SUPPORTING STATEMENT

SOCIOECONOMICS OF USERS AND NON-USERS OF
GRAYS REEF NATIONAL MARINE SANCTUARY

OMB CONTROL No. 0648-xxxx

Revised 2-6-2011

U.S. Department of Commerce
National Ocean and Atmospheric Administration
National Ocean Service
Office of National Marine Sanctuaries
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Describe whether, and to what extent, the collection of information involves the use of
automated, electronic, mechanical, or other technological techniques or other forms of

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B. COLLECTIONS OF INFORMATION EMPLOYING STATISTICAL METHODS

1. Describe (including a numerical estimate) the potential respondent universe and any sampling or other respondent selection method to be used. Data on the number of entities (e.g. establishments, State and local governmental units, households, or persons) in the universe and the corresponding sample are to be provided in tabular form. The tabulation must also include expected response rates for the collection as a whole. If the collection has been conducted before, provide the actual response rate achieved.

Users of GRNMS from Private Household Boats

The population was estimated at approximately 500 using satellite imagery and estimates of the number of people per boat. About 500 users have been identified by the Georgia Department of Natural Resources which randomly boards boats on random days through the year in GRNMS. The boaters are not selected because they are violating any rules or regulations; they are randomly selected. Boat registration number and name and address of the boat owner are obtained. All in the sample list will be surveyed via a mail survey. The current sample list is almost equal in number to the estimated population.

Non Users of GRNMS

For non users, the sample frame is the civilian non-institutionalized population of the U.S. living in households that are 16 years old or older. Since we will obtain samples of households, we will randomly select the respondent within the household who will answer the questions using the birthday rule i.e. the person in the household who is 18 years of age or older who last celebrated their birthday.

Our initial thoughts were to stratify the sample on the basis of the distribution of the civilian non-institutionalized population living in households' age 18 years old or older by coastal and non-coastal counties. NOAA has worked with the U.S. Bureau of the Census in developing population by county for coastal and non-coastal counties. However, in our calculations for desired precision and sample size requirements, we determined that we need to over-sample coastal residents (see answer to Question 2 below). In addition, mailing lists are likely to be by zip code, so we will do Geographic Information System GIS overlays of zip codes and counties to get distributions between coastal and non-coastal counties and coastal and non-coastal zip codes that come as closely as possible to the distributions by coastal and non coastal counties.

If 2010 Census data is not available by county and/or zip code before sampling begins, we will use the 2009 Census data for the samples and then post weight the data for the coastal and non-coastal strata when the 2010 data is available. Post sampling weighting will also be required to adjust for over-sampling coastal residents. Table 4 shows the estimates of the population of coastal and non coastal Georgia, expected response rates, and the expected total number of expected completed questionnaires by version of the survey. Table 5 shows the distribution by coastal and non coastal strata. For each version of the survey, we will split the 500 samples equally between coastal and non coastal residents of Georgia, which means we will over-sample coastal residents of Georgia for purposes of estimation precision (see answer to Question 2

below).

For-hire Recreational Diving Operations

We have identified a population of 10 operations. This was done through previous survey efforts conducted by Duke University and Savannah State University. We expect to get a 100% response rate or a census. The representative for the dive industry on the GRNMS SAC has assured us that all of their members are highly supportive of the effort and we should expect full cooperation (Table 4).

For the For-hire Recreational Fishing Operations

We have identified a population of between 20 and 30 operations. This population is more fluid and the numbers fluctuate. The current recession may affect this number of operations. We identified these operations through NOAA Fisheries, telephone yellow book, web sites and fishing magazines. Again, we expect to get a 80% to100% response rate or close to a census (Table 4). The representatives for the recreational fishing industry have assured us that their members are highly supportive of the effort and we should expect full cooperation.

Table 4. Populations, Sample Sizes, and Expected Response Rates
_____
Survey
_____

1. Users from Private Household Boats
   a. Population   500
  b. Samples
     (1) Version 1   500
     (2) Version 2   500
   c. Expected Response Rates   40 -70 %[1]
   d. Expected Completed Surveys/Version   200 - 350

2. Non Users of GRNMS   Percent
  a. Population of Georgia 2008 [2]   9,829,211
     (1) Coastal   609,762   6.2
     (2) Non Coastal   9,219,449   93.8
  b. Samples
     (1) Version 1   500
     (2) Version 2   500
  c. Expected Response Rates   40 - 70 %[1]
  d. Expected Completed Surveys/Version   200 - 350

3. Recreation For Hire Diving Operations
  a. Population   10
  b. Sample   10
  c. Expected Response Rate   100%[3]
  d. Expected Completed Surveys   10

4. Recreation For Hire Fishing Operations
  a. Population   20 - 30
  b. Sample   20 -30
  c. Expected Response Rate   85 - 100%[4]
  d. Expected Completed Surveys   17 - 30
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1. Based on experience with mail surveys of similar populations in consultation with the
   late Robert Ditton of Texas A&M University.
2. There are 11 coastal counties in Georgia based on the State's Coastal Zone Management
   Plan. See http://marineeconomics.noaa.gov/socioeconomics/welcome.html.
3. Based on experiences in the Florida Keys, Channel Islands, and Flower Gardens Bank
   National Marine Sanctuaries.
4. Based on experiences in the Florida Keys and Channel Islands National Marine Sanctuaries.

2. Describe the procedures for the collection, including: the statistical methodology for stratification and sample selection; the estimation procedure; the degree of accuracy needed for the purpose described in the justification; any unusual problems requiring specialized sampling procedures; and any use of periodic (less frequent than annual) data collection cycles to reduce burden.

Users from Private Household Boats

a. Statistical methodology for stratification and sample selection

For those who access GRNMS via private household boat, we have identified 500 users through the Georgia Department of Natural Resources which randomly boards boats on random days through the year in GRNMS. The boaters are not selected because they were violating any rules or regulations; they are randomly selected. Boat registration number and name and address of the boat owner are obtained. We will use a mail survey following the Dillman Method of sending a full survey, after two weeks those that have not responded will be sent a post card reminder, and after one month non-respondents will be sent a full package. We will send out surveys to all 500, and expect survey response rates will vary between 40 and 70 percent based on past experience with the Dillman Method for a total completion of 200 to 350 completed questionnaires (Table 4). Past experience with mail survey response rates is based on consultations over a period of several years with the late Robert Ditton of Texas A & M University. The response rates are based on the use of the full Dillman Method with prenotification letters.

For calculating required sample size, a hypergeometric distribution was proposed, since population size is small, as is the case for users of GRNMS (Morris, 2004). The equations for the hypergeometric populations are shown below:

Hypergeometric $\qquad n = N z^2 pq/(E^2 (N-1) + z^2 pq)$

Where:
a. N is the population size
b. n is the required sample size
c. p and q are population proportions
d. z is the value of the confidence level needed for the confidence interval used
e. E is the confidence interval used (or margin or error)

In the case of population sampling based on population proportions, the values for p and q are generally unknown, and thus are set equal to each other (0.5). The z value used is associated with an alpha of 0.05 (or 95% confidence level), which is 1.96. Finally, the E value depends on the confidence interval required (ex., where 5% = 0.05). See Table 5 for the calculations.

The population is considered as a single stratum, and stratifications are only considered at the analysis stage (ex. age, education level, income bracket, etc.).

b. Estimation procedure

Because the population for users of GRNMS is already known, there is no need to estimate the population. Our sample list is very close, if not equal, to the estimated population, so we are sampling the entire population or close to it. We are assuming relatively high response rates because users of GRNMS are highly committed to the site and want to be represented in management decisions.

c. Degree of accuracy

Because the large sample sizes due to high response rates and sampling rates, we expect a high degree of accuracy of estimated population parameters. The required sample sizes to achieve the desired precision of estimates are presented in Table 5. To obtain the desired precision of estimates at +/- 5 percent requires a sample size of 217. This is slightly more than what would be achieved at the lower bound estimate for a response rate of 40%. The required response rate is slightly higher at 43.4% to achieve the desired precision.

d. Unusual problems and the need to conduct periodic data collection cycles

Because of the burden hours required to obtain all the information desired, two versions of the survey were designed. The data collection for each version will be a done over a two-year period (two versions will be implemented to the same sample) periodic data collection cycle issues are applicable to this project.

Non Users of GRNMS

a. Statistical methodology for stratification and sample selection

For non-users from the general population of Georgia, we originally intended to select a random sample of 500 households in Georgia, stratified by the relative population in coastal and non coastal counties for each of the two versions of the questionnaire (Table 4). However, the calculations in Table 5 show that to achieve the desired level of precision of estimates for the two strata (coastal and non coastal), we need to over-sample those who live in coastal counties. So we will split the sample evenly between coastal and non coastal populations for each version of the survey (N=250 coastal and N=250 non coastal). With expected response rates we will achieve the desired precision for each stratum.

A mail survey will be used and all 500 will be sent questionnaires for each of the two samples. Again we will follow the Dillman Method described above an expect response rate to vary between 40 and 70 percent yielding between 200 and 350 completed questionnaires per version.

b. Estimation procedure

The population for non users of GRNMS is already known since it the total population of Georgia minus the amount of users (N=500). This will be the estimate of the population for extrapolating from sample to population of non users, non users will include most of the population of Georgia. The probability of sampling a user in our two 500 samples is very low, almost zero for practical application.

Degree of accuracy

Table 5 shows the calculations of the sample sizes required for achieving the desired level of precision in estimates. We use the information on Likert scale questions by Sclove (2001) for assumptions about the distributions across the five scale scores for the mean and Sigma. We use the equal proportion assumption (each response is equal to .2 of the distribution) with a mean equal to 3.0 and Sigma equal to 1.41. To obtain the desired precision of estimates at +/- 5 percent requires a sample size of 13.

We require desired precision for two strata (coastal and non coastal). Following a simple stratified random sample with N=500 for each version of the survey would only yield a sample size of 12 for coastal and 188 for non coastal respondents. To ensure sample sizes that will allow for achieving desired precision, we propose to over-sample coastal residents of Georgia and then post weight the sample to the coastal-non coastal distribution. By splitting the samples of 500 evenly between coastal and non coastal residents of Georgia and assuming a response rate of 40% yields a sample of 100 completed questionnaires for each strata. If response rates go to 70%, then sample sizes increase to 175 per strata. This will also allow for assessments across other groups for certain socioeconomic factors where mean scores might differ.

    c.   Unusual problems and the need to conduct periodic data collection cycles

We don't expect any unusual problems and both samples for each version of the survey will be implemented in year one, so there are no periodic data collection cycles. One problem with Likert scale questions is that the variance is a function of the mean. So when testing for differences in means between groups, we will have to adjust the variances. Sclove (2001) recommends and arc sine square root transformation.

For the "for-hire" operations, we expect to get a census or close to a census for both groups. This is based on past experiences in the Florida Keys, Channel Islands, and our current effort in the Flower Gardens Bank National Marine Sanctuaries.

Table 5. Required Sample Sizes for Desired Precision of Estimates
_____

Survey
_____

1. Users from Private Household Boats
    a. Desired Precision: +/- 5%
    b. Population: 500 (Note: Sample approximately equal to population)
    c. Population Proportions: p=.5 q=.5
    d. Value of z for 95% Confidence Interval: z=1.96
    e. Margin of Error: E=0.05
    f. Required Sample Size [1:] $n=NZ^2pq/E^2(N-1) + Z^2pq$
        n=217
    g. Required Response Rate to achieve desired precision: 43.4%

2. Non Users of GRNMS
   Using results from Sclove (2001) for Likert Scale, assuming equal proportions to each scale response,
   results in a mean=3.0 and a Sigma value of 1.41.
   a. Desired Precision: +/- 5% is equal to +/- 0.15
   b. Sigma: 1.41
   c. Required Sample Size for desired precison: $n=Sigma^2/.15 = 13.25$

   Two Strata for Sample Selection[2]:
     (1) Population in Coastal Counties of Georgia (6.2%)
     (2) Population in Non coastal Counties of Georgia (93.8%)
   A. Stratified Random Sample: Total Sample Size/Version N=500
    (1) Coastal Sample Size at 40% Response Rate: n=12
    (2) Non Coastal Sample Size at 70% Response Rate: n=188
   B. Over-sample Coastal: Total Sample Size/Version N=500
    (1) Coastal Sample Size at 40% Response Rate: n=100
    (2) Non Coastal Sample Size at 40% Response Rate: n=100
    (3) Coastal Sample Size at 70% Response Rate: n=175
    (4) Non Coastal Sample Size at 70% Response Rate: n=175

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1. See Morris (2004) for sample size determination for small populations.
2. There are 11 coastal counties in Georgia according to the Coastal Zone Management Plan for Georgia.
    A NOAA web site has a list of counties that are coastal in Georgia. The U.S. Census Bureau web site
    was used to get populations for all of Georgia and Georgia's coastal counties for year 2009.
    See http://marineeconomics.noaa.gov/socioeconomics/welcome.html for coastal counties.

3.   Describe the methods used to maximize response rates and to deal with nonresponse. The accuracy and reliability of the information collected must be shown to be adequate for the intended uses. For collections based on sampling, a special justification must be provided if they will not yield "reliable" data that can be generalized to the universe studied.

For all our surveys, we will use pre-notification letters to increase response rates.

We have worked closely with the GRNMS Advisory Council in establishing relationships with the for-hire operations that use the GRNMS and have surveyed most of them in the past. User

groups have requested the socioeconomic monitoring efforts in response to recent management strategies (spear fishing prohibition and establishment of a research only area) to monitor the extent of socioeconomic impacts and long-term changes in attitudes and perceptions of GRNMS management strategies and regulations. Therefore, we expect generally vey high response rates and don't expect non-response bias.

For users accessing the GRNMS via private household boats and non-users from the general Georgia population, we expect higher non-response. For users it will be difficult to detect non-response bias because we currently don't know the characteristics of the population of users. This will be the first attempt to survey this population, which is relatively small. For non-users, we can compare Census data for Georgia on socioeconomic/demographic characteristics to detect factors related to non-response and whether any of these factors are related to measurements of estimation in the effort. We can also compare some of our general opinion questions against those from Georgia in the "Ocean Project" survey to see if opinions on ocean and coastal resource protection in our sample of Georgia residents are statistically different from that obtained by the "Ocean Project" surveys. However, because the "Ocean Project" uses a 0 to 100 scale with a one number response, according to the research by Christian and Dillman (2004) and in Stern et al (2007) the Likert scale versus the one number response will could have significantly different distributions, thus eliminating the usefulness of this test. If we find non-response, we will develop sample weights to adjust for non-response bias.

For non-users, our approach has four steps. In step 1, we compare our sample to known distributions. For non-users, we would compare our sample with the U.S. Census across multiple demographic factors (e.g. sex, age, race/ethnicity, educational attainment, and household income). We conduct formal statistical tests using the SAS Software, PROC FREQ that supports testing the distributions between sample and Census distributions to identify significant under or over representation.

In step 2, we relate the demographic factors to key parameters in the survey. We conduct both non parametric univariate tests using the Kolgromov-Smirnoff test for the empirical distribution function (edf) and multivariate tests using OLS, probit and logit functions relating response rates to demographic and other key parameters for estimation.

In step 3, if we found statistically significant relationships between demographic factors and key parameters of estimation for which demographic factors were under or over represented, then we construct sample weights. Multivariate weights are constructed when possible, but at minimum multiplicative weights are constructed for all the factors. Multivariate weights are limited due to sample sizes.

In step 4, we compare weighted and unweighted estimates to get a sense of the possible extent of non-response bias.

For non-users, we can compare estimates of marine/saltwater recreational fishing form NOAA Fisheries Marine Recreational Fishing Survey (done annually) and the U.S. Fish and Wildlife Service's Survey of Hunting, Fishing and Wildlife Associated Activities (done every five years). Both surveys attempt to achieve statistically reliable estimates of participation and use for each

State. We can compare weighted and unweighted estimates with these two sources to assess the possible extent of non-response bias and how our weighting adjusts for the bias if it occurs.

In the Florida Keys, recreation-tourism is a dominant part of the economy. In this situation, estimating expenditures allows for consistency checks on selected expenditure items (e.g. lodging and food & drink at restaurants and bars). Our sample weighting was successful in that our weighted estimates were consistent with reported actual expenditures by the Florida Department of Revenue, while the unweighted estimates were not. In this case, we had significant non-response bias, but it was successfully corrected with sample weighting.

We don't have a similar situation for Grays Reef National Marine Sanctuary since its total use would not account for a large proportion of any local economy. So we could not conduct a step 5 consistency check. What we do know is that our non-response bias plan has worked elsewhere where we could test it and believe it is a valid and useful approach.

For users, we have nothing to compare to in step 1, so our non-response bias analysis will be more limited. No one has ever identified the population of users that use Grays Reef National Marine Sanctuary. Unlike the Florida Keys where we have extensive on-site surveys followed my mailback surveys for additional information, we have no way of knowing the demographic distributions of users before we sample them or the extent of their marine recreation activities compared to the general Georgia population from surveys by NOAA Fisheries in their Marine Recreational Fishing Statistics Survey (done annually) or the U.S. Fish and Wildlife Service's Survey of Hunting, fishing and Wildlife Associated Activities (done every five years).

4. Describe any tests of procedures or methods to be undertaken. Tests are encouraged as effective means to refine collections, but if ten or more test respondents are involved OMB must give prior approval.

All of the questionnaires and methods proposed here have been employed in past information collections and so are well tested. They all have been slightly modified for application to the GRNMS. We have also worked through the GRNMS SAC to make sure that the members of each user group will know why it is important to provide the information and how it will be used, in order to receive a high level of cooperation in providing the information requested.

5. Provide the name and telephone number of individuals consulted on the statistical aspects of the design, and the name of the agency unit, contractor(s), grantee(s), or other person(s) who will actually collect and/or analyze the information for the agency.

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ATTACHMENT A: Questionnaires

This attachment includes all the questionnaires and supporting materials (e.g. information cards and maps to assist respondents).

- **Users of GRNMS who access via Private Household Boats**
  - **Information Sheet describing information collection**
  - **Questionnaire**
  - **Cover letter (to be developed once contractor/institution is selected to conduct the survey).**

- **Non-users of GRNMS from Households in General Georgia Population**
  - **Information Sheet describing information collection**
  - **Questionnaire**
  - **Cover letter (to be developed once contractor/institution is selected to conduct the survey).**

- **For-hire Recreational Dive Operations**
  - **Information Sheet describing information collection**
  - **Part 1 (Socioeconomic/demographic, costs-and-earnings, spatial distribution of use)**
  - **Part 2 (Knowledge, Attitudes and Perceptions of Management Strategies and Regulations)**
  - **Maps of Georgia and GRNMS (To be developed before implementation)**

- **For-hire Recreational Fishing Operations (Charter-Party/Head Boats)**
  - **Information Sheet describing information collection**
  - **Part 1 (Socioeconomic/demographic, costs-and-earnings, spatial distribution of use)**
  - **Part 2 (Knowledge, Attitudes and Perceptions of Management Strategies and Regulations)**
  - **Maps of Georgia and GRNMS (To be developed before implementation)**