

BSAI CRAB RATIONALIZATION EDR AUDITS

**REPORT PREPARED FOR PACIFIC STATES MARINE
FISHERIES COMMISSION**

2010 Calendar Year Data

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TABLE OF CONTENTS

Introduction.....	1
Methodology	3
Support Classes	5
Catcher Vessel Audit Code Analysis	6
Processor Audit Code Analysis	8
Common Errors	9
Burden Hour Estimate.....	11
Commendation.....	12
Appendix A	13

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 2009. Prior years' data is audited in the current year; for example the 2009 data was audited in 2010.

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 an analysis performed by NMFS. Analysis is conducted as needed, based on prior year audit results and statistical analysis.

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

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

- Validate key data.
- 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 2010. A statistical sample was determined based upon a total submitted population of 106, 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 2010	Sample Size 2010
Catcher Vessel	75	22
Catcher Processor	3	1
Shoreside/Floating Processor	28	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 were 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 was 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 identified the population that it desired to validate through an outlier audit. These audits focused on EDRs that had a significant number of outliers identified through analytical review. Once a vessel had been identified has an outlier, it was subject to validation for only those variables for which an outlier status had been identified. NMFS did not select an outlier audit for the 2010 calendar year.
- 4) ***Determining for-cause audits.*** Vessels selected for for-cause audits are those that did not comply with an audit request in the previous year. There were no for-cause audits for the 2010 EDR data 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. AKT then verifies EDR data with the selected vessels original EDR submissions for accuracy.
- 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. Extensions are granted on an as-needed basis. If the selected vessels and processors do not comply within one month, they are individually contacted. 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.*** This process involves a review of the supporting documentation submitted against the original EDR data submission for each vessel and variable selected. Detailed notes related to the basis and quality of information is maintained in order to evaluate the validity of selected data. If clarifications on a discrepancy or additional supporting documents are needed, the vessel or processor is contacted as needed.
- 8) ***Summarize the results of the audit verification process.*** Support categories were created to classify and summarize the validity of the audit evidence received. Each audited variable is classified within one of the support categories. This enables AKT to perform an overall analysis of the validity of the data.
- 9) ***Compile a burden hour estimate.*** Selected vessels and processors are asked to estimate the amount of time dedicated to compiling their EDR submissions. Responses are then 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, specifically for the vessels. The processor reporting is 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.

AKT places phone calls to all submitters with estimates and hand written statements. AKT also validates all variables that are reported with no value (blank) or a zero value. If discrepancies are found between the original EDR submission and the supporting documentation, AKT contacts the vessel owner and/or preparer to validate the correct reported value. Many times this leads to receiving further documentation from the vessel and/or further explanation as to the methodology used to report EDR values.

If the initially provided documentation is determined to be insufficient support, or if support is missing for a certain variable, AKT contacts vessels to ask for further documentation. Once documentation is received, it is assessed and validated. In the current year, eight vessels and/or processors, in total, did not require follow-up information requests. All others required the follow-up research 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 two populations that were sampled and evaluated based on the above criteria are catcher vessels and catcher, floating, and shoreside processors. The records of 22 catcher vessels were requested, and 22 were received. Nine processors were requested to submit documentation, and nine packets were received. All catcher vessels and processors complied with AKT's requests for additional support, when applicable.

Accuracy of the original EDR data varies greatly by vessel and by variable. This is especially true when one or two errors of larger size skew the result for the entire group.

No vessels were selected for outlier audits.

CATCHER VESSEL - AUDIT CODE ANALYSIS



AKT analyzed the audit codes it 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. 22 catcher vessels submitted information for 19 items, totaling 418 audit codes. The distribution of those audit codes is summarized below. Where appropriate, examples of situations causing the reporting errors are included.

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	193	46.17%
1T	1	Original value is blank, or N/A	48	11.48%
2	1	Calculation error	27	6.46%
		<i>Rounding Error</i>	4	
		<i>Miscalculation</i>	23	
2T	1	Typographical Error	2	0.48%
3	1	Misinterpretation of question	43	10.29%
		<i>Reported gross revenue after deductions</i>	0	
		<i>Included captain in number of crew members</i>	5	
		<i>Did not deduct food paid for by crew from their payment amounts</i>	13	
		<i>Included food paid for by crew in Food and Provisions</i>	9	
		<i>Included BSAI fuel in annual fuel total</i>	6	
		<i>Other misinterpretations</i>	10	
4	4	Estimate is based on original documentation but flawed	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	38	9.09%
		<i>Estimate days fishing</i>	9	
		<i>Estimate days traveling/offloading</i>	12	
		<i>Estimate fuel quantity/cost</i>	6	
		<i>Estimate annual days at sea</i>	6	
		<i>Other Estimates</i>	5	
6	1	Original value was reported correctly based on original documentation, but corrected based on updated documentation	5	1.20%
7	7	Reported value is "best guess"; value is not derived from records	12	2.87%
8	1	Original value is unsubstantiated; correction based on new documentation	47	11.24%
9	9	No data reported	0	0.00%
10	10	Item "Not Applicable" to vessel	3	0.72%

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

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

These four vessel codes comprise 66.8% of all catcher vessel audit codes used, with 1,1, 1T,1 and 5,5 claiming 46.2%,11.5%, and 9.1% respectively.

Audit code 1T,1 was used most frequently in EDR section 5.1 – Cost for BSAI Crab Fishing Only when vessels did not purchase any food and provisions, pots, or line and other gear throughout the year.

Audit code 5,5 was used most commonly in reference to

- Sections 1.0 and 6.0 – Days crab fishing, traveling and offloading and at sea
- Section 5.1 - Cost for BSAI Crab Fishing Only, number of fuel gallons

Audit code 10,10 was used only three times or 0.72% when vessels pre-determine, before the crab season begins, the amount of payments to the owner, captain, and crew responsible for a particular vessel. As a result, there are no revenue share percentages paid, only flat dollar amounts.

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 2,1 appeared in 6.5% of items audited and represent addition or typographical errors due to Excel formulas or accidental omission of numbers.

Audit code 3,1 was documented 10.3% of the time. The most common source of misunderstanding of the question related to:

- Section 5.1 – Food and provisions deducted from crewmembers’ checks. This affected both labor payments in section 4.1 and food and provision purchases in section 5.1. Labor and food payments were reported inconsistently across vessels, as many vessels did not report the total payments made to captain and crew net of shared expenses.

Audit code 7,7 was documented appeared 2.3% of the time. The most common instances of lack of substantiating documents were for:

- Sections 1.0 and 6.0 - Days crab fishing, traveling and offloading and at sea

Anecdotal evidence suggests that many vessels currently have no system in place which allows them to monitor the days spent fishing, travelling and offloading, and at sea.

AKT used the 8,1 audit code most frequently at 11.2%. 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, but 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 accurately report original EDR information, but when forced to look more closely at their own data through the audit process more accurate numbers are produced and vessels revise their EDR submission.

Two additional audit codes appeared in a fraction of the catcher vessels: values updated for new information (6,1) at 1.2% and typographical errors (2T,1) at 0.5%.

Audit codes 4,4 and 9,9 was not used. AKT did not audit a vessel where an estimate was flawed, but based on original documentation and where the finding of 'o' was unreasonable and there was no documentation available to determine or estimate a corrected value.

PROCESSOR AUDIT CODE ANALYSIS



AKT analyzed the audit codes it 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. Eight shoreside/floating processors submitted information for 16 items and one catcher processor submitted information for 26 items, totaling 154 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	50	39.06%
1T	1	Original value is blank, or N/A	6	4.69%
2	1	Calculation error	8	6.25%
2T	1	Typographical Error	2	1.56%
3	1	Misinterpretation of question	1	0.78%
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	10	7.81%
6	1	Original value was reported correctly based on original documentation, but	0	0.00%
7	7	Reported value is "best guess"; value is not derived from records	1	0.78%
8	1	Original value is unsubstantiated; correction based on new documentation	13	10.16%
9	9	No data reported	0	0.00%
10	10	Item "Not Applicable" to vessel	37	28.91%

Like catcher vessels, the most common audit code for processors was 1,1 at 39%. However the second most common error was 10,10 which applies to non-applicable items and was not seen in any catcher vessels. The high usage of this audit code is due to the inclusion of three processors which have limited data because they did not operate a plant themselves, but rather hired another party to process their crab. PSMFC refers to this practice as custom processing. In the past, custom processing has been exempt from the audit process. However, because separating these special cases from the other processors became increasingly cumbersome for PSMFC they were included in the audit pool for 2010. As a result, 28.9% of processor audit codes were for non-applicable variables.

Also accounting for a sizable portion of audit codes used was 2,1 calculation errors at 6.3%, 5,5 logical estimates at 7.8%, and 8,1 originally unsupported values at 10.2%. Both calculation errors and originally unsupported submissions were evident across all variables. Estimates, however, were most frequently used to submit crab harvesting labor costs in section 3.1 and crab production costs in section 6.1. A number of processors were unable to articulate the exact portion of these costs allocable to BSAI production specifically, leading them to make estimates based upon proportion of pounds produced or days spent processing.

Additional audit codes used were 1T,1 for blanks or zeros at 4.7%, 2T,1 for typographical errors at 1.6%, 3,1 for misinterpretations at 0.8%, and 7,7 for unsubstantiated guesses at 0.8%.

At the request of PSMFC and NMFS, AKT analyzed the reasons for systemic failure to provide supporting documentation for 8 different variables – 4 Catcher Vessel variables and 4 Processor variables. Vessels and Processors that were consistently unable to provide concrete supporting documentation to substantiate the values recorded on their original EDR submissions, received 5,5 and 7,7 audit codes. .

Catcher Vessels

AKT found four variables which elicited 5,5 and 7,7 audit codes in greater than 10% of the Catcher Vessels tested. A summary of those variables is provided below.

EDR Section (Year)	EDR Item Description/Year	# of Vessels Receiving:		% of Vessels unable to substantiate
		5-5	7-7	
1.0 BSAI Crab Activity Chart (2010)	No. of Days Crab Fishing	9	0	40.91%
1.0 BSAI Crab Activity Chart (2010)	No. of Days Traveling and Offloading	12	2	63.64%
5.1 Costs for BSAI Crab Fishing Only (2010)	Fuel, Lubrication, and Fluids Used in BSAI Crab Fishing	5	1	27.27%
6.0 Annual Totals for All Fisheries (2010)	Days at Sea	6	4	45.45%

Variables 1.0 and 6.0 received unsupported audit codes, suggesting that, as a whole, Catcher Vessels do not currently have systems in place to accurately record the distribution of their time.

- 40.1% of vessels received 5,5 or 7,7 audit codes for the number of days crab fishing, while the number of days traveling and offloading and annual days at sea had the highest percentage of vessels unable to substantiate at 63.6% and 45.5% respectively.

AKT believes that the number of days crab fishing produced a slightly better rate of substantiation because of the inclusion of days at sea on fish tickets, while no such mechanism exists for days traveling or offloading or total days at sea.

Variable 5.1 also received unsupported audit codes as 27.2% of Catcher Vessels struggled to provide documentation for the quantity of fuel used during the BSAI Crab season. Six vessels had to estimate the number of gallons, usually by dividing the total fuel cost as recorded in their accounting system by the market price per gallon. This suggests that vessels are failing to retain applicable fuel invoices, and are thus forced to rely exclusively on their accounting records, which do not always include detail regarding gallons purchased.

Catcher/Shoreside/Floating Processors

AKT found four variables which elicited 5,5 and 7,7 audit codes in greater than 10% of the Processors tested. A summary of those variables is provided below.

EDR Section (Year)	EDR Item Description/Year	# of Vessels Receiving:		% of Vessels unable to substantiate
		5-5	7-7	
3.1 Crab Processing Labor Costs (2010)	Total Man-Hours	2	0	25.00%
3.1 Crab Processing Labor Costs (2010)	Total Processing Labor Payment	2	0	25.00%
6.1 Costs for BSAI Crab Production Only (2010)	Food and Provisions	2	0	25.00%
7.0 Annual Total for All Fisheries (2010)	Total Processing Days	1	1	25.00%

Three of the four frequently unsupported variables are related to the allocation of costs to BSAI crab processing. 25% of Processors estimated the number of man-hours, processing labor payment, and cost of food and provisions for BSAI processing specifically. This suggests that BSAI processing is not accounted for as a separate cost center, therefore making it difficult to tie costs directly to this activity.

Two processors were also unable to document the annual total of days processing. Interactions with these processors indicate that this lack of substantiation is not due to an insufficient tracking system, but rather to the preparer's inability to obtain the necessary supporting documents.

BURDEN HOUR ESTIMATE



As a result of its analysis and contact with the vessels and processors selected for audit, AKT asked all vessels to provide information regarding the time commitment (burden hours) to prepare original EDR submissions for PSMFC and to prepare submissions for AKT. Ten vessels were willing to participate and provide information in reference to our query. Of the ten vessels who responded to AKT’s query, 7 provided concrete estimates of the amount of time required to compile the EDR. 3 vessels responded generally, classifying the process as “time-consuming and stressful” and taking a “very long time” or “all year.”

A synopsis of the 7 concrete responses is provided below.

Vessel/Processor Type	Original EDR Submission to PSMFC	EDR Validation to AKT
Catcher Vessel	8 hours	Not reported
Catcher Vessel	8 hours	Not reported
Catcher Vessel	8-10 hours	1-2 hours
Catcher Vessel	10-12 hours	<1 hour
Catcher Vessel	30-35 hours	10 hours
Catcher Vessel	40 hours	16 hours
Shoreside Processor	Not reported	10-12 hours

Estimates regarding the time required for catcher vessels to complete the original EDR submission ranged from one day to one week, with 4 vessels estimating from 8 to 12 hours, and 2 vessels approximating from 30 to 40 hours. The shoreside processor did not respond to this inquiry.

Only 5 out of the 7 vessels/processors vessels provided information regarding the amount of time it takes to compile documentation for AKT. Two estimated the burden as less than two hours, while two placed the time commitment at 10 to 16 hours. The shoreside processor estimated the time to comply with AKT’s requests was 10-12 hours.

COMMENDATION



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

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

CONCLUSION



The 2010 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 sampling formulas derived for such projects and to ensure a statistical basis for the samples chosen are the following:

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

n_o = 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.