



# **BSAI CRAB RATIONALIZATION EDR AUDITS**

**Report Prepared for Pacific States Marine Fisheries Commission**

**2013 Calendar Year Data**

*January 2015*



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## Background

The Bering Sea and Aleutian Islands (BSAI) Crab Rationalization Program was developed to create a quota system that grants exclusive harvesting and processing rights to crab harvesters, processors and communities. The rationalized fishery began in fall 2005 with quota allocated to harvesters and processors based on historical participation in the fishery. Because of the expected impact on the industry, an economic data collection program was developed to better understand the economic impacts on the industry.

Economic data reports (EDRs) were developed to obtain information about the crab operations of harvesters and processors to help monitor how costs and economic returns of various stakeholders in BSAI crab fisheries are affected by rationalization. In order to ensure that the data submitted by respondents in the EDRs is accurate, Congress and the North Pacific Fishery Management Council specified that EDR data be subject to mandatory audits conducted by the third party collection agent, Pacific States Marine Fisheries Commission (PSMFC). PSMFC contracted AKT to develop and implement an EDR review and verification system which involves reviewing the data contained within submitted EDRs, conducting verification audits for those EDRs containing data values outside of the expected range, and conducting random audits for a certain percentage of submitted EDRs.

The EDRs were developed to help determine the effects of the rationalization program, including changes to the costs of production and the effect of consolidation. National Marine Fisheries Service (NMFS) sought to understand the general trends over the years and the effects of rationalization to translate to other fisheries that are beginning similar programs.

This validation process is a continuation of similar work done in years 2006 to 2012. Prior years' data is audited in the current year; for example the 2013 data was audited in 2014.

In summary, the purpose of the economic data report and data validation is to:

- 1) Aid the Council and NMFS in assessing the success of the program;
- 2) Understand the economic performance of crab fisherman;
- 3) Understand how the economic performance has changed after rationalization;
- 4) Isolate the effects attributable to the crab rationalization program;
- 5) Assess the validity of data reported in submitted EDRs; and
- 6) Provide guidance on improvements in the EDR process to improve the validity of future data reporting.

## Key Participants and Roles

The key participants in the project include:

- **National Marine Fisheries Service (NMFS)** – initiator of the audit process and end-user of the information contained in the EDRs.
- **Pacific States Marine Fisheries Commission (PSMFC)** – collector and manager of the data collected through the EDRs.
- **AKT LLP** – independent accountants and consultants selected to audit and validate the information collected in the EDRs.
- Participants in the crab rationalization program.

## Scope of Work

The following procedures were requested to be performed in the scope of work for this project:

- 1) **Random Audits** – Review and verification of a subset of data values reported in a randomly selected sample of EDRs.
- 2) **Outlier Audits** – Review and verification of data values reported in EDRs that contained multiple outlier variables. These outliers were identified through analysis performed by NMFS. Analysis is conducted as needed, based on prior year audit results and statistical analysis.
- 3) **For Cause Audits** – Review and verification of data values reported in EDRs that were non-compliant or that failed the audit process in the previous EDR calendar year.

The methodology to address the procedures above is outlined later in this report.

Based upon conversations with NMFS and PSMFC, the key objectives of the audit were outlined as follows:

- Validate key data reported by crab rationalization program participants in the Catcher Vessel (CV), Catcher/Processor (CP), and Shoreside Processor (SP) EDR forms.
- Identify problems with the data or EDR instructions and make suggestions for future reporting
- Promote compliance with timely and accurate data reporting requirements
- Identify appropriate changes to data when missing or incorrect
- Characterize, and in some cases quantify, the level of accuracy associated with particular data elements

## Key Information

The current analysis is based on the data collected from participants of the BSAI crab rationalization program for the year 2013. A statistical sample was determined based upon a total submitted population of 104, which was comprised of all unique submitters of information. The sample was determined based upon achieving a 95% confidence level with a precision level of 15% in terms of assessing the accuracy of the submitted data (see Appendix A for detailed discussion of the statistical basis of the sample). The following table summarizes the number of EDRs submitted by type and the resulting sample size.

Type	# of EDRs Submitted 2013	Sample Size 2013
Catcher Vessel	79	25
Catcher Processor	2	1
Shoreside/Floating Processor	23	8

AKT, PSMFC and NMFS worked together to determine the best process to analyze data submitted through the EDR process and to determine the methodology to sample and audit the data submitted in the EDRs. The process was based on prior year experience with improvements made to benefit the participants. The following is a summary of the steps taken throughout the audit process.

- 1) ***Determine appropriate variables to validate.*** The significance of the data for random audits and available audit evidence is considered when determining the appropriate variables to validate. This is a collaborative process between PSMFC, NMFS and AKT.
- 2) ***Determine population subject to random audit.*** The sample size is determined using a statistical model with a 95% confidence level and a 15% precision level. See Appendix A for a discussion of the statistical basis used for selection.
- 3) ***Determine outlier audit population.*** Based upon its analysis of the EDR data without vessel identity, NMFS identifies the population that it desires to validate through an outlier audit. These audits focus on EDRs for which significant outliers were identified through analytical review. 24 vessels and three processors were identified as having outlier variables for the 2013 EDR data year.
- 4) ***Determine for-cause audits.*** Vessels selected for for-cause audits are those that did not comply with an audit request in the previous year. Three vessels were selected for audit in the 2013 EDR data year as a result of a failed audit in the prior year.
- 5) ***Gather and crosscheck EDR data to be audited.*** EDR data pertaining to the variables selected for auditing are transferred to AKT from PSMFC. AKT uses a standard auditing analysis spreadsheet and imports data from PSMFC into this format.
- 6) ***Request information subject to audit for random, outlier and for-cause audits.*** Selected vessels and processors are asked to provide supporting information for the variables selected for validation. They are given one month to comply with the request, though extensions are granted on an as-needed basis. If the selected vessels and processors do not comply within one month, they are individually contacted and additional contact efforts are made as needed to ensure that each selected vessel and processor has an opportunity to respond in a timely manner.
- 7) ***Validate information by comparing with supporting documentation.*** AKT reviews the supporting documentation submitted by vessels and processors and compares the supported values to those submitted on the original EDR. Detailed notes regarding the basis and quality of information are maintained in order to evaluate the validity of selected data. The vessels or processors are contacted as needed for further clarifications and additional supporting documents.
- 8) ***Summarize the results of the audit verification process.*** Each audited variable is classified within a support category, which classify and summarize the validity of the audit evidence received, allowing for effective and meaningful overall analysis.
- 9) ***Compile a burden hour estimate.*** Selected vessels and processors are asked to estimate the amount of time dedicated to compiling their EDR submissions. The resulting responses are summarized into estimated burden hours by respondent type.

## Audit Methodology

AKT selects vessels or processors for random audit based upon the statistical sample outlined in Appendix A. AKT works with NMFS and PSMFC to determine the appropriate variables to validate.

For each data variable requested, AKT critically evaluates the support provided by the selected vessel or processor. Information is evaluated against third party support, such as invoices or fish tickets; internally-generated information, such as crew settlement sheets, general ledger details, invoices, detailed internal reports, or financial statements; and estimates made, including an assessment of the reasonableness of assumptions. Supporting documentation for internally-generated spreadsheets is requested on a judgmental basis. AKT also notes when no support is available to evaluate the information.

Many of the records provided to AKT are unique, specific to the vessels. The processor reporting tends to be more formal and standardized, reflecting the large company nature of those operations. Because the material provided is so unique, the audit process begins with a detailed review of each information packet received while comparing totals for each variable to the original EDR entry. Each supporting document is assessed for accuracy and depth of support. Estimates are accepted as long as a reasonable explanation and/or calculation are also provided. Handwritten statements are also considered adequate, but only after discussion with the EDR preparer and requests for additional support.

If discrepancies are found between the original EDR submission and the supporting documentation provided, AKT contacts the vessel owner and/or preparer to validate the corrected value. Many times this discussion leads to the receipt of additional documentation and/or further explanation as to the methodology used to report EDR values.

If the initially provided documentation is determined to be incomplete or insufficient, then AKT contacts the vessel or processor to request further documentation. Once this additional documentation is received, it is assessed and validated via the process described above.

AKT worked jointly with PSMFC and NMFS to develop the following classifications to describe audit evaluations and summarize the results of the audited values.

Validation Code Original Value	Is original value substantiated?	Is audited value substantiated?	Nature of Reporting Error	Correction	Validation Code - Audit Value
1	Yes	Yes (same)	No error; reported value is clearly substantiated by complete records	No	1
1T	Yes	yes (same)	Original value is blank or N/A	No	1
2	Yes	Yes (same)	Calculation error	Yes	1
2T	Yes	Yes(same)	Typographical Error	Yes	1
3	Yes	Yes (same)	Misinterpretation of question	Yes	1
4	Yes	Yes (same)	Estimate is based on original documentation but flawed assumption/logic	Yes	4
5	Yes	Yes (same)	Data cannot be reported precisely as specified in EDR form and must be estimated; estimate is based on appropriate documentation and sound assumptions/logic and is considered validated	No	5
6	Yes	Yes (updated)	Original value was reported correctly based on original documentation, but corrected based on updated documentation	Yes	1
7	No	No	Reported value is "best guess"; value is not derived from records	No	7
8	No	Yes (new)	Original value is unsubstantiated; correction based on new documentation	Yes	1
9	No	No	No data reported	Yes - "Corrected Value is -9"	9
10	No	No	Item "Not Applicable" to vessel	Yes - "Corrected Value is -7"	10

The records of 25 catcher vessels were requested and 22 were received. Three vessels did not submit their original EDRs to PSMFC or respond to the requests for audit documentation. In the current year, seven vessels selected for random audit did not require follow-up information requests. All other catcher vessels complied with AKT's requests for additional support.

AKT analyzed the audit codes assigned to each of the vessels in order to document consistent errors for each variable, along with the reasoning behind the error.

The total number of audit codes possible was determined by the number of EDR variables requested from selected vessels. The 25 catcher vessels that were selected for the audit produced a total of 646 audit codes. The distribution of those audit codes is summarized below. Where significant, a breakdown of the variables receiving the reporting errors is included.

Code - Original Value	Code - Audit Value	Nature of Reporting Error	Number of Occurrences	Percentage
1	1	<b>No error; reported value is clearly substantiated by complete records</b> <i>Table 2 - Pounds Transferred</i> <i>Table 2 - Total Cost</i> <i>Table 3 - Captain Labor Payment</i> <i>Table 3 - Crew Labor Payment</i> <i>Table 6 - Crew Licenses</i>	393 91 80 28 30 164	60.84%
1T	1	<b>Original value is blank, or N/A</b>	8	1.24%
2	1	<b>Calculation error</b>	12	1.86%
2T	1	<b>Typographical Error</b>	1	0.15%
3	1	<b>Misinterpretation of question</b> <i>Table 2 - Pounds Transferred</i> <i>Table 3 - Captain Labor Payment</i> <i>Table 3 - Crew Labor Payment</i>	20 2 9 9	3.10%
4	4	<b>Estimate is based on original documentation but flawed assumption/logic</b>	0	0.00%
5	5	<b>Data cannot be reported precisely as specified in EDR form and must be estimated; estimate is based on appropriate documentation and sound assumptions/logic and is considered validated</b>	0	0.00%
6	1	<b>Original value was reported correctly based on original documentation, but corrected based on updated documentation</b>	0	0.00%
7	7	<b>Reported value is "best guess"; value is not derived from records</b>	0	0.00%
8	1	<b>Original value is unsubstantiated; correction based on new documentation</b> <i>Table 2 - Pounds Transferred</i> <i>Table 2 - Total Cost</i> <i>Table 3 - Captain Labor Payment</i> <i>Table 3 - Crew Labor Payment</i> <i>Table 6 - Crew Licenses</i>	44 3 19 4 4 14	6.81%
9	9	<b>No data reported</b>	168	26.01%
10	10	<b>Item "Not Applicable" to vessel</b>	0	0.00%



### Non-Error Audit Codes

Of the twelve possible audit codes, four do not represent actual errors. These codes are:

- 1-1
- 1T-1
- 5-5
- 10-10

Only two of the four non-error audit codes were used and comprise of 62.07% of all catcher vessel audit codes used, with 1-1 and 1T-1 claiming 60.84% and 1.24% respectively.

**Audit code 1T-1** was used in EDR *Table 2 –CR Crab Fishing Quota Costs, by CR Fishery and Quota Type: Market Value and Negotiated Price Transfers Only* when vessels did not transfer any quota during the year.

**Audit codes 5-5 and 10-10** were not used.

### Error Audit Codes

AKT analyzed the following results for the remaining audit codes, which are used to categorize errors:

- 2-1
- 2T-1
- 3-1
- 4-4
- 6-1
- 7-7
- 8-1
- 9-9

**Audit code 9-9** was the error code used most frequently at 26.67%. This audit code was documented across all variables and indicates that the processor did not report any data. Of the number of variables that this code was used for, the majority are related to three catcher vessels that did not supply any audit documentation or complete an EDR for the 2013 year.

**Audit code 8-1** was documented 9.21% of the time. This audit code was documented across all variables and indicates that the vessel's original submission was incorrect, but that adequate documentation was provided to support the revised value. In some instances the vessels acknowledged the original error, and in others AKT determined the existence of the error based upon the audit information provided and conversations with the vessels. Anecdotal evidence suggests that vessels do not always thoroughly review their records to report an accurate EDR number initially, and only revise the figures when forced to look more closely at their own data to produce auditable support for AKT.

Three additional audit codes appeared in a fraction of the catcher vessels: calculation errors (**2-1**) at 2.51%, typographical errors (**2T-1**) at 0.21%, and misinterpretation of the question (**3-1**) at 4.18%.

**Audit codes 4-4, 5-5, 6-1, 7-7, and 10-10** were not used.

The records of nine processors were requested and eight packets were received. One of the selected processors did not provide any audit documentation. In the current year, three processors selected for random audit did not require follow-up information requests. All other processors complied with AKT's requests for additional support.

AKT analyzed the audit codes assigned to each of the processors in order to document consistent errors for each variable, along with the reasoning behind the error.

The total number of audit codes possible was determined by the number of EDR variables requested from selected processors. The eight shoreside/floating processors and one catcher processor produced a total of 245 audit codes. The distribution of those audit codes is summarized below.

Code - Original Value	Code - Audit Value	Nature of Reporting Error	Number of Occurrences	Percentage
1	1	No error; reported value is clearly substantiated by complete records	86	35.10%
1T	1	Original value is blank, or N/A	3	1.22%
2	1	Calculation error	0	0.00%
2T	1	Typographical Error	0	0.00%
3	1	Misinterpretation of question	0	0.00%
4	4	Estimate is based on original documentation but flawed assumption/logic	0	0.00%
5	5	Data cannot be reported precisely as specified in EDR form and must be estimated; estimate is based on appropriate documentation and sound assumptions/logic and is considered validated	0	0.00%
6	1	Original value was reported correctly based on original documentation, but corrected based on updated documentation	4	1.63%
7	7	Reported value is "best guess"; value is not derived from records	2	0.82%
8	1	Original value is unsubstantiated; correction based on new documentation	5	2.04%
8	5	Original value is unsubstantiated, correction based on an estimate	2	0.82%
9	9	No data reported	143	58.37%
10	10	Item "Not Applicable" to vessel	0	0.00%

**Audit code 1-1** accounted for 35.1% of variables tested. This has decreased significantly from prior year audits. The decline is related to one processor that did not submit an EDR or the requested audit documentation. This caused a high number of variables to have a 9-9 audit code. If the results for this processor were removed, audit code 1-1 would have accounted for 81.13% of all of the variables tested. This high rate attests to the quality of data submitted by the processors and is an indication of the larger operations and more sophisticated record-keeping practices of processors as compared to catcher vessels.

In total, non-error audit codes (1-1 and 1T-1) comprised 36.32% of processor audit codes used. Without the processor that did not submit any information, this total is 84%. Non-error audit codes 5-5 and 10-10 were not used.

## ***Error Audit Codes***

AKT analyzed the following results for the remaining audit codes:

**Audit code 9-9** was the error code used most frequently at 58.37%. This audit code was documented across all variables and indicates that the processor did not report any data. Of the number of variables that this code was used for, the majority are related to one processor that did not supply any audit documentation or complete an EDR for the 2013 year.

Three additional audit codes appeared in a fraction of the catcher vessels: original value was reported correctly based on original documentation, but corrected based on updated documentation (**6-1**) at 1.63%, “best guess” value (**7-7**) at 0.82%, and original value unsubstantiated (**8-1** and **8-5**) at 2.86%.

**Audit codes 2-1, 2T-1, 3-1, 4-4, 5-5, and 10-10** were not used.

Through the NMFS analysis process described in the Methodology section of the report, 24 vessels and 3 processors were selected for outlier audits. AKT received support for the unique variables identified by NMFS for each of the 27 entities selected. In the current year, 11 vessels selected for the outlier audit did not require additional requests. All other outliers complied with AKT’s requests for additional support.

AKT analyzed the audit codes it assigned to each of the outliers in order to document consistent errors for each variable, along with the reasoning behind the error.

The total number of audit codes possible was determined by the number of EDR variables requested from the outliers, totaling 103. The distribution of those audit codes is summarized below.

Code - Original Value	Code - Audit Value	Nature of Reporting Error	Number of Occurrences	Percentage
1	1	No error; reported value is clearly substantiated by complete records	43	41.75%
1T	1	Original value is blank, or N/A	14	13.59%
2	1	Calculation error	3	2.91%
2T	1	Typographical Error	8	7.77%
3	1	Misinterpretation of question	17	16.50%
4	4	Estimate is based on original documentation but flawed assumption/logic	0	0.00%
5	5	Data cannot be reported precisely as specified in EDR form and must be estimated; estimate is based on appropriate documentation and sound assumptions/logic and is considered validated	2	1.94%
6	1	Original value was reported correctly based on original documentation, but corrected based on updated documentation	0	0.00%
7	7	Reported value is "best guess"; value is not derived from records	0	0.00%
8	1	Original value is unsubstantiated; correction based on new documentation	14	13.59%
9	9	No data reported	0	0.00%
10	10	Item "Not Applicable" to vessel	2	1.94%

**Audit code 1-1** was used most frequently, at 41.75%, with overall non-error codes (1-1, 1T-1, 5-5, and 10-10) totaling 59.2%.

**Audit code 3-1** was used 16.5% of the time and spans a variety of variables. This audit code indicates that the entity misunderstood the question. This was determined through additional conversations with the vessel owners and examination of the audit documentation provided. This audit variable was used most with one vessel who did not report expenses because they did not make a profit and reported the pounds sold and transferred based on their fiscal year rather than the calendar year.

**Audit code 8-1** was used 13.59% of the time and spans a variety of variables. The audit code indicates that the vessel’s original submission was incorrect, but that adequate documentation was provided to support the revised value. In many instances this audit code is indicative of carelessness by the submitters when preparing the initial EDR.

**Audit codes 2-1, 2T-1, and 5-5** appeared in a fraction of outliers, at 2.91%, 7.77%, and 1.94%, respectively.

In addition to assessing the distribution and use of the various audit codes, AKT analyzed the EDR variables which were most frequently not supported by direct documentary evidence. This lack of support includes both errors and the necessary use of estimates.

## Random Audit – Catcher Vessel EDR Records

AKT identified four variables which received unsupported audit codes in greater than 30% of instances. Vessels were unable to substantiate these variables resulting in errors. A summary of those variables is provided below.

EDR Section (Year)	EDR Item Description/Year	# of Vessels Error	% of Vessels unable to substantiate
2.0 CR Crab Fishing Quota Costs	Pounds Transferred	55	37%
	Total Costs	72	40%
3.0 Crab Crew Labor Costs	Crew Labor	28	48%
	Captain Labor	28	50%

Over one-third of vessels received an unsupported audit code for the pounds transferred and total costs portions of *Table 2 – CR Crab Fishing Quota Costs, by CR Fishery and Quota Type: Market-Value and Negotiated Price Transfers Only*. This rate of unsubstantiation is in large part due to three vessels that did not provide the requested audit documentation. Additionally, some of the vessels originally reported pounds transferred and sold in the incorrect IFQ Type.

The variables for crew and captain labor in *Table 3 –CR Crab Crew Labor Payments, by CR Fishery* elicited unsupported audit codes for 48% and 50% of vessels respectively. Several of these errors were due to a misunderstanding of the question. Many vessels reported total crew and labor costs including food costs. These amounts were corrected through additional conversations with the vessels and the examination of documentation provided.

## Random Audit – Processor EDR Records

As noted in the Processor Audit Code Analysis section, one of the vessels did not submit an EDR or the requested audit documentation, resulting in a high number of error audit codes. Once this processor was removed it was noted that the quality of submissions was very high, with 84% of variables receiving a 1-1 or 1T-1 audit code. Accordingly, analysis of frequent errors is not material to the processors.

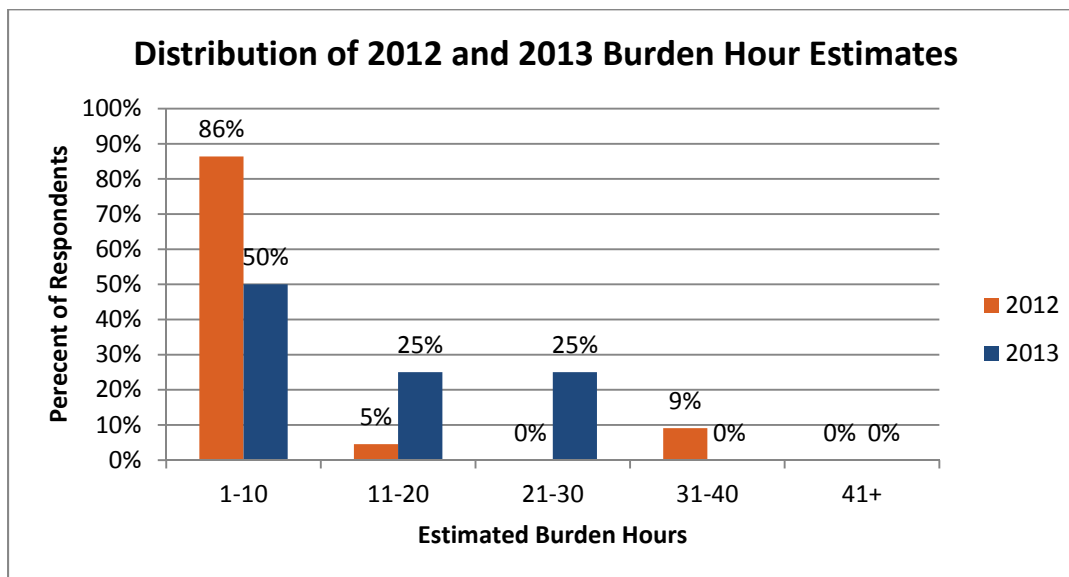
As a result of its analysis and contact with the vessels and processors selected for audit, AKT asked all vessels and processors to provide information regarding the time commitment (burden hours) to prepare original EDR submissions for PSMFC and to prepare submissions for AKT.

## Catcher Vessels EDR Form

A summary of the burden hours estimated by the responsive vessels is included below. Note that four vessels provided estimates as to the amount of time taken to prepare the initial EDR, while three provided estimates for the time spent preparing supporting materials for validation.

Original EDR Submission to PSMFC			EDR Validation to AKT		
Burden Hour Estimate Range	Number of Vessels	Percentage	Burden Hour Estimate Range	Number of Vessels	Percentage
< 5 hours	0	0.0%	< 3 hours	2	66.7%
6 - 10 hours	2	50.0%	4 - 6 hours	1	33.3%
11 - 15 hours	1	25.0%	7 - 9 hours	0	0.0%
16 - 20 hours	0	0.0%	10 - 12 hours	0	0.0%
> 20 hours	1	25.0%	> 13 hours	0	0.0%

Estimates regarding the time required for catcher vessels to complete the original EDR submission ranged from 2 hours to 3 days. The distribution of the vessels that took less than and more than 20 hours was 75.0% and 25.0%, respectively. This is consistent with the burden estimates provided in 2012. See the chart below for a comparison of 2012 and 2013 burden hour estimates.



Estimates regarding the amount of time needed to compile documentation for AKT after being selected for audit ranged from 2 hours to 1/2 of a day, with 67% of vessels spending less than 3 hours on the process.

## Shoreside Processor EDR Form

A summary of the burden hours estimated by the responsive processors is included below. Note that 4 processors provided estimates as to the amount of time taken to prepare the initial EDR, while two provided estimates for the time spent preparing supporting materials for validation.

Original EDR Submission to PSMFC			EDR Validation to AKT		
Burden Hour Estimate Range	Number of Processors	Percentage	Burden Hour Estimate Range	Number of Processors	Percentage
< 5 hours	3	75.0%	< 3 hours	2	100.0%
6 - 10 hours	0	0.0%	4 - 6 hours	0	0.0%
11 - 15 hours	0	0.0%	7 - 9 hours	0	0.0%
16 - 20 hours	0	0.0%	10 - 12 hours	0	0.0%
> 20 hours	1	25.0%	> 13 hours	0	0.0%

Estimates regarding the time required for processors to complete the original EDR submission ranged from 2 hours to 40 hours, with the distribution of processors taking less than and more than 20 hours at 75.0% and 25.0% respectively. As was noted for the vessels, the time burden has remained consistent with the prior year.

Estimates regarding the amount of time needed to compile documentation for AKT after being selected for audit ranged from 2 hours to 9 hours.

See Appendix B for detailed results of burden hour inquiries.

AKT worked collaboratively with members of the PSMFC and NMFS staff and would like to thank them for their commitment and time.

Name	Organization
<b>Dave Colpo</b>	Pacific States Marine Fisheries Commission
<b>Geana Tyler</b>	Pacific States Marine Fisheries Commission
<b>Brian Garber-Yonts</b>	National Marine Fisheries Service
<b>Audit participants</b>	Individual vessels and/or processors



The 2013 EDR yielded a high response rate from all catcher vessels and catcher, floating and shoreside processors. The vessels that contained errors on their submissions were corrected easily by contact with the vessel or by the addition of new information to substantiate the data reported.

AKT appreciates the opportunity to work with PSMFC and NMFS staff. This collaborative relationship is critical to AKT's success in completing this yearly audit.

## Statistical Sample

In order to determine an appropriate sample size as the basis of selection for the random audits, the main criteria to consider are the level of precision desired, the level of confidence or risk and the degree of variability in the attributes being measured. These elements are defined as follows:

- **Level of Precision** – Also referred to as the margin of error, this is the range in which the true point value of the population is estimated to be. This is expressed as a percentage  $\pm$  the true value (e.g.,  $\pm 5\%$ ). Thus, if it is found from the sample that on average 15% of the fisherman did not submit data then it could be concluded that for the total population, between 10% and 20% of the fisherman have not submitted data.
- **Confidence Level** – The degree to which we are certain that a result or estimate obtained from the study includes the true population percentage, when the precision is taken into account. In a normal distribution, 95% of the sample values are within two standard deviations of the true population value. If 100 vessels were sampled, 95 would have the true population values within the range specified.
- **Degree of Variability** – This measures the variability within the population (e.g. Catcher Vessels, Catcher/Processor Vessels, Shore/Floating Processors, Large Vessels, Small Vessels). The more heterogeneous a population, the larger the sample size required to obtain a given level of precision. The more homogenous a population, the smaller the sample size required. A variability of 50% signifies the greatest variability.

Due to the variability within the industry and the variability of the data being analyzed, there is not one specific variable that can be used to create a statistical model that would enable AKT to calculate a standard deviation and regression analysis for the project. This fact places the project in a similar category as a questionnaire, political poll, surveys and extension program impacts.

While there are no statistical analyses that can be applied directly, there are similar projects that derive statistical sampling methods relating to extension program impact. In these projects the samples are used to evaluate a change made to the extension programs.

The following sampling formulas were used to ensure a statistical basis for the samples chosen:

$$n_0 = \frac{Z^2(p)(q)}{(e)^2} \qquad n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

$n_0$  = Sample size

$n$  = Sample size with finite population correction for proportions

$Z$  = The number of standard deviations a point  $x$  is from the mean; is a scaled value

$p$  = Population variability

$q = 1 - p$

$e$  = The desired level of precision

$N$  = Total population

For this project  $p$  (variability) equals .5 to account for maximum variability in the population.

This type of sampling methodology takes into account errors and missing information in the data. The precision level quantifies the tolerable level of error based on the sample size. This error level is then projected to the total population.

The samples were stratified based on the proportion of the group versus the total population. The reasoning behind this is that by sampling each individual population there would be no statistical basis for both the Catcher/Processor and Stationary/Floater Processors. The only way to have a statistical basis for this population would be to census the population. Because this is not a reasonable approach, AKT suggested that the population include all groups and then additional random audits be performed for the Catcher/Processor and Stationary/Floater Processor populations.

The sample population was ultimately chosen based upon a 95% confidence level with 15% precision and variability of 50% (due to the variability of the information requested). This method ensures the data are correct (outlier audits) and provides a process to measure the quality of data (random audits). This sampling method provides a statistical basis for future studies and gives the agencies a basis to measure the accuracy of the population data.

## Time Burden Estimates

Time burden estimates for each respondent are summarized below:

Type	Original EDR Submission to PSMFC	EDR Validation to AKT
Catcher Vessel	3 days	1/2 day
Catcher Vessel	10 hours	2 hours
Catcher Vessel	6 - 8 hours	2 - 3 hours
Catcher Vessel	10 - 12 hours	Not reported
Shoreside Processor	2 - 3 hours	Not reported
Shoreside Processor	5 hours	Not reported
Shoreside Processor	2 hours	1 hour
Shoreside Processor	40 hours	2 hours