmental parameters into fisheries models and the state of current scientific knowledge remains insufficient to accommodate the conditions required under this indicator without further such development, and so some time is required to allow the necessary developments (see below). The plan must show how the authors of the 'Ecosystem Considerations' chapter explicit recommendations will be used in setting limits on ABCs based on each of the ecosystem data sets under review in the chapter where the data indicate that a constraint on pollock harvest may be an appropriate response to the pattern displayed by the data set. The evaluation team would request consideration of introducing more use of scenario planning in developing management strategies that are robust under several possible futures.
APA Activity	*This Condition and Action Plan response are identical for the BS/AI and GOA. The certification report notes that the "state of current scientific knowledge remains insufficient to accommodate the conditions required under this indicator without further…development (of fisheries science)". Importantly, the Final Report also notes repeatedly that management in the North Pacific is widely viewed as progressive and precautionary. Recognizing that the AFSC is consistently recognized for its leading edge practices, APA proposes this step-wise approach to meeting the Condition.* *APA will have a qualified individual, including contracting with an outside expert if necessary, review the literature to evaluate what constitutes state of the art practices in incorporating ecological indices into estimation of ABCs. Furthermore, APA will assess the extent to which AFSC incorporates such information into its annual SAFE report recommendations for groundfish fisheries, including recommendations on the pollock ABC.* *Based on its review of existing knowledge and methodologies, APA will identify in what areas, if any, AFSC's analysis could be enhanced. APA will have the report peer reviewed by at least one expert chosen in consultation with the certification body. APA will present its findings to the certifier at the first annual audit, and if the certifier agrees that the report is appropriate, APA will share its findings with AFSC and urge the agency to consider including such revisions in its annual SAFE reports. Furthermore, prior to the first annual audit APA will meet with AFSC staff to better understand the resources available to the agency and developments in ecological theory and provide to the certifier an assessment of the AFSC's long-term plan for further incorporating ecological indices in the ABC setting process.*
Conclusion of Surveillance Report 1	Progress to date is satisfactory and is clearly moving towards the objective of including ecosystem considerations in the setting of ABC's. In light of the comments above, the assessment team would propose to carry out specific discussions with relevant NMFS and APA staff during the second surveillance audit to determine further progress in 2006 and the latest status of current plans to achieve this objective. The audit team would then review Timescales relevant to this condition.
APA Progress Report	The Ecosystem Considerations portions of the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) Stock Assessment and Fishery Evaluation Reports (SAFEs) provide an ecosystem assessment within the context of measurements on a diverse array of oceanographic-conditions indicators over time. The foundation of the assessment is a set of measurements on the abundance and functioning of a diverse array of biological components. These ecosystem components run from bottom to top in the trophic pyramid — from nutrients

	and productivity, to habitat and forage fish, to the commercial fisheries species, and finally, to a constellation of higher-level organisms, the marine mammals and seabirds. A final section shows how the measurements that have been collected match up to policy goals for ecosystem conservation. An effort to advance the development of predictive multi-species models has been on-going for several years at the Alaska Fisheries Science Center, and some of the results of this effort are reported in the 2006 edition of Ecosystem Considerations. Progress has been made on two fronts — (1) multispecies stock population-dynamics models, and (2) ecosystem mass-balance, food-web models. Predictive models are important because they generate the "raw material" for hypothesis testing and assessing ecosystem features likely to be important for management strategy evaluation (MSE). Both modelling approaches are useful because both can be "compared with" and "calibrated to" outputs from the single-species models used to assess pollock biomass in the EBS, AI, and GOA. A review of the 2006 Considerations reveals a focus on employing the food-web models to assess whether the strategic assumption of single-species "surplus production" is valid, or whether ecosystems are better thought of as "strongly connected" predator-prey systems with all energy used within the system (e.g., see "Developing indices and thresholds of surplus production and predation," Boldt 2006, pp. 35-38) This work compares estimates of current total fishing and predation on Alaska pollock with estimates of stock production in the BSAI and GOA areas. All of the Alaska pollock stock assessments now include a standard-format ecosystem considerations section that identifies explicitly the factors that are taken into consideration in recommending over-fishing tonnages (OFLs) and acceptable biological catches (ABCs). In addition, each assessment also includes a mass-balance, food-web-based "energy map" of the ecosystem which illustrates the nature of the trophic linkages between pollock and the EBS, AI, and GOA ecosystems. Stock-assessment authors are encouraged to incorporate ecosystem considerations into recommendations for OFLs and ABCs. For 2006, the EBS assessment identified suspected changes in ecosystem productivity over the southeastern Bering Sea shelf and decreases in pollock spawning biomass as issues which motivated an ABC recommendation reduced by 14 percent from the max ABC of the reference-model. For the 2006 GOA assessment, ecosystem considerations focused on estimates of the relative levels of pollock predation by pollock, Pacific cod, Pacific halibut, and arrowtooth flounder. Of these predators, pollock and arrowtooth flounder consume smaller pollock (age one) while arrowtooth, cod and halibut consume adult pollock. As it turns out, pollock fishing has a lesser effect within the ecosystem as fishing mortality is small in proportion to predation mortality for GOA pollock. Of the predators of pollock, arrowtooth flounder has the largest impact on adult pollock, and the author notes that competition between arrowtooth and Steller sea lions for food may be under appreciated (Dorn *et al*. 2006). Because the GOA pollock biomass remains at a relatively low level, the author recommended a 15 percent reduction from the max ABC provided by the reference-model. The current drafts of the BSAI and GOA Fishery Management Plans (FMPs) are available from the North Pacific Fishery Management Council (NPFMC) website: www.fakr.noaa.gov. At a policy level, these fishery management plans and their amendments motivate and describe the transition to ecosystem-based fishery management in the U.S. North Pacific groundfish fisheries. In the very near future, revised FMPs that incorporate the legislative requirements of the 2006 reauthorization of the Magnuson-Stevens Fishery Management Act will be available. A major focus of this reauthorization was the incorporation of a more transparent, precautionary, ecosystem-based approach to fishery management nationwide, including in the North Pacific. At the broad, general level of policy, these management plans may be considered to specify the "reasonable upper bounds" on fishery impacts considered likely as well as those considered most potentially serious for the ecosystem. Stepping down from the policy level to the operational level, it falls to the NPFMC, the National Marine Fisheries Service (NMFS) Alaska Region Office, and the NMFS Alaska Fishery Science Center (AFSC) to establish the management plan rules and regulations that could be considered to "entrench" these limits as far as possible within the management system. To operationalize this task, during 2001-2004 representatives from these organizations developed a plan. This plan development was carried out in conjunction with the production

	of the Programmatic Supplemental Environmental Impact Statement for the Alaska Groundfish Fisheries (NMFS 2004). This plan was described in general terms in our 2006 surveillance submission. In a nutshell, the plan is as follows: 1. Develop an easily updatable synthesis of ecosystem features for use by the public, stock assessment scientists and regional fishery managers (see, i.e., the Ecosystem Assessment section of Boldt 2007); 2. From this information, distill a set of ecosystem status indicators for use by the public, stock assessment scientists and regional fishery managers (see, i.e., the Ecosystem Status Indicators section and Table 6 of Boldt 2007); 3. Make these data and information resources readily available to the public and regional fishery managers and stock assessment scientists via the internet (see, e.g., the AFSC website http://access.afsc.noaa.gov/reem/ecoweb/index.cfm). 4. Require that all single-species stock assessments include a standard-format ecosystem considerations section that identifies explicitly the factors that are taken into consideration in recommending over-fishing tonnages and acceptable biological catches; 5. Allow stock-assessment authors to specify and recommend reasonable upper bounds on fishery impacts on the ecosystem via a flexible set of harvest control rules which allows reductions from maximum-sustainable-yield-based exploitation levels; and 6. Allow the public, AFSC scientists, and NPFMC staff to use this same data and information resource as a basis for recommendations for alternative regulations intended to set reasonable upper bounds for fishery impacts on the ecosystem, consistent with the policies embodied in the FMPs. During 2006 the EBS and GOA pollock assessment authors recommended reductions in acceptable biological catch tonnages based on ecosystem features and the likely impacts of fishing on these features. As such, we believe that at both the policy and operational levels, the BSAI and GOA FMPs now contain what is required to specify reasonable upper bounds on the fishery impacts considered most likely as well as those considered most potentially serious for the ecosystem. In summary, it is our belief that we have now entered a period where mechanisms which allow the development of reasonable upper limits on fishery impacts on the ecosystem are well entrenched within the NPFMC management system. Our view of current circumstances is that the certification team will continue to monitor the development of reasonable upper bounds for fishery impacts on important ecosystem components. Because the ecosystems off Alaska are not static but dynamic in nature, any such upper bounds will necessarily also be dynamic in nature. The annual surveillance audit will provide the means to evaluate the fishery management and operations relative to these dynamic (changeable) ecosystem limits, as well as limits based on the dynamic properties of the pollock stock itself.
Observations	This is identical with Condition 4 for BS/AI. Much of the text associated with the initial condition is identical between the two stocks, and almost all the text of the APA Action Plan and progress report is identical between the two reports. Likewise, all the Observation commentary for Condition 4 of BS/AI applies to this stock as well. It may be useful to reiterate a point made in last year's evaluation Observations – "There *has* to be a plan which includes full accountability ("sets reasonable upper bounds") for the ecosystem effects of the *certified* fishery". The documentation on ecological relationships, environmental forcing, and species interactions in the Gulf of Alaska is, if anything, even more extensive than for the BS/AI stock. Combined with the spatial complexity of the stock complex and its pattern of variation in biomass over the past decade, there is huge scope for taking ecosystem interactions into an account in *ad hoc* manners. To some extent, in fact, it is essential that management taking account of ecosystem relationships remain flexible and adaptive, because patterns in complex systems are unlikely to repeat themselves identically, so

	a proper management response to a previous situation may not be the proper response to conditions even with some similarities to previous ones. However, for fisheries to be certified there has to be high certainty that appropriate conservation measures will be taken in a precautionary and anticipatory manner. Therefore it remains necessary that the management plan include clear identification of reasonable upper bounds for impacts of the fishery on the components in the Gulf of Alaska ecosystem most likely to be affected by the fishery. The adaptability in the management responses comes in the way that management complies with these upper bounds, given the particular circumstances of the status of the ecosystem components and the stock in a given year.
Conclusion	Progress is excellent in investigating the potential ecological impacts of the Pollock fishery on the Gulf of Alaska ecosystem. It remains necessary to specify the “reasonable upper bounds” on the impacts considered most likely and those considered most potentially serious for the ecosystem, and have these limits entrenched as far as possible in the management rules for this stock. Once this is achieved the condition would be met. The annual surveillance audit would then be expected to evaluate the fishery management and operations relative to these ecosystem limits, as well as limits based on properties of the Pollock stock itself. Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

5	**Condition of Certification 5:** Assessments are conducted to identify and estimate impacts of the fishery on habitats, especially on essential fish habitat (EFH) or critical habitat for protected, endangered, threatened or icon species, which are necessary to manage the fishery to minimize identified impacts.
Activity assessed	This Condition principally relates to Indicator 1.2.1. The intention of this performance indicator is to evaluate the extent to which the fishery demonstrates that it does not have unacceptable impacts on important habitats that might be vulnerable to alteration by the fishery. Elements considered in scoring include: • The effects of fishing on the habitat structure and productivity in fished areas, especially in areas used for spawning by fish. • The effects of fishing on foraging economics of predators utilizing the fished area • The effects of bycatch and discards/discharges on habitat structure and productivity in fished areas. • Information on the extent of lost fishing gear and any physical damage caused to habitats. • Information on the discharge of processing wastes, and their effects on the physical environment. • Management response to these collected data. **100 Scoring Guidepost** • Important adverse effects of trawling on benthic and pelagic habitats are measured at intervals on a programmatic basis. • Particular attention is given to effects of trawling on vulnerable habitats such as those inhabited by corals, and essential fish habitat or fish spawning areas. • Impacts of fishing on food-fish abundance and distribution are measured, in particular as they affect availability of food for consumers such as endangered, threatened, protected, or icon species. • Effects of discards and waste discharges on habitats are measured at intervals on a programmatic basis. • Quantities of gear lost are recorded, and the impact of lost gear on habitats is measured. • This information is presented in documents that are made available to stakeholders. • Responsive management changes occur as a direct result of assessment findings. **80 Scoring Guidepost** • The effects of trawling on benthic and pelagic habitats have been assessed and the results presented in documents available to stakeholders. • Particular attention is given to vulnerable habitats such as those inhabited by corals and those providing essential fish habitat. • Impacts of fishing on food-fish abundance and distribution have been considered and presented in documents available to stakeholders. • Effects of discards and waste discharges have been considered and presented in documents available to stakeholders. • Gear loss has been reviewed and impacts on habitats considered and presented in documents available to stakeholders. **60 Scoring Guidepost** • Adverse effects of trawling on habitats, especially on essential habitat for fish or critical habitat for protected, endangered, threatened or icon species, are documented by sporadic investigations, but many of these are not in the public domain. Coverage of topics is incomplete. Quantitative estimation of impacts is therefore subject to much uncertainty.

SCORE: 79

The score is very close to the 80 guidepost. The effects of trawling on benthic and pelagic habitats have been assessed and the results presented to stakeholders, for example in the PSEIS, and attention has been given to vulnerable habitats. Impacts of fishing on food fish abundance and distribution, on discards and waste discharges and on gear loss have been subjected to assessment, but we feel that these assessments fall slightly short of the required level..

As the APA submission on Principle 2 points out, there is an extensive body of information documenting GOA ecosystem features, both physical and biological. Extensive monitoring programs also exist to update key data series and research programs on ecosystem characteristics, and these monitoring programs extend back various periods in time, thereby allowing for some developments in 'historical science' or the inclusion of past patterns of ecosystem change into analyses of present conditions. APA also provides details of assessments of the impact of the groundfish fisheries on habitats. The vast majority of the pollock catch is taken mid-water. Occasionally, however, mid-water trawls may hit the bottom, and this can contribute to trawl damage to benthic habitats and communities. Such impacts are very much greater where a fishery is using a bottom trawl, but the very size of the pollock fishery does raise the question of how frequently pollock trawls drag on the bottom. Analysis of the frequency of benthic items in pollock catches indicates that this is infrequent.

Many aspects of these assessments meet or exceed the 80 scoring guidepost, but the state of knowledge of the impact of pollock fishing on Steller sea lion critical habitat (SSLCH) falls short of this. Even with ongoing studies to assess pollock prey fields in SSLCH more fully, the effects of harvesting from SSL 'critical habitat' on fish prey fields are not yet known.

One of the major hypotheses set up to explain the decline in numbers of Steller sea lions is the 'localized depletion hypothesis' The localized depletion hypothesis suggests 'that the Pollock fishery (and the Atka mackerel and cod fisheries) cause localized depressions in the prey field around Steller sea lion rookeries, haul outs, and other critical habitat' (DeMaster and Fritz, 2001; Livingston, 2001 page 104-105). There is some evidence for this hypothesis reviewed in NRC (1996) and NMFS (2001a,d), but the evidence is either incomplete or inconsistent with other data. The recent NRC panel (Committee on the Alaska groundfish fishery and Steller sea lions, 2002) found that reduced prey availability could not be ruled out, but was a less likely hypothesis than others such as climate change or killer whale predation on SSLs. This lack of understanding makes it impossible to say what effect pollock fishing has on SSLCH.

The frequent alterations to past RPAs intended to reduce the impact of pollock fishing within SSLCH is consistent with this lack of knowledge. Scientific data evaluating the efficacy of each past RPA, or the most recent SPMs (Sea Lion Protection Measures) were lacking at the time of this report, and therefore it seems impossible to assess whether any one set of RPA or SPM conditions is more successful than another in mitigating impacts. Empirical evidence from catches taken within SSLCH shows that the various past RPAs have not significantly reduced the proportion of the pollock catch taken from SSLCH (see Figure 2.1).

The analysis of telemetry data by NMFS summarized in the addendum to the 2001 BiOp led NMFS to conclude that all of SSL critical habitat (0-20 nm) is not used equally. Instead, NMFS draws the conclusion that 0-3 nm and 3-10 nm are used significantly more than 10-20 nm, so that fishing inside SSLCH can be allowed using a zonal approach. However, this view was based on preliminary and incomplete analysis of new telemetry data and the scientific basis for this conclusion has not been subject to peer review.

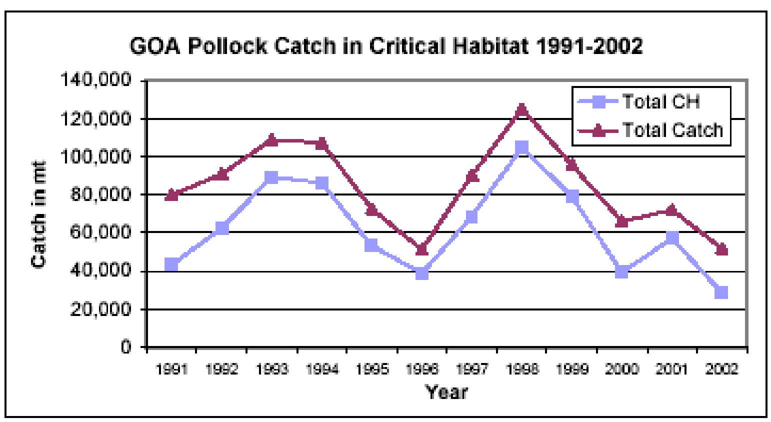
Subsequently, NMFS has revised its interpretation of the telemetry data in the light of findings by Judge Zilly that 'NOAA Fisheries determination that the near shore zone of critical habitat (3nm to 10 nm) is 3 times more important to the foraging needs of Steller sea lions than the offshore critical habitat (10 nm to 20 nm) was not supported by the filtered telemetry data cited by NOAA Fisheries' (NMFS, 2003).

NOAA Fisheries did use “filtered” telemetry data in the 2001 Biological Opinion as well as in the Supplemental Analysis that the agency submitted to the Court on 19 June 2003 (the “Supplement”). The filtering technique utilized in the Supplement, however, was more refined than that utilized in the 2001 BiOp.

In the 2001 BiOp, the agency attempted to eliminate potential bias in the telemetry data by simply eliminating “90% of the locations which occurred between 0 and 2 nm from shore.” This technique was designed as a precautionary method to minimize the possibility of overestimating “the dependence of juveniles and adult females on the inner 10 nm of critical habitat.” But the choice of 90% elimination of data was arbitrary and that specific filter could not be justified. The Supplement used a different and somewhat more refined approach—one that was based on a new telemetry analysis that “integrat[ed] dive depth with locations”. According to the Supplement, “[t]he new dive-related telemetry data identifies more specifically the mechanism that sea lions use to forage (i.e., diving).” (Supplement, p. 14). The restriction of analysis to devices that indicate diving behaviour will presumably remove much of the biased data from animals resting at haul-outs or sleeping rather than foraging. However, no validation of the depth selected to indicate ‘foraging’ was presented and this depth limit appears to be arbitrary and selected from the limited depth bins into which data are collected. It still seems uncertain how effective and reliable a filter this represents.

A further concern about the telemetry data that still remains after the new approach to filtering locations to reduce bias, is that much data from the PTTs comes from instruments deployed on SSL juveniles that may not be weaned, and so would have been remaining at rookeries or haul-outs to be fed by their mother. It is unlikely that the telemetry data can provide an accurate measure of how much SSLs feed within SSLCH, given that a high proportion of the data simply indicates that SSL pups waiting to be fed tend to stay close to home. This point is also made by NMFS when it states ‘there has been a disproportionate number of pups instrumented vs. juveniles (2 and 3 year olds), which may bias the information on sea lion geographic distribution with data on animals that are still nursing and may not be foraging’ and ‘to date, researchers have inadequate telemetry information on animals from 2-4 years of age, the time period which may be crucial to their survival’ (NMFS, 2003). The supplement reports on analyses completed in January and February 2003 “based on juvenile dive locations derived from satellite transmitters during the three-year period from 2000-2002.” Pages 15-19 of the Supplement provide information derived from satellite dive recorders for 63 juvenile Steller sea lions. Of note, the analysis indicates that, “In summer, juvenile sea lions predominately use the 0-10 nm zone of critical habitat (88.9%)…In the winter the pattern is similar with 90.3% inside 0-10 nm, and 7% in 10-20 n.m.” (See p. 18 of Supplement.)

Figure 2.1 (b). GOA pollock catch in SSLCH 1991-2002 (from NMFS, 2003).



Judge Zilly also found that ‘NMFS failed to adequately analyze the likely effects of fishing under the Steller sea lion protection measures on Steller sea lions, their prey, and their critical habitat. In this part of the Order, Judge Zilly concluded that even if NMFS had correctly evaluated the differing importance of the zones of critical habitat, the 2001 BiOp failed to evaluate “the differing effect of the current and proposed level of fishing on those zones of

	critical habitat and Steller sea lions." (NMFS, 2003). Analyses of fishery patterns in 2002 indicate that the present RPA fishery mitigation plan allows catches in critical habitat to remain high or to rise to formerly high levels that existed prior to the determinations of jeopardy and adverse modification in the 1998 and 2000 biological opinions. (NMFS 2003 Supplement to the Supplemental October 2001 BiOp, pp. 23-24; Tables III-2, 3,4,5,9; Figures III-1, 2,3). Given that the competing hypotheses associated with availability of pollock in SSLCH cannot be sorted, the continued high harvest from SSLCH has attracted criticism from several environmental groups as being less precautionary than they consider appropriate, and provides a strong case for more and continued detailed research to test these hypotheses. Apparently there is a lack of assessment of impacts of lost gear on habitat. According to the APA submission to the evaluation team (p16), 'no formal programs exist (sic!) at present to assess fishing gear loss and its concomitant direct and indirect effects on habitats in Alaska'. Although rates of discarding from the pollock fisheries are low compared to those in many other fisheries (Alverson *et al.*, 1994), and can reasonably be assumed to have a negligible effect on benthic habitats and communities, the extent to which the provision of discards as a novel food supply for scavenging seabirds alters their habitat, behaviour and spatial distribution, has apparently not been assessed in the GOA. While a discarding rate of only ca 1-2% of total catch is exemplary, this represented over 1,000 t of fish discarded each year 1998-2000 (Bernstein *et al*., 2002, Table 8). This is not a trivial amount of food to be providing to scavenging marine animals. In other parts of the world, there is strong evidence that discards and offal provide an important food supply for a variety of species of scavenging seabirds (Furness *et al.*, 1992; Blaber *et al.*, 1995; Thompson and Riddy, 1995; Garthe *et al.*, 1996) and this feeding opportunity affects not only distributions of seabirds (Ryan and Moloney, 1988; Arcos and Oro, 1996; Freeman, 1997) but also their body condition (Hüppop and Wurm, 2000), breeding success (Oro *et al.*, 1995; Oro *et al.*, 1996a), contaminant accumulation (Arcos *et al.*, 2002), interspecific interactions (Heubeck *et al.*, 1999; Oro and Furness, 2002), population size (Oro *et al.*, 1996b; Chapdelaine and Rail, 1997) and demography (Furness, 2003). In the pSEIS and Ecosystem Considerations, these issues are discussed and it is evident that effects are being assessed by 'expert guesswork' rather than from a basis of scientific knowledge. **CONDITION:** To improve the deficiencies in performance for this indicator, the fishery must improve assessments of impacts on habitats as follows: 1. Provide the certification body with information on ongoing research projects to determine the impact of pollock fishing, if any, on SSL critical habitat with particular emphasis on the effects of fishing, if any, on foraging sea lions. 2. Meet Condition 3.1 – thus provide a thorough written review of gear loss from pollock fishers and its impacts on habitats. 3. Provide a thorough written review of discarding from pollock fishing as a food supply affecting scavenging seabirds. We require that the certification body be provided a summary of the current state of knowledge on the identified issue areas of concern and that targeted, clearly defined research programs be undertaken, if necessary, after consultation between the certification body and the fishery based on the findings of the written reviews.

APA Activity	*With the exception of the reference to fur seals in the BS/AI report, this Condition and Action Plan response for the BS/AI and GOA are identical.* *Within 12 months, APA will provide to the certification body a comprehensive report documenting research completed since summer 2002 on the effects of pollock fishing, if any, on SSL critical habitat as well as discussion of ongoing research projects relating to the impact of pollock fishing, if any, on foraging sea lions. AFSC informs APA that the agency conducted research in 2004 (the so-called Chiniak study) on this specific issue. The report will include also discussion of research results reported in 2004 indicating that localized depletion of Pacific cod was not evident in an AFSC experiment that included control areas and areas in which cod trawling occurred.* *APA believes that it would be beneficial also to provide to the certifier an update on research on competing, and perhaps more salient, hypotheses relating to SSL populations, including the effects of "regime shifts" and killer whale predation on SSL populations. APA will also provide a written review prior to the first annual audit by the certifier of the effects, if any, of the de minimus amount of fish discarded by GOA pollock fishing vessels on scavenging seabirds. AFSC reports that Dr. Ann Edwards, a post doctoral fellow from the National Research Council, will be conducting relevant research on this topic. APA will provide to the certifier progress reports prepared by Dr. Edwards as well as the project's findings. Additionally, APA is participating in a seabird study that will include an inquiry into seabird foraging activities and potential interactions with pollock catcher/processor vessels. This study is partially funded through a grant by NMFS. APA will present the results of this NMFS-funded research program to the certifier prior to the first annual audit.*
Conclusion of Surveillance Report 1	The first part of this condition, providing an update on ongoing research re possible impacts of pollock fishing on SSL critical habitat, has been reasonably met. Current research on the possible effects of pollock fishing on SSL prey should provide valuable guidance on the likelihood of negative impacts and serve to improve future studies of possible impacts. A review of this issue (among others) by Professor I. Boyd will be presented in the second surveillance report to complement the work presented above. Other conditions are also relevant to this issue (Conditions 6 and 10) in terms of outcomes following from such research and this part of the Condition is therefore considered to be closed The second part of this condition refers to Indicator 3.1, to consider the impacts of gear loss. Indicator 3.1 is Condition 11 of the BS/AI Pollock Fishery Surveillance Report. The relevant conclusion of this was that the requirements of this condition have not yet been fully met. Accordingly, it is required that for Condition 11.1, APA carry out a systematic survey of members to determine incidents of gear loss and garbage disposal which could include plastic waste, a summary report of the results of this survey should be provided. A supporting report from the NMFS Observer programme should also be requested. These two reports should be presented to the assessment team prior to the second surveillance audit. For the third part of the condition, current research on the importance of discards in the diet of seabirds should provide a basis for making decisions about probably impacts on some seabird species. The research by Dr Edwards addresses several of the concerns of the initial assessment with respect to the impact of discards on seabirds. This work is due for completion in 2006 and will be discussed in full in the second surveillance report. Any further requirements in this regard will then be determined as part of the second surveillance report.
APA Progress Report	During 2006 the At-Sea Processors Association hired Prof. Ian L. Boyd, Director Sea Mammal Research Unit, Gatty Marine Laboratory, University of St Andrews, United Kingdom, for the purposes of providing a synthesis of recent research investigating the foraging habits of Steller sea lions (SSLs; Boyd 2006). The report assesses research in two areas: (1) the relationships between Steller sea lion foraging behaviour and pollock-as-prey abundance at the regional scale (related to pollock stock size and geographical distribution); and (2) the relationships between SSL foraging behaviour and pollock-as-prey abundance at the local scale related to putative fish-school disruption caused by trawling in localized areas. The objective was to evaluate what the completed research implies for characterizing SSL foraging movement and distribution on the local (rookery) scale, and whether there appear to be issues of significant

concern related to the effects, if any, of pollock fishing on the SSL.

Schedule for Recovery Plan and Revised Biological Opinion

During March, 2007 the NMFS informed the North Pacific Management Council of its revised schedule for completing the Recovery Plan (RP) for the SSL, and an updated Fishery Management Plan (FMP-level) Biological Opinion (BiOp) assessing the effects of the Alaska groundfish fisheries on the continued survival of the western distinct population segment of SSL. The development of an RP plan for the SSL has been a protracted effort. Work to produce the plan began in the fall of 2001, shortly after development of the reasonable and prudent alternative management measures for the Alaska groundfish fisheries was completed. Currently, the NMFS is revising the draft plan to incorporate comments received from a team of independent reviewers, the NPFMC SSC, and the public. A draft for release to the public is anticipated in May, 2007, and then an additional 90-day public review will follow. During the public review the NMFS will commission a second independent peer review by the Center for Independent Experts (CIE). The NMFS will consider suggestions concerning the CIE terms of reference from the NPFMC. The NPFMC has scheduled a special meeting in August to comment on the draft SSL RP. It is likely that the upcoming comment period for the RP will be extended 30-60 days to accommodate the CIE review. As such, the NMFS now expects to release a final SSL RP to the public near the end of 2007.

Further development of a draft FMP-level BiOp on the Alaska groundfish fisheries will follow completion of the SSL RP. Various approaches are possible to coordinating the activities of the scientists that will complete the BiOp and the NPFMC as it considers changes to the existing RPAs. A two-stage process has been suggested. In stage one, a BiOp assessing only the existing management regulations would be produced. This would provide a context within which the NPFMC could consider changes to the existing regulations. In stage two, any changes proposed by the NPFMC would be assessed. If this approach is adopted, a draft stage-one BiOp is anticipated by April 2008. A CIE review of the draft stage-one BiOp is also a possibility. As such, the first opportunity for the NPFMC to comment on the assessment of the existing regulations is not expected to arrive before June 2008.

Research on Steller Sea Lion Population Dynamics

In June, 2006, an aerial survey of the western distinct population segment of SSLs was conducted (Fritz and Gelatt 2007). However, a court-ordered cessation of research on SSLs authorized by NMFS permits caused the start of the survey to be delayed, and a complete assessment of all Kenai to Kiska “trend” sites was not possible. Table 1 summarizes the 2006 survey counts that could be compared to those from 2004. In 2006, 106 trend sites were counted compared to 161 sites in 2004. Most of the sites missed in 2006 were in the central GOA and the central AI (in 2006 all sites in the eastern GOA and the eastern AI were counted, and all but one of the western GOA and one of the western AI sites were counted).

Table 1. Counts of adult and juvenile (non-pup) SSLs, 2004 and 2006.

Area	2004	2006
Eastern GOA	3,129	3,115
Central GOA	4,180	—
Western GOA	4,603	4,448
Eastern AI	6,217	6,199
Central AI	7,145	—
Western AI	1,227	997

	In September, 2006 a preliminary version of parts of the anticipated FMP-level BiOp was provided to the members of the NPFMC SSL Mitigation Committee. This draft assessment pointed to a recent study by Holmes *et al*. (in review), which updated a SSL population analysis developed in 1994 by York. The analysis is carried out using a life table constructed from data on SSLs within the central GOA, an area where SSL declines have been significant since the late 1970s. In January, 2007 the Pollock Conservation Cooperative Research Center received a final report on an unusual project "Changes in Steller Sea Lion Skull Sizes: Testing the Nutritional Stress and Killer Whale Predation Hypotheses." The project measured the sizes of SSL skulls (1950s to present) housed at various institutions to determine whether body size changed as sea lions declined, and whether any changes would be consistent between the eastern and western Pacific (Trites *et al*. 2007b). The authors used these data to examine whether changes in body size are consistent with the nutritional stress hypothesis or with the killer whale predation hypothesis. Two other recent articles (Trites *et al*. 2007a, Kumagai *et al*. 2006) provide information on the ocean climate hypothesis as a factor in the SSL decline.
Observations	The APA commissioned report by Professor Boyd addresses the first condition with respect to evidence that the pollock fishery causes regional changes in foraging economics of SSL and NFS. Professor Boyd approached these questions within the context of a risk framework whereby the outputs of research are expressed in the form of research questions. The assessment evaluates the extent to which research has answered those questions. With respect to regional effects, Professor Boyd concluded, "the risk of the recent decline of the SSL being caused by the pollock fishery itself has declined. However, their remains a high risk that the current structure of the prey field available to SSL, including the preponderance of pollock in some regions, could be a cause of the decline. There is insufficient evidence to be able to assess if the fishery affects the structure of this prey field." Again, we view industry participation in the planning and conduct of future studies rather critical if the issue of the effects of fishing on the spatial and temporal dynamics of pollock school size, depth and behaviour at regional scales is to be better understood. Indicator 3.1 relating to gear loss form the pollock fishery is dealt with under Condition 11. The further research by the Pollock Conservation Cooperative (PCC) on means to mitigate seabird and trawl-gear interactions is also welcome. This work indicates that no short-tailed albatrosses are known to have been killed by BS/AI trawl-vessel fishing operations (NMFS 2005). However, several species of seabirds have been observed to interact with trawl wires, and Laysan albatrosses have been killed via contacts with net-sounding cables (third-wires, NMFS 2002). As a consequence, there is now increased monitoring of trawl-vessel and seabird interactions in general, and a small, incidental-take limit (2) has been placed on the short-tailed albatross. In 2003 and 2004, the PCC documented the nature and frequency of seabird and trawl-gear interactions and continued refining the observation protocol as well as evaluating additional potential mitigation devices, mapping the distribution of offal discharge around the vessel, and quantifying the rate of offal discharge. Prior to the next surveillance, the team looks forward to the opportunity to review the results of these studies. The surveillance team was informed that the research by Dr. Edwards on seabird use of pollock discards and offal is progressing and should be available for review prior to the 2007 surveillance audit.
Conclusion	As indicated in the first surveillance report, the first condition has been reasonably met. This has been further enhanced with Professor Boyd's reports on the possible impacts of the pollock fishery on regional abundance of SSL food and the consequences of such effects on SSL recovery. A review of Dr. Edward's findings will be important to our evaluation of the extent to which

	the third outstanding condition has been met. This should be available prior to next years surveillance audit. Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

<table>
<tr><td>6</td><td>Condition of Certification 6: Research is carried out to allow impacts of the fishery on the biodiversity and structure of invertebrate and vertebrate communities in relevant habitats to be identified, measured, and understood in terms of functional relationships.</td></tr>
<tr><td>Activity assessed</td><td>This Condition relates principally to Indicator 1.2.3, but, in part, Indicator 3.2 also relates.

The intention of this performance indicator is to evaluate the extent to which a body of knowledge exists to permit the impacts of the fishery to be identified, and discriminated from impacts due to other factors such as natural variations in environmental conditions. This involves both a research plan and an implementation strategy.

100 Scoring Guidepost

• There is detailed information on mechanisms through which the fishery causes adverse effects on habitats.
• There is detailed information on mechanisms through which the fishery causes adverse effects on invertebrate biodiversity, community structure and population dynamics.
• There is detailed information on mechanisms through which the fishery causes adverse effects on vertebrate biodiversity, community structure and population dynamics.
• There is a coordinated research plan to understand fishery impacts on habitats, biodiversity, structure of invertebrate communities, food webs, predator-prey dynamics and population dynamics.
• The results of research findings are made directly available to management authorities and the public on a programmatic basis.

80 Scoring Guidepost

• There is a continuing research program aimed at understanding mechanisms through which the fishery causes adverse effects on habitats.
• There is a continuing research program aimed at understanding mechanisms through which the fishery causes adverse effects on invertebrate biodiversity, community structure and population dynamics.
• There is a continuing research program aimed at understanding mechanisms through which the fishery causes adverse effects on vertebrate biodiversity, community structure and population dynamics.
• A coordinated research plan is being developed to understand fishery impacts on habitats, biodiversity, structure of invertebrate communities, food webs, predator-prey dynamics and population dynamics.
• As research proceeds and new information is learned, it is made available to management authorities and the public in a timely manner.

60 Scoring Guidepost

• Research into the effects of the fishery on habitats, animal communities, populations, food webs, and ecological functional relationships is carried out in sporadic projects with little strategic planning or coordination. Results therefore provide only a weak basis for adjusting fishery management to reduce impacts.

SCORE: 79

There is a very considerable research effort into many aspects of the ecology of the GOA. This high quality research is internationally respected as of a very high quality, and much of the research is directly relevant to the position of pollock within the ecosystem and to interactions between the pollock fishery and ecosystem processes. Some aspects of Pacific ecosystem research are not only directly relevant but also outstanding science (for example the Resource Ecology and Ecosystem Modelling Task (REEM) located within REFM at NMFS AFSC, which provides a continuing research program aimed at understanding mechanisms through</td></tr>
</table>

	which the Alaska fisheries may cause adverse effects on vertebrate and invertebrate biodiversity, community structure and population dynamics). Budgeting for research into key questions concerning the effects of the pollock fishery on the ecosystem seems weaker than might be expected knowing that a large fishery is occurring in and around the critical habitats occupied by an endangered species. While there is a research strategy, topics of highest importance in fishery-ecosystem impacts do not appear to receive adequate attention. Testing of key hypotheses have not been aggressively pursued in detail. For example there are many leading questions that continue to be unanswered such as, functional relationship between Steller sea lion foraging and pollock prey densities; the hypothesis that removal of Pollock from SSLCH has no effect on food availability to SSL. The following are relevant quotations from the Supplement to the Endangered Species Act – Section 7 Consultation Biological Opinion and Incidental Take Statement of October 2001 (June 2003: pp 57-58). "The analyses in the preceding sections of this biological opinion forms the basis for conclusions as to whether the proposed action, the ongoing fisheries for Pacific cod, Atka mackerel, and Pollock in the BSAI and GOA as modified by amendments 61/61 and 70/70 satisfy the standards of the ESA Section 7(a)(2)." "The supplement further explores the rationale of the 2001 BiOp, the telemetry information and the performance of the fisheries in relation to the requirement in order to remove jeopardy and adverse modification found in the FMP BiOp. On the basis of this information and the analysis (2001 BiOp and the supplement), NOAA Fisheries draws its conclusions about the effects of the pollock, Pacific cod, and Atka mackerel fisheries on the survival and recovery of the two listed populations of Steller sea lions." "In this section NOAA Fisheries must determine whether the species can be expected to survive with an adequate potential for recovery under the effects of the proposed action, the environmental baseline, and cumulative effects. The information available to NOAA Fisheries is both quantitative and qualitative. For Steller sea lions, although significant research has been funded over the past few years and new information is being developed on the habitat requirements of the species, as well as various reviews (e.g., Bowen *et al*., 2001; NRC 2003) the cause of the current decline of the species is still unknown. NOAA Fisheries expects that over the next 3-5 years a significant amount of new information will be available for future decision making, however, much of the available data today is based on the professional judgment of knowledgeable scientists." "After reviewing the current status of the endangered western population of Steller sea lions, the environmental baseline for the action area, the proposed action for Alaska Groundfish in the Bering Sea and Aleutian Islands and Gulf of Alaska, and the cumulative effects, it … is not likely to jeopardize the continued existence of the western population of Steller sea lions." The enormous increase in spending on SSL research for the past 2 years have occurred as a result of political negotiations rather than a sensible long-term research strategy. The fact that the set of RPA regulations have been altered on an almost annual basis means that it is very difficult to look at data sets for potentially impacted wildlife in relation to the management of the fishery, since impacts on population trajectories will likely be occurring over decadal scales. Although many aspects of this Indicator exceed the 80 guidepost, these weaknesses in focus of research on key issues relating to the impact of pollock fishing lead us to score this Indicator below the 80 threshold. **CONDITION:** To improve the deficiencies in performance for this indicator, research must be implemented to describe: • Relationships between Steller sea lion foraging behaviour (especially as this relates to foraging economics or sea lion foraging distribution) and pollock prey abundance at

	the regional scale related to stock size and stock geographical distribution; • Relationships between Steller sea lion foraging behaviour (especially as this relates to foraging economics or sea lion foraging distribution) and pollock prey abundance at the local scale related to putative fish school disruption in localized areas caused by trawling. • Plans for these research projects will be sent to the SCS team for review, and then initiated no later than the following calendar year. Where research leads to new information relevant to management, appropriate changes in management will be required.
APA Activity	*This Condition and Action Plan response are substantially the same for the BS/AI and GOA pollock fisheries. APA will provide a thorough written report to the certification body within 6 months of the issuance of the certificate on the status of research relating to SSL foraging behavior and pollock prey abundance at the regional and local scales. While the Condition calls for research to be "implemented," APA believes that the accounting of NMFS' research program provided under APA's responses to other Conditions will satisfy this Condition. APA will include in its report an assessment of work on this issue funded by the FY 2005 appropriations bill for NOAA, which was enacted in late November 2004.* *APA proposes that the certifier focus on this issue at the first annual audit. APA will request a meeting with relevant AFSC staff, the certifier and APA so that the certifier can understand fully the agency's program with regard to this issue.* *Tasks performed under other Conditions will be coordinated with the response to Condition #6.*
Conclusion of Surveillance Report 1	Progress to date is satisfactory.
APA Progress Report	During 2006 the APA hired Prof. Ian L. Boyd, Director Sea Mammal Research Unit, Gatty Marine Laboratory, University of St Andrews, United Kingdom, for the purposes of providing a synthesis of recent research investigating the foraging habits of Steller sea lions (SSLs; Boyd 2006). The report assesses research in two areas: (1) The relationships between Steller sea lion foraging behaviour and pollock-as-prey abundance at the regional scale (related to pollock stock size and geographical distribution); and, (2) The relationships between SSL foraging behaviour and pollock-as-prey abundance at the local scale related to putative fish-school disruption caused by trawling in localized areas. The objective was to evaluate what the completed research implies for characterizing SSL foraging movement and distribution on the local (rookery) scale, and whether there appear to be issues of significant concern related to the effects, if any, of pollock fishing on the SSL. **Schedule for Recovery Plan and Revised Biological Opinion** During March, 2007 the NMFS informed the North Pacific Management Council of its revised schedule for completing the Recovery Plan (RP) for the SSL, and an updated Fishery Management Plan (FMP-level) Biological Opinion (BiOp) assessing the effects of the Alaska groundfish fisheries on the continued survival of the western distinct population segment of SSL. The development of an RP plan for the SSL has been a protracted effort. Work to produce the plan began in the fall of 2001, shortly after development of the reasonable and prudent alternative management measures for the Alaska groundfish fisheries was completed. Currently, the NMFS is revising the draft plan to incorporate comments received from a team of independent reviewers, the NPFMC SSC, and the public. A draft for release to the public is anticipated in May, 2007, and then an additional 90-day public review will follow. During the public review the NMFS will commission a second independent peer review by the Center for Independent Experts (CIE). The NMFS will consider suggestions concerning the CIE terms of reference from the NPFMC. The NPFMC has scheduled a special meeting in August to comment on the draft SSL RP. It is likely that the upcoming comment period for the RP will

be extended 30-60 days to accommodate the CIE review. As such, the NMFS now expects to release a final SSL RP to the public near the end of 2007.

Further development of a draft FMP-level BiOp on the Alaska groundfish fisheries will follow completion of the SSL RP. Various approaches are possible to coordinating the activities of the scientists that will complete the BiOp and the NPFMC as it considers changes to the existing RPAs. A two-stage process has been suggested. In stage one, a BiOp assessing only the existing management regulations would be produced. This would provide a context within which the NPFMC could consider changes to the existing regulations. In stage two, any changes proposed by the NPFMC would be assessed. If this approach is adopted, a draft stage-one BiOp is anticipated by April 2008. A CIE review of the draft stage-one BiOp is also a possibility. As such, the first opportunity for the NPFMC to comment on the assessment of the existing regulations is not expected to arrive before June 2008.

Research on Steller Sea Lion Population Dynamics

In June 2006, an aerial survey of the western distinct population segment of SSLs was conducted (Fritz and Gelatt 2007). However, a court-ordered cessation of research on SSLs authorized by NMFS permits caused the start of the survey to be delayed, and a complete assessment of all Kenai to Kiska "trend" sites was not possible. Table 1 summarizes the 2006 survey counts that could be compared to those from 2004. In 2006, 106 trend sites were counted compared to 161 sites in 2004. Most of the sites missed in 2006 were in the central GOA and the central AI (in 2006 all sites in the eastern GOA and the eastern AI were counted, and all but one of the western GOA and one of the western AI sites were counted).

Table 1. Counts of adult and juvenile (non-pup) SSLs, 2004 and 2006.

Area	2004	2006
Eastern GOA	3,129	3,115
Central GOA	4,180	—
Western GOA	4,603	4,448
Eastern AI	6,217	6,199
Central AI	7,145	—
Western AI	1,227	997

In September 2006 a preliminary version of parts of the anticipated FMP-level BiOp was provided to the members of the NPFMC SSL Mitigation Committee. This draft assessment pointed to a recent study by Holmes *et al*. (in press) that updated a SSL population analysis developed in 1994 by York. The analysis is carried out using a life table constructed from data on SSLs within the central GOA, an area where SSL declines have been significant since the late 1970s.

In January, 2007 the Pollock Conservation Cooperative Research Center received a final report on an unusual project "Changes in Steller Sea Lion Skull Sizes: Testing the Nutritional Stress and Killer Whale Predation Hypotheses." The project measured the sizes of SSL skulls (1950s to present) housed at various institutions to determine whether body size changed as sea lions declined, and whether any changes would be consistent between the eastern and western Pacific (Trites *et al*. 2007b). The authors used these data to examine whether changes in body size are consistent with the nutritional stress hypothesis or with the killer whale predation hypothesis. Two other recent articles (Trites *et al.* 2007a, Kumagai *et al*. 2006) provide information on the ocean climate hypothesis as a factor in the SSL decline.

Observations	The APA commissioned report by Professor Boyd addresses the first condition with respect to evidence that the pollock fishery causes regional changes in foraging economics of SSL and NFS. Professor Boyd approached these questions within the context of a risk framework whereby the outputs of research are matched against a set of research expressed in the form of research questions. The assessment evaluates the extent to which research has answered those questions. With respect to regional effects, Professor Boyd concluded, "the risk of the recent decline of the SSL being caused by the pollock fishery itself has declined. However, their remains a high risk that the current structure of the prey field available to SSL, including the preponderance of pollock in some regions, cold be a cause of the decline. There is insufficient evidence to be able to assess if the fishery affects the structure of this prey field." Again, we view industry participation in the planning and conduct of future studies rather critical if the issue of the effects of fishing on the spatial and temporal dynamics of pollock school size, depth and behaviour at regional scales is to be better understood. Indicator 3.1 relating to gear loss form the pollock fishery is dealt with under Condition 11. The further research by the Pollock Conservation Cooperative (PCC) on means to mitigate seabird and trawl-gear interactions is also welcome. This work indicates that no short-tailed albatrosses are known to have been killed by BS/AI trawl-vessel fishing operations (NMFS 2005). However, several species of seabirds have been observed to interact with trawl wires, and Laysan albatrosses have been killed via contacts with net-sounding cables (third-wires, NMFS 2002). As a consequence, there is now increased monitoring of trawl-vessel and seabird interactions in general, and a small, incidental-take limit (2) has been placed on the short-tailed albatross. In 2003 and 2004, the PCC documented the nature and frequency of seabird and trawl-gear interactions and continued refining the observation protocol as well as evaluating additional potential mitigation devices, mapping the distribution of offal discharge around the vessel, and quantifying the rate of offal discharge. Prior to the next surveillance, the team looks forward to the opportunity to review the results of these studies. The surveillance team was informed that the research by Dr. Edwards on seabird use of pollock discards and offal is progressing and should be available for review prior to the 2007 surveillance audit.
Conclusion	As indicated in the first surveillance report, the first part of this condition has been reasonably met. This has been further enhanced with Professor Boyd's reports on the possible impacts of the pollock fishery on regional abundance of SSL food and the consequences of such effects on SSL recovery. Condition 11 (Indicator 3.1) is considered later in this report. A review of Dr. Edward's findings will be important to our evaluation of the extent to which the third outstanding condition has been met, i.e., whether appropriate changes in management will be required. Compliance with this condition remains on-target and the condition is expected to be closed within the term of the present MSC certification.

7	**Condition of Certification 7:** Data on spatial and temporal variations in abundances of animal populations and communities have been synthesized into a set of internally consistent explanatory hypotheses that can provide the basis for making predictions about future system states and consequences of management actions.
Activity assessed	The intention of this performance indicator is to evaluate how well data collected under 1.3.1 and 1.3.2 have been compiled and reviewed to enable intelligent choices among management actions. **100 Scoring Guidepost** • There is sufficient understanding of the information collected on functional relationships between fisheries actions and responses of animal populations and communities such that management decisions can be made to mitigate effects from fishing. • Information on changes in the status of animal populations and communities is provided in a timely fashion such that management decisions can be made, where appropriate, to mitigate the effects of fishing. **80 Scoring Guidepost** • At a minimum, estimates of empirical relationships between fisheries actions and responses of animal populations and communities have been made and provided to management for consideration in reducing the effects of fishing on animal species and communities and for informing research decisions. • Where it seems to be appropriate, management decisions respond to changes in the status of animal populations and communities, on a precautionary basis. **60 Scoring Guidepost** • For species that have been identified as effected by fishing, there is insufficient knowledge to estimate spatial and temporal variations in abundances of animal populations and communities adequate to permit management decisions to be made in response to changes in the status of animal populations and communities. **SCORE: 75** Research on the functional relationships between predators and pollock abundance and/or distribution has largely failed to determine whether or not predator populations are being affected by the pollock fishery. Too little is known to determine whether changes in abundances of predatory fish such as arrowtooth flounder or of potential replacement species for planktivorous (smaller) pollock (e.g. jellyfish) are likely to be due to reductions in pollock biomass consequent on fishing. Also, annual alterations in RPAs related to reducing impacts of the fishery on SSLCH appear to be rather arbitrary and based on inadequate scientific understanding to provide clear justification for actions taken. Nor have these measures been demonstrated to indeed mitigate putative impacts of the fishery on SSL. It is anticipated that this will change at the completion of the PSEIS if the management follows through on the information compiled and the results of the analyses. The score assigned is primarily based on the fact that little is known of the relationships between pollock harvest and arrowtooth flounder and jellyfish population trends, but also on the fact that the RPAs for the GOA fishery have been rather unsuccessful in reducing the very high proportion of pollock harvest taken from within SSLCH (see Figure 2.1(b)), and the fact that the GOA TAC has tended to be set at the highest level permitted by the ABC in recent years when the stock has been decreasing to all time low levels, despite the fact that the impact of a stock so greatly reduced in abundance on the wider ecosystem (and especially on SSL) is largely a matter of speculation. In the latter context we recognize that several risk-aversion measures have been put in place for the 2002 and 2003 ABC setting process that have reduced the ABC for pollock and thus the GOA TACs. According to the 2003 SAFE document for GOA pollock, “The elements of risk-aversion in

	this recommendation relative to using the point estimate of the model and the maximum permissible F-ABC are the following: 1) fixing trawl catch-ability at 1.0, 2) assuming an average 1999 year class instead of the model estimate, 3) not adjusting the 2002 Shelikof Strait survey biomass estimate despite evidence that the fraction of the stock spawning in Shelikof Strait was lower in 2002, 4) applying a more conservative harvest rate than the maximum permissible F-ABC. Collectively these risk-averse elements reduce the recommended ABC to less than 40% of the model point estimate." Therefore it is clear that the ABCs have been set conservatively in response to uncertainties in the GOA stock assessment data (which seem to have increased in recent years with the decline in stock biomass). However, it may be useful to note that where studies have investigated responses of top predators to reductions in their food fish abundance, decreases of 70-80% in food fish stocks (i.e. approximately the situation currently existing with pollock in the GOA), have led to some dramatic reductions in predator densities or breeding performance. However, responses may vary considerably among species as a function of their vulnerability resulting from aspects of the individual species' ecology. For example, black-legged kittiwakes, parasitic jaegers and terns at Shetland, U.K., showed almost total breeding failure in years when sandeel abundance was around 20% of 'normal' (Phillips *et al.*, 1996; Furness and Tasker, 2000) but the breeding of some other seabird species was almost unaffected as they were able to compensate by behavioural means. Similarly, in the case of the decline in abundance of capelin in the Barents Sea in the 1980-90s a population crash affected common murres as a result of winter starvation (Vader *et al.*, 1990; Barrett and Krasnov, 1996) but did not affect some other species. These examples suggest that a 70-80% decline in pollock abundance in the GOA may be expected to affect foraging top predators that are sensitive to food availability. Although the sensitivity of the Steller sea lion to prey field reduction is not known, the fact that SSL has an energetically expensive mode of foraging, and carries little fat reserves, would tend to suggest that sea lions will be more sensitive to reduced prey availability than some other species. **CONDITION:** To improve the deficiencies in performance for this indicator, the fishery must provide the SCS team with information on ecosystem modelling being carried out to investigate whether increases in jellyfish or arrowtooth flounder are likely to be due to reductions in pollock biomass consequent to fishing. Concerns regarding the relationship between the pollock fisheries and SSLs are dealt with under Indicator 2.3.1.
APA Activity	Within six months of the issuance of the GOA pollock certificate APA will meet with the authors of the GOA food-web model and request that a sensitivity analysis be carried out whereby perturbations to the pollock biomass, similar in scale to historic fishery removals, are analyzed with regard to their possible effects on arrowtooth and jellyfish biomass in the GOA. Prior to the first annual audit, APA will provide the certification body with a summary of the analyses conducted *by NMFS. If the certification body determines that the information does not adequately satisfy the condition, APA will within three months of the annual surveillance provide a revised action plan to the certification body outlining how and when the condition will be fully met.*
Conclusion of Surveillance Report 1	Progress to date is considered satisfactory. Modelling aimed at addressing the requirements of this condition is underway and some results are available. Further progress with this Condition will be evaluated at the second surveillance audit, at which time, subject to further progress and ongoing commitments, the Condition may be closed.
APA Progress Report	During the past several years the development of ecosystem mass-balance and simulation models has been a focus of the Resource Ecology and Ecosystem Modeling (REEM) task at the Alaska Fisheries Science Center. Although many of these models were developed in the past for the Alaska region, the National Marine Fisheries Service initiative in Large Marine Ecosystems has resulted in up-to-date, mass-balance, food-web (ECOPATH) models for the eastern Bering Sea, the western Bering Sea, and the adjacent Gulf of Alaska (Aydin et al. 2002). The data foundation for these models is the REEM fish food habits data base, which consists of diet data collected from key groundfish throughout the northeast Pacific. Data

	samples are primarily collected from trawl-caught groundfish by NMFS scientists aboard research surveys. Fishery observers also collect samples from regions and seasons outside of the Alaska survey areas. Fish stomach samples preserved in the field and returned to the lab for analysis account for the majority of the food habits data base. During 2007, a significant update of this initial work was presented at the North Pacific Fishery Management Council September Plan Team meetings (Aydin et al. 2007). The revised analysis is focused on the beginning of fully domestic fishery management in Alaska (1990-1996), and was constructed using improved analytical methods and ECOPATH models. The new analysis improves species and geographic resolution and provides a comparable modeling framework, including fishery definitions and biomass pools, for all three Alaska fishery management regions: the eastern Bering Sea (EBS); the Aleutian Islands (AI); and the Gulf of Alaska (GOA). (The analysis is based on new algorithms termed <u>Ecosense</u> routines. According to the authors, Ecosense is a method for incorporating ECOPATH thermodynamic constraints and model structure into dynamic ecosystem model projections within a Bayesian synthesis framework). Examination of the food webs for the management areas off Alaska showed that all three have the same apex predator — the Pacific halibut longline fishery. Although similar methods were used to construct the food web models, the data clearly define differences in food web structure which may be important for fishery managers to consider. For example, the results show that the EBS ecosystem possess a food web with a much larger benthic component than either the GOA or the AI. Conversely, the AI ecosystem has the strongest pelagic food web component. The GOA ecosystem appears more balanced between benthic and pelagic energy pathways, but is notable in having a smaller fisheries catch relative to the biomass of the other systems, and a large biomass of fish predators above trophic level four, in particular arrowtooth flounder and halibut. The issue that must be addressed to satisfy this condition is whether ecosystem modeling is underway to investigate whether increases in arrowtooth flounder and jellyfish in the GOA are likely due to reductions in pollock biomass consequent to fishing. As such, the interaction implied by this requirement is that the adult pollock biomass may serve as a check on the expansion of the arrowtooth flounder and-or jellyfish populations in the GOA, and due to pollock fishery removals of adult pollock, these populations may have increased more rapidly than for the case where pollock fishing had not occurred. For this to be feasible, adult pollock would need to be significant predators on juvenile or adult arrowtooth flounder or jellyfish, or linked to these species indirectly via competition for a common prey species (i.e., potential would exist for a competitive release of arrowtooth flounder or jellyfish due to reduced adult pollock abundance). With regard to jellyfish in the GOA, Martin (2007) provides an updated analysis of GOA jellyfish abundance as measured by the Alaska Fishery Science Center (AFSC) RACE bottom-trawl surveys 1985-2007. Although the survey gear is designed primarily to assess populations of commercially important fish and invertebrates, many other species are identified, weighed, and counted during the course of the surveys. Based on this data series, abundance of jellyfish has generally been higher in the central and eastern GOA than in the western GOA, and jellyfish abundance was quite low in 2007 compared to previous years. The highest jellyfish abundance seen in this GOA survey was in 1990 in the central GOA. For comparison, Lauth (2007) and Cieciel and Eisner (2007) provide an updated analysis of EBS jellyfish abundance as measured by the RACE bottom-trawl surveys (1982-2007) and by the Bering Aleutian Salmon International Survey (BASIS) surveys (2004-2006). In contrast to the RACE surveys, the BASIS surveys are conducted using a surface trawl which samples the top 18 meters of the water column. All of the survey data series' appear to show that jellyfish abundance is highly variable, possessing in particular transient spikes of very high abundance followed by returns to more commonly measured levels. In both the EBS and GOA, these "outbursts" in jellyfish populations are believed related to environmental forcing early in the growing season or during an earlier life-history stage (i.e., physical oceanographic conditions such as the prevailing winds and currents, and-or the timing of seasonal nutrient upwelling).

However, it nonetheless remains plausible that changes in pollock biomass in the GOA could have played a role in jellyfish abundance, although as described above, the pattern of changes in jellyfish biomass show transient spikes or outbursts that appear to shift much more rapidly than do the pattern of changes in pollock biomass. In addition, the GOA pollock fishery occurs mainly in the western and central areas, and changes in jellyfish abundance in the western GOA have been fluctuating only modestly compared to the central GOA. The best data and models to address this issue are the recently updated, mass-balance, food-web models described above. Key outputs from the earlier models are described in the "Ecosystem Considerations" and "Ecosystem Modeling" sections of the 2007 GOA pollock assessment (Dorn et al. 2007; this material is unchanged from the 2006 assessment).

As for last year, Figure 1.36 shows three scenarios of interest, and in particular, the bottom panel shows a scenario where GOA pollock fishery effort is reduced by ten percent. The results show the twenty species or species-groups with the largest changes in future equilibrium biomass levels. If over time the GOA pollock fishery were to have been responsible for changes in jellyfish via its effects on adult pollock mortality, then it might be expected that the jellyfish species groups would make part of the group of species or species groups most affected by a change in pollock fishing effort. However, this was not the case. Likewise, the top panel shows a scenario where adult pollock survival is reduced by ten percent. As for the bottom panel, jellyfish are not part of the group of species or species groups most affected by a change in adult pollock survival, despite the fact that the model incorporates juvenile and adult pollock diets dominated by copepods and euphausiids, species groups that would be expected to also comprise a large portion of the diet of jellyfish (Dorn et al. 2007, Figure 1.29).

Another way to evaluate the trophic linkages between pollock and jellyfish is illustrated in Figure 1.38. In the lower left panel, ecosystem-model outputs are shown for the twenty species or species groups with the largest effects on arrowtooth flounder. A similar set of results could be produced for the jellyfish species group, and while we indicated we would ask for such an assessment in the 2006 surveillance submission, this task was overlooked. As such, we could ask that it be produced in time for the 2008 surveillance submission. In addition, it may be that the stock assessment author plans to update the "Ecosystem Considerations" and "Ecosystem Modeling" sections of the 2008 assessment using the revised GOA food-web model (Aydin et al. 2007). If this were to be the case, then it is possible that the species estimated to be most affected by decreases in the pollock fishery or the adult pollock biomass would change.

With regard to the potential for GOA pollock fishery indirect effects on the arrowtooth flounder biomass, the interaction mechanisms described above for jellyfish are also certainly plausible for arrowtooth flounder. In fact, during the 2006 Plan Team meetings the possibility of cultivation-depensation effects arising between arrowtooth flounder and pollock in the EBS were discussed (e.g., see Walters and Kitchell 2001). For this particular interaction, the adult pollock biomass is assumed to serve as a check on the expansion of arrowtooth biomass via predation on juvenile arrowtooth. The notion of "cultivation" applies because both adult arrowtooth and adult pollock are known to prey on adult pollock, and so adult pollock may be thought to cultivate (maintain) other pollock prey via a presumed control of a direct competitor for pollock prey (adult arrowtooth biomass) through predation on juvenile arrowtooth.

A key feature in the presumed cultivation interaction between pollock and arrowtooth flounder in the EBS is the highly cannibalistic nature of pollock in the EBS. In the GOA, pollock are less cannibalistic, and so any potential effect on pollock would likely be depensatory in nature. According to the most recent food-web modeling results, in the GOA the vast majority of early 1990s adult pollock predation mortality was caused by three groundfish predators: arrowtooth flounder (32% of total mortality), halibut (22%), and cod (15%; Aydin et al. 2007, Fig. 10b, upper left panel). The pollock trawl fishery causes 8.7% of adult pollock mortality, which is slightly larger in magnitude to that caused by sablefish, Steller sea lions (adults and juveniles combined), and by adult pollock cannibalism. Consumption of pollock by arrowtooth flounder alone as estimated by the food web model ranges from 280 thousand to 400 thousand t annually, plus another 100-400 thousand t of juvenile pollock (Aydin et al. 2007, Fig. 10b, right panels). The majority (47%) of mortality on juvenile pollock is also caused by arrowtooth

	flounder, followed by adult pollock cannibalism (11%; Figure 10b, lower left panel). Seabirds are estimated to cause substantial juvenile pollock mortality (9% by murres, puffins, and kittiwakes combined), as are whales and groundfish. Halibut consume the second highest annual tonnage of pollock. Pollock experience so much predation mortality in the GOA that an "accumulation" term representing a declining biomass pool for the group must be included to account for the estimated consumption by the many pollock predators (Aydin et al. 2007). The GOA food web model shows that the overwhelming majority of explained pollock mortality is from predation by arrowtooth flounder, cod, and halibut rather than pollock cannibalism or fishing. This suggests that for GOA pollock, reducing fishing mortality may have little impact on their population trajectory, contrary to conventional fishing theory. It also suggests that increased fishing mortality might have a greater than expected effect if the population collapses under the combined effects of high predation mortality and increased fishing mortality. A further implication of the GOA food web model is that if pollock-predator populations change substantially, then predation mortality would likely change with them. Overall, the food web modeling indicates where commercially important species might benefit from some coordination of management (Aydin et al. 2007).
Observations	The new models reveal the interactions between a fishery or species group and each of its direct predators and prey, as well as the strengths of the interactions. The model results confirm the trophic level and role of hundreds of species within the continuum of low trophic level prey to apex predator. The models also document sources of mortality, differentiating fishing mortality relative to predation mortality and the remaining mortality not explained by the model, to determine the extent of potential control of species' mortality by fishery managers. Finally, the models allow some assessment of how sensitive each ecosystem is to changes in key species or species groups, and how the AI, EBS, and GOA compare in terms of trophic level biomasses and consumption characteristics.
Conclusion	Progress on this condition has been very satisfactory. The deficiencies in performance for this indicator have been significantly improved, information on ecosystem modelling has been conducted and the results demonstrated. Investigations have been undertaken into whether increases in jellyfish or arrowtooth flounder are likely to be due to reductions in pollock biomass consequent to fishing. For completeness the assessment team would like the output model to include an evaluation of the trophic linkages between GOA species and jellyfish as had been the intention in 2006. This will be reviewed in the 2008 surveillance audit and the condition is expected to be closed within the term of the present MSC certification.

8	**Condition of Certification 8:** The fishery is conducted in a manner, which does not have unacceptable impacts on biological diversity at the genetic, species or population level of endangered, threatened or protected species.
Activity assessed	This Condition principally relates to Indicator 2.1. . **100 Scoring Guidepost** • An ecological risk assessment has been conducted, based on knowledge of functional relationships, to determine the potential impacts of the fishery on the genetic, species and population level biodiversity endangered, threatened or protected species. Fishery management is constrained to minimize impacts on the basis of this risk assessment. Impacts are held below levels that would be unacceptable. **80 Scoring Guidepost** • An assessment has been conducted to estimate the potential impacts of the fishery on the genetic, species and population level biodiversity for endangered, threatened or protected species. Fisheries management has shown itself to be responsive to this risk assessment and attempts to minimize impacts. **60 Scoring Guidepost** • There is inadequate knowledge of endangered, threatened or protected species such that important impacts of the fishery on their biodiversity cannot be identified and it is impossible to adjust management to confidently expect reductions in these impacts. **SCORE 79** According to stakeholder reports submitted to the evaluation team (Bernstein *et al*., 2002), 'bycatch reduction and monitoring programs are effective. But bycatch reporting could be improved'. However, the main reason why the GOA pollock fisheries fell below the 80 guidepost derives from the fact that the impact of the fisheries on protected pollock predators is largely unknown. In the presence of this uncertainty, given the general lack of knowledge as to whether pollock fishing affects populations of pollock predators (especially Steller sea lions, harbor seals) a precautionary approach to fishery management would be expected. There is little evidence of precaution to avoid possible impacts on harbor seals despite some evidence suggesting an impact. RPAs have been rather ineffective in reducing harvest of pollock from SSLCH, and there does not appear to be a systematic approach to understanding or mitigating effects on other protected species such as harbor seals. In the absence of a better understanding about the effects of the fishery on these species, a more precautionary approach to constraining harvest from critical areas for predators would seem warranted. Setting TAC below the ABC is one way to be precautionary, but empirical evidence from these fisheries is that the TAC is only set significantly below the ABC when the stock size is exceptionally large (so that precaution is not a key issue). Another way to be precautionary would be to set ABCs using an approach that better incorporates ecosystem considerations. **CONDITION:** To improve the deficiencies in performance for this indicator, the fishery must: • Adjust management as described in the Conditions under Indicator 1.1. • Improve published reports by management agency on bycatch taken by the pollock fishery by structuring the reports to show data by species, vessel type, location of hauls, time of hauls, relationship to SSLCH, and by quarters, while protecting the rights afforded fishers under the law to protect against the release of certain proprietary information.
APA Activity	*This Indicator and Condition have identical wording to the BS/AI report. The Action Plan response for the GOA has been amended to reflect the differences in the two fisheries. Item #1 of this Condition is discussed in Condition #4 of the Action Plan. Item #2 above contains an apparent contradiction by requesting that NMFS publish information on bycatch in the pollock fishery on a vessel-by-vessel basis while noting that such action would violate confidentiality*

	rights provided to fishers under the Magnuson-Stevens Act. The reports correctly note the de minimis discard levels in the BS/AI and GOA pollock fisheries and note that the agency maintains an excellent pollock catch data programs as part of NMFS' precautionary approach to minimizing the impacts of fishing on the environment. *APA will request that NMFS prepare a report within 12 months that meets the issues raised in provision #2 of Condition #8. APA will provide the report to the certification body. APA will request a meeting with NMFS and the certification body to determine the utility of such report, and if it is found to be useful, determine the feasibility of the agency preparing such a report on an annual basis.*
Conclusion of Surveillance Report 1	Progress on the first part of this condition is reported under comments on Conditions 1 to 4 and so this part of Condition 8 is considered elsewhere, to avoid unnecessary duplication. There is evidence of progress on the bycatch reporting part of this Condition. A web-based system for public access to bycatch data, being developed by Seastate and NMFS, is not yet fully operational. It is understood that a beta-version of the website page and associated software has been sent to industry representatives and Oceana representatives for their preliminary use and evaluation. Following comment from these trial users, public access is to be provided. This system will be reviewed and reported on in the second surveillance report in relation to the requirements of this Condition.
APA Progress Report	During the first half of 2006 the NMFS Alaska Fisheries Science Center (AFSC) began the development of an internet-based interactive fishery data display page intended to allow the public to access and map Alaska groundfish fisheries catch and bycatch data. Final site development was delayed due to an initiative to display the ranges of the bycatch that correspond to the percentile intervals indicated on the maps. This was important because these ranges vary among the gear sectors and the site is designed to display the data as maps specific to a particular gear and target fishery combination. This past winter the site was made operational and is available to the public at: http://www.afsc.noaa.gov/FMA/spatial_data.htm. The site provides access to data on all of the fish and invertebrate species recorded by the observer program by year, by species or species category, and by gear type and target fishery. The site allows the user with to interactively display the data, to download the data selected for display to a client computer, and-or to download a shape file that allows the user to store an image of the displayed data on a client computer. The data is aggregated and displayed over a ten by ten kilometer grid that covers the BSAI and GOA management areas. Since all fishing operations are not observed, neither the maps nor the data can be used to characterize the fisheries completely. Furthermore, estimates of the composition of observed catches or sets are generally determined by expanding sample catch compositions recorded by observers, and so their is potential for inaccuracies for rarely-occurring species, and when sample sizes are relatively small. Cells representing less than three vessels of a particular gear type and calendar year are not shown due to confidentiality rules. The site also provides some analysis of the proportion of data available by target species and gear type, as this can differ by year and gear due to changes in fishing locations that may alter the confidentiality of values assigned to a grid location. For the BSAI pollock fishery in the EBS, 92-95 percent of the hauls are available and these data include 93-95 percent of the catch. For the fishery in the AI, which is more spread out, conducted by fewer vessels, and has generally occurred in different areas in different years, the data available to the user ranges from 0-90 percent of hauls covering 71-90 percent of the catch. For the GOA pollock fishery, with smaller vessels and less observer coverage, the available data covers 57-77 percent of the hauls and 56-80 percent of the catch. Because the Alaska pollock fisheries are the <u>only</u> fisheries that use pelagic trawl gear, selecting pollock and pelagic trawl gear provides a display of pollock target catches for the year selected. Selecting, say, Pacific cod and pelagic trawl gear provides the user with the bycatches of cod in the target pollock fishery. The latitude and longitude of the center of each

	100 square kilometre grid, along with the catch in weight and the catch rate, is provided with the data set, thereby allowing users with knowledge of latitude and longitude coordinates for areas of interest (e.g., the Steller sea lion southeastern Bering Sea foraging area) to determine the quantity of pollock target catch in the area. The catch and bycatch rates are calculated by summing observed quantities from all observed hauls or sets in a given cell and dividing by the sum of the estimated total catches for the same set of observed hauls or sets. For clarity, the site displays this information using a three-category scale defined as follows: 1) information present but rates not calculated because the species group was present in less than 1000 spatial cells for all years and gear types; 2) for all remaining species-gear-year combinations of the data, rates that fall within the top ten percentiles (91-100 percent); and 3) rates that fall within the remaining 90 percentiles. Data in category one are not shown on the maps or included in the data set available for download. Because observers are unable to identify bryozoans and most corals and similar organisms (although they have been trained to identify red tree coral recently), the category "Bryozoans/Corals" provides only an indication that sessile colonial organisms were present in an observed sample. A somewhat related project that benefited from the development of the observer data spatial display page is the bottom-trawl resource-survey display page developed by the AFSC Resource Assessment and Conservation Engineering Division, and available to the public at: http://www.afsc.noaa.gov/RACE/groundfish/survey_data/default.htm. The site provides access to data on all of the fish and invertebrate species recorded by the bottom-trawl survey program by year, by species or species category, and by survey area. The site allows the user with to interactively display the data and to download the data selected for display to a client computer. The data is aggregated and displayed over the bottom-trawl survey locations within the BSAI and GOA management areas. Data available for display and download includes the latitude and longitude of the survey trawl location, the depth, species catches in numbers and weight, and water temperatures at the surface and the seafloor.
Observations	In the latter half of 2006 a web page with interactive fishery data display was made available to the public and provides access to a map of the Alaska groundfish fisheries along with catch and bycatch data. Data is based on observer reports coverage. Observer coverage is achieved on 80-90% of the vessels (> 120 ft vessels have to have observers; catcher processors have 2 observers), 30% of all trips for vessels between 60-100 ft have observers.
Conclusion	Progress on the first part of this condition is reported under comments on Conditions 1 to 4 and so this part of Condition 8 is considered elsewhere, to avoid unnecessary duplication. Compliance with the second part of this condition has been met. Where a Performance Indicator is addressed by multiple conditions, a notional score of 80 will be required and applied to those elements of the Performance Indicator addressed by a condition being closed. The final score for the Performance Indicator will then be determined when the last relevant condition is closed. These Indicators will therefore be subject to total or partial re-scoring following confirmation of the requirements above.

9	**Condition of Certification 9:** The management system keeps impacts of the fishery on protected species within agreed and reasonable bounds, and keeps impacts on threatened or endangered species within the limits set by the Endangered Species Act.
Conclusion of Surveillance Report 1	Conditions 9.1 and 9.2 have been met and are now closed.

10	**Condition of Certification 10:** Assessments are conducted to identify and estimate impacts of the fishery on protected, endangered, threatened or icon species.
Activity assessed	This Condition relates principally to Indicator 2.3.1, but Indicators 2.3.3; 3.2 (in part) and Principle 3 Indicators 1.2 and 4.1.8 also relate The intention of this performance indicator is to evaluate the extent to which the fishery can demonstrate that it does not have unacceptable impacts on protected, endangered, threatened or icon species, and particularly those identified for protection under United States legislation. Elements considered in scoring include: • Information on the direct interactions of the fishery with protected, endangered, threatened or icon species, such as through by-catch, entanglement with lost fishing gear, effects on behaviour, or physical disruption of seabird and sea mammal populations is available, and management strategies have put in place systems to reduce direct impacts to minimum levels. • Information on the indirect interactions of the fishery with protected, endangered, threatened or icon species, such as through alterations to their foraging opportunities, is available, and management strategies have put in place systems to reduce indirect impacts to minimum levels. • Levels of impacts on protected, endangered, threatened or icon species do not have detrimental effects on their populations. **100 Scoring Guidepost** • Direct and indirect impacts of fishing on all protected, endangered, threatened and icon species are measured and are known to be below levels that harm population size (defined as causing a significant decrease in population size or a significant risk of local extinction). **80 Scoring Guidepost** • Direct impacts of fishing on all protected, endangered, threatened and icon species are measured and are known to be below levels that harm population size. • Indirect impacts of fishing (including food competition, changes in foraging behavior, disruption to animals and prey fields) on all protected, endangered, threatened and icon species have been examined and the evidence suggests that these impacts are below levels that harm population size. • Research needed to measure indirect impacts of fishing on all protected, endangered, threatened and icon species is being carried out. **60 Scoring Guidepost** • Knowledge of direct and indirect impacts of the fishery on protected, endangered, threatened and icon species is fragmented, incomplete and inadequate to permit management to develop methods to limit these impacts to within agreed and reasonable bounds. Research being carried out is not adequately focused to provide the missing information. **SCORE: 79** Direct impacts of the fishery are generally well known, monitored, and mostly held at levels that do not harm populations (National Marine Fisheries Service, 2001a). Some concern was expressed by the recent NRC review panel that entanglement might be contributing significantly to the decline of the Steller sea lion, suggesting that further assessment of that hypothesis is required (Committee on the Alaska Groundfish Fishery and Steller sea lions, 2002). Indirect impacts are even more difficult to assess. An experimental approach would be required to test the key hypothesis that Steller sea lion foraging is affected by harvest of

	pollock from SSL critical habitat. Although such an approach has been proposed by NMFS, it has not yet been carried out. In the absence of conclusions from research into the effects of the fishery on prey fields for dependent predators such as Steller sea lion, management cannot take these interactions into account except by precautionary limits to the fishery. **CONDITION:** 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, 2002) 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.

APA Activity	*This Condition is identical for the BS/AI and GOA pollock fisheries; however, the certification body required changes from the version approved for the BS/AI Pollock Action Plan. The Final Reports on BS/AI and GOA Alaska pollock recognize the legal and practical impediments identified by fishery management authorities and scientists to conducting the controlled area experiments proposed by the National Research Council (NRC) in 2002. In addition, NMFS's scientists have provided fishery management authorities with a detailed analysis of the substantial cost of such experiments, the decades-long commitment required for such a program and the likely prospect that the findings would be inconclusive.* *Notwithstanding the issues identified above, APA is aware that AFSC is in its fourth year of research testing the localized depletion hypothesis and will continue with its program if FY 2005 funding is available through Congressional appropriation. (See discussion under Condition #5 above.) NMFS' previous work on possible fishing effects on SSLs has examined fisheries for Alaska pollock, Pacific cod and Atka mackerel. APA will request a meeting with AFSC and the certifier within six months to review research results to date and to discuss ongoing research. APA will consult with the certifier and AFSC prior to the meeting to ensure all issues relevant to both groups are addressed at the meeting. APA and the certifier conducting the post-certification audits have agreed that the members of the original assessment team shall be consulted as well. In addition, APA will propose that the meeting include a thorough discussion on the current state of research on hypotheses relating to possible effects of pollock fishing on foraging sea lions, including agency-sponsored research and research projects conducted under the auspices of the Alaska SeaLife Center, the Pollock Conservation Cooperative Research Center, the North Pacific Research Consortium, and other noted authorities such as the recent work by Dr. Marc Mangel contracted by NMFS through MRAG Americas Inc..* *A review (summary of the meeting result) will be prepared by APA. In specific, the review will contain a thorough analysis of how the current research meets the condition, which is to conduct a direct experiment. APA will prepare and provide this report to the certification body detailing actions and timelines for meeting the objectives of this condition should the results of the meeting between APA, NMFS and the certification body identify continuing research needs to meet the condition.* *Tasks performed under this Condition will be coordinated with the responses to Condition #5, Condition #6 and Condition #7.*
Conclusion of Surveillance Report 1	Progress to date is considered to be satisfactory. As discussed above, relevant experiments have been designed and begun, complemented by modelling studies. Given the timescales over which such work is necessarily undertaken, and the clear commitment of NMFS to carry out such work, future reports will monitor continuing progress in this area, including any opportunities for participation by the membership of the certified fishery and the consideration of work such as that by Professor Mangel and colleagues. The results of ongoing work by NMFS and others will be considered more fully in the second surveillance report, together with the results of the review undertaken by Professor Boyd and the comments provided by Prof Furness.
APA Progress Report	During 2006 the At-Sea Processors Association hired Prof. Ian L. Boyd, Director Sea Mammal Research Unit, Gatty Marine Laboratory, University of St Andrews, United Kingdom, for the purposes of assessing the current state of research on hypotheses relating to the decline of the western stock of SSLs in the context of a potential experiment to test the hypothesis that fishing influences Steller sea lion (SSL) population dynamics (Boyd 2006). In brief, the NRC report Decline of the Steller Sea Lions in Alaskan Waters: Untangling Food Webs and Fishing Nets recommended that such an experiment be designed and carried out. However, the complex scientific and legal issues involved with managing the federal groundfish fisheries off Alaska present real-world constraints and limits on the design and implementation of experiments to assess the impacts of fishing on sea lions. As such, Dr. Boyd was asked to provide an assessment of recent research concerning alternative hypotheses about the cause of the decline of the western stock of SSLs since the NRC report as well as what these new research results may imply for the possible future design of controlled fishing experiments or

	adaptive management schemes intended to provide insights about possible interactions between the Alaska pollock fisheries and the endangered western stock of SSLs. APA, through its member-company activities on the Board of the Pollock Conservation Cooperative Research Center (PCC RC) at the University of Alaska, will submit a number of research proposals under the 2008 research priorities. These will include: a) an assessment of the feasibility of adaptive management experiments to test the efficacy of Steller sea lion mitigation measures, including non-traditional modeling methods such as those described in the Wolf and Mengel paper on this issue (MRAG Americas, Inc., "Understanding the Decline of the Western Steller Sea Lion: Assessing the Evidence Concerning Multiple Hypotheses," NOAA Fisheries, Alaska Fisheries Science Center #AB133F-02-CN-0085, 2005) http://www.soe.ucsc.edu/~msmangel/Steller%20final.pdf b) the development of a cost effective and practicable adaptive management experimental design to test in the field whether competition for fisheries contribute to the possible nutritional stress of Steller sea lions. The field experiment should be designed to provide statistically meaningful results with least disruption to fisheries and coastal communities. It should include a feasibility analysis. The analysis should include cost estimates to implement and monitor, and estimates of costs to fishery participants caused by lost access to fishing grounds. c) convening a panel of experts to review the best available science on killer whale predation of Steller sea lions, discuss predation as a threat to Steller sea lion recovery and recommend appropriate studies to better understand and quantify the impact of killer whale predation on endangered Steller sea lions in the western distinct population segment (WDPS). The PCC research committee will begin to review the proposals submitted in response to this RFP in December, 2007, and funding decisions will be made during January, 2008. By the end of January, 2008, APA will provide the Surveillance Team with an update on the results of the 2008 PCC RC Steller sea lion research initiative, and this update will include our current assessment of the suggestions of Dr. Boyd as well as any associated timelines that reflect expectations concerning PCC RC supported research, or the pursuit of alternative research initiatives that address the suggestions of Dr. Boyd.
Observations	The effect of the pollock fishery on pollock-as-prey for SSL has been a central issue in understanding the cause(s) of the decline of the western stock of SSL and more recently in the continued and accelerated decline of NFS. Controlled experiments can be a powerful approach to measuring the nature of such effects and a number of groups, including the original surveillance team and more recently the National Research Council, have recommended that a large-scale field experiment be conducted to determine the effects of the pollock fishery on SSL demography. As noted during the first surveillance audit, such an experiment has not been conducted. However, there have been small-scale short-term experiments to investigate the effects of fishing on pollock behaviour. These as noted above have yielded inconsistent results, underscoring the difficultly in conducting this kind of research in the open ocean. Professor Boyd parts company with those calling for such an experiment as the way to move forward. He notes a number of difficulties, many of which have been noted in the past, which could severely limit the value of a single large-scale, and multi-year, experiment. Instead, Professor Boyd suggests that there are alternative and less disruptive approaches such as statistical modelling that evaluate the likelihood of alternative hypotheses for the decline using available data from multiple sources. This approach has been applied to SSL data by Wolf and Mangel (2004) and Wolf *et al*. (2006). This multiple hypothesis approach appears to hold great promise and further research incorporating the most recent data may shed further light on the factors influencing the dynamics of SSL and more importantly their relative importance.
Conclusion	Given the difficulty embodied in this Condition, and the differences in scientific opinion as to the value of conducting a large-scale field experiment, the surveillance team feels that progress has been satisfactory. This conclusion is based on the findings of the Boyd report and the promising work involving the simultaneous testing of alternative hypotheses for the decline using multiple sources of data.

	With the aforementioned difficulties, providing an absolute timeline for meeting this Condition presents a challenge. That said, APA continues to progress toward meeting this Condition by facilitating meetings, contributing to detailed discussions and ensuring that research continues in a targeted way.

11	**Condition of Certification 11:** There are sufficient data, and understanding of functional relationships, to determine what changes in fishery management are necessary to recover depleted populations of impacted species.
Activity assessed	This Condition principally relates to Indicator 3.3. **100 Scoring Guidepost** • Alterations to fishing to recover and rebuild depleted species are based on a sound understanding of functional relationships between the impacted population and the fishery. This includes understanding predator-prey dynamics, species interactions, prey abundance/spatial distribution, foraging behaviour, food web requirements and habitat needs. **80 Scoring Guidepost** • Alterations to fishing to recover and rebuild depleted species are based on incomplete data and understanding, but take a precautionary approach to reduce impacts. **60 Scoring Guidepost** • Alterations to fishing to recover and rebuild depleted species are based on incomplete data, and are of largely unknown efficacy. **SCORE: 79** The score is better for fish stocks than it is for marine mammal populations, while less is known about interaction between the fishery and depleted populations of seabirds. Alterations to fishing to recover and rebuild depleted species are based on very incomplete data and understanding. In the GOA it is difficult to make a strong case that management to recover populations of depleted marine mammals has been precautionary, since the quantities of pollock removed from SSLCH have hardly been reduced from their previous high levels despite the series of different restrictions placed on fishing close to SSL rookeries and haul outs in recent years. Bernstein *et al.* (2002) suggest 'Where the knowledge payoff would be great, leading to better conservation and management of the ecosystem, ways should be found to carry out meaningful field experiments using the fishery'. The fact that it is unclear whether the fishery is the cause of declines in SSL populations is not a satisfactory reason for lack of action. The uncertainty over impact should have led to research to identify whether or not the fishery is the cause, and management should have responded in a timely manner and to introduce precautionary management until the cause-effect relationship had been resolved. According to APA (APA 2002; p106) 'As the hypothesized interactions between the Alaska groundfish fisheries and the vulnerable pinnipeds involve indirect ecosystem effects that are thought manifest via a localized depletion of prey resources, and thus intense competition for these resources, an appropriate research and monitoring program would be one that investigates and monitors the effect of the groundfish fisheries on the SSL prey field'. It is surprising that this research, identified as key to understanding by APA, has only just begun to be tackled and that no clear information on this question can yet be reported. Furthermore, this is but one specific hypothesis relating to effects of the fishery on SSL prey fields; given the satellite tracking data indicating that SSLs may range over very large areas in search of food (National Marine Fisheries Service, 2001d), there are equally important questions yet to be tackled concerning how SSLs respond to reductions in pollock stock biomass, both at a local 'prey-field' scale and at a larger ecosystem scale. This is especially important given the current situation in the GOA where pollock biomass has declined to only about 29% of predicted unfished biomass. For the relationships between the pollock fishery and depleted populations of harbor seals, kittiwakes and murres, very little is known, and so it is difficult to prescribe management of

	the pollock fishery that should help to recover these populations. There is, therefore, a need for research to determine what pollock biomass or density is required by populations of these species in order to permit them to forage at rates that support healthy populations and reproduction. **CONDITION:** To improve the deficiencies in performance for this indicator, it is important that the fishery be able to determine the effects of pollock fishing on other species in the area other than Steller Sea Lions. Specifically, SCS is requiring that the fishery also collect data on harbor seals, kittiwakes and murres, when conducting the work required under Condition 2.3.1.
Conclusion of Surveillance Report 1	Relevant experiments have been designed and begun, but research should more clearly seek to identify the linkages between the dynamics of these species and the pollock fishery. This may build on successful experience with current studies on Steller sea lion. As for Condition 10, given the timescales over which such work is necessarily undertaken, and the clear commitment of NMFS to carry out such work, future reports will monitor continuing progress in this area, including any opportunities for participation by the certified fishery. Progress on this condition is satisfactory.
APA Progress Report	The US Fish and Wildlife Service (FWS) compiles data collected annually for selected species of marine birds at breeding colonies on the far-flung Alaska Maritime National Wildlife Refuge and at other areas in Alaska to monitor the condition of the marine ecosystem and to evaluate the conservation status of species under the trust of the FWS. This progress report updates that for 2006 by reviewing information on breeding status, population trends and diets of kittiwakes and murres in Alaska from 2003. The strategy for colony monitoring includes estimating timing of nesting events, rates of reproductive success (productivity, e.g., chicks fledged per nest), population trends and diet composition of representative species of various foraging guilds (e.g., offshore diving fish-feeders, offshore surface-feeding fish-feeders, diving plankton-feeders) at geographically-dispersed breeding sites. Kittiwakes and murres are categorized as surface fish feeders (Dragoo *et al*. 2006). For the Gulf of Alaska (GOA), black-legged kittiwake colonies within Price William Sound and on Middleton Island are the largest and the colony within Chiniak Bay on Kodiak Island is the closest to fishing activities (red-legged kittiwakes are not present in the GOA in large numbers). For these sites, productivity in 2003 was average or above, although productivity at Middleton Island has been very low for 20 years and the colony has declined at about 7.5 percent per year for nearly 20 consecutive years. No information could be found concerning the likely cause of the decline in numbers of black-legged kittiwakes at Middleton Island. Being surface fish feeders, most kittiwake prey are included under the management category forage fish. Abundance trends for these species based on GOA survey catches are shown in Boldt (2006, pp. 173-4). Common and thick-billed murre colonies proximate to pollock fishing locations in the GOA include those within Puale Bay and on Chowiet Island. Productivity of both common and thick-billed murres was average or above at these locations in 2003, and estimated numbers for these species together have been stable at Chowiet Island 1975-2002 and within Puale Bay 1990-2002.
Observations	Several government agencies and independent researchers from a number of institutions are conducting targeted research and monitoring the abundance and reproductive success of seabirds, fur seals and harbour seals throughout the BS/AI. Collectively this research and monitoring are improving our understanding of biology of dependent species as inputs to models which explore the functional relationships and sensitivities of species to changes in the pollock fishery and pollock abundance. NMFS is continuing to develop more sensitive tools for exploring potential effects of changes in pollock abundance on the dynamics of dependent species of seabirds and pinnipeds. These tools include the development of minimum realistic models of key interacting species. There is also continued effort to turn ecosystem considerations into predictive tools and meaningful thresholds for action (i.e., ecosystem indicators) in relation to effects of the pollock fishery on dependent species.

Conclusion	The surveillance team is satisfied with the level of commitment and ‘active management’ to better understand the effects of the pollock fishery and pollock abundance on dependent species other than SSL. This is not an easy task and thus we expect that progress in the area (as with Condition 10) will be slow and incremental.

12	**Condition of Certification 12:** The fishery is managed and conducted in a manner that respects domestic law *[Relates to MSC Criterion 3.16]*
Conclusion of Surveillance Report 1	The requirements of this condition have been met and this Condition is closed. Ongoing legal compliance of the certified fishery will be monitored under general Sections of future surveillance reports.

<table>
<tr><td>13</td><td>Condition of Certification 13: The management system solicits and takes account of relevant information [Relates to MSC Criterion 3.2]</td></tr>
<tr><td>Activity assessed</td><td>Indicator 3.1.
Elements considered in scoring include:
Solicitation and treatment of scientific information from NMFS, NPFMC and other sources
Solicitation and treatment of information from stakeholders
Accommodation of dissent and respect for differing perspectives
Training at all appropriate levels with respect to management principles and criteria
100 Scoring Guidepost
The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information
The management system seeks affirmatively to acquire information that may be controversial or reveal weaknesses in the management system, including matters related to compliance with applicable international and domestic law
The management system evaluates information in an unbiased, objective manner and does not discriminate against information solely upon the basis of the identity of stakeholder category from which it was supplied
80 Scoring Guidepost
The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information
The management system accepts information that may be controversial or reveal weaknesses in the management system
The management system shows evidence of listening and responding to diverse points of view
60 Scoring Guidepost
The management system presents significant overt or implicit resistance to introduction or consideration of new information that is potentially relevant to the management of the fishery
SCORE 78

The applicant advised the evaluation team that, overall, the U.S. fisheries management system is open, transparent and is structured to encourage participation by all interested and affected parties.[1] In their view, management of the North Pacific groundfish fisheries recognizes the importance of considering a range of views and takes all appropriate steps to foster discourse among scientists, managers and stakeholders.

The applicant noted that all relevant regional offices and divisions of NMFS' Alaska Fisheries Science Center (AFSC) work with state fisheries management agencies, university scientists and stakeholders in presenting scientific information for peer review and public comment. The Plan Team process which reviews information relating to survey research, fishery dependent research and stock modelling is an open, public process.[2] The Plan Team, which includes scientists from a wide range of disciplines, includes NMFS scientists, Council staff, and state and university scientists. The public is advised of Plan Team meetings and public comment is encouraged at these meetings.</td></tr>
</table>

[1] APA at 16-18.

[2] http://www.fakr.noaa.gov/npfmc/Plan%20Teams/Groundfish/Planteam.htm

	The Council's SSC, which also includes individuals who represent a broad range of scientific expertise, is comprised of state, federal and university scientists.[3] The SSC comments to the North Pacific Council on all scientific matters on the Council's agenda. The SSC meetings are open to the public and public testimony is heard on all action items. To promote broad stakeholder involvement and facilitate constituent access, the Council meets at various locations in Alaska (including Anchorage, Kodiak, Dutch Harbor and Sitka) as well as in Portland and Seattle. Section 302(i) (2) (C) of the Magnuson-Stevens Act requires regional management councils to provide timely public notice of upcoming meetings, including providing a published agenda for the meeting.[4] The North Pacific Council considers public comment on all action items, including the development of management alternatives. Section 302(e)(5) of the Magnuson-Stevens Act states that if any voting member of the Council requests a roll call vote on any matter before the Council, then a roll call vote shall be held. Section 302(e) (4) of the Act permits any voting Council member who disagrees with a Council position to submit a statement to the Secretary setting forth the reasons for such disagreement. With respect to training, NMFS conducts workshops for all new North Pacific Council members to ensure full understanding of Magnuson-Stevens Act requirements as well as the Administrative Procedure Act and other relevant federal laws and regulations. Recently, the agency sponsored a NEPA training session attended by stakeholders, Council members, AP members and others. It is the industry's view that NMFS and the North Pacific Council, including its advisory bodies, treat all stakeholders fairly and equitably. The conservation stakeholders (Marz and Stump, 2002) contend that the North Pacific Council and NMFS solicit information from the public, but appear not to consider meaningfully information that is unfavourable to the fishing industry or the Council's reputation as "best managers." In the conservation stakeholders' terms: "The Council and NMFS have operated under crisis management, making changes in response to litigation, rather than to consider seriously comments made by conservation stakeholders and avoid litigation." The groups point to the manner in which the management system responded to information regarding the impacts of concentrated catch in Steller sea lion critical habitat, recommendations to set minimum stock size thresholds (MSSTs), differential gear impacts on Steller sea lions due to differing rates and volumes of biomass removal as well as on habitat, and establishment of EFH. In the view of the conservation stakeholders (Marz and Stump, 2002), "there are no procedures in the existing management processes to address the effects of fishing on protected species, habitat and their prey. This is a critical gap which must be formally addressed to ensure that deleterious impacts from fishing do not occur." The conservation stakeholders also note that the North Pacific Council and its Plan teams fail to incorporate information from the Ecosystem Considerations chapter of the SAFE report into stock assessments and management processes. The groups note, too, that there have been numerous peer reviews regarding the biological opinions and the RPAs drafted by NMFS to avoid jeopardy to Steller sea lions and, in their view, "it appears that the Council continues to seek out new peer reviews to support the Council's position." In the view of the evaluation team, there is no doubt that the management system solicits, develops and considers very large amounts of ever-changing information with regard to the pollock fisheries. In many important respects, the fishery management process is well informed. As noted previously, the evaluation team was impressed by the scope and depth of analysis applied to stock assessment and certain socioeconomic matters. The PSEIS now under preparation may come to represent an exhaustive effort to acquire and evaluate an extremely broad collection of information relevant to improved management of the fishery.

[3] http://www.fakr.noaa.gov/npfmc/SSCLIST.HTM

[4] http://www.fakr.noaa.gov/npfmc/Schedule.htm

	The NPFMC's decision to engage a panel of experts to evaluate the Tier system is an important, positive factor in the scoring of this indicator. However, the indicator score is reflective of the fact that, in reviewing the decision-making practices of the management system, the evaluation team discerned recurrent instances of resistance at all levels of the management system to information, advice, and opinions provided from outside the scientific and management community, especially if these embraced constraints on harvest levels. It would not serve a constructive purpose to delve into specific examples, but it should be noted that in many interviews we conducted, NMFS officials expressed palpable disdain for the views of stakeholders. We might not have viewed this attitude as a concern were it not for the fact that the same officials had turned aside advice or information from the same stakeholders that was subsequently vindicated (and imposed on the management system) by judicial opinion. The evaluation team is troubled by evidence of instances where the management system does not resolve matters of scientific uncertainty in favour of protected or endangered species, in contradiction to the purpose of the relevant legislation and a considerable body of directly relevant jurisprudence. The team was surprised and troubled to find through our interviews that many influential participants in the management system were fully aware that populations of certain animals potentially affected by the fishery are declining sharply, but expected that the management system would take no action to conserve the animals until their populations drop far enough to fall within the scope of the Endangered Species Act. The infirmities of the NMFS-Council process observed by the assessment team may be problematic and troubling, but as a matter of perspective, it is important to bear in mind they are also characteristic of agency behaviour and may be inherent but not beyond remedy in the dynamics of decision-making by any group of human beings. The leading legal scholar (Seidenfeld, 2002) has described the characteristic pathologies of decision-making by federal agencies: Decision-makers have a tendency to confirm an initial hypothesis in the face of later-acquired disconfirming evidence, even though the hypothesis may not have been based on substantial or reliable evidence. This bias manifests itself in the decision-maker being prone to search for information that confirms the hypothesis, as well as to interpret information that he has as confirming the hypothesis….The confirmation bias can cause a decision-maker to be overconfident about his predictions. **** Scholarship on group decision-making indicates that groups virtually never approach the accuracy of the best choice of their individual members for each problem posed. One legal scholar's recent review of the literature comparing group and individual accuracy identifies several studies in which groups outperformed their single best member. Such performance, however, could result simply from the averaging function of group decision-making; it does not indicate that those groups have effectively pooled the knowledge and skills of their members. In addition, there is a rich literature demonstrating that small groups tend to pay less attention to information known only to a few members, and focus instead on information that is known to all members prior to group discussion. **** When decisions that a group is asked to make become not only non-verifiable by other group members, but predictive or normative in nature, group dynamics can actually reduce the quality of decision-making. One phenomenon of group decision-making is group polarization - the "process whereby group discussion tends to intensify group opinion, producing more extreme judgments among group members than existed before discussion." When the outcome of a decision can be placed on a normative scale, such as being risky rather than safe, liberal rather than conservative, or certain rather than uncertain, then the dynamics of group decision-making can actually increase the tendency of the group to choose an outcome that is on one end of the scale rather than in the middle.

	**** [W]hen group members share an individual bias, polarization can cause the group decision to magnify the impact of that bias. The egocentrism bias is one that frequently might be magnified by polarization. By way of illustration, suppose a group composed of professionals from a single discipline and office within an agency. Group members are likely to share a professional or office norm that may lead them all to advance one value over alternatives, and they are all unlikely to consider sufficiently how others who do not share that norm would assess the available choices. In that case, having these individuals make the choice as a group is likely to lead to polarization and hence to an outcome that is even farther from what others outside their profession or office might choose. **** Like individuals, groups also tend to search unduly for information and pay too much attention to arguments that confirm initial hypotheses. If most of the members of a group share an initial view of the best decision, the group will seek predominantly information that supports that view. This is true even for groups of experts. Moreover, it is not simply a result of aggregating individual biases; the members' interaction increases the propensity of the group to prefer information supporting initially preferred decisions over and above the level that would occur if one simply pooled the individual requests for information. The phenomenon of biased information search decreases as the heterogeneity of members' opinions regarding the initial hypothesis increases…. Initial heterogeneity, however, did not curb the bias if the group had discussed the problem and reached some consensus on a preferred solution prior to seeking additional information. Even when some group members may be aware of information that undermines a group's initially preferred decision, the group may fail to consider the information to the same extent as it would consider confirming information. In other words, whether information is consistent with a group's preferred alternative affects the propensity of the group to discuss the information as well as its search for additional information. At the individual level, information consistent with the consensus group preference tends to be more salient and hence more easily recalled. In addition, there is often a group norm that expects group members actively to advocate their preferred outcome during debate. At the same time, groups try to simplify their decision-making tasks much as individuals do. Therefore, they try to narrow consideration early in the discussion to a few viable alternatives. As a result, groups tend to discuss information consistent with the position preferred by a majority of members, and to ignore information supportive of positions preferred by a minority of members. Even if a group has no initial majority position, a significant plurality preference can bias information discussion in favour of that preferred outcome and can repress discussion of minority positions. When only a plurality of the group favours a particular outcome, however, debate of alternatives preferred by minorities is not shut down, but tends to be limited to only one minority-preferred outcome. In sum, group dynamics tend to focus both search and discussion toward information that supports the initially preferred outcome of a majority of group members. This phenomenon creates a group analogue to the individual decision-maker confirmation bias to which agency staff groups could be subject. **** In addition to interactions that might increase individual decision-making biases, group decision-making exhibits its own set of pathologies that could affect agency rulemaking. As already mentioned, groups tend to be imperfect at pooling the totality of information available to their members. A key to understanding group consideration of information is the concept of "shared information." Information is "shared" when it is known to all members of the group prior to deliberation; it is "unshared" when only one member prior to deliberation knows it. One of the major impediments to optimal decision-making by groups is their tendency to focus on shared rather than unshared information. This is a particular concern when unshared or partially shared information not only counsels a different choice than that supported by shared information, but actually reveals that the choice favoured by the unshared information is the superior one.

	In many instances the problem is not merely that the group chooses to underutilize unshared information which is raised in discussion, but rather that the member who is privy to unshared information simply fails to mention the information in group discussion. This may be a statistical artefact of the group process - because unshared or partially shared information by definition is known to fewer group members, the chance of some member raising it is less than the chance that some member will raise information known to everyone. But there appear to be mechanisms other than mere statistical probability at work in suppressing unshared information. Even after a group member introduces unshared information into the group discussion, groups spend less time considering that information than they do shared information, and unshared information influences their decisions less than shared information does. In addition, the likelihood of a group hearing unshared information and relying on it depends on the status of the member who has the information. If the member is perceived by the group to be particularly competent at the task that the group is discussing, she is more likely to speak and to use unshared information to persuade the group to follow her preferred choice. Group leaders would thus be more apt to mention and prompt the group to rely on unshared information than would low-status members Seidenfeld, 2002). The assessment team directly observed each of these phenomena at some point in our review of the NMFS-Council process, and we present them here at length in the hope that participants in the management system might also recognize them. Again, it would serve no constructive purpose to give specifics regarding the individuals and entities at issue here. Every part of the NMFS -Council structure gave the assessment team the impression of being heavily burdened by at least some of these types of problems. There are inherent frailties in the way scientific committees, regional councils, and federal agencies behave because, simply, humans are involved. But the severity and influence of the frailties can be mitigated if the various entities take stock periodically of their performance, call on objective observers for criticism and advice, and make good faith efforts to improve those things that are within the capacity of humans to modify. **CONDITION:** To improve the deficiencies in performance for this indicator, the fishery must take affirmative steps to ensure that information and opinions submitted by stakeholders who do not represent the interests of the commercial fishing industry are given fair, professional, and transparent evaluation at all levels of the management system. The assessment team requires that the management system, ideally NMFS or the Council, commission, publish, and openly review an independent evaluation of the manner in which non-industry stakeholder information and opinions have been addressed in a representative set of circumstances identified by stakeholder interests. The evaluation should identify opportunities for procedural and substantive improvements, including measures to provide greater transparency and accountability to the process. The assessment team believes that the North Pacific Council and NMFS both would benefit from a candid evaluation of the quality and character of the procedures and practices by which the various layers of the management system invite and accommodate information that challenges the status quo. The management system should consider this type of inquiry to be fundamental to achieving continual improvement in the quality of its management practices and, thus, its service to the public. Though not a requirement, the assessment team recommends that the independent review consider the recommendations for improvement in Council processes proposed by the Heinz Center in 2002, the Pew Oceans Commission in 2003, and the U.S. Commission on Ocean Policy in 2004. The evaluation required by this condition must be performed and published not later than 18 months following finalization of this assessment report. The North Pacific Council must consider and discuss in a regularly-scheduled public meeting the evaluation report, including all recommendations, not later than 6 months following publication of the report. The Council's actions, if any, in response to the report will weigh heavily in future reviews of the fishery management system and may significantly affect the score for this indicator.

Conclusion of Surveillance Report 1	Satisfactory progress is being made against this condition. MSFCMA reauthorisation is in process for 2006 and the audit team will revisit this condition at the second annual surveillance audit to review the further effects of reauthorisation.
APA Progress Report	APA indicated in its Action Plan and in its submission for the first annual audit that there were few, if any, conditions more vexatious than the condition attached to Principle 3, Indicator 3.1—the management system solicits and takes account of relevant information. The original assessment team criticized the management system in the following terms. *"(T)he assessment team discerned recurrent instances of resistance at all levels of the management system to information, advice and opinions provided from outside the scientific and management community, especially if these embraced constraints on harvest levels. It would not serve a constructive purpose to delve into specific examples, but it should be noted that in many interviews we conducted, NMFS officials expressed palpable disdain for the views of stakeholders."* The original assessment team's views are at odds with the experiences of those who work day-to-day with fisheries managers and scientists in the National Marine Fisheries Service's Alaska region and with the North Pacific Council's members, staff and advisory bodies. On the contrary, the commonly held view is that the management authority is unfailingly professional, open and tolerant in its solicitation and treatment of information from all stakeholders. The original assessment team's harsh characterization of the management authority resulted in the MSC's leadership seeking a meeting with NMFS officials in Washington, D.C. to express its regret over actions of the original assessment team, including its criticisms of the agency staff that was so generous in its time and effort during the Alaska pollock assessment. As APA reported in its submission for the first annual audit, this episode led the MSC to reform its condition setting policies and procedures. APA also provided in its 2006 audit submission a telling example of how the fishery deserved a score well above "80" on this indicator. In an example not without irony, APA reported that three days before the BS/AI Alaska pollock fishery received its certificate, the environmental NGO Oceana, which was founded as the litigation arm of the Pew Trusts' marine program, issued a media release hailing the North Pacific Council's decision to close 370,000 square miles of ocean to bottom trawling. The release read in part, *"In an historic move for our nation's fisheries, the North Pacific Fishery Management Council today unanimously adopted Oceana's approach to protect nearly one million square kilometres of seafloor."* NMFS promulgated the rule making in short order, and the closure is in effect. In short, the management authority that the original assessment team contended, "expressed palpable disdain for the views of stakeholders" was warmly and publicly thanked for unanimously adopting "Oceana's approach" on a landmark habitat conservation measure. We ask the current assessment team, which has considerably more experience over the years with North Pacific fishery managers than the original assessment team, to re-evaluate the scoring for this indicator based upon your historical involvement in fisheries management in this region, including your experiences consulting with the management authority during the first and second annual audit process. The assessment team will notice when re-visiting this issue that the condition and APA's Action Plan response bear little, if any, relationship to one another. The condition requires the management authority to "commission, publish and openly review an independent evaluation of the manner in which non-industry stakeholder information and opinions have been addressed in a representative set of circumstances identified by stakeholder interests." In this instance as well as others, the original assessment team did not consult with the management authority or the client before developing the condition. This unfortunate and unwise approach, which occurred numerous times in the Alaska pollock certification, led directly to reform of the MSC program. The certification methodology was revised to require that *"(T)he certification body shall consult with all relevant entities (defined as all fisheries management authorities or regulating bodies) when setting conditions, if those conditions are likely to require investment of time or money by these entities…"*

The condition language is also prescriptive and provides no latitude for the client to develop an Action Plan item in a manner sufficient to raise the score for the relevant performance indicator to 80 or above. Again, the flawed approach of the original assessment team prompted the MSC to reform its condition setting procedures and policies. The Technical Advisory Board (TAB) issued directive D-014 in July 2006 stating that, "*Certification bodies must not be prescriptive about the means of meeting conditions, although they may offer recommendations or suggested solutions. The fishery client may develop their own corrective actions and deal with a condition in their own way.*"

Given the clear evidence that the development of the original Alaska pollock conditions was flawed, we urge the assessment team and certification body to review this matter consistent with the current MSC methodology and policy guidance.

The controlling circumstance is that APA's approved Action Plan makes no commitment to meet the condition language. What APA did commit to do was to report back to the certification body on Congressional reauthorisation of the nation's principal fisheries law, the Magnuson-Stevens Act. Specifically, APA would report on any action by Congress relating to the structure and authority of regional fishery management, specifically any changes to the law relating to stakeholder participation in the management process. We are fulfilling that commitment with the following report.

Reauthorisation of the Magnuson-Stevens Act

In January 2007, President Bush signed into law a major re-write of the Magnuson-Stevens Act. This comprehensive 240-page measure was the culmination of six years work, and the environmental community as well as commercial and sport fishing interests supported final passage.

Members of the environmental community, media editorials and other advocates of the bill all urged passage of the bill to standardize U.S. fishery management practices to replicate the successful "Alaska model" for management practices across the nation. Specifically, the Act, as amended, requires all regions to mirror the following North Pacific Council standard operating practices.

- Requires that every fishery management plan contain an annual catch limit that prevents overfishing in the fishery.
- Directs the Councils to set annual catch limits that are not to exceed the recommendations of the Scientific and Statistical Committees (SSCs).
- Specifies that the role of the SSCs is to provide Councils with ongoing scientific advice needed for management decisions, including acceptable biological catch or optimum yield and annual catch limits.

Importantly, Congress did not amend section 302(b) of the Magnuson-Stevens Act regarding qualifications of council members to require or encourage more non-commercial or recreational fishing participation on the councils. Nor did Congress amend section 302(i)(6) of the Act pertaining to opportunities for the public to provide new information to regional councils.

Congress did create a new subsection 302(k) that, among other things, mandates council member training, including training on public process for development of fishery management plans. At no point in the debate, however, was a case made that environmental stakeholders' views in the North Pacific were not being given appropriate consideration. On the contrary, fishery management in the North Pacific region was cited time after time for its progressive actions. Openness to stakeholders' views and stakeholder involvement in the process have certainly been key factors in continued improvements in fishery management, including developing new habitat protection measures and emphasis on ecosystem-based management considerations, and Congress appears to recognize that fact.

APA urges that the assessment team close out this condition by agreeing that the management

<table>
<tr><td></td><td>system meets both the 80 and 100 scoring guidelines for Principle 3, Indicator 3.1. We ask the team to rely on its experience with the North Pacific management authority in determining whether the management system meets the following scoring guidelines.

• The management system is stable, well-led, predictable, open and tolerant.
• The management system does seek to acquire information that may be controversial or reveal weaknesses in the management system.
• The management system evaluates information in an unbiased, objective manner and does not discriminate against information solely upon the basis of the identity of the stakeholder category from which it was supplied.

In reaching your decision, we ask that you also consider the following:

• The process by which the original assessment team set the condition was substantially flawed. The original condition falls far short of the current MSC guidelines for setting conditions.
• The original certification body approved APA's Action Plan, recognizing that the client made no commitment to pursue the prescriptive action set forth by the assessment team.
• APA has provided herein the required report on Congressional action on Magnuson-Stevens reauthorisation as it relates to the role of stakeholders in the public process under the Act, thereby fulfilling our obligation.</td></tr>
<tr><td>Observations</td><td>This condition requires an independent evaluation of the manner in which stakeholder information and opinions have been addressed in a representative set of circumstances identified by stakeholder interests. It also requires an identification of opportunities for procedural and substantive improvements, including measures to improve transparency and accountability of the process. As planned at the 2006 audit, the audit team revisited BSAI Condition 14 during its 2007 meeting.

In the Action Plan the APA proposed that work on this Condition be undertaken after the MSFCMA was reauthorised. Reauthorisation took place in December2006. APA indicated that it would consult with the certifier at the 2007 audit to develop a work plan to address any remaining concerns regarding public participation in the council process. APA committed to report back to the audit team on Congressional reauthorisation of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA); in particular, any action by Congress relating to the structure and authority of regional fishery management, or any changes to the law relating to stakeholder participation in the management process. APA fulfilled that commitment through a report that summarizes reauthorisation changes that relate to this subject. In summary, Section 302(b) regarding qualifications of council members was not amended, nor was Section 302(i)(6) regarding opportunities for the public to provide new information to regional councils. A new subsection 302(k) mandates council member training, including training on public process for development of fishery management plans.

Principle 3 concerns whether the management system solicits and takes into account relevant information. The original assessment team concluded that there were problems in the way stakeholder information and opinions were addressed within the management system, and that there needed to be procedural and substantive improvements to improve transparency and accountability.

The assessment team reached its conclusions on the basis of stakeholder consultations. It gave no specific examples of what it characterized as resistance at all levels to information, advice and opinions provided from outside the scientific and management community, especially if it involved harvest constraints. It also characterized NMFS officials as expressing palpable disdain for the views of stakeholders.

Since the assessment team provided no specific examples that led to their conclusions, the audit team looked at empirical evidence of processes enabling stakeholder input to management as well as actual stakeholder input. It also looked for evidence of resistance or disdain among agency personnel to stakeholder input or to information that would lead to</td></tr>
</table>

	increased harvest constraints. Empirical information on stakeholder processes was examined and enumerated by the team for the 2006 audit. The main conclusions of the 2006 audit were the following. Opportunities for stakeholder input were extensive and exhaustive. The North Pacific Fishery Management Council, and the regional fishery management council system in general, provide a number of opportunities for stakeholder input into management required by federal statute and implemented through council standard operating procedures. Discussions with NMFS and university scientists and APA personnel, combined with descriptions of NPFMC identified several elements of NPFMC procedures enable provision of information and public comment to management. Thirteen examples of public input procedures and processes were listed in the audit report. In addition, the team noted changes to the BS/AI and GOA FMPs to align requirements of the AFA and MSFCMA and to expand opportunities for public comment. These changes were implemented in November 2004, after the original assessment was completed. We found no evidence of agency scientists or management personnel expressing disdain for stakeholder views. Information provided during the 2007 audit further strengthened the findings of the 2006 audit. We conclude that the original scoring of this condition was flawed in being based on assertion without empirical foundation. It failed to document specific instances where relevant information was ignored and did not address the role of opinion in the provision of management information and how it should be addressed in the review process in light of the requirement to use the best available science as a basis for decision-making. We also find that the condition based on this scoring - requiring the management authority (NMFS) to commission an independent evaluation of the way in which non-industry stakeholder opinions have been addressed - is misdirected and taken without appropriate consultation with the agency. The fishery was scored 78 on Indicator 3.1. On the basis of information reviewed in 2006, interviews with scientific and management personnel in 2006 and 2007, and information received on the reauthorisation of the MSFCMA in 2007, the audit team concludes that the scoring guideposts for 80 were exceeded and the scoring guideposts for 100 were met. The key difference between the 80 and 100 scoring guideposts is whether the management system “seeks affirmatively to acquire information that may be controversial or reveal weaknesses in the management system.” Research on marine mammal ecology, habitat conservation trawl area closures, and quota reductions all initiated by the management system, provide affirmative evidence that this is the case. We therefore re-score the fishery 100 on Indicator 3.1. For reference: assessment-scoring guideposts. **100 Scoring Guidepost** • The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information • The management system seeks affirmatively to acquire information that may be controversial or reveal weaknesses in the management system, including matters related to compliance with applicable international and domestic law • The management system evaluates information in an unbiased, objective manner and does not discriminate against information solely upon the basis of the identity of stakeholder category from which it was supplied **80 Scoring Guidepost** • The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information • The management system accepts information that may be controversial or reveal weaknesses in the management system • The management system shows evidence of listening and responding to diverse points of

	view
Conclusion	On the basis of the above commentary the score associated with the relevant Performance Indicator 3.1 is adjusted as follows: 80 Scoring Guidepost • The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information • The management system accepts information that may be controversial or reveal weaknesses in the management system • The management system shows evidence of listening and responding to diverse points of view 100 Scoring Guidepost • The management system has a stable, well-led, predictable, open and tolerant process to solicit relevant information • The management system seeks affirmatively to acquire information that may be controversial or reveal weaknesses in the management system, including matters related to compliance with applicable international and domestic law • The management system evaluates information in an unbiased, objective manner and does not discriminate against information solely upon the basis of the identity of stakeholder category from which it was supplied The key difference between the 80 and 100 scoring guideposts is whether the management system "seeks affirmatively to acquire information that may be controversial or reveal weaknesses in the management system." Research on marine mammal ecology, habitat conservation trawl area closures, and quota reductions all initiated by the management system, provide affirmative evidence that this is the case. The audit team concludes that the scoring guideposts for 80 were exceeded and the scoring guideposts for 100 were met. The score allocated to this Performance Indicator is now raised to 100. This condition has now been closed and the outcomes of ongoing associated work will be reviewed as a function of annual surveillance audits.

14	**Condition of Certification 14:** The management system provides for internal assessment and review *[Relates to MSC Criterion 3.3]*
Conclusion of Surveillance Report 1	An extensive scientific review process is in place, conducted through both internal and external means. The existing review process constitutes the “periodic, candid and authoritative internal review process for pollock fishery management procedures and outcomes” required by the condition. The requirement of this condition has been met and the Condition closed.

15	**Any complaints against the certified operation; recorded, reviewed and actioned**
	The certified operation considered here is the following signatories to the APA MSC certification programme: Alyeska/Wards Cove Seafoods Trident Seafoods Corp. Westward Seafoods Icicle Seafoods Peter Pan Seafoods North Pacific Seafoods Ocean Beauty Seafoods There were no reported incidents of any complaints against the APA member companies or the above non-APA Alaska pollock producers relating to the scope of MSC certification. ‘Complaints’ against the management bodies have been considered here under Condition 13, but will be considered in this section in future surveillance reports.

16	Any relevant changes to legislation or management regime.
Activity assessed	In January 2007 the Magnuson-Stevens Act was revised. Of particular note: the Act, as amended, requires all regions to mirror the following North Pacific Council standard operating practices. • Requires that every fishery management plan contain an annual catch limit that prevents overfishing in the fishery. • Directs the Councils to set annual catch limits that are not to exceed the recommendations of the Scientific and Statistical Committees (SSCs). • Specifies that the role of the SSCs is to provide Councils with ongoing scientific advice needed for management decisions, including acceptable biological catch or optimum yield and annual catch limits. Also, a new subsection [302(k)] mandates council member training, including training on public process for development of fishery management plans.

17	Overall Conclusions
	The overall management of the fishery continues to at least the level as during the main assessment, and in many areas to a higher level. APA and/or NMFS have taken appropriate measures to address the conditions of certification raised during the MSC certification assessment. This can be summarised as follows: 1. Conditions where requirements are deemed to have been fully met and the condition closed: • Conditions 9, 12, 13, 14 2. Conditions where specific requirements are deemed to have been fully met and which will be considered in future surveillance reports, as required, as part of overall fishery management: • Conditions 1, 2, 3, 4, 5, 6, 7, 8 3. Conditions which will be subject to full review at the third surveillance audit: • Conditions 4. Conditions which will be subject to ongoing monitoring to achieve closure, or significant progress to an appropriate level, over the lifetime of the current MSC certificate: • Conditions 10; 11 Some comments and recommendations have been made by the assessment team to assist in further development of measures, as relevant. MSC Certification should therefore continue and surveillance audits continue to the same schedule.

Information Sources:

Meetings

1. 2nd May 2007, HOAA Fisheries, AFSC, Seattle. Pat Livingstone, Jim Cole, Kerim Aydin, Teresa A'mar, Steve Berbeaux, Jim Ianelli, Martin Don, Anne Hallowed, Rolf Ream, Lowell Fritz, Elizabeth Holmes, Brian Fadely, Tom Gilatt, Elizabeth Logerwell

2. 3rd May 2007, At-Sea Processors, Seattle. Jim Gilmore, Paul MacGregor, Ed Richardson

Reports etc.

1. Angliss, R.P., and R. Outlaw (eds.). 2007. Alaska Marine Mammal Stock Assessments, 2006. NOAA Technical Memorandum NMFS-AFSC-168. Washington: US Dept. of Commerce.

2. Angliss, R.P., Demaster, D.P., and A.L. Lopez (eds.). 2001. Alaska Marine Mammal Stock Assessments, 2001. NOAA Technical Memorandum NMFS-AFSC-124. Washington: US Dept. of Commerce.

3. Aydin, K. Y., Lapko, V.V., Radchenko, V.I., and P.A. Livingston. 2002. A Comparison of the Eastern Bering and Western Bering Sea shelf and Slope Ecosystems Through the Use of Mass-Balance Food Web Models. NOAA Technical Memorandum NMFS-AFSC-130. Washington: U.S. Department of Commerce.

4. Aydin, K., Gaichas, S., Ortiz, I., Kinzey, D., and N. Friday. 2007. "A comparison of the Bering Sea, Gulf of Alaska, and Aleutian Islands large marine ecosystems through food web modeling." September 2007 Plan Team Draft Manuscript, Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA 98115.

5. Barbeaux, S. 2006. "2006 Aleutian Islands Cooperative Acoustic Survey Study." Manuscript, BSAI Plan Team, September, 2006. Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA.

6. Barbeaux, S., Ianelli, J.N., Gaichas, S., and M. Wilkins. 2006. "Chapter 1a Stock Assessment of Aleutian Islands Region Pollock." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

7. Barbeaux, S., Ianelli, J.N., and E. Brown. 2005. "Chapter 1a Stock Assessment of Aleutian Islands Region Pollock." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

8. _______. 2004. "Chapter 1a Stock Assessment of Aleutian Islands Region Pollock." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

9. Boldt, J. (ed.). 2006. "Ecosystem Considerations for 2007." Appendix C. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

10. Boyd, I.L. 2006. "Marine Mammal Research Assessment: The relationships between Steller sea lion foraging behavior and pollock-as-prey abundance at the local scale related to putative fish-school disruption caused by trawling in localized areas." Atsea Processors Association, 4039 21st Avenue West, Suite 400, Seattle, WA 98199.

11. Boyd, I.L. 2006. "Marine Mammal Research Assessment: The relationships between Steller sea lion foraging behavior and pollock-as-prey abundance at the regional and local scale." Atsea Processors Association, 4039 21st Avenue West, Suite 400, Seattle, WA.

12. Cieciel, K. and L. Eisner. 2007. "Trends in Jellyfish Bycatch from the Bering Aleutian Salmon International Survey (BASIS)." In (Boldt, J. [ed.]), "Appendix C: Ecosystem Considerations for 2008." September 2007 Plan Team Draft Manuscript, Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA 98115.

13. Dorn, M., Aydin, K., Barbeaux, S., Guttormsen, M., Megrey, B., Spalinger, K., and M. Wilkins. 2007. "1. Gulf of Alaska Walleye Pollock." November, 2007 Plan Team Draft. Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA 98115.

14. Dorn, M., Aydin, K., Barbeaux, S., Guttormsen, M., Megrey, B., Spalinger, K., and M. Wilkins. 2006. "Assessment of Walleye Pollock in the Gulf of Alaska." Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

15. Dorn, M., Aydin, K., Barbeaux, S., Guttormsen, M., Megrey, B., Spalinger, K., and M. Wilkins. 2005. "Assessment of Walleye Pollock in the Gulf of Alaska." Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

16. Dorn, M., Barbeaux, S., Gaichas, S., Guttormsen, M., Megrey, B., Spalinger, K., and M. Wilkins. 2004. "Assessment of Walleye Pollock in the Gulf of Alaska." Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

17. Dorn, M.W., Hollowed, A.B., Brown, E., Megrey, B., Wilson, C., and Jim Blackburn. 2001. "Assessment of Walleye Pollock in the Gulf of Alaska." Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

18. Dorn, M., Aydin, K., Barbeaux, S., Guttormsen, M., Megrey, B., Spalinger, K., and M. Wilkins. 2005. "Assessment of Walleye Pollock in the Gulf of Alaska." Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

19. Dragoo, D.E., Byrd, G.V., and D.B. Irons. 2006. Breeding status, population trends and diets of seabirds in Alaska, 2003. Report AMNWR 06/13. Homer (Alaska): U.S. Fish and Wildlife Service.

20. Fritz, L. and T. Gelatt. 2006. "Survey of Adult and Juvenile Steller Sea Lions, June 2006." Memorandum. National Marine Mammal Laboratory, Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA.

21. Gaichas, S. 2006. Ecosystem Modeling for Fishery Sustainability: A Case Study for the Gulf of Alaska. Alaska Fisheries Science Center Quarterly Report July-August-September 2006. Seattle: Alaska Fisheries Science Center.

22. Goodman, D., Mangel, M., Graeme, P., Quinn, T., Restrepo, V., Smith, T., and K. Stokes. 2002. "Scientific Review of the Harvest Strategy Currently Used in the BSAI and GOA Groundfish Fishery Management Plans." North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

23. Holmes, E.E., Fritz, L.W., York, A.E., and K. Sweeney. (in review). Steady declines in Steller sea lion birth rate in the Gulf of Alaska suggest new conservation and research priorities. National Marine Mammal Laboratory, Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA

24. Honkalehto, T. 2005. "Results of the 2005 Bogoslof EIT pollock survey." Slide Presentation, BSAI Plan Team, September, 2005. Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA.

25. Hunt, G. L. Jr., Stabeno, P. J., Walters, G., Sinclair, E., Brodeur, R.D., Napp, J.M., and N. A. Bond. 2002. Climate change and control of the southeastern Bering Sea pelagic ecosystem. Deep-Sea Research II 49:5821-5853.

26. Ianelli, J.N., Barbeaux, S., Walters, G., Honkalehto, T., and N. Williamson. 2004. "Eastern Bering Sea Walleye Pollock Stock Assessment." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

27. Ianelli, J.N., Barbeaux, S., Honkalehto, T., Kotwicki, S., Aydin, K., and N. Williamson. 2006. "1.Assessment of Alaska Pollock Stock in the Eastern Bering Sea." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

28. Ianelli, J. N., Honkalehto, T. and N. Williamson. 2006. "Chapter 1b: An age-structured assessment of pollock (*Theragra chalcogramma*) from the Bogoslof Island Region." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

29. ________. 2005. "Chapter 1b: An age-structured assessment of pollock (*Theragra chalcogramma*) from the Bogoslof Island Region." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

30. Ianelli, J.N., Barbeaux, S., Honkalehto, T., Lauth, B., and N. Williamson. 2005. "1.Assessment of Alaska Pollock Stock in the Eastern Bering Sea." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

31. Ianelli, J.N., Barbeaux, S., Walters, G., and N. Williamson. 2003. "Eastern Bering Sea Walleye Pollock Stock Assessment." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

32. Kumagai, S., Rosen, D.A.S., and A.W. Trites. 2006. Body mass and composition responses to short-term low energy intake are seasonally dependent in Steller sea lions (*Eumetopias jubatus*). Journal of Comparative Physiology B 176: 589–598.

33. Martin, M. 2007. "Miscellaneous Species — Gulf of Alaska." In (Boldt, J. [ed.]), "Appendix C: Ecosystem Considerations for 2008." September 2007 Plan Team Draft Manuscript, Alaska Fisheries Science Center, 7600 Sand Point Way, N.E., Seattle, WA 98115.

34. McKelvey, D., Honkalehto, T. and N. Williamson. 2006. Results of the March 2006 echo integration-trawl survey of walleye pollock (*Theragra chalcogramma*) conducted in the southeastern Aleutian Basin near Bogoslof Island, Cruise MF2006-03. AFSC Processed Report 2006-14. Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle WA.

35. Mueter, F. J., Ladd, C., Palmer, M.C., and B.L. Norcross. 2006. Bottom-up and top-down controls of walleye pollock (*Theragra chalcogramma*) on the Eastern Bering Sea shelf. Progress in Oceanography 68:152–183.

36. National Marine Fisheries Service. 2007. "Alaska Groundfish Harvest Specifications Final Environmental Impact Statement." National Marine Fisheries Service, Alaska Region, P.O. Box 21668, Juneau, Alaska.

37. National Oceanic and Atmospheric Administration (NOAA). 2004. "BSAI Amendment 17: Renew Walrus Islands Closures, Experimental Permits, Establish Bogoslof District." Appendix C. Alaska Groundfish Fisheries Final Programmatic Supplemental Environmental Impact Statement. Juneau: NMFS Alaska Region.

38. North Pacific Fishery Management Council (NPFMC). 2006a. "Summary." BSAI Plan Team. Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

39. North Pacific Fishery Management Council (NPFMC). 2006b. "Summary." GOA Plan Team. Appendix B. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

40. Science and Statistical Committee (SSC). 2006. "Draft Report of the Scientific and Statistical Committee to the North Pacific Fishery Management Council, December 6-8, 2006." North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

41. Smith, G.B. 1981. The biology of walleye pollock. In Hood, D.W. and J.A. Calder [eds.], The Eastern Bering Sea Shelf: Oceanography and Resources. Vol. I. Washington: U.S. Dept. of Commerce.

42. Trites, A.W., Brunner, S., and T. Isono. 2007b. "Changes in Steller Sea Lion Skull Sizes: Testing the Nutritional Stress and Killer Whale Predation Hypotheses." Final Report. Pollock Conservation Cooperative Research Center, School of Fisheries and Ocean Sciences, University of Alaska - Fairbanks, Fairbanks, AK.

43. Trites et al. (29 others). 2007a. Bottom-up forcing and the decline of Steller sea lions (*Eumetopias jubatus*) in Alaska: assessing the ocean climate hypothesis. Fisheries Oceanography 16:46–67.

44. Walters, C. and J.F. Kitchell. 2001. Cultivation/depensation effects on juvenile survival and recruitment: implications for the theory of fishing. Canadian Journal of Fisheries and Aquatic Science 58:39-50.

45. Wespestad, V.G. 1993. The Status of Bering Sea Pollock and the Effect of the "Donut Hole" Fishery. Fisheries 18(3): 18-24.

46. Wespestad, V. G. and J. M. Terry. 1984. Biological and economic yields for eastern Bering Sea walleye pollock under differing fishing regimes. North American Journal of Fisheries Management 4:204-215.

47. Wilderbuer, T.K. and D.G. Nichol. 2006. "Chapter 6. Arrowtooth Flounder." Appendix A. Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, 605 West 4th Avenue, Suite 306, Anchorage, Alaska.

Standards and Guidelines used:

1. MSC Principles and Criteria for Sustainable Fishing
2. MSC Fishery Certification Methodology Version 5
3. TAB Directive 8