External Independent Peer Review Bering Sea and Aleutian Islands Atka Mackerel Assessment

By

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Center for Independent Experts

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Executive Summary

AMAK, the assessment model for Alaska, used for the Atka mackerel assessment is state of the art. The analysts use the available fishery dependent and fishery independent data in a sensible and reasonable way to analyze the data and help make fishery management decision. I recommend that the aerial expansion be abandoned to avoid giving the impression that the survey provide an absolute estimate of biomass and that either the stratified average or the straight average be used as a relative index of stock size.

The proportion of positive tows showed a marked increase in 2002 in all areas when the tow duration was reduced from 30 minutes to 15 minutes in the survey. This could be due to a range expansion or to more access to preferred habitat with the shorter tows. This should be investigated further.

No gaps or inconsistencies in the population dynamics modeling methodology or logic were identified. There are indications that q is not well estimated or known. This lends further support to treating the survey as a relative index rather than an absolute index of stock size. Considering that Atka mackerel does not migrate and shows little movement after settlement, behaving like a reef fish, it might be useful to consider making three separate assessments, one for each area.

The uncertainty reported in the assessment report is relatively large, and probably reflective of actual uncertainty. Fishery management in this area has generally been cautious and the good health of fish stocks reflects this cautiousness. It is my understanding that the point estimates have been used in the past, but as indicated above, in a cautious manner. I am suggesting to continue to use the assessment results and uncertainty estimates in the same successful way as has been done so far.

The assessment, although it may have considerable uncertainty, is the best available science to make fishery management decisions.

Background

The Alaska Fisheries Science Center (AFSC) requested a review of the Bering Sea and Aleutian Islands stock assessment for Atka mackerel from the Center of Independent Experts (CIE). In the Aleutian Islands Atka mackerel are a key prey for several top trophic level consumers in the region including being a dominant prey item for the endangered Steller sea lion. The Aleutian Islands Atka mackerel supports a valuable commercial fishery that varied between 11700t and 104000t, averaging 46000t during 1977 to 2012. In 2011, substantial changes to the operations of the Atka mackerel fishery were imposed as protection measures for Steller sea lions. These measures included large area closures and reduction in directed fishing quotas. To decrease the potential of local depletion, the Atka mackerel quota was divided over the three management areas of Eastern, Central and Western Aleutian Islands. Currently the Atka mackerel fishery is closed in the western Aleutians (representing about 34% of the quota). Because of their

unique role in the Aleutian Island ecosystem and their importance to industry, the best estimates possible of Atka mackerel biomass and trends are needed to provide informed catch and management recommendations. Several changes have been made to improve the assessment since the last CIE review in 2008. Recent model explorations have focused attention on alternative approaches to specifying selectivity, natural mortality, and age-specific survey catchability. The AFSC is seeking advice on incorporating alternative approaches for the estimation of these key parameters.

Description of the Individual Reviewer's Role in the Review Activities

A link to a directory with the working and background documents for the review was sent on July 11, 2014. I reviewed the main working document and the 2008 CIE reviews prior to the meeting and looked at the background documents as necessary in preparing the review and during the review. I participated in the meetings during July 29 - 31.

This was not a typical CIE review where a report is deliberated. The reviewers were there to make suggestions on how to improve the Atka mackerel assessment which is to be completed in the next few months by the Plan Development Team (September) and by the SSC (November). This was the first time that this step in the assessment process was public with one participant from at-sea processors.

The protection of the food supply of Steller sea lion has played a major role in the management of the Atka mackerel fishery since 2011, mostly by closing areas where the fishery used to operate to protect the food supply of Steller sea lions.

Summary of Findings

The strengths and weaknesses of the modeling efforts for the Bering Sea and Aleutian Islands Atka mackerel assessment and harvest recommendations

AMAK, the assessment model for Alaska, used for the Atka mackerel assessment is state of the art. AMAK employs an explicit age-structured model with the standard catch equation as the operational population dynamics model. Previous reviews commented that documentation was poor and the code not available. This has been rectified and there is now a repository where the files, documentation and source code can be downloaded from a website (https://github.com/NMFS-toolbox/AMAK). The model is listed in the official NFMS NFT toolbox (http://nft.nefsc.noaa.gov/AMAK.html), but it is not possible to download the model from there and it is not clear how to run the GUI version. Catch at age from the commercial fishery seems reasonable, and is certainly well fitted by the model, but it is not clear that stock size indices from the surveys reflect actual changes in stock size.

The analysts' use of fishery dependent and fishery independent data sources in the assessments

The analysts use the available fishery dependent and fishery independent data in a sensible and reasonable way to analyze the data and help make fishery management decision.

The survey population estimates are expanded spatially to obtain an "absolute" biomass estimate with catchability expected to be around 1.0. Atka mackerel are found in rocky areas and on rough bottoms with strong currents. The commercial fishery uses nets and gear configurations suitable to fish in those areas, but the survey does not and survey sampling sets are therefore on softer grounds in habitat that are not considered optimal for Atka mackerel and where the density is likely to be lower than in more suitable habitat. However, this low density is expanded spatially to areas where Atka mackerel density may be even lower or zero. Not knowing how the underestimated density due to towing in marginal habitat compares with the density in prime habitat, and not knowing the proportion of non-suitable habitat vs marginal habitat vs prime habitat, it is not possible to qualify the biomass estimate. It is therefore impossible to know if the survey biomass estimate is a minimum, a maximum or if it overestimates considerably the actual biomass.

I recommend that the aerial expansion be abandoned to avoid giving the impression that the survey provide an absolute estimate of biomass and that either the stratified average or the straight average be used as a relative index of stock size. Survey people who participated in the meeting also made that suggestion. Note that the stratified and straight averages generally show the same trend as shown in Figure 1.

Numerous changes have been made to the surveys over the years. The earlier surveys (1980, 1983 and 1986) missed important strata and they are not used as indices of abundance but the age compositions of the 1986 survey are used. Since 1991, stations are sampled from a pool of previously trawled stations and a Scanmar net mensuration system is used, the stratification scheme changed in 1994, a modified Neyman optimal allocation was introduced in 2000, tow duration was decreased to 15 minutes in 2002, the bottom contact sensor was replaced with an accelerometer in 2010 and in 2012, the Marport net mensuration was used for the first time (note that in the Bering Sea survey and adjustment was made for the change). In 2012, the number of stations sampled was reduced for operation reasons and in 2014, for the first time, the survey was excluded from sampling in Steller Sea lion exclusion zones. Participants in the meeting noted that reducing tow duration implies that it should be possible to enlarge the sets of trawlable stations with those areas where it would be possible to place a 15 minutes tow but where a 30 minutes tow was not possible one.

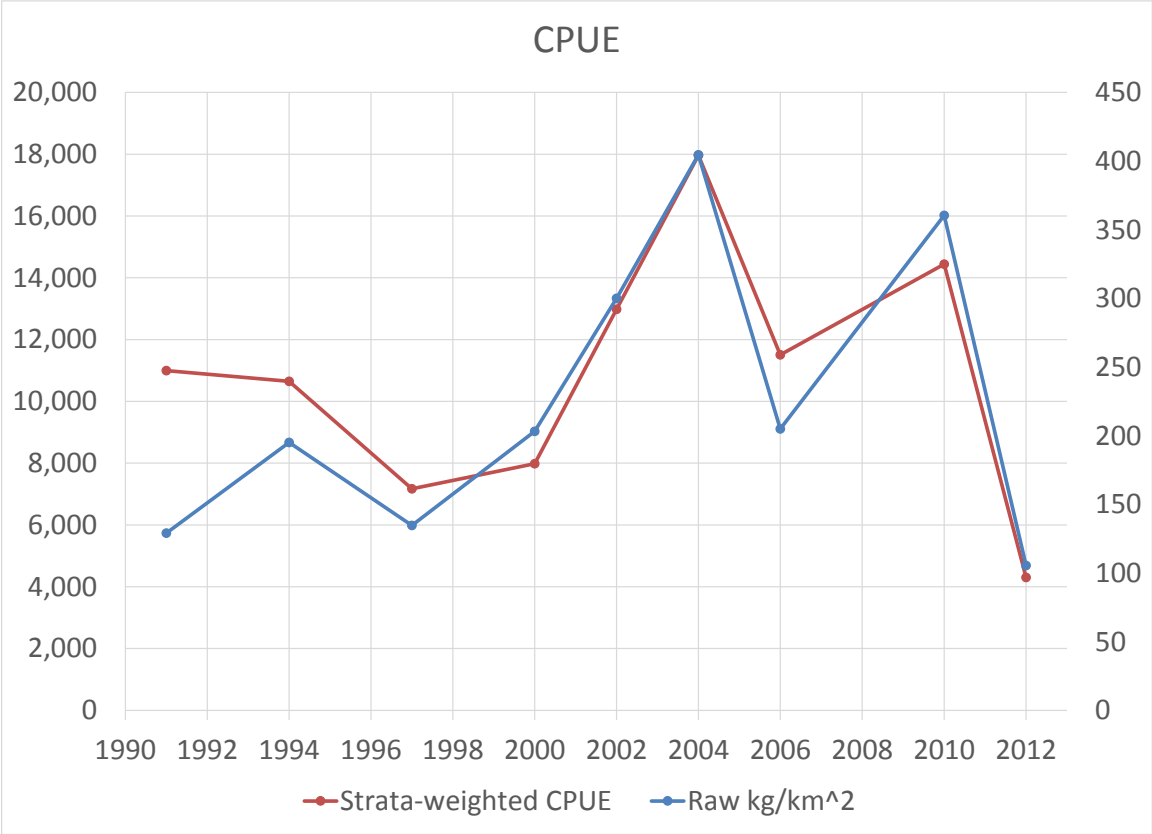

Figure 1

The analysts also examined the proportion of positive tows over time in the survey data. The proportion of positive tows showed a marked increase in 2002 in all areas when the tow duration was reduced from 30 minutes to 15 minutes in the survey. This could be due to a range expansion or to more access to preferred habitat with the shorter tows. This should be investigated further.

Although it uses a gear that is not optimal to sample in prime Atka mackerel habitat, the survey does make large catches of Atka mackerel (10-15 tons) and it is apparently becoming more common to bust the net. When the monitoring equipment shows that the net is closing, indicative of a large catch, tow duration may be shortened.

Survey people who participated in the meeting believe that it would be possible to design a good Atka mackerel survey by using a different gear configure it to be able to sample in prime Atka mackerel habitat (rocky areas, rough bottoms, passes, strong currents) as the fishery does. Designing such a dedicated survey and conducting a few times sampling in prime Atka mackerel habitat and expanding only to areas where Atka mackerel is expected to be present might provide a so-called minimum biomass estimate.

The domestic fishery started in 1990. A total of eleven vessels are participating in the fishery, these are relatively large vessels with conveyor belts making it easier to sample randomly. On hundred % of the hauls are monitored by observers (2 observers on board).

Sampling of the domestic commercial fishery is good, with 30-40 thousand otolith readings per year. Age readings are routinely monitored and there is good agreement on Atka mackerel age reading. When a new reader is trained, an experienced reader tests all the ages and when there is a disagreement, the two readers have to reach an agreement.

It is not clear that there are large benefits in starting modeling prior to the beginning of the domestic fishery. Starting modeling in 1990 might help reduce uncertainties. Originally, the modeling was started in 1977 to include the strong 1977 year-class. Several year-classes of that magnitude or larger have been produced since.

The fishery experiences tows of 50 tons or more, not uncommonly in 30 minutes. The objective is to keep the factory running with production of 70-100 tons per day for large catcher processor. The analysts provided crude estimates of fishery CPUE by tow for bottom trawlers with more than 80% of the catch comprised of Atka mackerel. The results are shown in Figure 2.

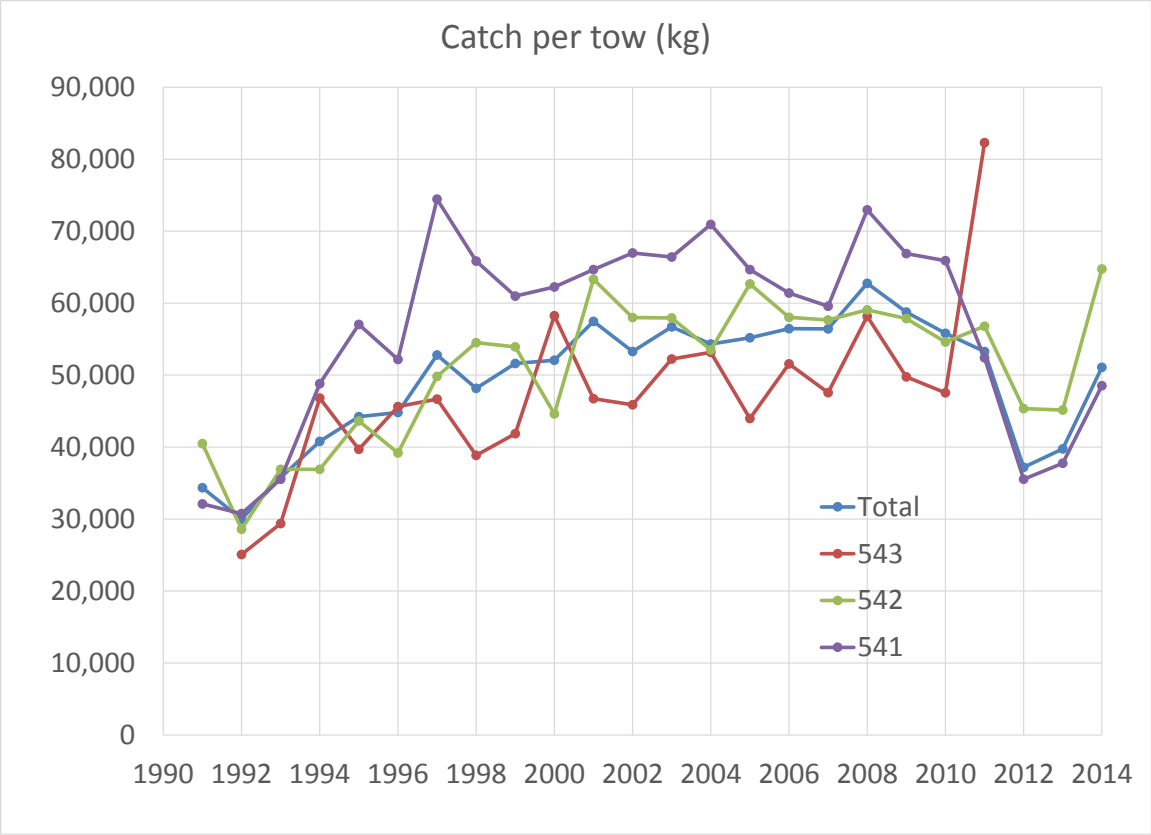

Figure 2

This should be validated with the fishing industry first, but the results suggest that further work could be warranted. One possibility would be to calculate minimum biomass estimates for the fished area based on the density observed in the commercial fishery and the area covered by the commercial fishery (or the areas known to be prime Atka mackerel habitat). There may have been too many restrictions (industry has been trying to limit the size of tows since 2008) on the fishery for this to be a useful approach.

Gaps or inconsistencies in the population dynamics modeling methodology or logic

No gaps or inconsistencies in the population dynamics modeling methodology or logic were identified.

While this appears to be reasonably standard practice in assessments at the AFSC, it is not clear that expanding the survey population estimate to an absolute estimate is useful as indicated above. Atka mackerel apparently has very specific habitat preferences, rocky habitat where it is very difficult for the survey to sample, and expanding the average catch/tow to the surface of a stratum where Atka mackerel is unlikely to be present would be expected to be misleading. This complicates the interpretation of the catchability coefficient for the survey. As suggested above, it may be preferable to keep the survey estimates on a relative scale, kg/tow or kg/surface to obtain an index of relative changes in biomass rather than think that the survey can provide a realistic estimate of absolute biomass.

Figure 3, adapted from the overview presentation on the first day of the meeting, raises questions about the stock definition.

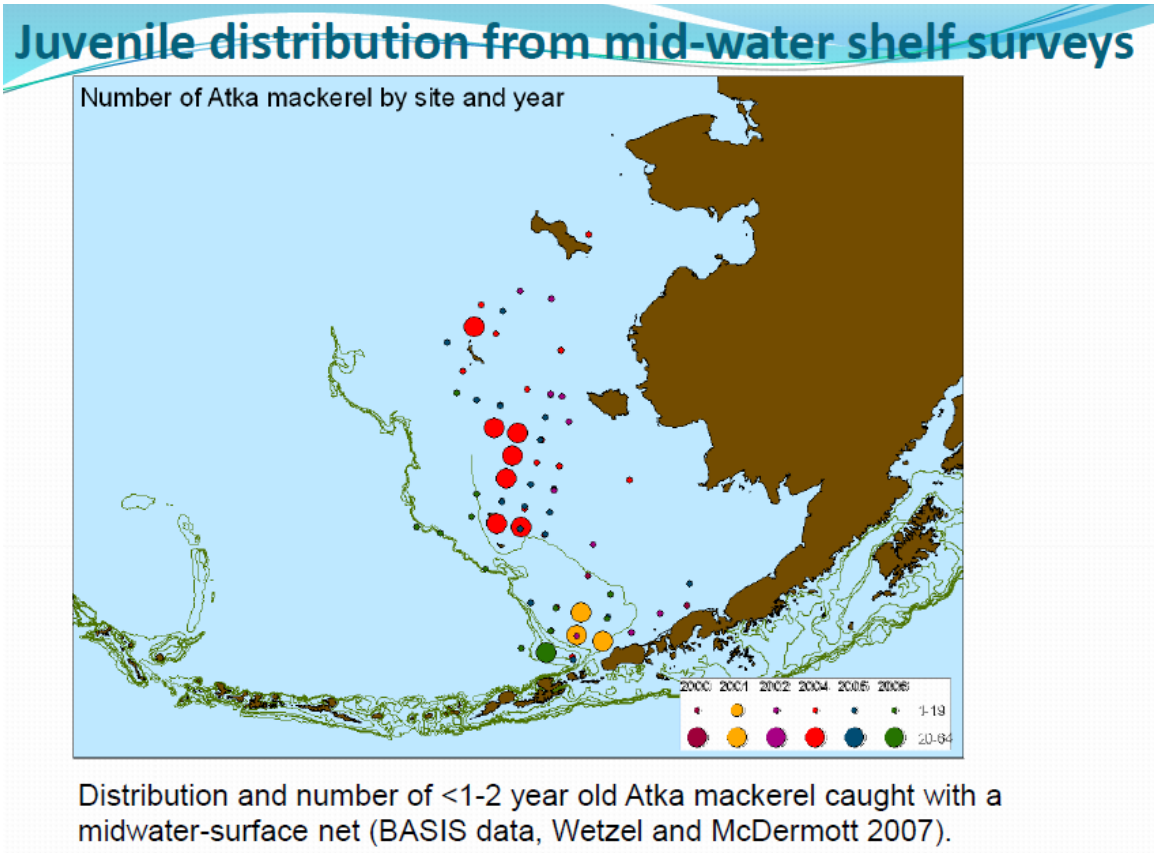

Figure 3

The survey and the fishery take place in close proximity to the Aleutian islands proper. The slide above suggests that juvenile Atka mackerel are found in a considerably wider area. It would be interesting to know if these juveniles migrate back to the Aleutian

Islands, if they can find a suitable habitat to settle elsewhere or if they are simply lost to the system altogether. The figure above also suggests that if juveniles are indeed pelagic, they could be easier to survey. A good index of age 1 or 2 Atka mackerel could be very useful in modeling the population if natural mortality does not vary too much by year or according to year-class size.

Currently, female spawning stock biomass is reported, assuming a 1:1 sex ratio in the catch. This assumption seems to have been reasonable for the central area for most of the period (see Figure 4), but there appears to be an increasing trend toward catching females in recent years in the eastern and western areas. Considering that males are guarding the nests, if a sizeable portion fishery occurs at that time, a higher proportion of female in the catch would be expected. It would be prudent to keep an eye on the sex ratio in the catch to avoid it becoming too skewed.

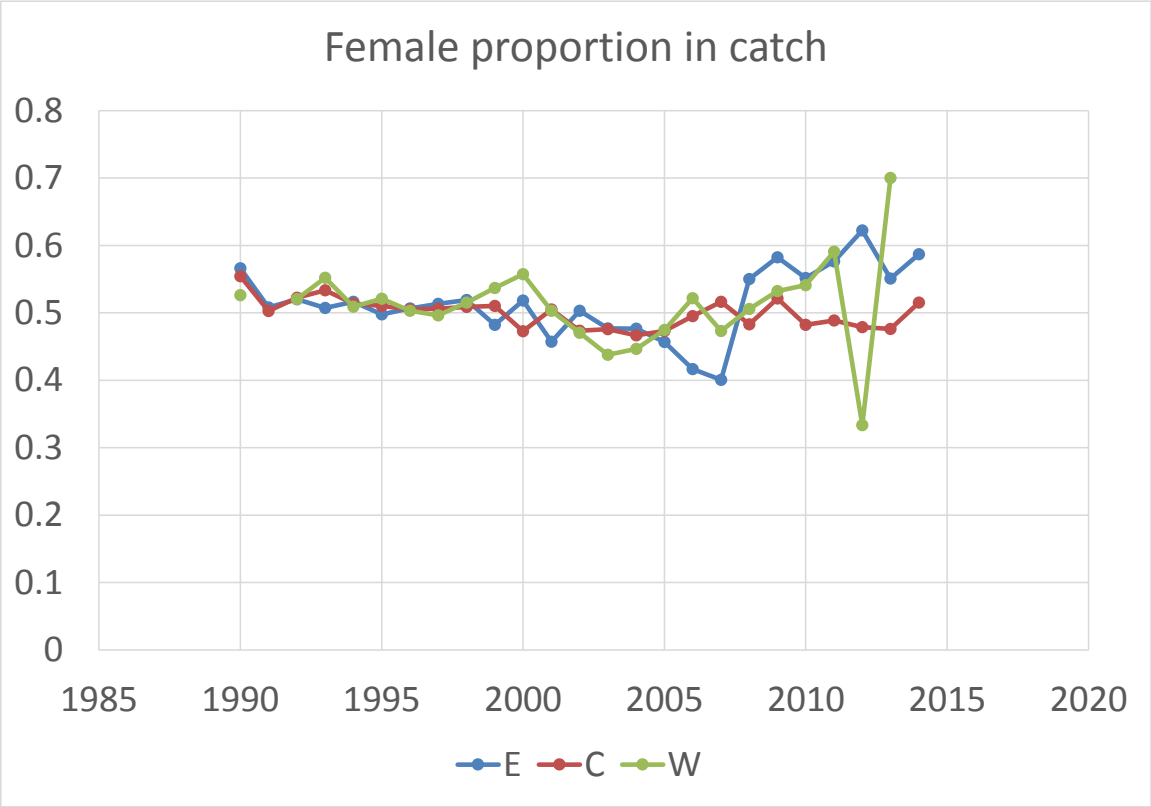

Figure 4

Assessment approaches like AMAK estimate stock size not only based on abundance indices but also using the age and length composition. The meeting asked the analysts to down weight the trend in survey and use only the age-composition. When the prior on survey catchability was retained, this resulted in nearly identical trends but overall a lower biomass. When the prior on survey catchability was removed, the model converged on an extraordinarily large biomass. Using the survey results as a relative abundance index could imply similar results if it is the prior on q that is scaling total abundance. The analysts believed that with some effort on conditioning, it may be possible to "tame" this result. In a second exercise, the analysts allowed larger variability in q. Allowing a more

flexible q, decreased the CV on biomass estimates, i.e. better fit to the data if the model can go to higher q. Although this may be due to the low biomass estimate in 2012, it suggests that q is not well estimated or known. This lends further support to treating the survey as a relative index rather than an absolute index of stock size.

The geographical distribution of the fishery has changed: it is no longer allowed in the Western area and most fishing is now occurring in the East. This may imply a change in the relationships between the catch, the survey and the modeled population which could materialize as a change in selectivity or in q. For example, the 2007 year-class was estimated to be strong in the 2012 survey, but it was not seen in the fishery, and therefore it does not to be strong in the assessment. The fishery being highly constrained geographically it is possible that it has not seen this year-class yet, but this would be somewhat surprising.

Considering that Atka mackerel does not migrate and shows little movement after settlement, behaving like a reef fish, it might be useful to consider making three separate assessments, one for each area. Starting the 3 assessments in 1990, when the domestic fishery began, could mean that there would be sufficient information to do so or even having 10-15 years of information would be enough for an assessment.

The report presents the model fit to the age composition for each year with the observed percentage at age as a bar and the predicted one as a line. This is useful and shows that the catch age composition (figure 17.11) is good. A complementary way to look at the data is to plot for each age the time series of observed and predicted values as in Figure 5 below for age 7.

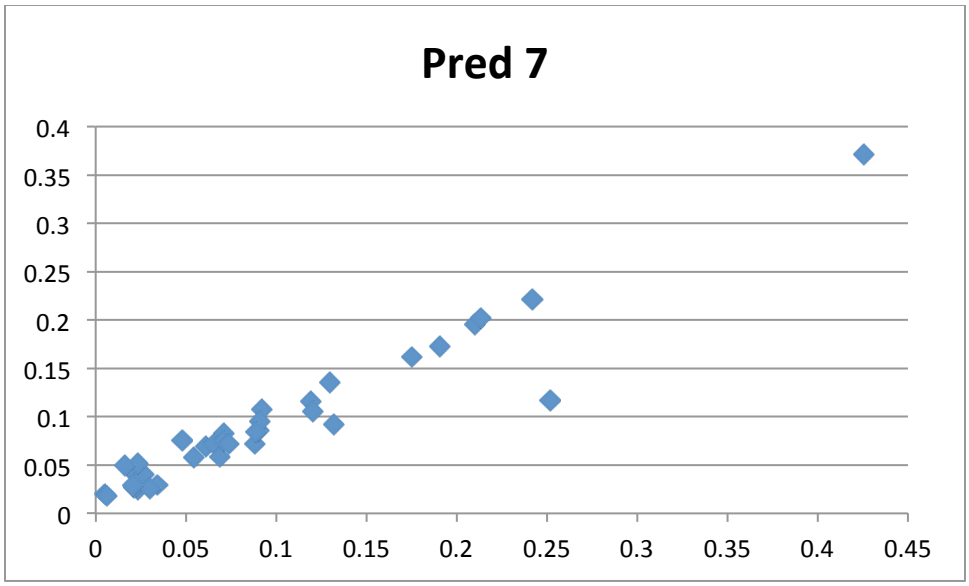

Figure 5

Both types of presentation are useful and both should be used as they allow to look at the data and model results from different perspective.

The catch at age for Atka mackerel seems to be well estimated, particularly from 1991 onwards when the fishery was domestic. Using the assumptions that fishing mortality in the most recent year was equal to the previous three years and that fishing mortality on the oldest true age was equal to that on the previous three younger ages, I iteratively ran a cohort analysis 4-5 times in an Excel spread sheet, updating the average F in the most recent year each time (Figure 6). The year-class sizes estimated this way are very close to those from the assessment (except obviously for the most recent year-classes).

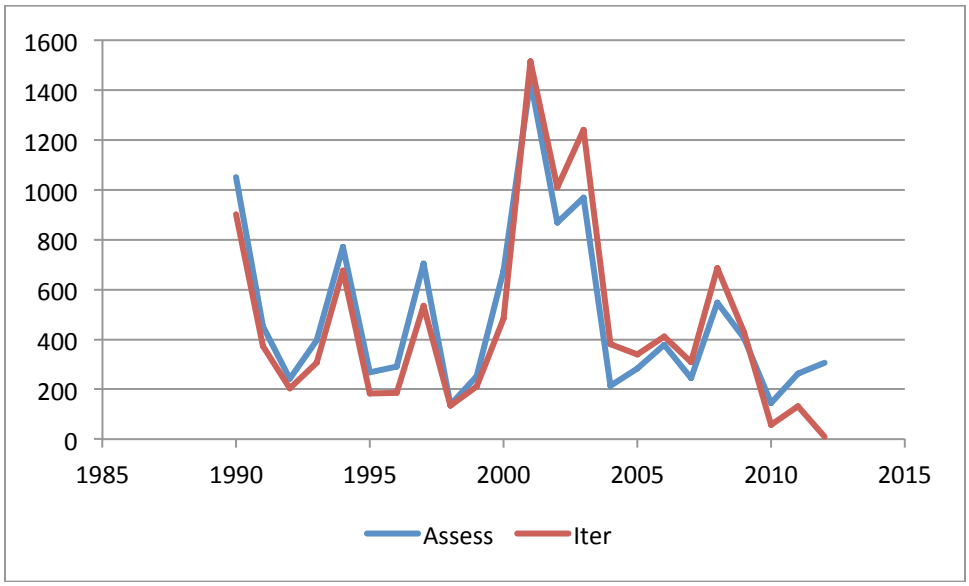

Figure 6

If it is indeed the case that catch at age from 1990 onwards is reliable, it might be possible to use the robustness of cohort analysis for the early period for estimating year-class size and exploitation pattern (selectivity) and assume separability for more recent years, as Integrated Catch Analysis (ICA) by Patterson and Melvin does.

How assessment uncertainties may best be applied for management advice

The uncertainty reported in the assessment report is relatively large, and probably reflective of actual uncertainty. Fishery management in this area has generally been cautious and the good health of fish stocks reflects this cautiousness. It is my understanding that the point estimates have been used in the past, but as indicated above, in a cautious manner. I am suggesting to continue to use the assessment results and uncertainty estimates in the same successful way as has been done so far.

Whether the assessments provide the best available science

The assessment, although it may have considerable uncertainty, is the best available science to make fishery management decisions.

The specification of time-varying and age-specific selectivity parameters

Size at age for Atka mackerel varies by geographic areas with larger size at age in the Eastern area where the food is more abundant and of better quality. Protecting the food supply of Steller sea lions has implied closing areas that were previously available to the fishery in the Western management area. This change in the geographic allocation of

catches, to protect the food supply of Steller seal lions in the Western area, is likely to result in changes in selectivity at age. The assessment team also hypothesized that the fishery might have the ability to target strong year-classes and have higher selectivity on those. That is not impossible, but for this to happen strong year-classes would need to settle to the bottom in a few specific geographical areas in close proximity and stay there as they grow; they would also have to grow at approximately the same rate to be equally vulnerable to the trawl.

Current modeling appropriately allows considerable flexibility for selectivity to change over years and ages. Selectivity at age can also be obtained directly from the Fs at age in cohort analysis as shown in Figure 7.

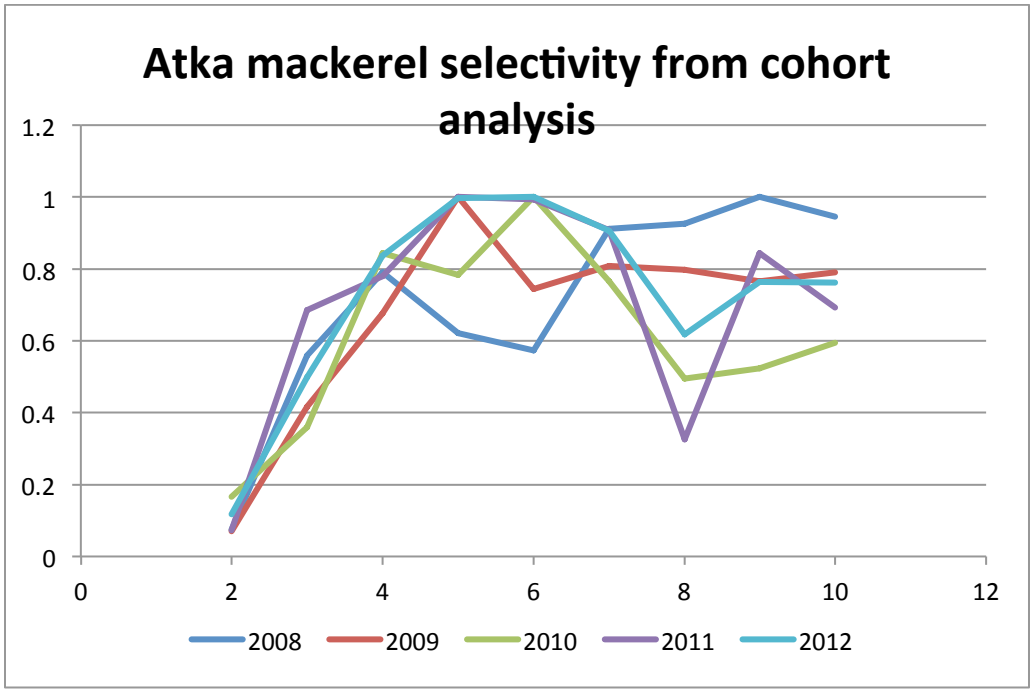

Figure 7

Cohort analysis could be used to confirm the selectivity at age estimated in AMAK.

The treatment and application of survey data; specifically

Survey biomass estimates by management areas as used for quota apportionments; this stock forms dense patchy schools resulting in high variability

The original reason for the quota apportionments by management areas was to reduce the risks of localized depletion of this highly aggregated species. Currently, some 90% of critical habitat for Steller sea lion is closed to Atka mackerel fishing to protect the food supply of Steller sea lion (http://alaskafisheries.noaa.gov/sustainablefisheries/sslpm/atka_pollock.pdf) and the areas where the fishery is open no longer seems to be taken into account in the context of Atka mackerel local depletion. In other words, local depletion is likely to be prevented in

Steller sea lions protection zones, but not necessarily outside of them where the fishery is open.

While the survey estimates have considerable uncertainty and problems, they seem to be the only basis on which geographical apportionment of the quota can be accomplished. The approach taken, giving more weight to the most recent survey estimate is sensible, but given the results of the calculation, a one third, one third, one third apportionments in the three management areas would also have been sensible.

Given the apparently highly sedentary nature of Atka mackerel once they settle to the bottom, the apportionment by management areas may prevent large scale local depletion, but as hinted above, it does nothing to prevent localized depletion at a finer scale in the areas open to fishing. It is my understanding that migration of post juveniles from an area to the next is unlikely. This means that areas where Atka mackerel might be depleted would have to wait for the settlement of a new cohort to be repopulated.

Survey catchability

As indicated above, calculating an absolute biomass estimate by an aerial expansion of the survey catch/tow, with an expectation that catchability would be around 1.0, is likely to be misleading. The survey is not able to operate in prime Atka mackerel habitat because the gear used on the survey is too fragile to fish in such rocky habitat. The aerial expansion for the survey includes habitat where Atka mackerel is unlikely to be present or at least less dense than in the sampled portion of the total area. It is therefore highly likely to be misleading to calculate an absolute biomass estimate and it would be preferable to remain on a relative scale. This may not make a large difference in terms of model performance, but it would make a difference in terms of perception - it is illusory to think that the survey provides an estimate of absolute abundance, particularly thinking that it is a minimum estimate of abundance.

This issue is also discussed under "*Use of fishery dependent and fishery independent data*" above.

The incorporation of age differential natural mortality and the interaction with selectivity and survey catchability parameters

In areas where predation mortality has been estimated by size and age (e.g. North Sea, Baltic Sea, Barents Sea, Georges Bank), it has generally been found that predation is higher on younger ages and smaller sizes than older larger ones. Atka mackerel is unlikely to be different and it would seem sensible to use a variable natural mortality at age. Given changes in the abundance of preys and predators, natural mortality is also unlikely to remain constant over years, but this is a more difficult issue to address in the absence of food consumption studies.

The National Marine Fisheries Service Assessments Methods Working Group reached a similar conclusion at a 2009 Workshop (http://spo.nwr.noaa.gov/tm/119.pdf): "*Empirical evidence and ecological theory indicate that the M of fish and invertebrate fishery resources scale with body mass or size. For a given species, early life history stages experience higher M than juvenile stages which, in turn, experience higher M than*

mature adults. (page 1). They also recommended that "*When juvenile fish need to be modeled explicitly (e.g. because these juveniles are targeted in a fishery or caught as bycatch), size dependence in M should be incorporated into the assessment application, for example, by means of a Lorenzen curve*". I agree entirely with that conclusion and recommendation.

Conclusions and Recommendations

AMAK, the assessment model for Alaska, used for the Atka mackerel assessment is state of the art. The analysts use the available fishery dependent and fishery independent data in a sensible and reasonable way to analyze the data and help make fishery management decision. I recommend that the aerial expansion be abandoned to avoid giving the impression that the survey provide an absolute estimate of biomass and that either the stratified average or the straight average be used as a relative index of stock size.

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Survey people who participated in the meeting believe that it would be possible to design a good Atka mackerel survey by using a different gear configure it to be able to sample in prime Atka mackerel habitat (rocky areas, rough bottoms, passes, strong currents) as the fishery does. Designing such a dedicated survey and conducting a few times sampling in prime Atka mackerel habitat and expanding only to areas where Atka mackerel is expected to be present might provide a so-called minimum biomass estimate.

No gaps or inconsistencies in the population dynamics modeling methodology or logic were identified. There are indications that q is not well estimated or known. This lends further support to treating the survey as a relative index rather than an absolute index of stock size. Considering that Atka mackerel does not migrate and shows little movement after settlement, behaving like a reef fish, it might be useful to consider making three separate assessments, one for each area.

It is not clear that there are large benefits in starting modeling prior to the beginning of the domestic fishery. Starting modeling in 1990 might help reduce uncertainties.

The usefulness of catch per unit of effort in the commercial fishery should be further investigated. One possibility would be to calculate minimum biomass estimates for the fished area based on the density observed in the commercial fishery and the area covered by the commercial fishery (or the areas known to be prime Atka mackerel habitat).

There appears to be an increasing trend toward catching females in recent years in the eastern and western areas. Considering that males are guarding the nests, if a sizeable portion fishery occurs at that time, a higher proportion of female in the catch would be

expected. It would be prudent to keep an eye on the sex ratio in the catch to avoid it becoming too skewed.

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Appendix 1: Bibliography of materials provided for review

1. Lowe, S., J. Ianelli, W. Palsson. 2013. Stock assessment of Aleutian Islands Atka mackerel. In Stock Assessment and Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Regions. North Pacific Fisheries Management Council, P.O. Box 103136, Anchorage, Alaska, 99510. http://www.afsc.noaa.gov/REFM/Docs/2013/BSAIatka.pdf

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2008 CIE reviews
12. Francis
(http://www.afsc.noaa.gov/program_reviews/2014/cie/Francis%20AK%20pollock%20and%20mackerel%20review%20report%20-%20final%2028July08.pdf)

13. Parma
(http://www.afsc.noaa.gov/program_reviews/2014/cie/Parma%20AK%20pollock%20and%20mackerel%20review%20report%20-%20final%2022July08.pdf)

14. Trzcinski
(http://www.afsc.noaa.gov/program_reviews/2014/cie/Trzcisnki%20AK%20pollock%20and%20mackerel%20review%20report%20-%20final%2022July08.pdf)

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http://www.afsc.noaa.gov/REFM/Docs/2013/AIpollock.pdf

16. South Pacific Regional Fisheries Management Organization's Jack Mackerel assessment (using the same software as for Atka mackerel).
http://www.southpacificrfmo.org/assets/Scientific-Committee-1st-2/Report/SC-01-2013-Annex-5-CJM-Assessment-Amended-16-Dec-13-a.pdf

Appendix 2: A copy of the CIE Statement of Work

Attachment A: Statement of Work for Dr. Jean-Jacques Maguire

External Independent Peer Review by the Center for Independent Experts

Bering Sea and Aleutian Islands Atka Mackerel Assessment

Scope of Work and CIE Process: The National Marine Fisheries Service's (NMFS) Office of Science and Technology coordinates and manages a contract providing external expertise through the Center for Independent Experts (CIE) to conduct independent peer reviews of NMFS scientific projects. The Statement of Work (SoW) described herein was established by the NMFS Project Contact and Contracting Officer's Representative (COR), and reviewed by CIE for compliance with their policy for providing independent expertise that can provide impartial and independent peer review without conflicts of interest. CIE reviewers are selected by the CIE Steering Committee and CIE Coordination Team to conduct the independent peer review of NMFS science in compliance the predetermined Terms of Reference (ToRs) of the peer review. Each CIE reviewer is contracted to deliver an independent peer review report to be approved by the CIE Steering Committee and the report is to be formatted with content requirements as specified in **Annex 1**. This SoW describes the work tasks and deliverables of the CIE reviewer for conducting an independent peer review of the following NMFS project. Further information on the CIE process can be obtained from *www.ciereviews.org*.

Project Description: The Alaska Fisheries Science Center (AFSC) requests a Center of Independent Experts (CIE) review of the Bering Sea and Aleutian Islands stock assessment for Atka mackerel. In the Aleutian Islands Atka mackerel are a key prey for several top trophic level consumers in the region. Of particular concern, Atka mackerel are a dominant prey item for the endangered Steller sea lion. In addition, Aleutian Islands Atka mackerel supports a valuable commercial fishery. In 2011, large scale changes to the Atka mackerel fishery were imposed as protection measures for Steller sea lions. These measures included large area closures and reduction in directed fishing quotas. Currently the Atka mackerel fishery is closed in the western Aleutians (representing about 34% of the quota). Because of their unique role in the Aleutian Island ecosystem and their importance to industry, reliable estimates of Atka mackerel biomass and trends are needed to provide informed catch recommendations. Several changes have been made to improve the assessment since the last CIE review. Recent model explorations have focused attention on alternative approaches to specifying selectivity, natural mortality, and age-specific survey catchability. We will be seeking advice on incorporating alternative approaches for the estimation of these key parameters. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**.

Requirements for CIE Reviewers: Three CIE reviewers shall have the necessary qualifications to complete an impartial and independent peer review in accordance with the tasks and ToRs described in the SoW herein. The CIE reviewers shall have expertise in conducting stock assessments for fisheries management, and be thoroughly familiar

with various subject areas involved in stock assessment, including population dynamics, separable age-structured models, harvest strategies, survey methodology, and the AD Model Builder programming language to complete the tasks of the scientific peer-review described herein. Each CIE reviewer is requested to conduct an impartial and independent peer review in accordance with the ToRs herein. The CIE reviewer's duties shall not exceed a maximum of 14 days conducting pre-review preparations with document review, participation in the panel review meeting, and completion of the CIE independent peer review report in accordance with the ToR and Schedule of Milestones and Deliverables.

Location of Peer Review: Each CIE reviewer shall participate and conduct an independent peer review during the panel review meeting scheduled at the Alaska Fisheries Science Center (AFSC) in Seattle, Washington during the dates of July 29-31, 2014.

Statement of Tasks: Each CIE reviewer shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

Tasks prior to the meeting: The contractor shall independently select qualified reviewers that do not have conflicts of interest to conduct an independent scientific peer review in accordance with the tasks and ToRs within the SoW. Upon completion of the independent reviewer selection by the contractor's technical team, the contractor shall provide the reviewer information (full name, title, affiliation, country, address, email, and FAX number) to the contractor officer's representative (COR), who will forward this information to the NMFS Project Contact no later than the date specified in the Schedule of Milestones and Deliverables. The contractor shall be responsible for providing the SoW and stock assessment ToRs to each reviewer. The NMFS Project Contact will be responsible for providing the reviewers with the background documents, reports, foreign national security clearance, and other information concerning pertinent meeting arrangements. The NMFS Project Contact will also be responsible for providing the Chair a copy of the SoW in advance of the panel review meeting. Any changes to the SoW or ToRs must be made through the COR prior to the commencement of the peer review.

Foreign National Security Clearance: The reviewers shall participate during a panel review meeting at a government facility, and the NMFS Project Contact will be responsible for obtaining the Foreign National Security Clearance approval for the reviewers who are non-US citizens. For this reason, the reviewers shall provide by FAX (not by email) the requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/.

Pre-review Background Documents: Approximately two weeks before the peer review, the NMFS Project Contact will provide copies of stock assessment documents, survey reports, and other pertinent literature on a web site for the reviewers to conduct the peer review, and the COR will forward these to the contractor. The reviewers are responsible only for the pre-review documents that are delivered to the contractor in accordance to the SoW scheduled deadlines specified herein. The reviewers shall read all documents deemed as necessary in preparation for the peer review.

Tasks during the panel review meeting: Each reviewer shall conduct the independent peer review in accordance with the SoW and stock assessment ToRs, and shall not serve in any other role unless specified herein. **Modifications to the SoW and ToRs shall not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COR and contractor.** Each reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the stock assessment ToRs as specified herein. The NMFS Project Contact will be responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The NMFS Project Contact will also be responsible for ensuring that the Chair understands the contractual role of the reviewers as specified herein. The contractor can contact the COR and NMFS Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

Tasks after the panel review meeting: Each reviewer shall prepare an independent peer review report, and the report shall be formatted as described in **Annex 1**. This report should explain whether each stock assessment ToR was or was not completed successfully during the panel review meeting. Additional questions and pertinent information related to the assessment review addressed during the meetings that were not in the ToRs may be included in a separate section at the end of an independent peer review report.

The chairperson shall generate a Summary Report that compiles the points made by the three individual reviewers into one succinct document. The individual reports shall be appended to the Summary Report, thereby providing the complete detailed information from the individual reviewers.

Contract Deliverables - Independent CIE Peer Review Reports: Each CIE reviewer shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in Annex 1. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in Annex 2.

Specific Tasks for CIE Reviewers: The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

1) Conduct necessary pre-review preparations, including the review of background material and reports provided by the NMFS Project Contact in advance of the peer review.
2) Participate during the panel review meeting at Seattle, Washington during July 29-31, 2014.
3) Conduct an independent peer review in accordance with the ToRs (**Annex 2**).
4) No later than August 15, 2014, each CIE reviewer shall submit an independent peer review report addressed to the "Center for Independent Experts," and sent to Mr. Manoj Shivlani, CIE Lead Coordinator, via email to shivlanim@bellsouth.net, and CIE Regional Coordinator, via email to Dr. David Die at ddie@rsmas.miami.edu. Each CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in **Annex 2**.

Schedule of Milestones and Deliverables: CIE shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

23 June 2014	CIE sends reviewer contact information to the COR, who then sends this to the NMFS Project Contact
7 July 2014	NMFS Project Contact sends the stock assessment report and background documents to the CIE reviewers.
29-31 July 2014	Each reviewer shall conduct an independent peer review during the panel review meeting in Seattle, Washington
15 August 2014	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
29 August 2014	CIE submits CIE independent peer review reports to the COR
5 September 2014	The COR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: This 'Time and Materials' task order may require an update or modification due to possible changes to the terms of reference or schedule of milestones resulting from the fishery management decision process of the NOAA Leadership, Fishery Management Council, and Council's SSC advisory committee. A request to modify this SoW must be approved by the Contracting Officer at least 15 working days prior to making any permanent changes. The Contracting Officer will notify the COR within 10 working days after receipt of all required information of the decision on changes. The COR can approve changes to the milestone dates, list of pre-review documents, and ToRs within the SoW as long as the role and ability of the CIE reviewers to complete the deliverable in accordance with the SoW is not adversely impacted. The SoW and ToRs shall not be changed once the peer review has begun.

Acceptance of Deliverables: Upon review and acceptance of the CIE independent peer review reports by the CIE Lead Coordinator, Regional Coordinator, and Steering Committee, these reports shall be sent to the COR for final approval as contract deliverables based on compliance with the SoW and ToRs. As specified in the Schedule of Milestones and Deliverables, the CIE shall send via e-mail the contract deliverables (CIE independent peer review reports) to the COR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards:
(1) The CIE report shall completed with the format and content in accordance with **Annex 1**,
(2) The CIE report shall address each ToR as specified in **Annex 2**,
(3) The CIE reports shall be delivered in a timely manner as specified in the schedule of milestones and deliverables.

Distribution of Approved Deliverables: Upon acceptance by the COR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COR. The COR will distribute the CIE reports to the NMFS Project Contact and Center Director.

Support Personnel:

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Key Personnel:

NMFS Project Contact:

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed. The CIE independent report shall be an independent peer review of each ToRs.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work

Annex 2: Terms of Reference for the Peer Review

Bering Sea and Aleutian Islands Atka Mackerel Assessment

All reports shall address the following points.

(1) The strengths and weaknesses of the modeling efforts for the Bering Sea and Aleutian Islands Atka mackerel assessment and harvest recommendations. Specifically, the review shall evaluate:
   - The analysts' use of fishery dependent and fishery independent data sources in the assessments;
   - Gaps or inconsistencies in the population dynamics modeling methodology or logic;
   - How assessment uncertainties may best be applied for management advice; and
   - Whether the assessments provide the best available science.

Additionally, the review shall (to the extent practical) evaluate and provide advice on:

(2) The specification of time-varying and age-specific selectivity parameters

(3) The treatment and application of survey data; specifically

   - Survey biomass estimates by management areas as used for quota apportionments; this stock forms dense patchy schools resulting in high variability

   - Survey catchability

(4) The incorporation of age differential natural mortality and the interaction with selectivity and survey catchability parameters

The AFSC will provide copies of stock assessment documents, survey reports, and other pertinent literature on a web site.

Annex 3: Agenda for

CIE Bering Sea/Aleutian Islands Atka mackerel Stock Assessment Review

NMFS Alaska Fisheries Science Center
7600 Sand Point Way NE, Building 4, **Room 2039,** Seattle, Washington

AGENDA *JULY 8 VERSION* July 29-31, 2014

Tuesday July 29th

9:00	Welcome and Introductions	**Martin Dorn (Chair)**
9:15	**Overview** (management, fishery, biology descriptions)	
	Management control rules and general modeling approach	**Jim Ianelli**
	Atka mackerel fishery and life history	**Sandra Lowe**
10:30	*Break*	
10:45	**Observer** sampling and coverage (1 hr)	**FMA TBD**
11:45	***Lunch***	
13:00	**Age and growth** (1 hr)	**Age and Growth TBD**
14:00	**Bottom trawl survey** (1 hr)	**Ned Laman, Susanne McDermott**
15:00	*Break*	
15:15	Aleutian Islands **ecosystem** overview (45 min)	**Stephani Zador**
16:00	Assessment model (AMAK) details	
17:00	Meeting adjourns for the day	

Note *At the end of each presentation and after the panel has had an opportunity for questions, we will solicit brief public comment and questions as moderated by the Chairperson*

Wednesday July 30th

9:00	Atka Mackerel stock assessment **Sandra/Jim**
10:45	*Break*
11:00	Review of stock assessment issues: incorporation of uncertainty, time-varying and age-specific selectivity, survey estimates by management area as used for quota apportionments, survey catchability, age differential *M* and interactions with selectivity and survey catchability parameters
12:00	*Lunch*
13:00	Discussion of proposed assessment model changes
15:00	Meeting adjourns for the day (afternoon reserved to work on model runs)

Thursday July 31st	
9:00	Evaluation of alternative model configurations
	Reviewer discussions with assessment authors
12:00	***Lunch***
1:00	Reviewer discussions with assessment authors as needed (continued)
3:00	Report writing. AFSC analysts will be available to respond to requests and answer questions