Review of the Bering Sea and Aleutian Islands Crab Fisheries

Economic Data Collection Program

CIE Independent Peer Review Report

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Executive Summary

This section presents a broad summary of detailed review findings and recommendations contained the report.

Findings

The Council objective to assess the economic performance of the crab rationalization program is a laudable one and exhibits leadership in U.S. fishery management practice.

The economic data collection program is comprehensive, developed through an extensive consultative and transparent process among economists and industry, and represents a significant improvement in the economic information base over previous economic data collection efforts.

The data requirement in this fishery is reasonable to support a core set of economic analyses.

The existence of reporting problems is a new data system not surprising. Crab rationalization is a rapidly evolving program which has created economic monitoring challenges. The need to develop a functioning data infrastructure while resolving data quality problems compounded the difficulty of getting the EDR program established.

The most severe data quality problems are associated with specification errors such as IFQ leasing costs and cost partitioning over multiple activities.

Some early data quality problems have been resolved, but harvesters and processor reporting continuing problems with reporting burden resulting from the level of reporting aggregation and the duplication of reporting effort. They are also concerned about the quality of some data elements

Industry members and analysts have different perspectives on the quality of the economic data generated through the EDR Program.

Data quality protocols in place throughout the program's existence result in extensive and multidimensional data quality assessment that is likely unique in fisheries economic data programs. It includes data entry error checks, third-party audits, statistical analyses, and industry review.

The process of data entry and management is well documented and contains numerous error checks. The usability of the database for researchers could be improved. Better use could be made of the EDR database to supply submitters with information of value. The EDR database does not presently have sufficient technical support.

The data collected through the EDR and other sources are capable of supporting a wide range of analyses important to short term regulatory assessments as well as longer-term understanding of the function and effects of rationalization.

The question of data sufficiency depends on the use and the level of precision required.

The EDR program comprises the best available science on the economics of the BSAI crab fisheries.

Recommendations

Objectives for economic analysis should continue to be derived from the objectives for the rationalization program, both short-term and long-term. Objectives for the economic data program should derive from economic analysis needs.

The structure and process of data collection, data management and data quality control can best be designed by those with expertise in economic analysis, as advised by industry members with expertise in fishery operations and financial accounting.

The existing data collection program should be continued at its present scope and scale. The Council should be able to expect that analysis to inform future decision making about the crab or other rationalization programs will be supported by a robust and complete economic database. It should also be able to rely on a standard and stable set of economic indicators to monitor program performance over time.

Difficulties of allocating variable and fixed costs across multiple activities can be addressed by increasing the level of aggregation at which reporting takes place and allowing analysts to perform data disaggregation according to fully documented processes.

Redundancy in economic data reporting should be addressed. A first step would be to conduct a systematic assessment of the data programs that exist to identify areas of overlap and potential coordination.

Provide feedback to EDR submitters on subsequent changes to submitted information as a result of audits.

Form a standing technical body of economists charged with coordinating and advising on economic data issues, in a function similar to that of the Plan Development Teams with biological data.

The Economic Data Committee could be charged with the following tasks:

- Define core data needed to address both current and anticipated future management issues across multiple fisheries;
- Define data products that address regulatory analysis needs as well as provide value to stakeholders;
- Develop a taxonomy of economic data quality and supportable types of analysis similar to the Tier system used in stock assessments;
- Develop a standard set of metrics for economic monitoring and evaluation;
- Define the appropriate level of aggregation for data collection, including options for performing disaggregation using econometric techniques;
- Develop standards for data accuracy and address the question of data uncertainty;

- Use PNCIAC rankings to identify reporting problems and recommend approaches to their resolution;
- Oversee the process of data quality assessment and reporting of data quality results;
- Develop a matrix of acceptable levels of data uncertainty for different types of analysis;
- Oversee the use of statistical techniques to test for accuracy at different levels of aggregation;
- Develop and maintain metadata;
- Develop best practices for data interface across existing processes;
- Track economic data and analytical issues within the rapidly developing program;
- Identify contextual fishery issues that influence economic performance of the fishery;
- Recommend changes to improve the research usability of the EDR data;
- Assess opportunities to integrate economic information with non-economic information on communities and ecosystems;
- Establish an educational process regarding the purpose and limits on use of the EDR data.

Introduction

Background

In 2005 the North Pacific Fishery Management Council (Council) developed and NOAA Fisheries implemented the Bering Sea and Aleutian Islands (BSAI) Crab Rationalization Program which included individual transferable quota shares for harvesting and processing each of eight crab stocks. Among the Council's objectives in rationalizing the crab fisheries were addressing excess harvesting and processing capacity, and improving the economic performance of the crab fisheries by addressing low economic returns and economic instability for harvesters, processors, and communities (AFSC 2011b).

In anticipation of potential changes in the social and economic effects of the fishery, the Council tasked the Alaska Fisheries Science Center (AFSC) with leading the development and implementation of a mandatory annual economic data collection program, Economic Data Reports (EDRs). The EDR program was designed to collect detailed cost, earnings, and employment data from fishery participants to support computation of a number of performance metrics (AFSC 2011b).

Data collection processes, data elements and survey instruments, were developed with extensive industry consultation and Council review. EDR reporting requirement went into effect in 2005, with EDR baseline data submission required retroactively for 1998, 2001, and 2004 and subsequently, for calendar year crab fishing activities for 2005 to present (AFSC 2011a).

Extensive efforts have been taken to investigate and validate the quality of the information reported in the EDR forms. Several informal focus groups have been held with EDR submitters

and more formal review has been conducted through data entry error checks, audits, statistical analysis, discussion papers, scientific review and industry review (AFSC 2011a).

Because reporting is mandatory, the EDR is a census of all active crab fishery participants in the harvest and processing sectors. Revisions to EDR forms were incorporated in 2006 and 2007 to address some identified data quality concerns. In 2010 the Council initiated a process to review the analytical objectives of the EDR program and develop revised regulations and reporting requirements. Council decisions regarding objectives and data reporting requirements are expected in December 2011 (AFSC 2011b)

Terms of Reference

The Center for Independent Experts (CIE) reviewers were asked to address the following issues:

1. Review and discussion of data collection and analytical objectives defined by the Council, and associated data quality objectives, as context for evaluation of methods under ToR's 2 through 10;
2. Evaluation and findings regarding establishment survey questionnaire design, evaluation, and testing methodology employed to date and recommendations for improvement;
3. Evaluation and findings regarding data collection administration and data management to date and recommendations for improvement;
4. Evaluation and findings regarding protocols and metrics, for data quality assessment employed to date and recommendations for improvement;
5. Evaluation and findings regarding data quality control standards employed to date and recommendations for improvement;
6. Evaluation and findings regarding analytic methodologies and treatment of uncertainty employed to date and recommendations for improvement;
7. Evaluation and findings regarding interpretation and conclusions of data analyses employed to date and recommendations for improvement;
8. Explicit determination as to whether this NMFS project presented the best available science;
9. Recommendations for further improvements, including all elements of the EDR program development and evaluation process and appropriate institutional and scientific capacity;
10. Brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Description of Review Activities

Document Review

In preparation for the panel site visit I reviewed the following background documents provided by AFSC:

- Annual Catcher/Processor Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Annual Catcher Vessel Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Annual Shoreside Processor Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Historical Catcher/Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Historical Catcher Vessel Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Historical Shoreside Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Five-Year Review of the Crab Rationalization Management Program for Bering Sea and Aleutian Islands Crab Fisheries. 2010. North Pacific Fishery Management Council, Anchorage, AK. December 28, 2010
- Discussion paper on crab economic data collection. 2010. North Pacific Fishery Management Council, Anchorage, AK. October 2010.
- Discussion paper on economic data collection. 2010. North Pacific Fishery Management Council, Anchorage, AK. February 2010.
- Final EIS for BSAI King and Tanner Crab Fisheries. NOAA Fisheries. August 2004.
- Garber-Yonts, B. and J. Lee. 2010. Stock Assessment and Fishery Evaluation Report for King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2010 Economic Status Report. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- Alaska Crab Economic Data Report Data Validation: Report Prepared for Pacific States Marine Fisheries Commission, 2009 Calendar Year Data. 2010. AKT, LLP, Portland, OR. November 2010.
- 2006 Economic Data Report (EDR) Data Collection Difficulties. 2007. Pacific States Marine Fisheries Commission, 205 SE Spokane Street, Suite 100 Portland, OR. July 2007.
- BSAI Crab Economic Data Report Database: Metadata. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
- BSAI Crab EDR Database: Data Quality Summary. Updated January 30, 2008. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.

In addition I reviewed materials related to the directives of the Magnuson Stevens Fishery Conservation and Management Act, Appendices A (social and community impacts) and B (safety) to the five year review of the crab rationalization program, meeting minutes of the

North Pacific Fishery Management Council (NPFMC), NPFMC SSC, NPFMC AP, and the Pacific Northwest Crab Industry Advisory Committee (PNCIAC). I also reviewed data program performance evaluations of the Pacific States Marine Fisheries Commission (PSMFC) and a National Academy of Science report on fisheries data. I list these supplemental review materials in Appendix 1.

Site Visit

I and other panel members participated in the site visit at the Alaska Fisheries Science Center (AFSC), 7600 Sandpoint Way Seattle, WA on August 23-25, 2011. On August 23-24 the panel met with Dr. Brian Garber-Yonts, Dr. Ron Felthoven, and other AFSC staff, PSMFC staff, fishing industry members and other public. The panel met in executive session at the AFSC on August 25.

Findings and Recommendations

In this section I present findings and recommendations for each of the ten areas of evaluation described in the Terms of Reference.

1. Objectives for data collection, analysis and data quality:

Background

The BSAI Crab Rationalization Problem Statement developed by the North Pacific Fishery Management Council (Council) identifies the need for a rationalized crab management regime to address five major problems facing the fishery:

1. Resource conservation, utilization and management;
2. Bycatch and its associated mortalities, and potential landing deadloss;
3. Excess harvesting and processing capacity, as well as low economic returns;
4. Lack of economic stability for harvesters, processors and coastal communities; and
5. High levels of occupational loss of life and injury.

The objectives for the crab rationalization program were to mitigate these problems by slowing the race for fish, reducing bycatch mortality, increasing the efficacy of crab stock rebuilding strategies, addressing the social and economic concerns of communities, maintaining healthy harvesting and processing sectors and promoting efficiency and safety in the harvesting sector. A further objective was to achieve equity between the harvesting and processing sectors, including healthy, stable and competitive markets (NPFMC and NMFS 2004b).

The objectives for economic data collection, analysis and quality control derive from these larger program objectives. In establishing the crab rationalization program, the Council identified a corresponding need to monitor the success of the program in achieving its objectives and to assess its economic effects through the collection of economic data more extensive than existing programs. Accordingly, the Council established a mandatory data

collection program through the vehicle of Economic Data Reports (EDR's) that would ensure the provision of data necessary to understand the impacts of crab rationalization. The crab rationalization program is the first of three rationalization programs managed by the Council to include a mandatory data collection program component. For these programs, the Council has developed a purpose and need statement that considers balancing of data collection costs with the contribution those data provide to the fisheries management process. (NPFMC and NMFS 2004b; NPFMC 2010b).

The Council's Scientific and Statistical Committee (SSC) has also articulated the need for systematic collection of coherent, comprehensive social and economic data from Crab Rationalization Program fisheries (NPFMC SSC 2011), as has the Advisory Panel (AP) (NPFMC AP 2011.) However, various issues with data detail, reporting burden and quality have arisen in the course of the program's first years of implementation. In 2010 the Council initiated a process to review the analytical objectives of the EDR program and develop revised reporting requirements. It is expected to consider alternatives for program restructuring at its December 2011 meeting (NPFMC 2010b; AFSC 2011b).

Findings

The economic data collection program is comprehensive and represents a significant improvement in the economic information base over previous economic data collection efforts. The primary area of improvement is in the collection of cost data, essential to the analysis of net economic effects of regulatory programs but chronically absent from standard fishery economic data collection. Previous cost data collection has been the result of voluntary and *ad hoc* efforts.

The Council objective to assess program economic performance is a laudable one. Rationalization is an economic approach to management that changes incentives of fishery participants and affects subsequent behavior in ways that may alter the distribution of rents among industry sectors and communities. There is a need to understand the economic dynamics of rationalization as expressed in quota leasing, coop function, price determination, crew employment, rates of capacity reduction, and community impacts. Understanding these program elements and their effects on communities and on different fishery sectors is an important component of assessing regulatory impacts, but an approach that is still not standard practice. Making data reporting mandatory conveys the importance placed by the Council on understanding the effects of the rationalization program. The North Pacific Fishery Management Council has once again exhibited leadership in U.S. management practice.

A notable aspect of this program is the engagement of the Council and its advisory panel beyond the specification of objectives for the economic data program to the design of the program and the determination of data elements. This seems to be an unusual level of involvement of policy bodies and non-scientific advisors in the determination of the content of scientific data.

Although the Magnuson Stevens Fishery Conservation and Management Act specifies that fishery management plans should assess and specify the nature and extent of scientific data needed for effective implementation of the plan, a more usual approach would be for the Council to articulate its objectives for a data collection program, subject-area scientists would identify the data elements needed to conduct analysis in support of those objectives, and industry would be engaged to advise on the operational aspects of reporting those data. This is the approach followed for biological data collection in fisheries and offers a good model for economic data collection.

Recommendations

Objectives for economic analysis should continue to be derived from the objectives for rationalization program performance, both short-term and long-term. Objectives for the economic data program should derive from these analytical needs.

The structure and the process of data collection, data management and data quality control can best be designed by those with expertise in economic analysis, as advised by industry members with operational expertise in financial accounting.

There would be benefit to stabilizing the components and collection protocols of the economic data program so that a systematic and consistent time series can be built over time.

The economic data developed for the crab rationalization program could usefully be thought of as a pilot model from which to expand economic data collection to all fisheries under Council management so that the analysis of economic performance of fishery management can be conducted systematically and consistently at the system level of the Council's managed ecosystems.

2. Survey questionnaire design, evaluation, and testing methodology:

Background

The need for mandatory economic data collection as part of the crab rationalization program was first discussed by the Council and its Scientific and Statistical Committee (SSC) during the process of program development in 2002 and 2003. In 2002 the Council adopted a preferred alternative for the program which identified elements of such a data program, and appointed an industry Data Collection Committee charged with developing proposals for further program development. (NPFMC and NMFS 2004a)

The Council tasked the AFSC with leading the development and implementation of Economic Data Reports (EDRs). The purpose of the EDR program was to collect detailed cost, earnings, and employment data to support the evaluation of rationalization effects and to provide data and analysis in support of future management changes (AFSC 2011b).

The final design of the data collection, including data elements and questionnaires, was guided by the Council's five statements of rationalization program objectives and developed through an iterative process with extensive industry consultation and Council review. The focus of discussions was on the types of metrics that were needed to monitor progress toward resolving the problems the rationalization program was designed to address (NPFMC and NMFS 2004a).

In developing the EDR's, attempts were made to identify a level of reporting that was feasible and supportable by industry. The EDR reporting requirement went into effect in 2005, with EDR baseline data submission required retroactively for 1998, 2001, and 2004 and subsequently, on an annual basis, for calendar year crab fishing activities for 2005 to present (AFSC 2011b).

The purpose of the retroactive data collection was to generate baseline data prior to be able to compare pre-rationalization to post-rationalization conditions. The majority of time was spent pre-testing the survey of historical activity; less time was spent pre-testing the survey of current conditions. As a result some questions on the existing survey (for example on leasing) were not pre-tested.

Because cost data have not traditionally been collected in fisheries except on voluntary basis, the implementation of a mandatory comprehensive economic data collection program was an ambitious effort that required extensive discussion and negotiation. Major issues that arose included the types of fixed cost data to be collected and options for preserving data confidentiality.

Findings

Discussion at the review meeting identified an extensive consultative process among economists and industry to identify needed economic data. The process that was followed to develop the survey instrument resulted in a rationale for each EDR data element to address gaps and weaknesses in the existing data.

Now that the survey is an implemented requirement, harvesters and processors are expressing compliance problems. The main issue with the survey as expressed by industry representative meeting participants is reporting burden. Reporting burden arises from the level of reporting aggregation and the duplication of reporting effort.

Reporting aggregation: industry representatives expressed difficulties with apportioning selected operational and financial variables, for example multiple-fishery costs, across specific fisheries. They expressed frustration with the time it takes to estimate the apportionment, the potential for different estimation methods across submitters, the likelihood of inconsistent data, and the resulting erosion of data quality.

Duplication of reporting effort: Industry representatives noted the time burden of reporting through multiple processes and expressed a strong interest in avoiding duplication of effort. There are multiple databases with some reporting overlap, such as catch accounting, quota accounting, VMS, logbooks, production reports and observer reports. Interest was expressed in better interface among existing databases and processes.

During the development of the crab rationalization program the Council recognized its potentially significant economic effects and, in setting up the EDR, articulated a need for an economic information base that would support the analysis of economic performance of the program. This analysis would necessarily be both short-term assessments of impacts and longer term analysis and modeling of the economic dynamics of rationalization (NPFMC 2010b; 2010c).

The data requirement in this fishery is reasonable to support a core set of economic analyses. In particular, the need to build a consistent time series of economic data to support as yet unspecified analysis in the longer-term supports the continuation of extensive economic data collection.

Several Council documents provide good rationale and justification for the extensive collection of economic data through EDRs. The process that was followed to identify the needed data was appropriately consultative and transparent, involving people with economics analytical expertise as well as those with fishery operational expertise.

The existence of reporting problems is a new data system not surprising, and indeed has been anticipated by the extensive data check, audit, and reporting mechanisms that have been put in place. Part of the reporting burden comes from adjustments to a new data program. The question is how these problems can best be addressed.

Recommendations

The existing data collection program should be continued in its present scope and scale. The Council should be able to expect that analysis to inform future decision making about the crab or other rationalization programs will be supported by a robust and complete economic database. It should also be able to rely on a standard and stable set of economic indicators to monitor program performance over time.

Difficulties of allocating variable and fixed costs across multiple activities can be addressed by increasing the level of aggregation at which reporting takes place. A high level of aggregation in reporting will not remove the analytical need to apportion costs across individual fisheries or activities, but it will reduce the reporting time burden for submitters and remove the inconsistency of reporting generated by diverse methods of apportionment followed by multiple submitters. There is value in having a single analyst apportion costs and be explicit about assumptions and methods. One option is to derive estimates of likely values and ask submitters to comment on the reasonableness of the values.

One way to address reporting redundancy across multiple efforts would be for the Council to expand economic data reporting across all fisheries to avoid multiple fishery reporting. The EDR could then serve as a core economic information base for Council managed fisheries. A first step in the process of eliminating duplication would be to conduct a systematic assessment of the data programs that exist to identify areas of overlap and potential coordination. Meeting discussion indicated that this effort may have been begun; existing work could be expanded by

a comprehensive examination of all information sources, the allocation of reporting burdens across sources, and the avoidance of redundancies.

A means to address both data disaggregation and reporting streamlining would be to form a standing technical body charged with coordinating and advising on economic data generation, survey modifications, data apportionment, etc. in a function similar to that of the Plan Development Teams and biological data. This Economic Data Committee could comprise economists from AFSC, Council, state and interstate agencies and academia. Committee members should have expertise in economic theory and analysis and have a working familiarity with applied economic analysis within the Council setting. The Committee could be formed as a FACA committee under the auspices of either the AFSC or the NPFMC.

The Economic Data Committee could be tasked with the design of a standard set of economic data to be collected across fisheries to eliminate the separate data collections for particular programs. The committee could define core data needed to address both current and anticipated future issues, and could develop best practices for data interface across existing processes. It could also identify contextual fishery issues – for example the dynamics of coops - that influence economic performance of the fishery, and look for opportunities to integrate economic information with non-economic information on communities and ecosystems.

Some duplication results from programs with different reporting formats and protocols and different data needs. A multi-agency effort to reconcile data could be fruitful.

3. Data collection, administration and data management:

Background

Economic data are collected and held by the Pacific States Marine Fisheries Commission (PSMFC) as a third party not engaged in crab fishery management. The PSMFC abides by all statutory and regulatory requirements for data confidentiality and “blind” data reporting that masks the identity of individual data submitters except in the case of enforcement or other legal actions (NMFS AK Region 2011).

EDR is a novel program for PSMFC in that they are getting direct submissions of raw data instead of data feeds from agencies, such as with the Alaska Fisheries Information Network (AKFIN). PSMFC is therefore responsible for entering and verifying data, and are in the position of trying to improve the consistency of data submitted across individual submitters. EDRs are submitted by harvesters in paper form as well as online, and by processors in paper form. A certified public accountant conducts annual records-check validation by means of mandatory audits of operational and financial records for a random sample of the submitted EDRs as well as selected for-cause and outlier audits. These audits do not serve as checks on data accuracy but rather as checks on the adequacy of documentary support for data provided (AKT LLP 2010)

The PSMFC reports annually on the conduct of data collection, administration and management (cf. PSMFC 2007). The reports focus on elements of the EDRs that cause confusion or create

problems for submitters, and as such provide valuable feedback regarding survey design and instructions.

Findings

The CIE Review Panel received a detailed presentation of the data entry and management system that revealed a well documented process of data entry containing numerous error checks (Tyler 2011). Program management is responsive to submitter concerns and maintains ongoing communication and feedback. The annual reports identifying problems with the survey form or other areas of reporting provide feedback useful to the refinement and improvement of the survey instrument.

Discussion with PSMFC personnel indicate that the program does not have access to sufficient technical support and consequently outsources its programming to a third party (cf. Resource Data Inc 2011). This is an expensive approach and cost savings could be realized through the hire of in-house staff dedicated to this project.

Researchers have commented that the database is complex and difficult to use. Stakeholder comment at the CIE review meeting indicated that the online entry form also has the potential to provide submitter with information of value. Internalizing technical programming support would also provide the benefit of close access to submitter feedback that would encourage database revisions to make it more user-friendly to researchers and stakeholders alike.

Another recommendation from stakeholders for improvement in the EDR management system concerns the auditing process. Under the present process people who "pass" an audit receive a letter saying that adequate support was provided, but no information is provided regarding any changes in data that were made as a result of examining the provided documentation. Industry participants in the CIE meeting indicated that they would like to receive feedback regarding which information was changed so that they can provide consistent information.

Recommendations

The suggestions for enhanced in-house programming and database management staff and improvements in the usability of the database seem well justified and should be implemented. Increased data program staff has the potential to both reduce the reporting burden on submitters and draw more utility from the data.

Providing feedback to EDR submitters on subsequent changes to submitted information as a result of audits would be a worthwhile additional step to implement.

4. Protocols and metrics, for data quality assessment

Background

Since its inception the EDR program has generated data of varying degrees of quality. The first EDR submissions in 2005 had significant problems of data quality associated principally with questionnaire design. Revisions to EDR forms were incorporated in 2006 and 2007 to address some identified data quality concerns (AFSC 2011b).

Between 2006 -2010 numerous efforts have been directed toward measuring data quality and detecting error. Protocols for data quality assessment and control have been developed jointly by AFSC and PSMFC. PSMFC has produced annual reports summarizing data submission problems raised by submitters (PSMFC 2007). A certified public accountant has conducted annual data validation audits of operational and financial records for a random sample of the submitted EDRs (AKT 2010). Meetings with crab industry stakeholders have solicited feedback on potential reporting errors and survey design flaws (AFSC 2011a). The Pacific Northwest Crab Industry Advisory Committee (PNCIAC) has conducted qualitative data quality assessments and categorization of data on the basis of reporting burden and data accuracy (AFSC 2011a). A metadata document incorporating results of audits and PNCIAC assessments has been reviewed by the Council's Scientific and Statistical Committee (AFSC 2010).

In addition, the AFSC has conducted statistical analysis of audit data to identify patterns in reporting error and whether error is systematic or random. Two methods of testing for systematic reporting error are used: computation of reliability ratios and regression analysis of error distribution (AFSC 2011a).

Findings

Crab rationalization is a rapidly evolving program with associated economic monitoring challenges. There have been some unanticipated data reporting issues, such as informal leasing within coops, and early problems with non-response. Data quality problems have been compounded by problems in the data infrastructure.

Nevertheless, protocols have been in place from the beginning of the EDR Program for data quality assessment. Metrics to measure sources of error were developed soon after implementation. An analytical approach to identifying data quality problems has been taken. The approach to data quality assessment checking is extensive and multidimensional and is likely to be unique in fisheries economic data programs. Validation statistics indicate continued improvement in data quality over time.

Industry remains concerned about the quality of some data elements, expressing fear that analysts will consider the data to be problem free and will use the data in ways that will be problematic. Industry participants in the review offered numerous examples of areas in which they feel the EDR does not capture data with sufficient accuracy, often because of requirements to apportion costs to various activities or fisheries.

Review meeting discussion revealed that there may be some lack of clarity about the intended use of the EDR data. Some industry expressed concern that submitted data could be used to monitor individual behavior and lead to administrative sanction, while analysts expect the data to be used to assess trends in the economic performance of the fishery and to identify distributional impacts on sectors or communities.

Recommendations

The EDR program is new and has had the inevitable difficulties of reporting procedures and data quality. Data quality is improving with time as a result of feedback from and consultation with submitters. Rather than reduce the amount of data collected because of reporting problems, AFSC and PSMFC should continue established protocols to monitor data quality and fix identified problems.

The degree of data quality assessment is admiral and should continue. What is needed is a stable process for data quality checking and reporting of data quality results. The existing quantitative evaluation of audit data is a valuable means to identify patterns of error and should continue, with experimentation in alternative regression estimation techniques.

The qualitative data assessment performed by the PNCIAC is useful in identifying problems from the submitter perspective that could be used to identify areas where process improvements could be made. The PNCIAC rankings score data elements on the basis of accuracy and reporting burden but are undocumented. Documentation of these rankings would make them more useful in the identification of specific corrections to data problems.

The EDR program is new both as a general concept of mandatory economic data reporting as well as in the specific requirement for the BSAI crab fishery. It is therefore important that there be a clear understanding of the purpose and intended use of the EDR data. It would be helpful to establish a process for the purpose and limits on use of the EDR data to be made clear within the Council system. The earlier recommended standing economic data committee could perform this educational function.

5. Data quality control standards

Background

The NOAA Data Quality Guidelines (NOAA 2006) note the importance of using sound quality control techniques to maintain the objectivity of original data. Under these guidelines quality control has two major elements:

- Data collection via documented procedures reflecting standard scientific practices;
- Quality control of original data before agency use or external dissemination.

Some aspects of the data quality control standards are more applicable to physical instrumentation for oceanographic or atmospheric measurements then to economic measurement. However, the elements are sufficiently comprehensive to allow meaningful

application to economic data. The first element requires that the methods, systems, instruments, training, and tools of data collection be designed to meet the needs of the target data user and be validated before use. The second element allows a range of appropriate quality control techniques, including gross error checks for data outliers, comparison with other measurement sources, examination of time series and statistical summaries, and visual inspection of the data.

The Guidelines state that the assessment and control of NOAA data quality is an on-going process involving evolution and improvements in survey techniques, instrument performance, and data processing (NOAA 2006).

Since its inception in 2005, the EDR program for the Bering Sea and Aleutian Islands crab fisheries has developed protocols for data quality control and assessment in collaboration between the AFSC and the PSMFC. The process of data quality assessment has included feedback from and discussions with industry representatives, the public, Council staff, PSMFC and AFSC (AFSC 2011a).

Economic data have been subjected to a number of procedures to assess and control for data quality. These include error checks during processes of data entry and management, audits of data documentation, statistical tests of data reliability, and industry rankings. The procedures are described in greater detail under items 3 and 4.

Findings

Meeting discussions revealed different perspectives of industry members and analysts on the quality of the economic data generated through the EDR Program. Many of the industry's concerns with data accuracy are related to inconsistencies between standard bookkeeping practices and the level of aggregation of requested data. For some data elements submitters report difficulties apportioning cost data among categories.

The first element of the NOAA Data Quality Standards requires that methods, systems, training, and tools of data collection be designed to meet the needs of the target data user, and are validated before use:

- Target data users of EDR's are primarily economic analysts supporting the NPFMC decision process through the analysis of regulatory alternatives and assessment of program implementation effects. Additional potential users of the economic data are fishing industry members, who could benefit from receiving aggregate assessments of program or sector performance. Extensive consultation during the data program design process provided many opportunities to articulate these data needs.
- An historical survey was developed in addition to the survey to be used post-implementation. The majority of time was spent pre-testing the historical surveys; less time was spent pre-testing the survey of current conditions. As a result some questions on the existing survey (for example on leasing) were not pre-tested.
- At the beginning of data collection, the need to develop a functioning data infrastructure while resolving data quality problems compounded the difficulty of

getting the EDR program established. However, data quality control checks in place since the program's inception have ensured that data are validated before use in analysis.

The second element of the NOAA Data Quality Standards requires a range of appropriate quality control techniques, including gross error checks for data outliers, comparison with other measurement sources, examination of time series and statistical summaries, and visual inspection of the data:

- PSMFC error checks: the process of submitting (electronic and paper), entry, error checks and management of EDR data includes well-documented steps of validation.
- Audits: third-party audits assess documentation and supportability of data provided by individual submitters, but do not attempt to assess the quality of information across submitters for the data as a whole. The audit process is designed to quantify error in EDR variables and identify the nature and source of that error, resulting in a quantified measure of data quality (AFSC 2011a).
- AFSC statistical analyses: these include two methods of statistical analysis of measurement error: computation of reliability ratios of audit data and regression analysis of error distribution.
- PNCIAC data quality tiers: survey data were assessed on the basis of data accuracy and reporting burden. The resulting ABC data categories are a qualitative assessment representing the industry perspective on accuracy and burden. They do not identify either the source of the data problem or a path to its correction.

The quality control methods embedded in the PSMFC data entry and management process combined with statistical testing for error patterns and reliability are appropriate methods of testing and reveal a pattern of improving data quality over time. Taken together, e.g. as compiled in Appendix A of AFSC (2011a), they comprise a more detailed data quality control system than is normal in fisheries.

The question of data sufficiency depends on the use and the level of precision required. For purposes of monitoring the effect of a regulatory program on the fishery as a whole, the less detailed data are generally sufficient. Assessing trends and changes and their statistical significance at the sector level requires a greater level of data precision.

The methods of data quality control have revealed that the most severe data quality problems are associated with specification errors such as IFQ leasing costs and cost partitioning over multiple activities.

Recommendations

A number of data quality concerns have been identified through data quality control methods as well as by industry submitter feedback. Addressing these concerns will be a matter of continuing the data validation processes already in place as well as some adjustment of data collection to accommodate reasonable industry concerns. It is important to maintaining the scale and scope of the economic data needed for the analysis of program performance. After

the long consultative process of defining an admirably complete and substantive economic data system for the BSAI crab fishery it would be a step backward to react to data quality concerns by reducing the amount of economic information provided.

To address industry concerns about data accuracy and reporting burden, the data reporting process should be redesigned to collect information at a level of aggregation consistent with bookkeeping that can be validated against industry accounts. Data should be reported at whatever level of aggregation can be demonstrated to be accurate over multiple fisheries or larger units of time. Streamlining the data reporting process will enhance the potential for leveraging the EDR infrastructure to expand economic data reporting across a greater number of fisheries.

There is value in having economic data reported at a level of aggregation that is obtainable at a high level of accuracy. This will generally mean reporting at a higher level of aggregation, which would reduce reporting burden on the part of the submitters and concomitantly require analysts to perform the disaggregation necessary for analyses through statistical processes. The advantages of analyst disaggregation over disaggregated industry reporting are the transparency and consistency of disaggregation methods used.

The methods of data validation in place through the PSMFC error checks, third party audits, and AFSC and statistical analyses are excellent and should continue. If the level of data reporting is aggregated to be consistent with industry recordkeeping, as recommended above, this will allow further data validation through cross checking data submissions with record books during the audit process.

It is important to stabilize the data quality control and data validation process so that there are consistent transparent methods employed, standard metrics used and metadata monitored. Both data providers and data users need to be comfortable with the level of data accuracy and its appropriateness to various levels of analysis. This is a function that could be performed by the standing economic data committee.

6. Analytic methodologies and treatment of uncertainty

Background

NOAA Data Quality Guidelines (NOAA 2006) note that scientific information and its statistical variation reflects the inherent uncertainty of the scientific process. All fishery data are characterized by some level of uncertainty. Information is considered accurate if it is within an acceptable degree of imprecision appropriate to the particular kind of information and meets commonly accepted scientific and statistical standards. Original data or analytical results within an accepted degree of imprecision or error are by definition within the agency standard and are therefore considered correct.

The principle source of uncertainty in scientific data is usually sampling error. However, because submission of Economic Data Reports is required of all fishery participants, the resulting data represent a complete census of the fishery population and sampling error does not exist. Instead, uncertainty in the EDR database results from errors of specification and measurement.

Current discussion within the NPFMC process indicates different degrees of tolerance for data uncertainty within the EDR program. At its April 2011 meeting the Advisory Panel indicated that EDR program data collection should be focused on those data that are fully accurate (NPFMC AP 2011). At that same time the SSC advised the Council that the level of data accuracy needed may depend upon the desired level of analysis (NPFMC SSC 2011). In response the Council, in recognition of the inherent uncertainty in scientific data, passed a motion indicating that the EDR data should be "sufficiently accurate" (NPFMC 2011).

Findings

The major source of uncertainty in the EDR data is measurement error. It is clear that there are different perceptions among industry and economic analysts as to the acceptable level of uncertainty to accommodate within the EDR data.

As noted by the SSC, a specific definition of "sufficiently accurate" depends on the type of analysis to be conducted. A taxonomy of the types of analysis and acceptable levels of uncertainty associated with each analysis has not yet been developed.

It appears that the scientific review process for meeting NOAA data quality guidelines on data uncertainty is not fully developed. Because the usual source of data error is sampling, established processes of scientific review may be less well adapted to evaluating measurement and non-response error in census surveys.

Recommendations

It would be helpful to have the question of acceptable levels of data uncertainty addressed in a specific manner. The Council could be more explicit in how it interprets "sufficient accuracy" of economic data for different types of analysis. Without a clear definition the "sufficiency" question is likely to be the source of varying interpretation and continuing challenge.

The previously recommended Economic Data Committee could be charged with developing standards for data accuracy and address the question of data uncertainty. The Committee could: develop a taxonomy of data quality and supportable types of analysis similar to the Tier system used in stock assessments; define the appropriate level of aggregation for data collection, including options for performing disaggregation for particular analysis using econometric techniques; oversee the use of statistical techniques to test for accuracy at different levels of aggregation; and define data products that address regulatory analysis needs as well as value to the stakeholder suppliers of economic data.

7. Interpretation and conclusions of data analyses

Background

Three examples of application of the data in analyses of the crab rationalization program are found in an analysis of the employment and remuneration effects of the crab rationalization program (Abbott et al. 2010), the Five-Year Review of the Crab Rationalization Management Program (NPFMC 2010a) and the 2011 Economic Status Report (Garber-Yonts and Lee 2011). In their analysis of the effects of crab rationalization on crew, Abbott et al. combine data from fish tickets and EDRs. The Five-year review uses EDR and other sources of data to assess share holdings in the harvesting and processing sectors, community effects and markets, among other program elements. The existence of historical EDR data allows the construction of a baseline against which to compare program effects. Garber-Yonts and Lee use EDR and other data to calculate statistics on harvesting, processing, revenue, labor employment, labor compensation, operational costs, and quota usage and disposition among fishery participants.

Findings

Abbott et al., the Five-Year Review and Garber-Yonts and Lee are three examples of the type of economic analysis supportable by the EDR data and useful to the Council in its monitoring and evaluation of the economic effects of the crab rationalization program. The analytical methodologies employed are appropriate to the data. Particularly useful is the ability to assess distributional effects of rationalization across different fishery sectors.

Two areas that do not appear to have yet been the focus of economic analysis are the effects of crab rationalization on communities and the economic structure and function of co-ops, particularly in regard to quota leasing.

The data collected through the EDR and other sources is capable of supporting a wide range of analyses important to short-term regulatory assessments as well as longer-term understanding of the function and effects of rationalization.

Recommendations

Emphasis should be placed on reconciling formatting complications in the EDR data to improve the usability of the data for analysis.

The Economic Data Committee could help define needed analysis to assess impacts of the rapidly changing crab rationalization program.

8. Best available science

Background

Section 301 of the Magnuson Stevens Fishery Conservation and Management act requires that all fishery management plans and regulations adhere to ten national standards. National Standard 2 states "Conservation and management measures shall be based upon the best scientific information available" (MSFCMA 2007).

A key word in this requirement is "available," which reflects the fact that scientific information supporting fishery management decisions is never complete. The implementing guidelines for the national standards developed by the National Marine Fisheries Service (NMFS 2009) indicate that documents supporting fishery management plans and regulations must take into account the best scientific information available at the time of preparation. When new information becomes available it should be incorporated where practicable to assist assessment of whether a management plan or regulation is achieving its objectives.

The point of National Standard 2 is twofold: to ensure that fishery management decisions are informed by the best available science and, in recognizing "best available", to not allow the perfect to become the enemy of the good.

As noted above, NOAA Data Quality Guidelines (NOAA 2006) note that data uncertainty is inherent to fisheries, and that information generated from those data is considered accurate if it is within an acceptable degree of imprecision and meets commonly accepted scientific standards.

Findings

The mandatory collection of economic data is relatively recent in U.S. fisheries. The EDR program represents an extensive consultation process of data identification and survey instrument development. The Program was developed to address the analytical needs of assessing program performance against Council objectives for the crab rationalization program. The EDR program has identified problems of data quality in some elements, but these quality aspects are the subject of ongoing monitoring, validation and improvement through established and comprehensive quality control processes. Further improvements are possible through adjustments to data reporting processes.

Taken altogether, these attributes determine that the EDR program comprises the best available science, in both data and analysis, on the economics of the BSAI crab fisheries.

9. Recommendations for further improvements

I have no further recommendations beyond those contained throughout the report.

10. Panel review proceedings

The panel review discussions centered on a number of key issues surrounding:

- Data quality problems and options for their resolution;
- The survey instrument and options for revision;
- The process of industry-agency consultation;
- Appropriate levels of data aggregation;
- Feasibility of data reporting;
- Reconciling levels of existing industry practice with economic data needs;
- The need for continuous engagement of economists in data specification and metadata.

Discussions were open and constructive and included engagement with industry and agency participants who provided invaluable clarification on the details of data program structure and process.

Acknowledgements

The panel acknowledges the cooperation of the scientists at the Alaska Fisheries Science Center, staff of the Pacific States Marine Fisheries Commission, members of the Bering Sea crab fishing industry as well as the work of Manoj Shivlani in review coordination.

Appendix 1: Bibliography of Materials Provided for Review and Supplemental References

Abbot, K., B. Garber-Yonts and J. Wilen. 2010. Employment and remuneration effects of IFQs in the Bering Sea/Aleutian Island crab fisheries. *Marine Resource Economics* 25:333-354.

AKT LLP. 2010. "Alaska Crab Economic Data Report Data Validation: Report Prepared for Pacific States Marine Fisheries Commission, 2009 Calendar Year Data," Portland, OR: Pacific States Marine Fisheries Commission, 8 p.

Alaska Fisheries Science Center. 2009; 2010. Annual Catcher/Processor Crab Economic Data Report (EDR). NOAA Fisheries, , Seattle, WA.

Alaska Fisheries Science Center. 2009; 2010. Annual Catcher Vessel Crab Economic Data Report (EDR). NOAA Fisheries, , Seattle, WA.

Alaska Fisheries Science Center. 2009; 2010. Annual Shoreside Processor Crab Economic Data Report (EDR). NOAA Fisheries, , Seattle, WA.

Alaska Fisheries Science Center. 2004; 2006. Historical Catcher/Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Seattle, WA.

Alaska Fisheries Science Center. 2004; 2006. Historical Catcher Vessel Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Seattle, WA.

Alaska Fisheries Science Center. 2004; 2006. Historical Shoreside Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Seattle, WA.

Alaska Fisheries Science Center (AFSC). 2010. BSAI Crab Economic Data Report Database: Metadata. 2010. NOAA Fisheries, , Seattle, WA.

Alaska Fisheries Science Center (AFSC). 2011a. BSAI Crab EDR Database Data Quality Summary. Economics and Social Science Research Program, August 10, 2011.

Alaska Fisheries Science Center (AFSC). 2011b. Public Announcement, Bering Sea and Aleutian Islands Crab Fisheries Economic Data Collection Program External Independent Peer Review by the Center for Independent Experts Panel Review Meeting, August 23-25, 2011 NOAA Alaska Fisheries Science Center, 7600 Sand Point Way NE, Seattle, WA

Garber-Yonts, B. and J. Lee. 2010. Stock Assessment and Fishery Evaluation Report for King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2010 Economic Status Report. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.

Magnuson Stevens Fishery Conservation and Management Act (MSFCMA). 2007. Public Law 94-265 as amended by the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (P.L. 109-479). An Act to provide for the conservation and management of the fisheries, and for other purposes. As Amended Through January 12, 2007. http://www.nmfs.noaa.gov/sfa/magact/

Minor, S. 2011. Written statement provided to the CIE review team. August 24, 2011.

National Marine Fisheries Service (NMFS). 2009. National Standard Guidelines. 50 C.F.R. 600.310 et seq., updated 8/29/ 2009. http://www.nmfs.noaa.gov/sfa/reg_svcs/Councils/Training2010/Tab%20F%20%20Introduction%20to%20MSA%20&%20National%20Standards/Handouts/Tab%20F2%20%20Nat%20Standards%20guide%20910.pdf

National Marine Fisheries Service (NMFS) Alaska Region. 2011. Crab Rationalization website. http://www.fakr.noaa.gov/sustainablefisheries/crab/crfaq.htm

National Oceanic and Atmospheric Administration (NOAA) 2006. NOAA Information Quality Guidelines. http://www.cio.noaa.gov/Policy_Programs/IQ_Guidelines_110606.html

National Research Council (NRC). 2000. *Improving the Collection, Management and Use of Marine Fisheries Data*. Commission on Geosciences, Environment and Resources (CGER), Ocean Studies Board (OSB), National Academy of Sciences. Washington, DC: National Academies Press.

North Pacific Fishery Management Council. 2010a. Five-Year Review of the Crab Rationalization Management Program for Bering Sea and Aleutian Islands Crab Fisheries. Appendix A. Social and Community Impacts. Anchorage, AK. December 28, 2010. http://www.fakr.noaa.gov/npfmc/current_issues/crab/5YearRev1210_AppxA.pdf

North Pacific Fishery Management Council. 2010b. Discussion paper on economic data collection. February 2010.

North Pacific Fishery Management Council. 2010c. Discussion paper on economic data collection. October 2010.

North Pacific Fishery Management Council. 2011. April 2011 Meeting Minutes. http://www.fakr.noaa.gov/npfmc/minutes/411Council.pdf

North Pacific Fishery Management Council AP. 2011. April 2011 Meeting Minutes. http://www.fakr.noaa.gov/npfmc/minutes/AP411.pdf

North Pacific Fishery Management Council SSC. 2011. April 2011 Meeting Minutes. http://www.fakr.noaa.gov/npfmc/minutes/SSC411.pdf

North Pacific Fishery Management Council (NPFMC) and National Marine Fisheries Service (NMFS). 2004a. Final Environmental Impact Statement for the Bering Sea and Aleutian Islands Crab Fisheries. August 2004. http://alaskafisheries.noaa.gov/sustainablefisheries/crab/eis/default.htm

North Pacific Fishery Management Council (NPFMC) and National Marine Fisheries Service (NMFS). 2004b. Appendix 1 to the Final EIS: Regulatory Impact Review/ Initial Regulatory Flexibility Analysis, Voluntary Three-Pie Cooperative Program for the Bering Sea And Aleutian Islands Crab Fisheries. August. Http://Www.Fakr.Noaa.Gov/Sustainablefisheries/Crab/Eis/Final/Appendix1_Rir.Pdf

Pacific States Marine Fisheries Commission (PSMFC). 2007. 2006 Economic Data Report (EDR) Data Collection Difficulties. 205 SE Spokane Street, Suite 100 Portland, OR. July 2007.

Resource Data, Inc. 2011. Alaska Fisheries Information Network Economic Data Reporting (EDR) Program. System and Process Analysis. Version B1.0. 431 North Franklin St., Suite 400, Juneau, Alaska 99801.

Tyler, G. 2011. Power Presentation to the CIE Review Team on EDR data entry and administration at PSMFC.

Appendix 2: CIE Statement of Work for Dr. Susan Hanna

External Independent Peer Review by the Center for Independent Experts

Review of the Bering Sea and Aleutian Islands Crab Fisheries

Economic Data Collection Program

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 Technical Representative (COTR), 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: : In 2005 the Bering Sea and Aleutian Islands (BSAI) crab fisheries underwent a drastic change in management regime, moving to an individual quota-based system (also referred to as "rationalization") which involved both harvesters and processors. Among the Council's objectives in rationalization are addressing excess harvesting and processing capacity, and improving the economic performance of the crab fisheries by addressing low economic returns and economic instability for harvesters, processors, and communities. In anticipation of potential changes in the magnitude and distribution of benefits, employment, and other social and economic effects of the fishery, the North Pacific Fishery Management Council (Council) tasked the Alaska Fisheries Science Center (AFSC) with leading the development and implementation of an extensive and mandatory annual data collection program (referred to as Economic Data Reports, or EDRs). The EDR program was designed to collect detailed cost, earnings, and employment data from crab fishery participants to support computation of a number of specific performance metrics to evaluate the effects of rationalization on fishery participants and to provide data and analysis in support of future management changes.

The final design of the data collection, including data elements and survey instruments/questionnaires, was developed with extensive industry consultation and review by

the Council. The final design was specified in detail in the Code of Federal Regulations (CFR). The EDR reporting requirement went into effect in 2006, with EDR baseline data submission required retroactively for 1998, 2001, and 2004 and subsequently, on an annual basis, for calendar year crab fishing activities for 2005 to present. The annual deadline for completed data reporting forms submission is July 1 for the previous calendar year. Significant data quality limitations, associated with questionnaire design, were apparent with the first EDR submissions in 2006. To date, extensive efforts have been taken to investigate and validate the quality of the information reported in the EDR forms. Several informal focus groups have been held with EDR submitters and more formal review has been conducted as follows:

- the contractor collecting the data in conjunction with the AFSC has prepared annual reports documenting questions raised by submitters and known or potential flaws in questionnaire design
- a certified public accountant has been contracted to conduct annual records-check validation by means of random and for-cause audits on subsets of the submitted EDRs and supporting financial records
- a formal industry committee established by the Council has conducted two reviews of the EDR forms and audit findings and provided data quality and reporting burden assessments
- statistical and qualitative results of audit findings and industry assessments have been incorporated into a detailed metadata document and distributed for public review
- the Council's Scientific and Statistical Committee has reviewed the metadata
- and the Council has received a staff discussion paper on EDR data quality limitations and endorsed constraints on use of a substantial subset of EDR data.

The EDR is a census of all crab fishery participants in the harvest and processing sectors and compliance is a mandatory condition of annual permit renewal. As such, data quality limitations do not arise from sampling design or unit nonresponse error. Rather, data quality limitations arise principally from error sources associated with availability and accuracy of records maintained by submitters, flaws in questionnaire design (including specification errors, excessive computations required of the submitter, and incompatibility with standard industry recordkeeping conventions), and coverage and measurement error due to frame design and changes in industry structure. Revisions to EDR forms were incorporated in 2006 and 2007 to address some identified data quality concerns; however, revisions are limited by specifications set forth in the CFR. Further measures to improve data quality and utility, and reduce submitter burden, will require substantial redesign of the EDR program and associated regulatory specifications. The Council has initiated a process to review the analytical objectives of the EDR program and develop revised regulations and reporting requirements. This process is currently ongoing, with decisions regarding objectives and data reporting requirements expected in December of 2011.

The objective of the CIE review is to identify appropriate methodological best practices and standards for survey design, evaluation, and testing, and to define data quality assurance and data quality control QA/QC procedures to be employed in the EDR program redesign and

subsequent administration. The program falls within the class of statistical data collection referred to in the scientific literature as an establishment survey, for which the existing methodological literature is limited and exists largely in government statistical agency documents, conference proceedings, and institutional knowledge. As an agency, NOAA Fisheries is relatively inexperienced with regard to conducting establishment surveys, particularly with respect to industry financial information, although it does conduct a number of administrative record reporting systems that include financial information. NOAA largely lacks specialized staff expertise and institutional knowledge of relevant methodologies and scientific standards for establishment survey methods for financial information and data QA/QC methods and standards appropriate for different data uses (e.g., administrative, research, or policy/management program evaluation). As such, a broader objective of the CIE review is to identify institutional gaps in appropriate managerial and scientific expertise to carry out statistical social and economic data collection as mandated by the Magnuson-Stevens Act in the context of regulated fishing business establishments.

The CIE panel members will be selected on the basis of their expertise in establishment survey design methodology and implementation in regulated industries, survey data QA/QC, and analysis of economic performance of business establishments in commercial fisheries or similar statistical and/or regulatory and industry settings. Panel members are expected to review the documented record of the analytical objectives and process of crab EDR design, evaluation, testing, and data QA/QC employed to date in order to identify process and technical/scientific shortcomings, develop recommended best practices, objective standards, and evaluative criteria in these areas as applicable to the program setting and objectives. To the extent that the scope of the CIE review does not permit the specification of methodological best practices and standards in sufficient detail to be implemented directly in EDR program redesign, the panel is expected to provide recommendations for process improvements and development of appropriate institutional capacity to enable further methodological development and defensible standards in establishment survey design, evaluation, testing, and data QA/QC in this and other fishery economic data collection programs.

The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers: Three CIE reviewers shall conduct an independent peer review during the panel Review Committee (RC) meeting scheduled in Seattle during 23-25 August 2011. The CIE reviewers shall have the requested expertise necessary to complete an impartial peer review and produce the deliverables in accordance with the SoW and ToR and as stated below:

<u>CIE Reviewer 1</u> shall have working knowledge and recent experience in the application of fishery economics. This reviewer must be an expert in applied economic research and policy/management analysis in commercial fisheries, and must have a well-established record of publication that includes the results of applied analyses in commercial fisheries management. It is also desirable to have familiarity with financial accounting practices in

fishing/seafood processing and comparable industries and experience in US federal fisheries management would be beneficial.

CIE Reviewer 2 shall have working knowledge and recent experience in the application of survey research. This reviewer must be an expert in the use and methodology of survey design and administration as they apply to data collection for research, management analysis, and regulatory compliance in the context of regulated industries. The review must also have a well-established record of publication that includes the results from studies of survey research methodology in the context of business establishments. In addition, the reviewer must be engaged (currently or in the very recent past) in research that addresses theoretical or methodological advances related to the use of establishment survey methods and institutional best practices for economic survey design and administration.

CIE Reviewer 3 shall have working knowledge and recent experience in the application of data validation and data QA/QC methodology. This reviewer must be an expert in practical and statistical data quality assessment and data validation in the context of recordkeeping and monitoring of regulated industries. Experience with financial accounting practices in small to medium scale business enterprises and application of US Federal Information Quality Act requirements to collection of financial and business data from regulated industries by federal agencies. Experience with records-check validation methods would be useful.

Location of Peer Review: Each CIE reviewer shall conduct an independent peer review during the panel review meeting in Seattle, Washington during the 23-25 August 2011 as specified in the Schedule of Milestones and deliverables herein.

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

Prior to the Peer Review: Upon completion of the CIE reviewer selection by the CIE Steering committee, the CIE shall provide the CIE reviewer information (name, affiliation, and contact details) to the COTR, who forwards this information to the NMFS Project Contact no later the date specified in the Schedule of Milestones and Deliverables. The CIE is responsible for providing the SoW and ToRs to the CIE reviewers. The NMFS Project Contact is responsible for providing the CIE reviewers with the background documents, reports, foreign national security clearance, and information concerning other pertinent meeting arrangements. The NMFS Project Contact is also 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 COTR prior to the commencement of the peer review.

Foreign National Security Clearance: When CIE reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for CIE reviewers who are non-US citizens. For this reason, the CIE reviewers shall provide 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/sponsor.html).

Pre-review Background Documents: Two weeks before the peer review, the NMFS Project Contact will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. In the case where the documents need to be mailed, the NMFS Project Contact will consult with the CIE Lead Coordinator on where to send documents. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

The following background documents will be provided in preparation for the peer review.

1. Annual Catcher/Processor Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
2. Annual Catcher Vessel Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
3. Annual Shoreside Processor Crab Economic Data Report (EDR), Calendar Year 2009. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
4. Historical Catcher/Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
5. Historical Catcher Vessel Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
6. Historical Shoreside Processor Crab Economic Data Report (EDR), Calendar Year 2004. 2006. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
7. Five-Year Review of the Crab Rationalization Management Program for Bering Sea and Aleutian Islands Crab Fisheries. 2010. North Pacific Fishery Management Council, Anchorage, AK. December 28, 2010
8. Discussion paper on crab economic data collection. 2010. North Pacific Fishery Management Council, Anchorage, AK. October 2010.
9. Discussion paper on economic data collection. 2010. North Pacific Fishery Management Council, Anchorage, AK. February 2010.
10. Final EIS for BSAI King and Tanner Crab Fisheries. NOAA Fisheries. August 2004.
11. Garber-Yonts, B. and J. Lee. 2010. Stock Assessment and Fishery Evaluation Report for King and Tanner Crab Fisheries of the Bering Sea and Aleutian Islands Regions: 2010 Economic Status Report. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
12. Alaska Crab Economic Data Report Data Validation: Report Prepared for Pacific States Marine Fisheries Commission, 2009 Calendar Year Data. 2010. AKT, LLP, Portland, OR. November 2010.
13. 2006 Economic Data Report (EDR) Data Collection Difficulties. 2007. Pacific States Marine Fisheries Commission, 205 SE Spokane Street, Suite 100 Portland, OR. July 2007.

14. BSAI Crab Economic Data Report Database: Metadata. 2010. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.
15. BSAI Crab EDR Database: Data Quality Summary. Updated January 30, 2008. NOAA Fisheries, Alaska Fisheries Science Center, Seattle, WA.

This list of pre-review documents may be updated up to two weeks before the peer review. Any delays in submission of pre-review documents for the CIE peer review will result in delays with the CIE peer review process, including a SoW modification to the schedule of milestones and deliverables. Furthermore, the CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein.

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs. **Modifications to the SoW and ToRs can not be made during the peer review, and any SoW or ToRs modifications prior to the peer review shall be approved by the COTR and CIE Lead Coordinator.** Each CIE 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 ToRs as specified in the contract SoW. The NMFS Project Contact is responsible for any facility arrangements (e.g., conference room for panel review meetings or teleconference arrangements). The CIE Lead Coordinator can contact the Project Contact to confirm any peer review arrangements, including the meeting facility arrangements.

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 eaczh ToR as described in Annex 2.

Other Tasks – Contribution to Summary Report: Each CIE reviewer will assist the Chair of the panel review meeting with contributions to the Summary Report. CIE reviewers are not required to reach a consensus, and should instead provide a brief summary of their views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

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 in the Seattle during 23-25 August 2011 as called for in the SoW, and conduct an independent peer review in accordance with the ToRs (Annex 2);

3) No later than REPORT SUBMISSION DATE 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 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;
4) CIE reviewers shall address changes as required by the CIE review in accordance with the schedule of milestones and deliverables.

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

July 19, 2011	CIE sends reviewer contact information to the COTR, who then sends this to the NMFS Project Contact
August 8, 2011	NMFS Project Contact sends the CIE Reviewers the pre-review documents
August 23-25, 2011	Each reviewer participates and conducts an independent peer review during the panel review meeting.
September 9, 2011	CIE reviewers submit draft CIE independent peer review reports to the CIE Lead Coordinator and CIE Regional Coordinator
September 23, 2011	CIE submits CIE independent peer review reports to the COTR
September 30, 2011	The COTR distributes the final CIE reports to the NMFS Project Contact and regional Center Director

Modifications to the Statement of Work: Requests to modify this SoW must be made through the Contracting Officer's Technical Representative (COTR) who submits the modification for approval to the Contracting Officer at least 15 working days prior to making any permanent substitutions. The Contracting Officer will notify the CIE within 10 working days after receipt of all required information of the decision on substitutions. The COTR can approve changes to the milestone dates, list of pre-review documents, and Terms of Reference (ToR) of the SoW as long as the role and ability of the CIE reviewers to complete the SoW deliverable in accordance with the ToRs and deliverable schedule are not adversely impacted. The SoW and ToRs cannot 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 COTR for final approval as contract deliverables based on compliance with the SoW. As specified in the Schedule of Milestones and Deliverables, the CIE

shall send via e-mail the contract deliverables (the CIE independent peer review reports) to the COTR (William Michaels, via William.Michaels@noaa.gov).

Applicable Performance Standards: The contract is successfully completed when the COTR provides final approval of the contract deliverables. The acceptance of the contract deliverables shall be based on three performance standards: (1) each CIE report shall have the format and content in accordance with Annex 1, (2) each 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 notification of acceptance by the COTR, the CIE Lead Coordinator shall send via e-mail the final CIE reports in *.PDF format to the COTR. The COTR will distribute the approved CIE reports to the NMFS Project Contact and regional Center Director.

Key Personnel:

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Appendix 3: Panel Membership

The review panel consisted of four persons:

Dr Chris Anderson (Chair)
Associate Professor, Department of Environmental and Natural Resource Economics
University of Rhode Island, Kingston, RI

Dr Susan Hanna
Professor Emeritus of Marine Economics
Oregon State University Corvallis, OR

Dr Danna Moore
Associate Director, Social & Economic Sciences Research Center
Washington State University, Pullman, WA

Dr Richard Wang
Director, MIT Information Quality Program
Massachusetts Institute of Technology, Cambridge, MA