

## **Appendix I: Modeler's Updates (February – November 2008)**

SECOND STATUS REPORT FOR AAG MODELING EFFORT  
February 28, 2008

February 28, 2008

To: Scott McCreary, Principal, CONCUR, Inc  
From: Yan Jiao, VMS  
Cc: Eric Poncelet, Rob Williams, Resolve

Re: Status Report on CONCUR Contract 455832 in Support of the AAG

Hi Rob and Scott,

**Introduction:**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress last month. Beside this written report, I have conveyed an oral report to Scott McCreary and the AAG through a teleconference call This month Feb 7 at Eastern Time 4:00-6:00PM.

**No Cost Timeline Extension has been permitted:**

My request for no cost timeline extension has been permitted by Scott McCreary. I appreciate this.

**Data Sets Received:**

The data described in the descriptive matrix (v7) represents the conversation from the February 7, 2007 AAG-TP meeting. The data received to date have been analyzed.

**Key Data Sets Still to Be Transmitted:**

I realized there is still one data set to be transmitted

- PISCO subtidal monitoring data (data set #11)

**Progress from December 2007 to January 2008:**

In the last month, I have synthesized all the data received, and input them to a MATLAB file so they are ready for modeling analysis.

I have analyzed the CINP fishery independent survey in 1983 to 2006. The survey design is changing with new location of high abalone density added from 2001. So, I split the survey into 3 indices with each of them represents the temporal relative abundance changes from 3 locations.

I am also working on the state-space surplus production model, and the yield-per-recruitment model. However because of the new input of the CINP fishery independent survey data, I have not got a chance to update the results from these models. To save my effort, I'd like to wait until the panel gets agreement on the data synthesis before I work on the update of the results.

I am working on the age/length structured models also. There are difficulties in using the data because of the invisibility of the small abalone which bring large bias if the length frequency data are used. I am working on the computer coding, but will wait for the panel on their opinion before I finalize the data and the models.

Yan Jiao, PhD,  
Assistant Professor  
Virginia Polytechnic Institute & State University

## Memorandum

**Date:** April 14, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** Status Report for TAC Modeling Effort (March 2008)

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### **1: Introduction**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress for March 2008.

### **2: Data Sets Received**

Beside the data described in the descriptive matrix (v8), I received the following data sets from Ian Taniguchi:

- a. DFG SMI size & timed swim data 1993-2001. Besides SMI data, Santa Rosa Island (SRI) data are also included.
- b. Revised Historical SMI red abalone density data (data set # 2). This data set now only has density data and associated size frequency information.
- c. Revised CPFV DB SMI SRI 91-97 (data set #9) - This is the revised data set with the corrected fishing hours for 1993-97.
- d. Cruise reports - These are the outstanding cruise reports mentioned on the March 13 TP/AAG teleconference plus a few other relevant reports.
  - 79A4 through 79A6 cruise reports - These are the cruise reports from 1979.
  - 74KB11 cruise report - This is the cruise report mentioned on the SMI DFG red abalone surveys summary document. This has timed swim data for different areas of SMI.
  - 74KB2 Cruise Report - This cruise report has summarized timed swim and size frequency information for Santa Rosa Island.
  - 74KB8 Cruise Report - This cruise report has summarized timed swim information for Santa Rosa and Santa Cruz Islands.
- e. Preliminary report on pathology study 2007

The data received to date have been looked through and analyzed preliminarily. The first four above data sets listed above will be used to develop relative abundance indices and will be used in the state-space surplus production model and the catch-at-age/size model. The fifth data set listed above will be addressed further when Laura Rogers-Bennett provides updated pathology data.

### **3: Data needs**

Pending data:

- a. PISCO subtidal monitoring data (data set # 11). This data set will have abalone density and size frequency data for SMI and SRI. Ian Taniguchi is working on cleaning it up and putting it in the same format as all other data sets.

- b. Ian Taniguchi has agreed to work on synthesizing the Historical SMI red ab density cruise data 1993-2001 to help prepare the data appropriately for the models. He will finish it in a couple of weeks.

#### **4: Progress in data analysis and model development**

Data analysis:

Steps taken:

- a. John Butler reviewed a time series of historical commercial catch and recommend a percentage of the catch from the “catch all block” to be attributed to SMI based on historical commercial catch trends. This suggestion has been accepted and used in updating the catch data.
- b. As a simple decision rule, I proposed omitting size classes below a 100 mm when the length frequency data (DFG red abalone cruise data) were used in the model. TP members confirmed this approach on their March 13, 2008 call.
- c. The fecundity data, and the weight-length relationship have been analyzed and were confirmed by the TP members.
- d. The length frequency data (DFG red abalone cruise data) from different trips in the same year were aggregated. TP members confirmed this approach on their March 13, 2008 teleconference.
- e. I proposed to develop 3 indices from the Channel Islands National Park monitoring data (data set #12) because of the dramatic differences in different survey locations. TP members confirmed this approach on their March 13, 2008 call.

Problems faced and strategies adopted to address them:

- a. CPFV DB SMI SRI 78-90 and CPFV DB SMI SRI 91-97 were analyzed, but the data sets were not used in the model yet because of the mistakes in the datasets. Ian Taniguchi has revised the data set with the corrected fishing hours for 1993-97 and emailed these to me last week.
- b. The references on natural mortality of SMI red abalone have been summarized: further hypothesis about the increased mortality by the 2007 Pathology data (data set #3) and the newly transmitted Preliminary report on pathology study (March 11).

Model analysis:

- a. The model framework of state-space surplus production model has been finished. Because we changed our methods in developing relative abundance indices, the framework needs to be revised from 2 relative abundance indices to (? unknown yet), and modeling results from the state-space surplus production model will need to be updated as more data become available.
- b. The yield-per-recruitment model has been developed, and model is ready to be used. I’ll update the results on natural mortality and present the result in the next report.

#### **5: Pending data analysis/model development issues**

- a. Data analysis: My analysis on the Historical SMI red abalone density cruise data 1993-2001 needs to be re-analyzed because of the varying survey locations and type of survey among years. The cruise survey (DMI swim time survey) was not available until now. Ian Taniguchi has agreed to work on it. He will work out the appropriate locations and develop more than one index from these surveys; we agreed that two types of indices will be developed: abalone/hour, and abalone/m<sup>2</sup>.
- b. Model development: After the above information becomes available from Ian, I will work on the catch-at-age/size model. As stated at the November 29, 2007 AAG/TP meeting, I would like to explore developing this model, since we have some length frequency data from the *historical surveys*. There are some data limitations, however, that may limit the application of this model. It turns out that there is no length composition information from the *historical harvest/catch data*. Moreover, the invisibility of the abalone <100mm may also limit the application of this model. I

will spend some time trying to develop the model using simulated data before I receive the synthesized index data from Ian.

- c. I developed 3 indices from the Channel Islands National Park (CINP) monitoring data (data set #12)—see Figure 1 below. There are 3 survey locations, Hare Rock (HR), Miracle Mile (MM), and Wyckoff Ledge (WL), in this data set. Each of them has significantly different abalone densities. Because the survey starting years and ending years are different for all the 3 locations, mining the data together will mislead the trend of the abalone population. Technical Panel: Please refer to Figure 1 below and confirm whether it is appropriate to use these data for the surplus production model (and possibly the catch-at-age size model).

I plan to use the same strategy to analyze the historical SMI red abalone density cruise data, which have different survey locations in different years.

#### **6: Next steps in model development**

- a. Ian Taniguchi expected to finish the index data synthesis in mid April.
- b. I will update the state-space surplus production model in one week after I received the data from Ian.
- c. I will spend one week time to design the scenarios of the yield-per-recruitment analysis.
- d. I will spend another 2 weeks time to work on the catch-at-age/size model after I receive the index data from Ian. After that, I will confirm whether I will use this model or not and explain the reasons through monthly report and TP teleconference(s).
- e. Technical panel members: please respond by email to confirm whether the Channel Islands National Park Monitoring data (Figure 1 below) is appropriate for use in the modeling effort.

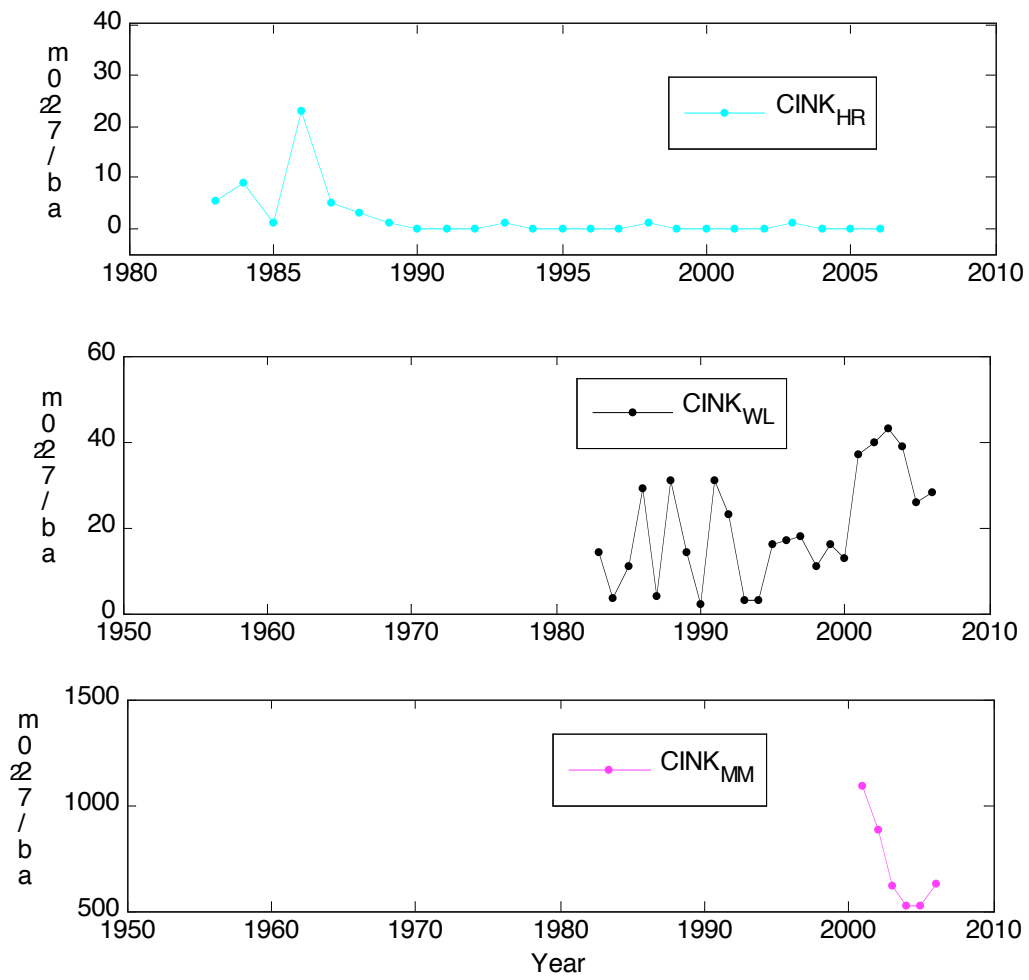
#### **7: Other**

Ian Taniguchi pointed out the concern on the genetic connection between SMI and Santa Rosa Island abalone. This is important from a conservation standpoint, considering the fact of lower levels of abundance of red abalone at other islands and a longer time frame for recovery. Ian has recently reported that preliminary results from the DFG genetics study maybe available real soon that would provide additional information on the possible connectivity of abalone stocks among islands. At this moment before further data available, I will continue to work on the single-species-island model, but will spend some time to investigate the water circulation around SMI and Santa Rosa Island and think of the possibilities of developing model/analysis to address this concern.

Lastly, I would like to thank Ian Taniguchi for his great effort on abalone survey data.

Appendix:

Figure 1: 3 indices developed from the CINP data set.



## Memorandum

**Date:** May 9, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** April, 2008 Status Report for AAG Modeling Effort  
**Cc:** AAG Technical Panel

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### 1: Introduction

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress last month. Much of the effort this month revolved around data mobilization, scanning the data sets, and confirming that they are properly formatted. Details are summarized below:

### 2: Data Sets Received

The data received up to now were described in the descriptive matrix (v10). I received the following data sets from Ian Taniguchi last month:

Revised data sets:

1. Data 2a - Historical SMI red ab density.xls
2. Data 2b - SMI time swim\_93-01.xls
3. Data 9b - CPFV DB SMI SRI 91-97
4. Data 12d - CINP-KFM abalone transect counts.xls"

New data sets:

1. Data 11a - PISCO abalone data 2003\_2007.
2. PISCO random ab swim data 2003.xls
3. JEngle CIRP red ab size & random swim data 1997\_2004.xls
4. Data 17 - SMI Aerial kelp flight data 1989-2006.xls

Supplement data sets:

Supplemental K: PISCO

1. Sup K1 - PISCO subtidal monitoring description
2. Sup K2 - PISCO subtidal sampling protocols

Supplemental L: 1974 cruise reports:

1. 74KB11 cruise report
2. 74KB2 Cruise Report
3. 74KB8 Cruise Report

Supplemental M: 1979 cruise reports.

1. 79A4 cruise report
2. 79A5 cruise report
3. 79A6 cruise reports

Supplemental N: 1993 cruise report

1. 93M6 Cruise Report

Supplemental Q: 1999 cruise reports

1. 99M1 and 99M5 Cruise Reports



The data received to date have been scanned. All the revised data sets listed above and the new dataset 1 will be used to develop relative abundance indices and will be used in the state-space surplus production model and the catch-at-age/size model. The other three new data set listed above will be considered further.

### **3: Data needs**

Pending data:

1. Updated pathology data is pending.

### **4: Progress in data analysis and model development**

Data analysis:

Steps taken

1. I proposed to use the 3 indices from the Channel Island National Park Monitoring (data set #12) because of the dramatic differences in different survey locations. It will be updated this month (May) based on the revised data from Ian Taniguchi.

Problems faced and strategies adopted to address them

2. Ian Taniguchi has revised several data sets last month and emailed them to me. No specific problems were encountered.

Model analysis:

1. The model framework of state-space surplus production model has been finished. Because we changed our methods in developing relative abundance indices, the framework needs to be revised from 2 relative abundance indices to (? unknown yet), and modeling results from the state-space surplus production model will need to be updated as more data become available.
2. The yield-per-recruitment model has been developed, and model is ready to be used. I'll updated the results on natural mortality and present the result in the next monthly report.

### **5: Pending data analysis/model development issues**

Data analysis: Ian Taniguchi has work out several revised data sets. I have not yet been able to put the updated data sets in the model.

Model development: Model framework on the catch at age/size model will be developed and preliminary analysis will be done in the next report.

I plan to use the strategy used to analyze CINP data to analyze the historical SMI red abalone density cruise data, which have different survey locations in different years.

### **6: Next steps in model development**

1. I will update the state-space surplus production model; the yield-per-recruitment analysis.
2. I will also work on the catch-at-age/size model after I re-analyze the index data from Ian. After that, I will confirm whether I will use this model or not and explain the reasons through monthly report and TP teleconference(s) as needed.

### **7: Other**

No additional information has been received regarding further update on the potential genetic connection between SMI and Santa Rosa Island abalone this month.

I would like to thank Ian Taniguchi for his great effort on abalone survey data.  
Please note, I have been busy with the final exams and the national stock assessment workshop, which slightly delayed my submitting this report.

## Memorandum

**Date:** June 30, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** June 2008 Status Report for AAG Modeling Effort  
**Cc:** AAG Technical Panel

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### **1: Introduction**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress during June 2008. Much of the effort this month revolved around scanning the length frequency (LFQ) data sets, confirming that they are properly formatted, and reorganizing them based on their spatial location to make the datasets comparable among years, and finally using the data sets in the catch-at-age/length model. Details are summarized below:

### **2: Data Sets Received**

The data received up to now were described in the descriptive matrix (v10) and listed in the April 2008 Status Report. No new datasets were received last month.

The data received to date have been scanned and reorganized.

### **3: Data needs**

Pending data:

1. Updated pathology data is pending. Ian Taniguchi and Laura Roger-Bennett will update it later. It may help us to understand natural mortality over time.

### **4: Progress in data analysis and model development**

Data analysis:

Steps taken

1. I developed 4 LFQ datasets according to the survey location (NW, NE, SW, SE) based on different fishery independent surveys. LFQ from these datasets were used in the catch-at-age/size model.
2. I showed the differences of LFQ in different locations, but in the model, the data cumulated among locations of NW, SW and SE were used in the assessment because of the cumulated catch used in the model.
3. I also developed the recreational Catch per unit of Effort (CPUE) .
4. Results can be seen from the Figure 18 of LFQs.

Problems faced and strategies adopted to address them

5. Since there were limited abalones observed and harvested from NE area of SMI, these LFQ datasets from this area were not included in the modeling analysis.
6. 0 values also exist in abundance indices and catch. In the modeling analysis, 0s are replaced by missing values due to the use of lognormal distribution.

Model analysis:

1. The temporal variation of individual growth was modeled using a Bayesian hierarchical model. Results are attached and included in Figures 1, 2 and 3.
2. The yield-per-recruitment model has been developed and the model is ready to be used. 3 natural mortality assumptions were used in the modeling analysis. The three assumptions are: 1)  $M=0.15$  for all length groups; 2)  $M=0.30$  for all length groups; 3)  $M=0.45, 0.20$  and  $0.10$  for length groups of  $<100$ ,  $100<L<178$ ; and  $L>178$ . Results are attached and included in Figures 8, 9 and 10.
3. Modeling results from the Bayesian state-space surplus production model are attached based on the 12 abundance indices.
4. Modeling results from the catch-at-age/size model are attached based on the 12 abundance indices, and LFQs. I called this model a “catch-at-age/size” model because the model that I developed is not a size structured model, but at the same time we didn’t use age frequency but used length frequency and individual growth model to link the length frequency with the age-frequency.

**5: Pending data analysis/model development issues**

Data analysis: further discussion of this issue will be during July 7 call with the technical panel.

Model development: Model framework will be updated based on the discussion on the preliminary analysis of the models this month and next month.

**6: Next steps in model development**

1. Discuss sensitivity analysis used in the state-space surplus production model;
2. Discuss discrepancy among natural mortality estimations from different studies and their influence on the per-recruitment analysis and catch-at-age/size model;

\*\* further discussions on the data quality is needed. The 13 abundance indices are very inconsistent which can be seen from figures 11 and 12. We can see that rarely two of them shows consistent trend through the cross correlation figure. I’d suggest that we use some of them that are of high quality. At least we need to develop data scenarios that are of highest quality; medium, and low. This will be needed to justify the possible management strategies evaluation. Another reason that may cause the noisy abundance indices from different surveys is because of the patchy recruitment of this species, i.e., for local cohort, current driven larval settlement causes variation of the population abundance to be heterogeneous among spatial and temporal scales. We may request that CDFG staff further clarify this issue.

**7: Other**

No additional information has been received regarding further update on the potential genetic connection between SMI and Santa Rosa Island abalone this month.

Feel free to email or call me on questions.

Attachment 1: Abalone modeling analysis results in figures and tables.

## Memorandum

**Date:** July 30, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** July 2008 Status Report for AAG Modeling Effort  
**Cc:** AAG Technical Panel

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### **1: Introduction**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress during July 2008. Much of the effort this month revolved around discussion of the quality of the data sets through a teleconference among the TP members, follow-up discussion with Ian Taniguchi and Laura Rogers-Bennett about the data usage, updating the modeling results based on the preliminary discussion among TP members about results on data quality, and writing the report (not finished yet). Details are summarized below:

### **2: Data Sets Received**

The data received up to now were described in the descriptive matrix (v10) and listed in the April 2008 Status Report. No new datasets were received last month.

The data received to date have been scanned and reorganized.

### **3: Data needs**

Pending data:

1. Updated pathology data are pending. Ian Taniguchi and Laura Roger-Bennett will update them later. These data may help us to understand natural mortality over time. (we do not need it for the modeling analysis at this moment)

### **4: Progress in data analysis and model development**

Data analysis:

Steps taken

1. Discuss the natural mortality assumption in models and detailed discussion with Laura Rogers-Bennett.
2. Discuss the relative abundance indices, to decide sources used/deleted and quality of the sources that are used.
3. Improve the summary of the data and models used based on the data, and/or data used in each model.

Problems faced and strategies adopted to address them

4. Time series that are short, or surveys with limited spatial and temporal coverage are deleted
5. Time series that are from fishery-independent surveys are ranked as high quality, while those from fishery-dependent surveys are addressed as low quality. Quantitatively, high is replaced with weight 1, while low is replaced with weight 0.5.
6. Sensitivity analysis will be further used to address the data weighting problem in stock assessment.

Model analysis:

**5: Pending data analysis/model development issues**

Data analysis: further discussion of this issue will be held during the August 14-15 meeting with the technical panel.

Model development: The model framework is being updated based on the discussion on the analysis of the models this month and next month.

**6: Next steps in model development**

1. conform data usage and update the modeling results if needed
2. finish writing the report.
3. discuss management issues related to the model to develop a needed risk assessment given management solutions.

**7: Other**

No additional information has been received this month regarding further updates on the potential genetic connection between SMI and Santa Rosa Island abalone.

Feel free to email or call me with questions.

## Memorandum

**Date:** August 30, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** August 2008 Status Report for AAG Modeling Effort  
**Cc:** AAG Technical Panel

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### **1: Introduction**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress during August 2008. Much of the effort this month revolved around discussion of the quality of the data sets the advantages and disadvantages of different type of models that can be used for this stock assessment, and writing the report (not finished yet). The technical panel also held a face-to-face meeting in August where these issues were discussed. Details are summarized below:

### **2: Data Sets Received**

The data received up to now were described in the descriptive matrix (v10) and listed in the April 2008 Status Report. No new datasets were received last month.

The data received to date have been scanned and reorganized.

### **3: Data needs**

Pending data:

1. Updated pathology data are pending. Ian Taniguchi and Laura Roger-Bennett will update them later. These data may help us to understand natural mortality over time. (we do not need it for the modeling analysis at this moment)

### **4: Progress in data analysis and model development**

Data analysis:

Steps taken

1. Discuss the natural mortality assumption in models and detailed discussion with Technical Panel (TP) .
2. Discuss the relative abundance indices, to decide sources used/deleted and quality of the sources that are used.

Problems faced and strategies adopted to address them (the following are the discussion result from the face to fact TP meeting)

1. Recreational CPUE abundance index was eliminated from all the models because the fishery was regulated on a small daily bag limit (2 or 4 abalone per day) and thus CPUE does not truly reflect directly with abundance. Also during the time frame of the data collection the bag limit was reduced by half from four abalone per day to two, so the drop in CPUE was artificial.

2. Channel Island National Park (CINP) Kelp Forest Monitoring site Hare Rock was eliminated from all the models because abalone abundance dropped to zero around 1990. Also the Hare Rock site is located in the NE zone of the island where there has always traditionally been low densities of abalone and the site is now in a reserve.
3. Channel Island National Park Kelp Forest Monitoring site Miracle Mile was eliminated from all the models because densities were 100 times larger than other abundance indices. This is due to the site being placed specifically in a high density abalone area and is therefore not reflective of overall population abundance and is not truly random.
4. The four remaining abundance indices for the catch-at-age/size model are the DFG historical survey abundances for the SW, SE, NW, and the CINP Kelp Forest Monitoring site Wyckoff Ledge (WL). The TP discussed running several scenarios with the existing indices; 1) all indices separate 2) combining SW, SE and NW and assume that there are no spatial heterogeneity since the model is not spatial structured; 3) Delete CINP WL since WL occurs within the SW zone.

Model analysis: Provided a presentation to the Technical Panel on the model analysis based on the data discussion results in July. I haven't yet updated the modeling results (re-run the models with the remaining data sets) after the face to face meeting in August, and add more results that may of interests to the AAG and for the management purposes.

#### **5: Pending data analysis/model development issues**

Data analysis: reorganize the relative abundance indices. As mentioned in the data analysis, one of the scenarios is to combine SW, SE and NW and assume that there is no spatial heterogeneity. Based on our previous discussion on the data application, I have split the data according to their spatial location and saved only the surveys with consistent and comparable locations over time (example, 2006 and 2007 surveys have wider coverage than surveys before that). Now, I need to pull out the original datasets from sent to CONCUR and reorganize them by assuming that spatial coverage uncertainty does not exist over time.

Model development: I'm updating the model framework based on the discussion on the analysis of the models and data this August, but haven't finished them yet.

#### **6: Next steps in model development**

1. update the modeling results
2. finish outlining the report.
3. discuss management issued related to the model to develop a needed risk assessment given management solutions.

#### **7: Other**

No additional information has been received this month regarding further updates on the potential genetic connection between SMI and Santa Rosa Island abalone.

Feel free to email or call me with questions.



## Memorandum

**Date:** Nov 30, 2008  
**To:** Scott McCreary, CONCUR, Inc.  
**From:** Yan Jiao  
**Re:** Nov 2008 Status Report for AAG Modeling Effort  
**Cc:** AAG Technical Panel

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### **1: Introduction**

In accordance with CONCUR contract (455832) dated Dec 2007, I am reporting the project progress during Nov 2008. Much of the effort this month revolved around updating the stock assessment results based on discussions among TP members at meetings in August, October, and November, and writing the report (not finished yet). Details are summarized below:

### **2: Data Sets Received**

The data received up to now were described in the descriptive matrix (v10) and listed in the April 2008 Status Report. No new datasets were received last month.

The data received to date have been scanned and reorganized.

### **3: Data needs**

Pending data:

1. Updated pathology data are pending. Ian Taniguchi and Laura Roger-Bennett will update them later. These data may help us to understand natural mortality over time. (we do not need it for the modeling analysis at this moment)

### **4: Progress in data analysis and model development**

Data analysis:

No further data analyses were done this month because all scenarios have been decided during the last two months.

I have updated the modeling results (re-run the models with the remaining data sets) after the teleconference meeting in Nov, and added more results that may be of interest to the AAG and for management purposes. I am specifically working on the risk assessment for possible management strategies.

### **5: Pending data analysis/model development issues**

None.

Model development: I have been updating the model framework based on the November TP meeting discussion on the analysis of the models and data, but a full uncertainty analysis is still pending. Results are expected to come out this December.

**6: Next steps in model development**

1. Further validate the modeling results
2. Finish writing the report based on the agreement of the outline.
3. Discuss management issues related to the model to develop a needed risk assessment given management solutions.

**7: Other**

No additional information has been received this month regarding further updates on the potential genetic connection between SMI and Santa Rosa Island abalone.

Feel free to email or call me with questions.