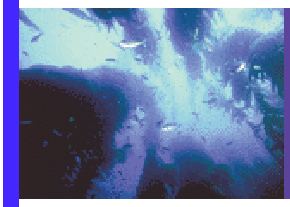
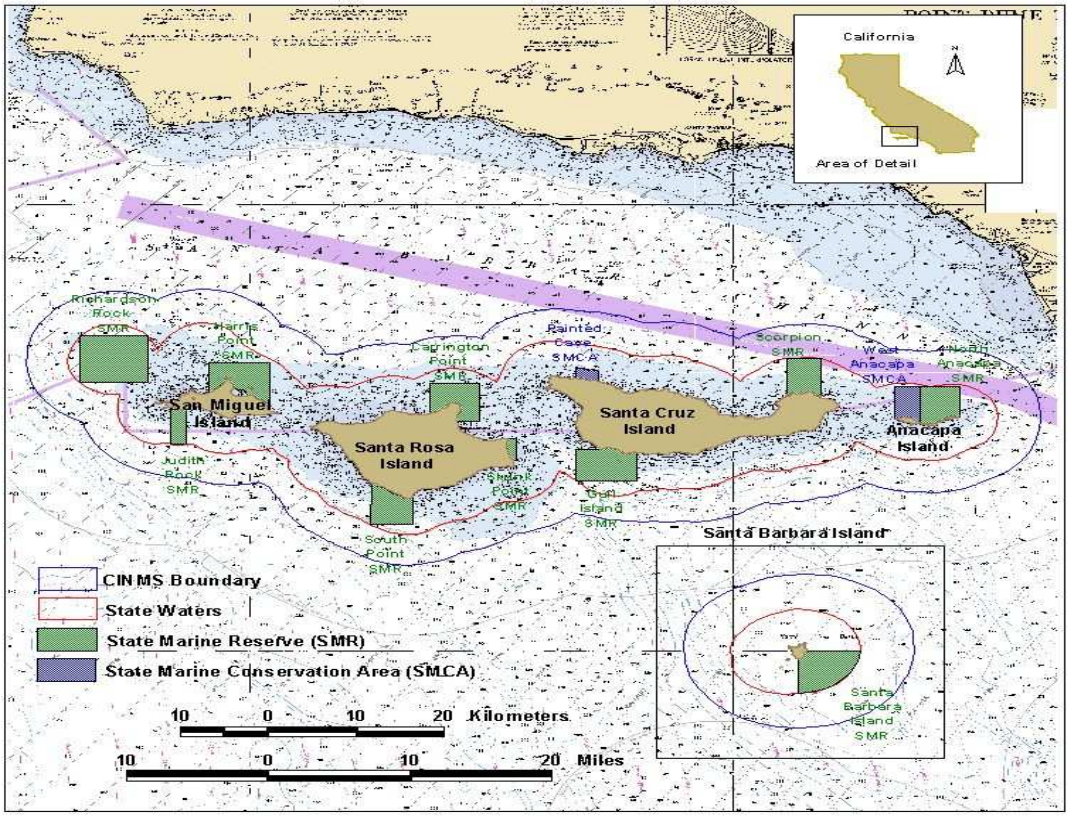


Valuing Marine Protected Areas:
A Monitoring Protocol for Recreational Non-Consumptive Use Applied to the Channel Islands National Marine Sanctuary



Group Project – Master Thesis

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In Partnership with the
Channel Islands National Marine Sanctuary,
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April 2004

UNIVERSITY OF CALIFORNIA
Santa Barbara

VALUING MARINE PROTECTED AREAS: A MONITORING PROTOCOL FOR RECREATIONAL NON-CONSUMPTIVE USE APPLIED TO THE CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

A Group Project submitted in partial satisfaction of the requirements for the degree of
Master's in Environmental Science and Management
for the
Donald Bren School of Environmental Science & Management

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VALUING MARINE PROTECTED AREAS: A MONITORING PROTOCOL FOR RECREATIONAL NON-CONSUMPTIVE USE APPLIED TO THE CHANNEL ISLANDS NATIONAL MARINE SANCTUARY

As authors of this Group Project report, we are proud to archive it on the Bren School's web site such that the results of our research are available for all to read.

Our signatures on the document signify our joint responsibility to fulfill the archiving standards set by the Donald Bren School of Environmental Science & Management.

Robert Ellis_____ Kristine Herrington_____

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The Group Project is required of all students in the Master's of Environmental Science and Management (MESM) Program. It is a three-quarter activity in which small groups of students conduct focused, interdisciplinary research on the scientific, management, and policy dimensions of a specific environmental issue.

This Final Group Project Report is authored by MESM students and has been reviewed and approved by:

Dr. Chris Costello_____ Dr. Michael McGinnis_____

DEAN_____

DATE_____

Acknowledgements

We express our gratitude to our faculty advisors, Chris Costello and Michael V. McGinnis, who worked with us from the beginning of this project, offering guidance, support, challenges, and encouragement the entire way.

We thank our client, Sean Hastings, Resource Protection Coordinator at the Channel Islands National Marine Sanctuary for his support, time, and enduring enthusiasm for this project. This project would not have been possible without the cheerful support and cooperation of the entire Channel Islands National Marine Sanctuary staff, and the expert guidance of Dr. Vernon R. (Bob) Leeworthy and Peter Wiley from the National Oceanic and Atmospheric Administration (NOAA) Special Projects Office in Washington, D.C.

We extend our gratitude to the following individuals who assisted us in this project through their expertise, time, and advice: Dr. John Loomis, Colorado State University; Dr. Charlie Kolstad, University of California Santa Barbara; Dr. Hunter Lenihan, University of California Santa Barbara; Dr. Bruce Kendall, University of California Santa Barbara. We would like to extend a special thanks to Dr. Mike Ward who helped tremendously in developing and analyzing our economic model.

This project would not have been possible without the cooperation of the owners and operators of the charter companies servicing the Channel Islands National Marine Sanctuary. We thank them for their time in completing the questionnaire and cooperation in allowing us to survey their passengers. We are also grateful to the passengers who participated in our study.

We are grateful for the support from our friends and family who listened, advised, and encouraged us through this project.

Finally, we thank the Donald Bren School of Environmental Science and Management for the financial and technical support.

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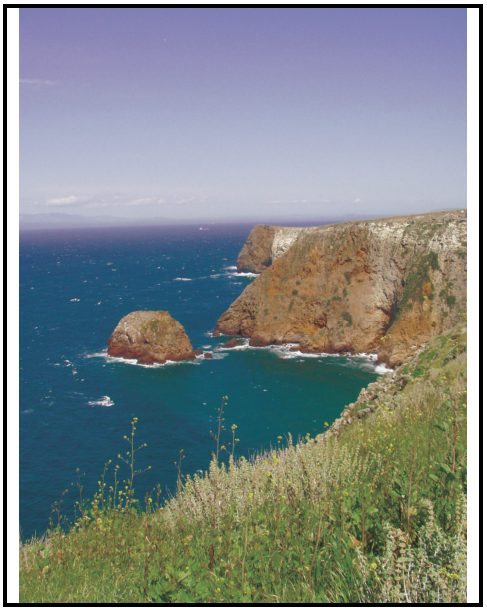
LIST OF COMMON ACRONYMS

CDFG	California Department of Fish and Game
CINMS	Channel Islands National Marine Sanctuary
CPFV	Commercial Passenger Fishing Vessel
CVM	Contingent Valuation Method
E.O.	Executive Order
ITCM	Individual Travel Cost Method/Model
MMS	Minerals Management Service
MPAs	Marine Protected Areas
MRWG	Marine Reserve Working Group
NOAA	National Oceanic and Atmospheric Administration
NMFS	National Marine Fisheries Service
NPS	National Park Service
OMB	Office of Management and Budget
PISCO	Partnership for Interdisciplinary Studies of Coastal Oceans
RNC	Recreational Non-Consumptive
SAC	Sanctuary Advisory Council
SBC	Santa Barbara Channel
SCB	Southern California Bight
SCEI	Southern California Education Initiative
TCM	Travel Cost Method/Model
UCSB	University of California, Santa Barbara
ZTCM	Zonal Travel Cost Method/Model

Abstract

The designation of twelve Marine Protected Areas (MPAs) in the state waters of the Channel Islands National Marine Sanctuary (CINMS) in April 2003 may economically impact multiple user groups. A complete economic analysis of these impacts would include both consumptive and non-consumptive consequences of the MPAs and would monitor changes in these effects over time. To date, a lack of formal studies exists on the long and short-term economic impacts of MPAs to recreational non-consumptive (RNC) users. We develop a pragmatic monitoring protocol to estimate the non-consumptive benefits attributable to RNC activities in the CINMS and MPAs, and to measure changes in these benefits over time. Economic impacts are estimated using the Travel Cost Method. This methodology allows us to specifically differentiate the RNC value attributable to the CINMS from that of the MPAs. We perform a pretest and calculate a partial monetary value for the RNC use of the CINMS and MPAs. We also use the results of the pretest to modify our survey tools, methods, and analytical model for the monitoring protocol. We discuss our pretest results and make recommendations for future use of this monitoring protocol as part of a comprehensive monitoring program to evaluate the effectiveness of MPAs as ecosystem-based management tools.



Executive Summary

Problem Statement

The designation of twelve Marine Protected Areas (MPAs) in the state waters surrounding the northern Channel Islands in April 2003 will likely have varying short and long-term economic impacts on different user groups. To assess the practical use of MPAs as an ecosystem-based marine resource management tool, both the ecological and economic effects of MPA implementation need to be examined. A complete economic analysis of this socioeconomic impact would include both the consumptive and non-consumptive effects of the MPAs and monitor changes in those effects over time. Currently, there is a paucity of socioeconomic data that describe the costs and benefits associated with MPAs[i]. Existing economic data pertains primarily to the monetary costs resulting from the establishment of the MPAs and more specifically focuses on quantifying the loss to consumptive activities[ii]. Potential benefits associated with non-consumptive activities have received little to no focused study.

Goals

The goals of this study are to develop a pragmatic monitoring protocol for recreational non-consumptive (RNC) activities in the CINMS and the northern Channel Islands MPAs, and conduct a pretest of the protocol to test and redefine the methods. We design the protocol to capture the benefits of non-consumptive use attributable to charter vessel-based recreation, and measure change in those benefits over time. Given that the RNC value of the CINMS may change with improved ecological parameters (i.e. size, diversity, and abundance of marine organisms), it is important to develop a repeatable methodology that can measure this change. We expect the initial value to be low until visitor demand increases due to improved ecological parameters. Ongoing monitoring is necessary to illustrate the relationship between the expected changes in ecological parameters within the MPAs, and the RNC benefits associated with these changes. We focus on creating a protocol that balances the monitoring objectives and resource constraints of the CINMS to provide a practical instrument for an ongoing monitoring program.

Research Approach

During the course of this study, we develop the necessary data-gathering tools, methodology, and analytical models to measure the value of the CINMS and MPAs. We conduct a comprehensive pretest, analyze the results, and adjust our tools, methods, and analytical model based on our findings. From these findings, we prepare a complete monitoring protocol for the CINMS to use in future monitoring.

Background

The northern Channel Islands located offshore of Santa Barbara and Ventura counties in California are part of a unique transitional marine ecosystem known as the Southern California Bight. The northern Channel Islands are one of the world's top biodiversity

hotspots[iii], which attract tens of thousands of recreational visitors annually[iv]. In 1980, the waters surrounding the northern Channel Islands from mean high tide to six nautical miles offshore were designated a National Marine Sanctuary (15CFR922).

In April of 2003, twelve MPAs were established in the state jurisdictional waters (0-3 nautical miles) surrounding the northern Channel Islands. Ten of the twelve MPAs are no-take marine reserves, thus prohibiting the removal of any species. However, regulation permits RNC activities such as SCUBA diving, snorkeling, kayaking, sailing, wildlife viewing (including whale watching), photography, and underwater photography within the MPAs[v], all of which have potentially large economic value[vi].

An increasing number of user groups, scientists, and policy makers recommend using MPAs to protect marine ecosystems, and potentially restore depleted fish stocks[vii]. The northern Channel Islands MPAs are an ecosystem-based management strategy designed to protect multiple marine species and their habitat[viii]. The burgeoning science of MPAs shows that well-designed and well-enforced MPAs result in relatively rapid recovery of species of concern[ix].

Methods

To quantify the RNC value of the northern Channel Islands MPAs, we apply the Travel Cost Method (TCM), a technique that translates the non-market benefits of recreation into a market price[x]. The TCM uses the costs incurred by visitors in traveling to a recreational area as well as their visitation rate to estimate the value attributable to a site. We use this model to calculate the value attributable to the CINMS and the MPAs.

Since the MPAs are situated within the CINMS, a major aim of our study is to separate the RNC value of the MPAs from the RNC value of the CINMS as a whole. To estimate the difference in visitation attributable to the MPAs, we calculate the demand curve and consumer surplus for two scenarios:

- CINMS Including the MPAs (includes all visitors, including those who stated their primary purpose was the MPAs)
- CINMS Excluding MPAs (does not include visitors who stated their primary purpose was the MPAs)

The area between these two demand curves is the consumer surplus specifically attributable to the MPAs. This method results in a conservative estimate for the value of the MPAs, since our survey does not capture the preference of visitors who may value recreating inside the MPAs, but do not consider it the primary purpose of their visit to the CINMS.

We developed two survey tools to conduct a travel cost analysis of the CINMS and the MPAs:

- A charter vessel operator questionnaire
- A charter vessel passenger survey

All charter vessel operators who offer RNC trips in the CINMS were invited to participate in the study. From the participants, we collected data on the seasonal

variation of the number of trips, passengers, and types of RNC activities in the CINMS. The operator questionnaire results determine low-bound annual visitation to the CINMS, since we do not perform a complete census of the operators. This value allows us to calculate a scaling factor that translates the results from our pretest sampling period to annual consumer surplus. In October and November 2003, we sampled charter vessel passengers at the three primary harbors servicing the CINMS: Ventura, Santa Barbara, and Channel Islands harbors. We use the results of the passenger survey pretest in the travel cost analysis and the user statistics.

Results

For the pretest analysis, we run a grouped logit regression to calculate the consumer surplus (value) for non-consumptive recreation in the CINMS and the MPAs. Based on this preliminary data collection effort, our model predicts total consumer surplus for the CINMS at approximately $253,000 and approximately $14,000 for the MPAs. Individual consumer surplus values range from $0-$15; the value being greater for individuals living closer to the CINMS, having higher income, and living further from comparable alternative recreational sites.

Our results are consistent with our prior beliefs about the relationship between total travel cost, substitute sites, and visitation rate. We find that total travel cost and substitute costs significantly influence visitation rate. Based upon the predicted visitation function, we estimate a number of visitors to CINMS. Our predicted number of visitors to the CINMS closely mirrors the observed number of visitors. The map in Figure 4 shows that our results adhere to standard travel cost theory, which predicts visitation to increase with lower travel costs. Counties closer to the destination have a lower total travel cost, and thus a higher number of predicted visitors.

User statistic results illustrate that of the surveyed visitors, only 40% are aware of the existence of the MPAs, and of those, only 40% understand the level of protection afforded by the MPAs. Approximately 58% of visitors think the CINMS restricts fishing or harvesting, while only 9% correctly understand CINMS regulations. Nearly 25% of visitors believe the CINMS and MPAs afford equal levels of protection.

We also use the results of our pretest to modify our survey tools, methods, and analytical model for the final monitoring protocol. We re-design the passenger survey and databases, and develop new sampling methods that will improve the quality and quantity of responses without substantially increasing surveyor effort.

Discussion and Recommendations

During the course of this study, we develop the necessary data-gathering tools, methodology, and analytical models to measure the economic value of RNC use of the CINMS and MPAs. The number of surveys we conducted for this pretest was adequate only to test our methodology and model, and is not a representative sample of annual RNC visitors to the CINMS. Due to the brevity of the sampling period and the fact that not all charter operators participated in the study, our sample may not be representative

of the annual visitor population. Therefore, our reported results may not accurately represent the actual current value of the CINMS and MPAs. Our methodology is designed conservatively to give a lower bound estimate of the actual value, resulting in a likely underestimate of the actual value of the CINMS and MPAs.

Through this study, we have produced an easily administered monitoring protocol that can value a recreational site over time, while simultaneously valuing the site at any one time. Based upon the preliminary results of our model, the methodology appears to generate plausible estimates of the RNC value attributable to the CINMS and the MPAs. We have intentionally kept the surveys and analytical methods as simple as possible without sacrificing accuracy to allow the monitoring protocol to be implemented regularly, with a relatively low time and financial commitment.

In order to detect changes in economic value over time we recommend this monitoring protocol as an ongoing program aimed at quantifying the RNC value of the MPAs. Ideally, this protocol would be conducted in conjunction with a more comprehensive monitoring program including all aspects of biological and socioeconomic monitoring as identified at the Marine Protected Areas Monitoring Workshop[xi]. Additionally, we recommend that the managing agencies improve education and outreach efforts. Heightened awareness and understanding of the MPAs may increase the proportion of visitors whose primary purpose is to visit the MPAs.

Conclusion

Socioeconomic monitoring of the northern Channel Islands MPAs provides an understanding of the costs and benefits to different user groups and how these costs and benefits may fluctuate over time. The value of RNC activities in CINMS and the MPAs represents one of the potential positive economic impacts of the MPAs. Through this study, we produce a cost-effective monitoring tool to measure the RNC value of the CINMS and the MPAs over time.

The MPAs in the state waters surrounding the northern Channel Islands are the first significant network of MPAs in the western United States. In several ways, the Channel Islands MPAs can be considered a test case for the future use of MPA networks as a marine management strategy. Using this monitoring protocol to understand the potential change in RNC value of the MPAs will provide a piece of the puzzle to evaluate MPA effectiveness. In addition, implementing this protocol in conjunction with a comprehensive ecological and socioeconomic monitoring program could help policy makers evaluate the effectiveness of MPA networks as a management tool.

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1. Problem Statement

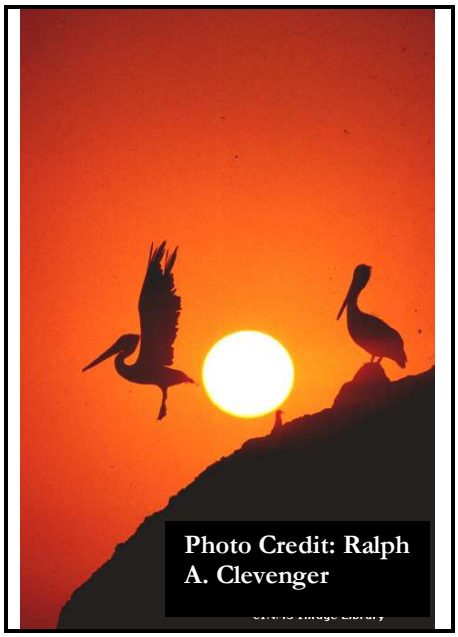
In April 2003, twelve Marine Protected Areas (MPAs) were established within the state waters of the Channel Islands National Marine Sanctuary (CINMS). Ten of the twelve protected areas are no-take marine reserves where fishing and harvesting are prohibited. While it is assumed that the designation of no-take reserves may have potential short-term negative economic impacts on extractive users, no formal analysis of the economic impacts (benefits) of the MPAs on recreational non-consumptive (RNC) users has been conducted (Leeworthy and Wiley, 2002).

The Santa Barbara Channel (SBC) hosts a flourishing consumptive and non-consumptive recreational industry, a large commercial fishing industry, a long-standing history of oil and gas development, and a place in the hearts of many environmentalists (SCEI, 2004). These groups reflect a wide range of short and long-term economic interests in the area. Despite the economic importance of this region, a general paucity of socioeconomic data on SBC coastal communities has been recognized for decades (Molotch and Woolley, 1994). Molotch and Woolley (1994) describe past efforts of the U.S. Minerals Management Service (MMS) to develop a socioeconomic monitoring program relating the oil extraction industry and the coastal communities of the SBC, in the mid-1980's. Prior to this effort, there was little data on the socioeconomic status of SBC coastal communities. More recently, a costs, earnings, and investments study has attempted to quantify the value of the local charter industry (Leeworthy and Wiley, 2002). In spite of these efforts, the gap in socioeconomic information has not yet been completely filled (NOAA, 2003).

Considering purely economic purposes, access restrictions are justifiable when the benefits of the restriction are larger than the cost (Farrow, 1996). In order to assess the full economic impact of the MPAs, analyses of consumptive and non-consumptive effects of the MPAs over time is critical. Currently, there is a scarcity of socioeconomic data describing the economic interests associated with the northern Channel Islands, and specifically how those interests may be affected by the MPAs (Leeworthy and Wiley, 2002). The economic data that exists pertains primarily to the costs resulting from the establishment of the MPAs. Moreover, most of these studies to date have focused on quantifying the monetary costs attributed to the prohibition on harvesting within the CINMS (Leeworthy and Wiley, 2002). Therefore, there is a crucial need for more studies that evaluate the benefits, if any, of the implementation of the northern Channel Islands MPAs.

RNC activities in and around the Channel Islands include SCUBA diving, snorkeling, kayaking, sailing, wildlife viewing (including whale watching), photography, underwater photography, research opportunities, and educational opportunities. Potential benefits to RNC users and associated businesses resulting from the designation of the MPAs are largely unknown, and may represent some positive economic impacts of the MPAs (NOAA, 2003). Recreational demand may increase due to an actual and/or perceived

change in the quality of the recreation available, or due to decreased conflict with consumptive users (Murray et al., 1999; Leeworthy and Wiley, 2002). Murray et al. (1999) also note that the economic benefits from enhanced recreation might even exceed extractive benefits. Since the potential benefits associated with non-consumptive activities have been poorly documented, we develop a means to quantify a part of these benefits.



We do not expect the RNC use value of the northern Channel Islands MPAs to be substantial under current ecological conditions. We hypothesize that there is a time lag between the implementation of the MPAs and the socioeconomic impact to RNC use, since the biological conditions within the MPAs may not noticeably improve for several years. This is a result of the time necessary for biologically depressed populations to increase their population size and range, and for relatively young fish to grow to sizes that attract recreational visitors.

2. Goals and Objectives

The goals of this project are to develop a pragmatic monitoring protocol that can be used to determine an economic value for recreational non-consumptive (RNC) activities in the Channel Islands National Marine Sanctuary (CINMS) and the northern Channel Islands marine protected areas (MPAs) over time, and to conduct a pretest of the protocol to test and redefine the methods. Given that the RNC economic value may change with the changing ecological "quality" (see Glossary) of the CINMS as a result of the MPAs, is it essential that a methodology be developed that can be repeated on a periodic basis. A single study can only give a snapshot of the value associated with the MPAs and this value is unlikely to be considerable until changes in the ecological parameters (i.e. factors that contribute to perceived quality for recreation such as sea life abundance and diversity) occur. Therefore, periodic monitoring is necessary to trace out the relationship between the ecological change that the MPAs are designed to bring about and the potential RNC economic benefit that is associated with that change. An accurate description of this relationship will assist managers weigh decisions concerning future MPA expansions or additions.

Since resource constraints such as time, money, and available staff often create an impediment to the implementation of monitoring studies, our objective is to recommend a methodology that fits both the CINMS' monitoring objectives and budget constraints. In order to confidently recommend a particular methodology, we research a variety of

potential recreational valuation methodologies to illustrate and weigh the advantages and disadvantages of each. This report will summarize and discuss these methodologies as well as explain our rationale for proposing each aspect of our recommended monitoring protocol.

We will provide the CINMS with our monitoring protocol as well as our recommendations for how to use it as a part of a larger ongoing monitoring program. In this way, we aim to provide an accurate and cost effective methodology that can be used to help fill the gap in socioeconomic data that is necessary to evaluate the costs and benefits associated with the implementation of the MPAs. This information can then be used to more accurately characterize the potential socioeconomic benefits of additional MPAs within the CINMS. It can also be used to help evaluate MPAs as a practical ecosystem management tool. Furthermore, we intend for this protocol to provide a model for effectively monitoring MPA value over time that can be adapted to additional MPAs in other parts of the country or world.

Table 1.1: Goals and Objectives of the Study

Goals	Develop a monitoring protocol used to determine an economic value for RNC activities in the northern Channel Islands MPAs over time
	Conduct a pretest of the protocol to test and redefine the methods
Objectives	Assist agencies in organizing a socioeconomic monitoring workshop for the northern Channel Islands MPAs
	Recommend a methodology that fits both the CINMS' monitoring objectives and budget constraints
	Provide a model for monitoring the value of MPAs that can be adapted to MPAs in other parts of the world
	Present a tool for evaluating the effectiveness of MPAs as a practical ecosystem management strategy

3. Research Approach

During the course of this study, we develop the necessary data-gathering tools, methodology, and analytical models to determine the recreational non-consumptive (RNC) value of the Channel Islands National Marine Sanctuary (CINMS) and marine protected areas (MPAs). We conduct a comprehensive pretest, analyze the results, and make adjustments to our tools, methods, and analytical model based on our findings. Based on our pretest and results, we prepare a complete monitoring protocol that we will deliver to the CINMS for their use in future monitoring.

At the end of the report, we present our recommended monitoring protocol. This monitoring protocol includes a report and a CD with final versions of our surveys, databases, recommended sampling methods, analytical models, and step-by-step

instructions for collecting new data and using it to complete an economic analysis. The monitoring protocol is designed to be a stand-alone document from which an independent researcher could repeat this study for the purposes of ongoing monitoring of the change in economic value of RNC activities in the CINMS and the MPAs.

We include results from our pretest in this report to demonstrate the use of our model to estimate the recreational non-consumptive (RNC) value of the CINMS and the MPAs. However, we emphasize that our study is intended only as a pretest and not a first year value for the CINMS and MPAs; we sampled only enough visitors to develop and test our analytical model. Therefore, while we are confident that the model can accurately represent the surplus of the CINMS and the MPAs when complete data is input, we cannot assume our results accurately represent the true first year value of the MPAs due to our small and non-representative data set.

3.1 Expectations

We expect the value of the MPAs to be relatively low for the first few years. Since the MPAs were only recently established, it will take time for ecological improvements to occur and for visitors to realize the potentially enhanced recreational opportunities that the MPAs may provide. We predict that the percent of visitors to the CINMS specifically interested in visiting the MPAs will increase over time as actual or perceived ecological conditions within the MPAs improve. If visitation to the MPAs increases, then we expect to see an increase in MPA or overall CINMS value with time.

In addition, if ecological conditions (such as increased size and abundance of sea life) improve within the MPAs, the improved conditions may be experienced outside the MPAs as well. If this spillover effect does occur, then the value specifically attributable to the MPAs may not change over time. However, we may see an increase in the total value of the CINMS due to overall higher ecological quality and subsequent increased visitation. Therefore, it will be important to monitor changes to both the value of the MPAs and the CINMS over time.

3.2 Report Organization

In order to accurately characterize the importance and complexity associated with developing a recreational non-consumptive (RNC) monitoring protocol, this following sections of this report is organized into chapters that describe different concepts essential in understanding how, and by what justification we decide to recommend the monitoring protocol that is available at the end of this report. The chapters are organized as follows:

- Chapter 4 (Background) introduces background information that is necessary to understand the context in which the goals and objectives of this project fit. This includes background information on the science of MPAs, a discussion of current legislation information on the site location, a brief history of marine management in the CINMS, and the history of the designation of the northern Channel Islands MPAs.

- Chapter 5 (Economic Techniques for Recreation Valuation) provides an overview of recreational valuation techniques with an emphasis on travel cost models. It also presents a survey of assumptions within the relevant economic literature and describes the conceptual framework that is the basis for our models.
- Chapter 6 (Discussion of Pretest Methods, Results, and Recommendations for Protocol Use) describes our methodological approach to illustrate the advantages and disadvantages of each model. It includes a discussion of survey development, sampling methodology, pretests, user statistics, economic model development and analysis of each methodology. Additionally, it provides an interpretation of the results and an explanation of any changes we made prior to developing the final protocol. Finally, it discusses potential implications and uses of this study.
- Chapter 7 (Future Actions and Recommendations) makes recommendations to the CINMS as a result of our findings and describes potential additions to the study as well as additional RNC monitoring studies that are necessary to create a comprehensive RNC monitoring program.
- Chapter 8 (Conclusion) reiterates the main findings and summarizes the importance of this report.
- Monitoring Protocol – A step by step manual for conducting the surveys and analysis

4. Background

The Channel Islands National Marine Sanctuary (CINMS) is a unique natural environment that draws tens of thousands of visitors every year (NPS, 2004). The following section provides background information on the CINMS, the science of marine protected areas (MPAs) and a discussion of current policy issues surrounding the use of MPAs. Additionally, we present an overview of the ecological features and processes that make this study area so unique.

4.1 Marine Protected Areas - General

A marine protected area (MPA) is an ecosystem-based management tool designed to protect or conserve marine life and its habitat (Ugoretz, 2002). Specifically, MPAs "protect and restore habitats and ecosystems, conserve biological diversity, provide a refuge for sea life, enhance recreational and educational opportunities, provide a reference point against which scientists can measure changes elsewhere in the environment, and help rebuild depleted fisheries" (McArdle et al., 2003).

Within the state of California, there are three classifications of MPAs, each with varying degrees of protection. In order from highest to lowest protection, they are:

- State Marine Reserves (no-take)
- State Marine Conservation Areas (species specific take prohibited)
- State Marine Parks (no commercial take, but recreational take permitted) (McArdle et al., 2003).

Marine reserves are the strictest type of MPA where the taking of all living, geological, or cultural resources is prohibited, and typically generate the most noticeable ecological changes (Ugoretz, 2002).

4.1.1 Science of MPAs

Marine systems are very different than terrestrial systems. The marine environment can be very complex, with nebulous boundaries, large spatial and fine temporal scales, three-dimensional living spaces, unstructured food webs, and nonlinear systems dynamics (Agardy, 2000). This complexity has made studies of marine systems challenging, resulting in less certainty about the processes directing the marine environment than the terrestrial environment.

MPAs are a relatively new approach to marine resources management, and much research is currently being conducted to determine the effects of MPAs. In 2002, the Partnership for Interdisciplinary Studies of Coastal Oceans (PISCO) published a report to summarize the existing research on the science of MPAs. A year later, the Pew Oceans Commission came out with their report on the state of marine policy, which discussed the importance of MPAs as a management tool (Pew Oceans Commission, 2003). Additionally, other scientists have also synthesized the evidence for the effects of MPAs. In this section, we draw mainly from these sources to present an overview of the current available science of MPAs. Research on over 80 MPAs worldwide shows that most well enforced reserves result in increased size and abundance of marine organisms within the reserve (PISCO, 2002:4; Halpern, 2003).

4.1.1.1 Effects of MPAs

There are several mechanisms believed to be the cause of the success of MPAs as a management tool to protect and restore marine life (Palumbi, 2002:ii). First, organisms are allowed to live longer because they are not extracted; that alone provides the opportunity for these organisms to grow larger and more abundant. Older, larger females are often more fecund than younger fish. Therefore, allowing fish to live longer can have an impact on the number of juveniles produced each year. Moreover, the increase in abundance of certain prey species can result in an increase in predator species, even if the predator species were not originally targeted by fishing efforts. The ban on extractive efforts in MPAs can also help the habitat recover from disturbances associated with fishing, which in turn can be beneficial to the species dependent on that habitat (Palumbi, 2002:ii).

However, there are some exceptions to the potentially positive effects of MPAs presented above. Some populations of marine organisms may decline or fail to recover after the implementation of MPAs. This lack of positive effect on some species may be due to several factors:

- If a predator species starts to increase in abundance, its prey species may start declining over time due to a higher predation rate.
- If a species does not experience heavy fishing pressure outside of the reserve, its abundance may not increase within the MPA because there is no direct release from an external pressure. Nonetheless, these species may recover if they are responding to better overall ecological conditions (Palumbi, 2002:23).
- Some populations of marine organisms lack the minimum abundance necessary to initiate the recovery of the species.

In these cases, MPAs may not result in recovery of the species (PISCO, 2002:5).

MPAs are a useful management tool to give the opportunity for marine ecosystems to recover from human disturbance related to extraction of organisms. However, they may not provide protection against other human impacts such as pollution, coastal erosion, global warming, and non-native species introduction (PISCO, 2002:1; Sanchirico et al., 2002). There is a possibility that healthy marine ecosystems are likely to be more resistant to such human disturbances though, which would provide an indirect benefit of MPAs. For example, Stachowicz et al. (1999) provide evidence that a healthy marine ecosystem can be more resistant to invasion by non-native species. Conversely, MPAs are not meant to provide protection from large-scale environmental fluctuations. These fluctuations may decrease the effectiveness of MPAs regardless of the enhanced protection from anthropogenic impacts that MPAs may provide.

4.1.1.2 Spillover and Export

The waters surrounding MPAs can also benefit from the protection afforded within the MPA (Palumbi, 2002:25). Some mobile organisms will migrate outside of the MPAs, possibly due to over-crowding of organisms and competition for food within the MPA (PISCO, 2002:8). This could provide opportunity for enhanced fishing near MPAs, known as "spillover" effect. Moreover, many marine species start their lives as larvae or propagules, which are carried by ocean currents and can travel large distances before reaching adulthood and settling in an area. Offspring produced in MPAs may help to restock populations outside of the MPAs, in a process known as "export" (Palumbi, 2002: 25). At this time, large-scale effects of spillover are not well documented but they are hypothesized to occur widely surrounding MPAs (PISCO, 2002:8). However, the local spillover effect of MPAs has been shown in some cases to enhance fisheries. In the future, much work remains to be done to understand the large-scale effect of MPAs on a regional level (Palumbi, 2002:27).

4.1.1.3 Migratory Species

Pelagic species, such as tuna, North Sea plaice, or Caribbean Nassau grouper, are not easily protected by MPAs since by definition they travel long distances. However, they

do aggregate during certain stages of the lifecycle such as spawning grounds, nursery habitats, and migratory paths. These populations are vulnerable to over-fishing in aggregating areas. Therefore, the location of MPAs around sensitive migratory fish habitat can provide valuable protection for these species (PISCO, 2002:9). Areas that are likely to produce a large number of marine organisms of the same species, such as nursery habitat or spawning grounds, are called "sources". In contrast, areas with high mortality or emigration rates are called "sinks". The design of MPAs with respect to biological consideration usually centers on the need to protect source areas (Dugan and Davis, 1993). Roberts and Hawkins (2000) have shown that some pelagic migratory species can recover from overfishing with protection of the spawning ground or juveniles' nursery areas, which are considered source areas for those species.

The burgeoning science of MPAs has shown that, although the processes and biotic interactions influencing marine organisms are complex, well-designed and well-enforced MPAs can result in relatively rapid recovery of some species of concern (PISCO, 2002:4; Halpern, 2003). Therefore, adequately sized and positioned networks of MPAs may protect or enhance the biodiversity and natural conditions valued by humans in such areas as the CINMS. These enhanced characteristics may result in an increase in recreational activities including scuba diving, snorkeling, kayaking, wildlife viewing, and underwater photography. This supports the theory that MPAs can provide a socioeconomic benefit to coastal communities by increasing the value of RNC use.

4.1.2 Policy of MPAs

MPAs have become a more common marine management tool over the last few years (PISCO, 2002:1). Increasing numbers of user groups, scientists and policy makers are recommending the use of MPAs to protect marine habitats and ecosystems, and restore depleted fish stocks. The following sections describe a few key policies and reports that recommend the use of MPAs.

4.1.2.1 Executive Order 13158

On May 26, 2000, President Clinton signed Executive Order (E.O.) 13158 to strengthen and expand the national system of MPAs in order to protect significant natural and cultural resources within the marine environment. The Order calls for a scientifically based, comprehensive national system that represents diverse ecosystems.

This E.O. also established a Marine Protected Area Center to help carry out the order by developing a website, forming partnerships with governmental and non-governmental organizations, and establishing a framework for a national system of MPAs. On June 4, 2001, it was announced that President Bush's Administration would proceed with the Order.

4.1.2.2 Pew Oceans Commission Report (2003)

In May 2003, the Pew Oceans Commission (POC) released its report on the status of America's oceans, America's Living Oceans: Charting a Course for Sea Change. The

report identifies all known major threats to the marine environment and makes recommendations towards managing the ocean and its resources. The Commission recommends establishing a national system of no-take MPAs to protect marine ecosystems for current and future generations (Pew Oceans Commission, 2003). Specifics on MPAs are highlighted in a separate report (Palumbi, 2002).

4.1.2.3 California Marine Life Protection Act of 1999

The primary goals of the Marine Life Protection Act (MLPA) are to improve the design and the management of California's MPA system in order to increase their coherence and effectiveness (Ugoretz, 2002). The MLPA requires the California Department of Fish and Game (CDFG) to establish a statewide network of no-take marine life reserves where all extractive activities are prohibited (Ugoretz, 2002). The Act cites the historical piecemeal approach to establishing MPAs in California as too fragmented to fulfill its potential to protect and conserve living marine life and habitat. Moreover, the Act states that marine reserves should be established according to "clear, conservation-based goals and guidelines that take full advantage of the multiple benefits that can be derived from the establishment of marine life reserves" (Fish and Game Code Section 2850 [h]).

4.2 Natural History of the Region

This Section provides background information on the geographic and oceanographic setting of the northern Channel Islands, starting with a general overview of the Southern California Bight.

4.2.1 Southern California Bight

The Southern California Bight (SCB) is the portion of the northeast Pacific ocean surrounding North America from Point Conception, north of the Santa Barbara Channel, to Punta Banda in Baja California (Dailey et al., 1993), with the California Current acting as its western boundary. The Southern California Bight has an area of approximately 30,500 square miles, with a length of 1600 miles and a maximum width of 500 miles (Dailey et al., 1993).

The topography of the SCB is characterized by a narrow and terraced coastal continental shelf that shapes into a steep slope and then forms a marginal shelf (Carlucci et al., 1986). A series of submarine canyons are interspersed throughout this continental shelf. Further seaward, the ocean floor is marked by basins and ridges arranged in northwest to southeast rows.

Circulation patterns within the SCB are primarily dominated by the California Current moving southward. The California Current introduces cold water from the subarctic Pacific into the SCB (Reid et al., 1958), where it moves toward shore into the northward flowing Southern California Countercurrent (Hickey, 1993). The water within the SCB is vertically stratified with respect to temperature, salinity and density, and has upwelling events limited to winter and early spring (Jackson, 1986). The nutrient composition of the water varies spatially. The chemistry of the water column is defined along a vertical

gradient. In general, nutrients such as nitrates are maintained at very low concentrations in surface waters (Eganhouse and Venkatesan, 1993). Typically, the nutrient-rich deeper waters provide the primary source of nutrients.

4.2.2 Northern Channel Islands

Situated offshore from Santa Barbara and Ventura Counties, the northern Channel Islands are at the northern end of the SCB and are one of the world's top biodiversity hotspots (McGinnis, 2000; NOAA, 2003). The high level of biodiversity can largely be attributed to the island's regional transition zone where the cool waters from the southern-flowing California Coastal Current diverges slightly offshore and converges with the warmer California Counter Current. The mixing of these two currents forms a biologically diverse transitional marine ecosystem that is suitable for both northern and southern species of fish, invertebrates, mammals, birds and plants (Harms and Winant, 1988).

4.3 Channel Islands National Marine Sanctuary

The Channel Islands National Marine Sanctuary (CINMS) consists of 1,252 square nautical miles of ocean, which surrounds the northern Channel Islands and extends from the mean high tide line to six nautical miles offshore. The CINMS primary purpose is to protect the marine resources around the northern Channel Islands. It also supports several important commercial and recreational fisheries, as well as non-consumptive (RNC) activities such as diving, sailing, and nature viewing (CINMS, 1983). To help the reader understand the differences between the CINMS and the MPAs, the following section describes the history of the creation of the CINMS, its purpose and its jurisdiction

4.3.1 Levels of Protection

The northern Channel Islands have unique ecological characteristics due to their location in a transition zone of oceanographic currents, as mentioned in Section 4.2.2. For this reason, as well as to protect local cultural heritage, the northern Channel Islands of Anacapa, Santa Cruz, Santa Rosa, San Miguel and Santa Barbara were designated as a National Marine Sanctuary in 1980 (CDFG[a], 2003; NOAA, 2003). The primary objective of the CINMS under the National Marine Sanctuary Act of 1972 is to protect the area's natural and cultural resources (15CFR922; 1972). This includes preventing discharge of pollutants into the water, prohibiting alterations to or construction on the seabed, restricting large commercial vessel (i.e. tanker, barge) approach within one nautical mile of the islands, preventing disturbances to marine mammals or birds, and prohibiting the removal of cultural or historical resources (CDFG[a], 2003; CINMS[a], 2003; NOAA, 2003). However, marine sanctuary status does not currently restrict or regulate fishing in the CINMS (15CFR922.71).

4.3.2 Jurisdiction Within the CINMS

The waters around the northern Channel Islands, from the mean high tide line to six nautical miles offshore, are under the jurisdiction of several federal and state agencies.

The National Park Service (NPS) manages all of the northern Channel Islands including surface waters to one nautical mile offshore. The State's jurisdiction extends from the mean high tide line to three nautical miles offshore. The California Department of Fish and Game (CDFG) manages the recreational and commercial fisheries in this area. From three to two hundred miles offshore, the National Marine Fisheries Service (NMFS) regulates federal fisheries. A summary of the main agencies in charge of regulating the waters around the northern Channel Islands is provided in Table 4.1.

In addition to these four primary agencies that have jurisdiction over the water of the CINMS, there are a number of other agencies and groups that share jurisdiction over the northern Channel Islands. These include the Resource Agency of California, the California Coastal Commission, the Minerals Management Service, the US Coast Guard, Santa Barbara County, Ventura County, and the Ventura County Naval Complex (CINMS, 1999).

Table 4.1: State and Federal agencies that have primary jurisdiction over the waters within the Sanctuary (CINMS, 1999)

Agency	Objectives	Jurisdiction
CINMS	Protect Natural and Cultural Resources (Federal)	0-6 nautical miles
CDFG	Conserve and Manages Marine Resources (State)	0-3 nautical miles
NPS	Promote and Regulate Use of the National Parks (Federal)	0-1 nautical miles (surface)
NMFS	Conserve and Manage Marine Resources (Federal)	3-200 nautical miles

4.4 Northern Channel Islands Marine Protected Areas

The establishment of the MPAs in April 2003 is an ecosystem-based management strategy designed to protect a network of quality habitat for the recovery of fish species and marine ecosystems around the Channel Islands (CDFG[b], 2003). The Channel Islands MPA network represents the first significant attempt on the west coast of the United States to implement MPAs as a tool to protect marine life. Prior to the establishment of the northern Channel Islands MPAs, only 0.2% of California State waters were designated as no-take marine reserves (McArdle, 2002).

The new state MPAs in the CINMS are located in the state jurisdictional waters (0-3 nautical miles offshore from the islands). They include two marine conservation areas where some take of a limited number of species is allowed, and ten no-take marine reserves where all take of marine life is prohibited (See Appendix B for a map of the specific areas). The establishment of the northern Channel Islands MPAs fully restricts consumptive activities such as fishing or harvesting except in the two marine conservation areas. On the other hand, all non-consumptive activities such as boating,

anchoring, tide pooling, swimming, kayaking, snorkeling, and recreational diving are permitted within MPAs (CDFG[a], 2003).

4.4.1 History of the MPA Establishment Process

In 1999 the CDFG and the Channel Islands National Marine Sanctuary (CINMS) developed a joint federal and state partnership to consider establishing no-take marine reserves within the CINMS. In order to represent community perspectives on the creation of MPAs, the CINMS Sanctuary Advisory Council (SAC) created a Marine Reserves Working Group (MRWG). The goal of the MRWG was to seek a consensus agreement on recommendations for marine reserves within the CINMS (CINMS[a], 2001). The MRWG consisted of 17 members from commercial fishing, recreational fishing, recreational diving, and non-consumptive interests as well as members from conservation groups and the public-at-large. The SAC also created a Science Advisory Panel, and a Socio-Economic Panel to provide expert guidance to the MRWG. The MRWG worked for nearly two years on recommendations for establishing MPAs around the northern Channel Islands (CINMS[a], 2001). Figure 4.1 represents the advisory and decision making process that led to the creation of the northern Channel Island MPAs.

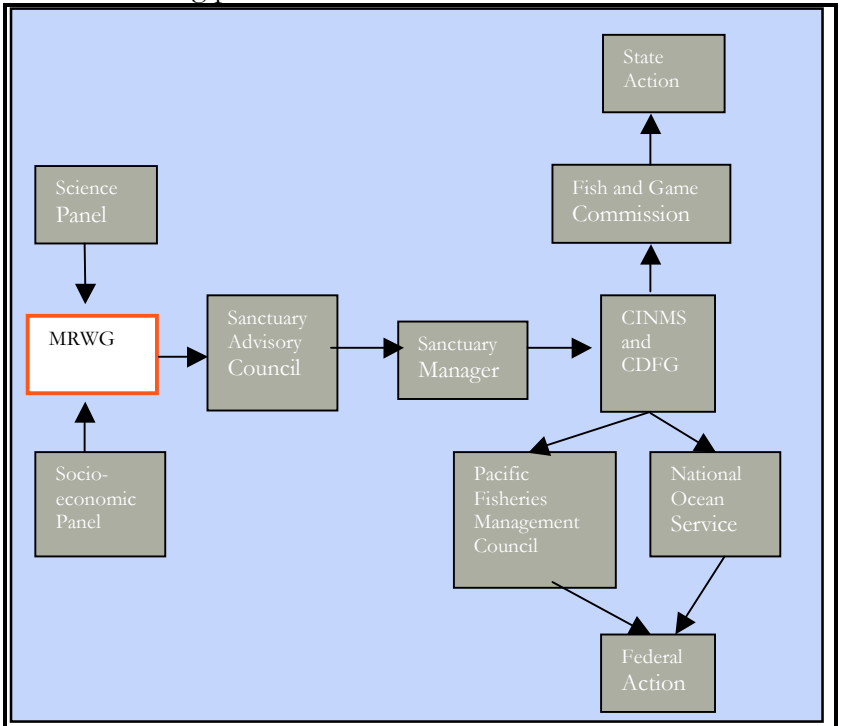


Figure 4.1: Policy making process for the CINMS MPAs

During the process, the CDFG and CINMS sponsored public meetings to gain community input on the process and recommendations. Through these meetings and other forms of communication, the CINMS received over 9,000 public comments. Approximately 94% of the comments were in support of establishing marine reserves within the Sanctuary, but these comments varied in the size or extent of reserves recommended (CINMS[a], 2001).

Both the science and socioeconomic panels made recommendations to the MRWG. The science panel recommended that 30-50% of the CINMS should be included as MPAs to be effective (CINMS [b], 2001). In addition, it was determined (Leeworthy and Wiley,

2002) that there would be net national benefits resulting from the implementation of the northern Channel Islands MPAs. Despite these recommendations, the MRWG was unable to reach a final consensus agreement on the exact size and location of marine reserves. However, it did produce consensus goals, objectives, and recommendations for successful implementation. All consensus and non-agreement materials, public records, and Advisory Panel recommendations were forwarded to the Sanctuary Advisory Council and then onto the agencies, which were then responsible for delivering a final recommendation to the California Fish and Game Commission (CINMS[a], 2001).

In October 2002, the California Fish and Game Commission voted to establish marine reserves in the CINMS, according the agencies' preferred alternative recommendation (See map, Appendix B). On April 9, 2003, the state marine reserves status officially took effect.

4.4.2 Monitoring Recommendations

The MRWG developed monitoring recommendations that were prioritized by the SAC and led to the establishment of the MPAs (CINMS[a], 2001; NOAA, 2003). Following the decision, the CINMS and CDFG hosted a Marine Protected Areas Monitoring Workshop to collect expert recommendations for both ecological and socioeconomic monitoring (NOAA, 2003). In this section, we present a summary of the recommendations of the SAC, the MRWG and the Monitoring Workshop attendees and demonstrate that all three groups identified the potential impact of MPAs on the RNC industry and its users as a significant data gap. We used these recommendations to help us focus our study on RNC users.

4.4.2.1 Marine Reserves Working Group

One of the goals that the MRWG agreed on for measuring the success of MPAs in the CINMS focused on socioeconomic impacts. Specifically, this goal was "to maintain long-term socioeconomic viability of while minimizing short-term socioeconomic losses to all users and dependent parties" (CINMS[a], 2001). In order to ensure that this criterion be met over the long term, monitoring of all economic aspects of the user groups dependent on the MPAs is necessary. The RNC users of the MPAs were identified as one of the important user groups.

4.4.2.2 Sanctuary Advisory Council

In September 2002, the SAC provided a list of priorities for the monitoring of MPAs based on their constituency. The results of this priority ranking exercise were then compiled into tables used to guide agencies and researchers for prioritizing monitoring efforts. In the "recreational non-consumptive use" category, the monitoring of non-consumptive users within MPAs was identified as the 2nd priority, and the knowledge, attitudes and perceptions of management strategies and regulations was identified as the 4th priority (NOAA, 2003).

4.4.2.3 MPAs Monitoring Workshop

In March 2003, the CINMS, CDFG and National Park Service (NPS) hosted a Marine Protected Areas Monitoring Workshop to gather experts and stakeholders together to develop preliminary biological and socioeconomic monitoring recommendations for the northern Channel Islands MPAs. The participants' recommendations were compiled into a report designed to be a guide for government agencies and outside researchers to select relevant projects related to monitoring the socioeconomic effects of the new MPAs (NOAA, 2003). In the recreational panel, it was emphasized that non-consumptive users are key stakeholders in the CINMS and potentially major beneficiaries from the establishment of MPAs. The participants identified a need to monitor charter vessels and their passengers to collect information on the use and economic value of MPAs as well as knowledge, attitudes and perception of the MPAs users.

5. Economic Techniques for Recreational Valuation

Assigning a value to a recreational opportunity on public land (or ocean) can be a challenge because there is no market price attributed to nature. In quantifying the recreational non-consumptive (RNC) value of a site, it is necessary to use a technique that can translate the non-market benefits of recreation into a market price (Hotelling, 1947; Clawson and Knetsch, 1966). Calculating the economic value of a good requires the derivation of an economic concept called a "demand curve".

Demand curves are summaries of consumer preferences that can be used to calculate the consumer surplus, which is used to attribute a value to the good in question. The market value of the site (also known as the consumer surplus) measures the difference between the value gained and the average price paid by each individual in accessing the site. In calculating the consumer surplus of the site, the value attributable to the site is the value gained beyond the average price each individual spent in accessing the site (Ward and Beal, 2000:78). However, there is no direct way to construct a demand curve for recreation on public land because there is no observation of how much of the good is consumed at different prices. Therefore, valuation methods are needed to accurately value a recreational site (Kolstad, 2000:289).

Two general approaches can be used to value a recreational public area: revealed preferences or stated preferences (Mendelsohn and Markstrom, 1988). Revealed preferences are "inferred preferences for environmental goods from observed behavior in actual market transactions" (Kolstad, 2000:313). Stated preferences require finding an individual's willingness to pay for a god by posing a set of questions regarding preferences directly to the individual (Kolstad, 2000:356).

There are also two types of value relevant to the valuation of a recreational site: use and non-use value. The use value is the value attributed to a site by people who use the site

for recreation, or visitors. The non-use value, or existence value, is the value attributed to a site by people who have never visited, and may never visit, the site. They are not visitors, but value the existence of the site nonetheless.

In the following sections, we describe the basic theoretical and conceptual premise for the travel cost method and briefly describe two alternate methods used to value recreational sites.

5.1 Travel Cost Method

The most commonly used instrument to monetize the value of natural environments such as parks, lakes or other recreational site that individuals visit to appreciate, is the Travel Cost Method (TCM) (Mendelsohn and Markstrom, 1988; Forster, 1989; Kolstad, 2000:344). More recently, this method has been applied to value recreation in marine protected areas, such as the Julian Rocks Aquatic Reserve and the Great Barrier Reef in Australia (Davis et al., 1995; Carr and Mendelsohn, 2003). The TCM can quantify either the value of a recreational site or the economic impact to affected businesses, such as service providers to recreational non-consumptive users (Davis et al., 1995; Herath, 1999). Specifically, the TCM presents a revealed preference technique that estimates the market value of a site based on the costs incurred in traveling to a site (Smith, 1996). In capturing the expenditures paid by visitors in accessing the site, the TCM can derive a demand curve to ultimately quantify the market value of the site (Fix and Loomis, 1997).

The simple travel cost method is "designed to value an entire site by estimating the demand for trips to the site" (Mendelsohn and Markstrom, 1988). The TCM operates under the premise that the costs of travel incurred by a visitor to a recreational site can be used to estimate the value attributed to the site by the visitor. This method uses revealed preferences, such as the cost to travel, to estimate a demand curve (Kolstad, 2000:289). As mentioned above, revealed preferences are "inferred preferences for environmental goods from observed behavior in actual market transactions" (Kolstad, 2000:313). The theory behind the travel cost method is that people tend to visit a site less often if they live further away and incur higher travel costs when visiting the site (Mendelsohn and Markstrom, 1988). Additionally, in using the TCM we can account for other factors that may influence an individual's decision to visit a particular site such as income, travel to multiple destinations, or the availability of an alternative site with similar recreational opportunities. We use the information collected to derive a demand curve, from which we can calculate the consumer surplus.

Individuals demonstrate different preferences and thus value alternative sites differently (Harberger, 1971). Generally, the number of visits to a recreational site is a function of both the implicit price of that trip and the implicit price of substitute trips, as shown in Equation 5.1.

$$\text{Visitation Rate}_i = f(\text{Total Travel Cost}_i, \text{Substitutes}_i) \qquad \text{(Equation 5.1)}$$

Substitutes are hypothesized to have a positive effect on visitation rates while total travel cost should have a negative effect (Parsons, 2003). As the distance from a given zone to a substitute site increases, the cost associated with that trip to the substitute site increases and in turn an individual is more likely to visit the primary site being studied. However, it should be mentioned that a host of studies including Liston-Heyes and Heyes (1999) and Bell and Leeworthy (1990) omitted substitutes. Financial and time constraints often restrict studies from including substitution measures, as well as the difficulty in identifying appropriate substitutes.

There is a lack of consensus within the travel cost literature on the most appropriate method of analysis. Two main methods are commonly used in travel cost models: the individual travel cost model (ITCM) and the zonal travel cost model (ZTCM). The ZTCM uses geographic zones as the basic units of observation while the ITCM uses individual observations (Kolstad, 2000:348; Ward and Beal, 2000:43).

5.1.1 Zonal Travel Cost Models (ZTCM)

The ZTCM values demand for a recreational site as a function of zone-based income and demographic variables. For a ZTCM, we collect individual information on travel cost, on-site cost and opportunity cost. However, we assume that the preferences of the surveyed individual or the collection of surveyed individuals from a given zone directly mirrors the mean preferences of the population of their zone of origin. In other words, the ZTCM data reveals that the average person in a population and the surveyed respondent will demonstrate the same response to an increase in recreational prices or a change in recreational quality (Clawson and Knetsch, 1966). In a ZTCM, the predicted number of visits to the site of study is based upon total travel costs, zonal preferences, and substitute sites. The number of visits generally serves as the measure of visitation rate.

In order to derive demand for an entire zone, we aggregate observations from individual consumers into zones and then calculate a single average travel cost and visitation rate for each of these zones ((Kolstad, 2000:348; Ward and Beal, 2000:35). Based upon the observed visitation rates and observed travel costs in each zone we derive a predicted visitation rate that we later use to estimate the demand for recreation, as shown in Equation 5.2.

$$Visitation\ \ Rate = f(TTC_i, Income_i, Demographics_i, Substitutes_i)$$

(Equation 5.2)

5.1.1.1 Total Travel Cost

We construct total travel cost (Equation 5.3) as a function of four primary factors: onsite cost, roundtrip travel cost, opportunity cost of travel time, and opportunity cost of onsite time. These factors are described in detail below. It should be noted that the opportunity costs of travel time and on-site time depend upon census average county-level incomes.

Total Travel Cost = OTC + RTC + OCT + OCO (Equation 5.3)

Where:

OTC is the onsite travel cost
RTC is the roundtrip travel cost
OCT is the opportunity cost of travel time
OCO is the opportunity cost of onsite time

Onsite Travel Costs

Based upon the price paid in equipment and site entry fee, individuals reveal a value for recreating in the site. It should be noted that the majority of recreational travel cost models omit expenditure on food and lodging as onsite costs, finding that both food and lodging present a separate choice that is distinct from an individual's choice to travel to the recreational site.

Roundtrip Travel Costs

The costs that individuals incur in traveling to the site of study partially reflect the value they attribute to that site. To calculate this we assign a price to the distance traveled to reach the site, as seen in Equation 5.4.

Roundtrip Travel Costs = distance traveled * (standard fuel efficiency, gasoline price and miles per hour) (Equation 5.4)

In the above equation, the distance traveled presents the only variable in the roundtrip travel cost calculation. The other factors are fixed values.

Opportunity Cost of Travel Time

The opportunity cost of travel time accounts for the benefit that could have been gained from an alternative activity during the time spent traveling to the recreation site (Knetsch, 1963). For example, a person could have engaged in wage-earning activities or in recreational activities. While the intuition behind opportunity cost can be obvious, the measurement of opportunity cost is quite difficult (Ward and Beal, 2000:36). Because of the difficulty in accounting for opportunity costs, no systematic approach has been developed (McConnell 1992). Specifically, two main concerns surround the quantification of opportunity cost: time pricing and utility gained from travel itself. The following two sections provide details on each of these concerns.

Time Pricing: In a hypothetical world characterized only by a continuous trade-off between work and recreational benefit, the opportunity cost of time would equal the monetary benefit of work. However, in reality an individual's work schedule allows for paid vacation, weekends and holidays. Individuals thus often choose to recreate during a time when they do not have the opportunity to work. Additionally, an individual's allocation of time is not simply divided between work and recreation. As a result, we cannot directly substitute the time spent in travel for the time that is spent earning a wage.

Bockstael et al. (1987) argue that to determine the opportunity cost of time, one must determine the individual's decision to work and the subsequent effect this decision has on the tradeoff between the individual's budget and time constraints. If an individual chooses to recreate and forego wage-earning activities, then the budget constraint equals the time constraint. However, if an individual would not have earned wage earning activities, then two separate constraints, time and money, guide the individual's recreation decision.

In this circumstance, there is no set relationship between the marginal value of time and the wage rate. Since there is no consistent relationship between price and the marginal value of time, the demand for trips functions according to money prices and time costs. The conventional proportion of wage attributed to the opportunity cost of time is 1/3 x individual annual income (Englin and Shonkwiler, 1995). Equation 5.5 shows the calculation of the opportunity cost of travel time:

Opportunity Cost of Travel Time = (1/3*Wage Rate) * Distance Traveled * (1/MPH) (Equation 5.5)

Utility of Travel:
Individuals will likely incur additional costs or benefits of travel aside from the opportunity cost of travel time and the direct transportation costs (Walsh, Sanders et al. 1990). For example driving through a scenic area will likely serve as an additional benefit while long traffic delays will serve as an added cost. The utility of travel can be considered subjective depending of the visitor's preference, and is difficult to quantify without an in-depth questionnaire. Studies generally do not assume additional net costs or benefits of travel aside from the direct transportation costs and the opportunity costs of travel time.

<u>Opportunity Cost of Onsite Time</u>
Opportunity Cost of Onsite time accounts for cost associated with time spent in the recreational site. Currently, there is no systematic approach to incorporate the opportunity cost of onsite time (Ward and Bearl 2000: 39). However, it is often assumed that individuals gain a benefit from recreation that at least approximates the opportunity cost of onsite time. Therefore, many studies assume an opportunity cost of onsite time of zero.

5.1.1.2 Definition of Zones

When the ZTCM was originally developed, zones were defined by drawing concentric circles around the site (Clawson and Knetsch, 1966). However, more recent studies use administrative units, such as county or zip code, to define the zones to simplify collection of population and demographic data (Ward and Beal, 2000:44). Each zone is represented by data collected from an individual visitor or representative group of visitors from that region. Taking the average of the demographic characteristics across a zone can result in loss of information. Using the smallest zones possible reduces this error, keeping in mind the feasibility of demographic data gathering.

5.1.1.3 Income and Demographic Variables

A major constraint of the ZTCM is found in the model's inability to incorporate the significance of individual preferences in determining recreational decisions. Specifically, the ZTCM assumes that each individual traveling to the site of study is representative of the zone of origin. Rather than using individual demographic data as revealed by the visitor, the ZTCM averages across the zonal population to determine a single demographic variable for the entire zone. In using zonal data, we reduce the demographic variation necessary to reveal the influence of individual preferences.

5.1.1.4 Summary of the ZTCM

The ZTCM requires less data collection and more easily accounts for variations in the frequency of visitation under the premise that zones farther away from the destination will produce fewer visitors than zones closer to the destination. The ZTCM has several shortcomings however. One problem with the ZTCM arises when dealing with zones with zero visitation rates. Zero visitation rates may occur as a result of the sample size or zone definition (Ward and Beal, 2000:43). Additionally, the ZTCM assumes that the demographic characteristics and preferences of the entire zone's population can be represented by the average estimates for the zone (Kolstad, 2000:349). Therefore, in averaging individual preferences to construct zonal values we often compromise the strength and accuracy of other determinants of demand. Specifically, in disregarding individual preference we would likely find that the socioeconomic variables are insignificant. As a result, the model might suffer from a loss of information efficiency (Ward and Beal, 2000:35).

On the following pages, Figure 5.1 presents a simplistic example of a Zonal Travel Cost analysis that estimates a surplus associated with a hypothetical recreational site. This recreational site, Site 2, is located within a larger region of recreational value, Site 1.

Simplified Zonal Travel Cost Analysis

1. Collect information on destination of origin of visitors in a survey.

2. Group the visitors' responses into county zones based on their destination of origin. In this example, we observe 0 visitors from county A, 1000 visitors from County B, and so on (1st column in Table 1).

County	Total Travel Cost	Visitors Site 1 Including Site 2	Visitors Site 1 Excluding Site 2
A	300	0	0
B	200	1000	700
C	100	2000	1400
D	0	3000	2200

Table 1: An example of TCM

3. Calculate the *total travel cost* (2nd column in Table 1) incurred in traveling to the site by doing the following:

- Determine *transportation cost* by multiplying the distance from the county of origin to Site 1 by a standard cost per mile driven.
- Determine *opportunity cost of time* by multiplying the time taken to travel to Site 1 by a portion of the zonal income.
- Sum transportation cost and the opportunity cost of time to determine *total travel cost*.

4. Based upon the observed number of visitors and the observed total travel cost, predict the best relationship between total travel cost and number of visitors using a regression. Simply, this relationship is: Number of Visitors = Coefficient*Total Travel Cost + intercept (Equation 1). Predict a regression line for visitors who came to Site 1 specifically to visit Site B, and another regression line for those who did not.

5. To determine the *demand curve* for Site 1, calculate the predicted visitation rate for a variety total travel costs input in Equation 1 for both regressions. The demand curves are represented in Figure 1, where each point of the demand curve corresponds to a predicted number of visitors for an input total travel cost.

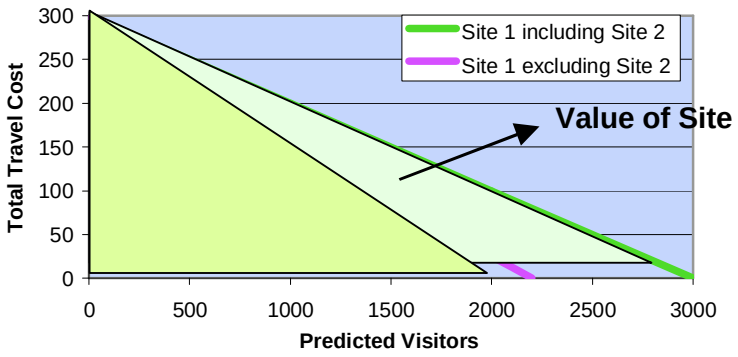


Figure 1: Demand curves and consumer surplus for both types of visitors

6. To determine the *consumer surplus*, measure the area under each demand curve. The area under the pink line, shaded in yellow, represents the surplus attributable to Site 1 if Site 2 did not exist. The area under the blue line labeled "Site 1 Including Site 2" represents the value attributable to Site 2 situated within Site 1.

7. To tease out the value attributable to Site 2 alone, calculate the difference between the two areas. In this example, the green shaded area represents the value of Site 2

Figure 5.1: A Hypothetical Example of a ZTCM

5.1.2 Individual Travel Cost Models (ITCM)

In response to the limitations of the zonal travel cost model (ZTCM), experts introduced an individual travel cost model (ITCM) that evaluates individual visitors and their revealed preferences (Brown and Nawas, 1973; Gum and Martin, 1975). The individual models differ largely from zonal models in that they incorporate individual socioeconomic variables and travel cost as well as travel time. To determine the costs incurred in traveling to the site, the ITCM relies on individual responses that reveal the distance traveled, on-site costs and opportunity (time) costs paid by each individual (Forster, 1989). Additionally, in using the ITCM we account for other factors that may influence an individual's decision to visit a particular site such as income, travel to multiple destinations, perceived quality or the availability of an alternative site with similar recreational opportunities.

The ITCM more or less mirrors the ZTCM in the calculation of onsite costs, total transportation costs and the opportunity cost of time. It differs from the ZTCM in its treatment of demographic variables and other individual preferences.

5.1.2.1 Income and Demographic Variables

Ideally, a TCM would effectively incorporate individual demographic and income characteristics. A benefit of the ITCM is that it captures individual factors aside from travel cost that influence the decision to recreate in the study site. Earlier studies have consistently identified tastes and preferences as significant factors influencing demand (Smith, 1996:98). To account for such factors, ITCM studies often include personal demographic characteristics as a measure of preferences (Ward and Beal, 2000:71).

With the inclusion of demographic and income variables a model better describes the factors contributing to the decision to visit a recreational site. An individual model that includes individual demographic factors can highlight variables aside from cost that significantly determine visitation rate.

5.1.2.2 Multi-destination Trips

A multi-destination trip describes a trip in which the individual visits multiple sites during a single trip. For example, individuals traveling from northern California to Mexico might visit the CINMS as well as multiple other destinations on the trip southward. In the instance of multi-destination trips, we cannot allocate the entire travel cost to a single destination (Kerkvliet and Nowell, 1999); doing so could overestimate the value of the recreational site being considered.

The task of allocating transportation costs to multi-destination trips is problematic and remains debated in the literature (Ward and Beal, 2000:39). Specifically, many multi-destination techniques seem to oppose the fundamental intuition behind the TCM. Earlier studies in accounting for multi-destination trips report that individuals traveling longer distances face lower transportation cost (Ward and Beal, 2000:41). The TCM assumes that price and demand are inversely related. In other words, as the price of a trip

increases, the demand for visits to the site of study will decrease. It follows that as the distance traveled increases, and in turn the costs to reach the site increase, the visitation rate should decrease. However, with multi-destination trips the cost of a trip is split between multiple destinations and as a result, individuals traveling greater distances incur a lower travel cost (than individuals traveling shorter distances).

A simplistic method to address the multi-destination trip suggests that all individuals engaging in a multi-destination or multi-purpose trip be dropped from the sample (Smith and Kopp, 1980). However in omitting all multi-purpose individuals, the value of the site will be most likely underestimated. On the other hand, ignoring the distinction of multi-purpose and multi-destination trips in the sample will probably overestimate the consumer surplus. Recently Loomis et al. (2000) evaluate the significance and the extent to which the exclusion and inclusion of multi-destination visitors affect travel cost models and consumer surplus. The authors test whether this multi-destination bias was statistically significant.

Loomis et al. (2000) base their analysis largely on an earlier model that incorporates multi-destination trips into the demand equation (Parsons and Wilson, 1997). Specifically Parsons and Wilson (1997) consider joint-consumption trips as a bundle of visits to nearby or related sites. They next assign a dummy variable indicator to multi-purpose trips that to effectively adjust the total trip cost to reflect multi-destination visitors.

In applying the Parsons and Wilson multi-destination model, we can derive separate consumer surplus values for single purpose and multiple purpose/destination users. Loomis et al. (2000) find that while the exclusion of multi-destination users is not statistically significant, it nonetheless underestimates the consumer surplus.

5.1.2.3 Summary of ITCM

In sum, an ITCM values a recreational site more accurately and precisely than a ZTCM, although it is both time and financially costly. In incorporating quality, socioeconomic data, and travel time an ITCM explicitly measures all factors that contribute to an individual's decision to recreate in a given site. However, it is significantly more time-consuming and expensive to collect data for an ITCM. The individual visitor must respond to a lengthy survey including questions on his/her preferences, demographic status, expectations, etc. This can result in survey fatigue, which can translate into sub-optimal quality of responses.

For an individual travel cost model to be effectively implemented, visitors need to display a highly variable number of trips in a given period (Ward and Beal 2000: 34). Visitors regardless of their origin of destination will often only visit a site once. Thus the dependent variable, i.e. number of visits per period, will take on a value of one regardless of the independent variables. The ITCM works best when the number of visits by individuals is highly variable because it relies on individual visitation rates. If the visitation rate does not vary, then it becomes impossible to measure how a change in

travel cost affects the visitation rate (Ward and Beal, 2000:74) and a zonal model will be more appropriate (Ward and Beal, 2000:43).

Table 5.1: Summary of the advantages and disadvantages of ITCM and ZTCM

	ADVANTAGES	DISADVANTAGES
INDIVIDUAL TRAVEL COST MODEL	❖ Individual preference is taken in account	❖ Data gathering requires high effort and survey fatigue
	❖ Other explanatory variables, such as demographics, are included	❖ A "zero population" is hard to include in the model
ZONAL TRAVEL COST MODEL	❖ Data gathering requires low effort and cost	❖ Individual preference is not taken in account
	❖ Data on "zero population" is readily available	❖ Each visitor is assumed to be representative of their zone of origin

5.2 Alternate Recreational Valuation Techniques

In addition to the travel cost method, there are other methods of estimating the value of a recreational site. Two of these methods are briefly introduced as alternate methods of calculating the value of use and non-use of a recreational site.

5.2.1 Hedonic Travel Cost

The hedonic travel cost method "estimates the value of site characteristics by examining how users choose which site to visit" (Mendelsohn and Markstrom, 1988). The underlying theory is that observable characteristics of the site are the reason people choose to visit. Observable characteristics include factors such as cleanliness, crowding, scenery, wildlife viewing, and others. Visitors reveal their preferences through their choice of site for recreation; therefore, for the hedonic travel cost method to work the respondents must have a choice of recreational sites to visit. This method generally measures the value of site characteristics, not the value of a site as a whole (Kolstad, 2000:313).

5.2.2 Contingent Valuation

The Contingent Valuation Method (CVM) is used to calculate non-use values. The primary premise of this method is that an individual's willingness to pay for the existence of a recreational site can be used to estimate the non-use value of the site. The CVM attempts to quantify the value of a recreational site attributed by non-users using a state preference method. According to Kolstad (2000:356), stated preference methods of valuations involve finding an individual's willingness to pay for a good by posing a set of questions regarding preferences directly to the individual. The willingness to pay is therefore calculated from an individual's answer to a survey. Because a non-use value is

the value attributed to a site by all the people who do not visit the site, it usually involves extensive survey effort.

6. Pretest Methods, Results, and Recommendations for Protocol Use

In this section, we describe the methodology used in our pretest, discuss our results, and explain further recommendations for the monitoring protocol.

6.1 Monitoring Workshop

In March 2003, the California Department of Fish and Game (CDFG) and the Channel Islands National Marine Sanctuary (CINMS) organized a two-and-a-half day Marine Protected Area (MPA) Monitoring Workshop. Our first objective for this project was to assist these agencies in organizing the socioeconomic monitoring workshop. The goal of the workshop was for MPA experts and stakeholders of the northern Channel Islands MPAs to work together to detail monitoring recommendations and identify monitoring priorities. The recommendations would enable the agencies to construct a robust and useful biological and socioeconomic monitoring program for the MPAs.

This menu of recommendations was designed to provide the agencies with a set of monitoring tools to choose from, as well as estimates of the funding necessary for each option and ideas on how to raise those funds. The recommendations can also guide independent researchers in choosing a research topic that would have immediate and applied management relevance. The workshop was held at the Donald Bren School of Environmental Science and Management at University of California, Santa Barbara (UCSB). All results summarized here can be found in entirety in the "Socioeconomic Research and Monitoring Recommendations for MPAs in the CINMS" report released in July (NOAA, 2003).

6.1.1 Organizing the Workshop

As a part of this project, we assisted the staff of the CDFG and the CINMS in planning the socioeconomic part of the Monitoring Workshop. We helped in contacting the participants, creating an invitational packet, coordinating the catering, as well as reserving and arranging the rooms. In this section, we present the organization of the Monitoring Workshop.

6.1.1.1 Working Groups

Three main areas of interests based on different user groups of MPAs were identified. Each user group was asked to discuss several topics, as shown below:

1. Commercial Fishing
   - Use, Catch and Value
   - Edge Effect
   - Displacement

- Knowledge, Perceptions and Attitudes
- Socioeconomic Profiles

2. Recreation: Consumptive and Non-Consumptive
   - Use and Catch – Consumptive Users
   - Edge Effects
   - Knowledge, Perceptions and Attitudes: Consumptive and Non-Consumptive
   - Uses and Economic Value of MPAs – Non-Consumptive Recreation Users
   - Option/Nonuse Values of Consumptive Users of MPAs
3. Education, Research and Outreach
   - Education Values
   - Scientific Values
   - Public Outreach

An additional working group discussed the potential collaboration between the Socioeconomic and Biological Monitoring Plans. Moreover, some participants felt during the workshop that an area of interest was missing from this original design. They took the initiative to develop a new group for Nonuse or Passive Economic Use Values of MPAs, and created a set of recommendations for this new topic. They addressed the issue of value of MPAs to nonusers (i.e. people who may value the existence of MPAs but may never visit them).

6.1.1.2 Workshop Sessions

During the Workshop, each of the Group Project members worked with a facilitator in different breakout sessions by keeping track of the discussions and recording the results of the discussions in electronic format. Each breakout group was given a list of questions to answer on the several different topics listed above, and the answers were assembled in the "Socioeconomic Research and Monitoring Recommendations for MPAs in the CINMS" report released in July 2003 (NOAA, 2003).

6.1.2 Participants: Experts and Stakeholders

A total of forty-six stakeholders and experts in the social sciences from around the United States were brought together for the workshop. The CINMS staff and the NOAA planning team assembled a list of potential participants from universities, governmental agencies, as well as the commercial and recreational industry. Each invitee was given the opportunity to refer other experts or stakeholders, to ensure that all disciplines and interests were represented in the list of invitees. The public was also invited to attend as observers only. Near the end of the organizing phase, the planning team and the CINMS staff aimed for adequate representation of interests and expertise in each of the breakout groups. A list of participants is available in the final report of the Workshop mentioned above (NOAA 2003).

6.1.3 General Results of the Workshop

The main recommendations from the participants and the workshop planning team were as follows:

Participants Priority Recommendations:

1. Hire a Social Science Coordinator
2. Create an Oversight Committee and a Peer Review Committee
3. The Sanctuary Advisory Council should review the current set of recommendations and establish priorities among them
4. CINMS and CDFG should aggressively seek funding support for monitoring

Workshop Planning Team Recommendations:

1. The SAC should meet and establish socioeconomic measurement thresholds – Social scientists are not able to give guidelines for when impacts become significant to particular individuals or user groups
2. Evaluation of socioeconomic impacts must include information on factors other than the Marine Protected Areas

6.1.4 Recreational Non-Consumptive (RNC) Results from the Workshop

The RNC user breakout session participants provided advice on the monitoring of four major topics. In all cases they recommended new data collection, and emphasized that students and/or volunteers could perform much of the work in order to minimize the cost to the governmental agencies responsible for the monitoring. The four topics were:

1. Measurement of benefits to RNC users from the implementation of MPAs, focusing on the economic impact to for-hire operations such as charter vessels businesses.
2. Measurement of benefits to RNC users from the implementation of MPAs, focusing on the recreational users themselves.
3. Measurement of value of MPAs with respect to RNC users
4. Knowledge, perceptions and attitudes of the RNC users towards the MPAs

It was emphasized that non-consumptive users are key stakeholders in the CINMS and potentially major beneficiaries from the establishment of MPAs. It would be costly to monitor non-use value since it could require a nation-wide survey effort. In addition, monitoring private boat users is challenging since there is no easy manner to survey individual private boats. However, the exclusion of non-use values and recreational private boat use may significantly underestimate the benefits of MPAs when monitoring the RNC users.

The specific recommendations from the RNC user breakout session participants were ranked from HIGH to LOW, with HIGH being the highest and costliest survey effort, and LOW being the minimum effort required for a useful monitoring program. Some of these recommendations were combined with the recommendations for monitoring of recreational consumptive users in order to save valuable survey effort. Below are the LOW effort recommendations.

- Use and Catch (combined with consumptive)

Monitor commercial passenger fishing vessels (CPFV) covered by CDFG logbooks. Conduct surveys of all CPFV business operations with separate surveys of passengers to get spending and socioeconomic profile information.

- Edge Effects (combined with consumptive)

Combine with Catch and Use, limit focus to CPFV.

- Knowledge, Perceptions and Attitudes

Focus on CPFV and could be combined with Use and Catch. New survey questions layers could be added to both the surveys of CPFV business operations and to surveys of passengers to gather information on knowledge, perceptions and attitudes.

- Use and Economic Value of Reserves

Monitor charter/party/guide services and their customers. Could replicate Dr. Kolstad's study to get use spatially inside and outside MPAs. Design new survey for passengers of commercial operations to get estimates of their willingness to pay for MPAs vs. areas outside the reserves. Obtain cost and earnings of operations and add spending profiles to the passenger

6.2 Operator Questionnaire

We developed a questionnaire to gather data from the charter boat operators on the seasonality of their operations including the number of customers and types of activities offered. The operator questionnaire was based on a cost and earnings study performed for the Channel Islands National Marine Sanctuary in 1999 (Leeworthy and Wiley, 2002)

6.2.1 List of Operators

The database containing the list of operators was designed from an existing database developed by Dr. Charlie Kolstad for CINMS survey work in 1999. We updated the list

of charter operators that visit the CINMS by searching phone books for Ventura and Santa Barbara Counties, Yahoo online yellow pages, and searching the Internet for any operators in Southern California that visit the CINMS. We updated the address and phone number for each of the operators by viewing their web sites and/or calling each company. (See Monitoring Protocol CD, Operator Information, *Operator_List.xls* for these files.)

6.2.2 Operator Questionnaire Design

We modeled this questionnaire after a study by Dr. Kolstad of the University of California Santa Barbara. The original survey was shortened for our purposes to include only the seasonal and spatial components. The operator questionnaire includes maps of the CINMS to collect information on where the company operated for each RNC activity prior to and after the establishment of the MPAs. The survey had recently received an Office of Management and Budget (OMB) expiration extension for continued use (OMB Approval #: 0648-0408, Expiration: 08/31/2006).

The Office of Research – Human Subjects Committee at UCSB required all surveyors to complete an online training module prior to conducting any interviews. Therefore, all group members completed the University requirements.

6.2.3 Operator Sampling Methods

All charter operators that conduct trips within the CINMS were invited to a meeting to complete the questionnaire and receive information about this project. The meeting was designed to gather information from many operators in one setting, therefore eliminating costly individual interviews. All operators were mailed a packet containing a letter describing the purpose of the study, an explanation of how the information would be used, a list of items to bring to the meeting in order complete the questionnaire, a sample copy of the questionnaire, and a RSVP form with a stamped return envelope. (See Monitoring Protocol CD, Operator Information, 2003 Pretest for these files.) Operators were also offered an incentive (Sampson Braid 1-inch line for boats) for attending the meeting and completing the questionnaire.

6.2.4 Operator Databases

The original operator data entry database was created as a table in Microsoft Access.
We later developed a second database in Microsoft Excel that would ease data entry procedures and allow us to run simple analysis within the same spreadsheet. This database separated monthly visitation by each activity and recorded only trips per month and passengers per trip. This Excel spreadsheet is important to help understand the seasonal variation in number of passengers, and how that visitation may vary for each activity. Additionally, we used the operator data to understand what percentage of annual visitors were surveyed during our sampling period, and what scaling factor should be used to calculate a value for annual visitation.

We communicated to the operators that all of the information that they provided to us would not be associated with their name, the name of their business, their address, the names of their boats, or other similar identifying information. Therefore, each operator was given a company identification number (i.e. CID1, CID2, etc.) to aid in analyzing the data without specifically identifying the actual companies. For each company, this company identification number remained constant in the first column while adjacent columns described the monthly number of trips run, the number of trips that could have been run if operating at full capacity, the average number of days per trip, the average number of passengers per trip, and the maximum number of passengers possible per trip for each activity that the company offers. This format allowed us to query numerous relationships and analyze the data more effectively.

6.2.5 Operator Questionnaire Sampling Results

Two meetings for charter vessel operators were organized in Santa Barbara and Ventura. In follow-up phone calls prior to the meetings, we found that many operators had not read or understood the mailing we had previously sent that explained the study and invited them to the meeting. There were some concerns with attending a meeting to provide what can be considered sensitive and confidential information. Some operators were interested or willing to attend, but were unavailable on either of the meeting dates, so we followed up with some individual interviews. Unfortunately, the attendance rate at these meetings was low.

Five of the approximately twenty RNC operators servicing the CINMS completed the questionnaire. However, we believe these five companies represent a significant portion of the market. From phone conversations with the other operators, it appears that most only visit the CINMS a few times annually. However, since we are unsure what percent of real annual visitation the visitation reported in our operator survey actually represents, we treat the results of the operator data as a low bound for annual visitation. This means that when we use the operator data to scale for annual visitation, all final economic surplus estimates are a low bound estimate of the actual value of the CINMS and the MPAs.

In the operator surveys, we find that some companies run mixed trips of consumptive and non-consumptive users, but do not know what percent of each is represented on each trip. Therefore, it is difficult to discern in the results the exact total of RNC visitors annually. Since we surveyed all passengers, but do not include consumptive users in our travel cost analysis, we are able to determine that approximately 30% of our respondents are primarily interested in consumptive activities. Therefore, when calculating annual visitors, we scale down the annual visitors on the dive boats by 30%.

We also find that some trips were multi-purpose and include divers, kayakers, and wildlife viewers. When operators responded to the questionnaire for number of visitors per trip, they were not able to separate how many visitors per trip were participating in each activity. Also, some operators completed only one map for all activities; this makes

it difficult to run our spatial analysis for each activity since they are not specifically differentiated. Different sampling methods may help alleviate some of these errors and will be discussed in the recommendations section.

6.2.6 Scaling to Annual Visitation

The operator questionnaire data are used to scale up observed visitation from the sample to annual visitation. To use the operator data to scale visitation, we need to first determine the total number of passengers per month per activity. We use responses to the operator questionnaire to calculate the total number of annual visitors.

We adjust the operator responses to ensure that their reported number of visitors matched the criteria we used in our sample. One operator in our study reported the total number of visitors for a mixed purpose vessel that runs both consumptive and non-consumptive activities simultaneously. Since this study is concerned with only non-consumptive passengers, we calculate a total number of passengers that does not include consumptive passengers. Based on the number of respondents to our survey from that vessel, we are able to determine that approximately 30% of their passengers are primarily interested in consumptive activities. Therefore, for that vessel only, we scale down the number of visitors per trip by 30% to account for the consumptive users on their vessel. Also, based on responses to our pretest survey, we are able to determine that approximately 20% of the visitors sampled during our study are not from California. For this study, we restrict our sample to California visitors only, so we scale down all vessels' total reported passengers by 20%.

Once we adjust the operator responses, we multiply the stated number of trips/month by the stated number of passengers/trip. Then we calculate the total number of passengers per month by adding passengers per month for each activity. Once we calculate the total number of passengers per month for all activities, we need to determine what percent of annual visitors we surveyed. We determined this by first calculating what percent of visitors were surveyed during the sample period, and what percent of annual visitors the sample period represents.

We determine that we sampled only 0.29% of annual visitors to the CINMS. Therefore, we calculate a scaling factor of 339.86. The scaling factor is applied to the absolute consumer surplus that we calculate in the travel cost analysis. Scaling up the surplus is necessary to give an annual value for recreation in the CINMS and MPAs.

Sampling only 0.29% of annual visitors does not likely lead to a representative sample of visitors; visitors that come during different times of the year may have different preferences and/or travel from different locations. We acknowledge that our study sample is not representative and reiterate that our study was intended only as a pretest. We sampled only enough visitors to develop and test our analytical model. We are confident that the model is accurate, but we cannot be confident that the resulting economic value is representative of the real value for the CINMS and MPAs since our

sample size is so small. The operators who participated in the study do not constitute a census of all charter vessel operators accommodating RNC use in the CINMS; this results in the calculation of a partial value for RNC use. Therefore, the scaling factor produces an underestimate of the consumer surplus. Future studies will want to obtain a larger percent of annual visitors to derive a more representative value. If a larger sample is obtained, the scaling factor will be proportionately smaller.

6.2.7 Recommendations for Future Use of the Operator Questionnaire

The operator portion of this study is important for scaling up passenger data to calculate annual visitation to the CINMS. The operator data is also useful to understand the predominance of particular recreational activities and develop an understanding of where these activities are happening spatially within the sanctuary. The following recommendations address these uses of the operator questionnaire.

6.2.7.1 Recommended New Sampling Methods

In order to assure the highest quality and quantity of responses, we recommend conducting one-on-one interviews of each charter vessel operator. We have found that the operator questionnaire data is sensitive due to intense competition between charter vessel businesses; taking into account these privacy concerns, personal interviews may help to further assure the operator that the information will not be shared. One-on-one interviews will also ensure the operator understands the questions clearly, especially when important details are involved.

One-on-one interviews could potentially be conducted over the phone if the operator has received the materials in advance. One concern with sending advance materials however is that the operator may choose to fill them out independently, and not allow you to guide them through the questionnaire over the phone. This will not resolve the quality issues we experienced. We strongly recommend in-person interviews whenever possible.

6.2.7.2 Spatial Information

In study, we develop GIS maps and a database to create a visual representation of where operators were taking passengers for each type of recreational non-consumptive (RNC) activity. Due to time and technical constraints, we are not able to develop this portion of the study fully. However, the value of a spatial understanding of recreation in the CINMS could be useful for future monitoring efforts. Using the maps and the GIS we develop, location and intensity of RNC activities could be mapped at the 1x1 minute scale (See the Monitoring Protocol CD, Operator Information, GIS folder). Additionally, the CINMS has an aerial monitoring database that could be combined with spatial information collected from operators.

6.3 Charter Vessel Passenger Survey

A survey targeting passengers of charter vessels was created in order to gather the data necessary to run the travel cost model (TCM). The passenger survey was based on a

Florida Keys National Marine Sanctuary socio-economic monitoring effort conducted in the mid-1990s (Leeworthy and Wiley [a], 1997; Leeworthy and Wiley [b], 1997).

6.3.1 Survey Design

In an attempt to discover the most accurate, as well as time and cost effective method for determining the RNC value of the MPAs in the CINMS, we originally created a multi-purpose survey that would allow us to test different analysis methods and compare the tradeoffs in results for future recommendations. This survey includes portions of the surveys conducted in the Florida Keys National Marine Sanctuary to assess recreational user economic value (Leeworthy and Wiley [a], 1997; Leeworthy and Wiley [b], 1997; FKNMS, 2003). In this survey, passengers are asked to give travel information associated with their trip to the northern Channel Islands, as well as general demographic parameters and preferences that allowed us to create user statistics. Questions include an assessment of visitation frequency; money spent traveling to the destination and within the destination; preferred recreational activities; and importance value of variables affecting recreational experience. (For a complete list of questions and question abbreviations that we used in the pretest survey, refer to Appendix B.) These questions are consistent with travel cost methodology used in other studies (Mendelsohn and Markstrom, 1988; Freeman, 1993).

6.3.2 Passenger Databases

Using Microsoft Access, we create a database to serve two primary goals. First, we design a database that categorizes information at an individual survey level. Second, we create a database that organizes and sorts not only each individual survey, but also the responses to each question in the survey.

To complement the database, we designed a form in Microsoft Access that allows us to enter survey information. In using Microsoft Access forms, we are able to enter each survey as a single entity. This information is then sorted into fields in Microsoft Access.

6.3.3 Passenger Sampling Methods

We pretested the survey by distributing it to passengers waiting on the docks prior to boarding a vessel en route to the northern Channel Islands. We were interested in determining the passengers' reasons for choosing to recreate in the CINMS based on their expectations, and not their actual experience. Therefore, we decided to survey passengers prior to departure instead of after their return. While previous studies relied on one-on-one interviews (Leeworthy and Wiley [a], 1997; Leeworthy and Wiley [b], 1997; Herath, 1999), we chose to test another sampling method that would maximize the number of passengers surveyed as well as minimize the number of surveyors required for the monitoring effort.

We decided to distribute surveys for passengers to complete independently prior to boarding. Distributing surveys to be completed on-site is less expensive to conduct than one-on-one interviews. Testing the effectiveness of this method is important since

budget constraints may prevent monitoring from occurring if costs are too high. It should be noted however, that in conducting surveys before passengers board the vessel, we are potentially creating a bias against passengers who arrive late and thus cannot take the time to participate in the study.

6.3.4 Separating MPA Value

A major aim of our study is to find a way to separate the RNC value of the MPAs from the non-consumptive recreational value of the CINMS as a whole. As acknowledged in other studies (Taylor and Buckenham, 2003), differentiating between two adjacent protected areas can be a challenge. In this case, the northern Channel Islands MPAs are located within the CINMS, thereby making it difficult to qualify whether participants are choosing to visit the MPAs specifically or the CINMS as a whole.

Since the MPAs are situated within the CINMS, a major aim of our study is to separate the RNC value of the MPAs from the RNC value of the CINMS as a whole. To estimate the difference in visitation attributable to the MPAs, we calculate the demand curve and consumer surplus for two scenarios:

- CINMS Including MPAs (includes all visitors, including those who stated their primary purpose was the MPAs)
- CINMS Excluding MPAs (does not include visitors who stated their primary purpose was the MPAs)

The difference between these two demand curves is the consumer surplus specifically attributable to the MPAs (see Figure 2). This method results in a conservative estimate for the value of the MPAs, since our survey will not capture the preference of visitors who may value recreating inside the MPAs, but do not consider it the primary purpose of their visit to the CINMS.

6.3.4.1 Method for the Pretest

In order to differentiate the visitors' primary reason for visiting the CINMS, we included two specific questions in the pretest survey. These questions were designed to allow us to attribute different visitation rates to "CINMS Including MPAs" and "CINMS Excluding MPAs", depending on the visitors' primary purpose. Originally, we intended these questions to indicate slightly different levels of preference for visiting the MPAs, but later found the difference between the questions was not distinct enough.

The following two questions were presented on the survey:

1. Did you choose to recreate in the CINMS because of the MPAs (Question A)?
2. If so, would you have come to the CINMS anyway, even if there were no MPAs (Question B)?

Since we found the difference between these questions was not clear, visitors who responded positively to <u>either</u> question (yes for question 1, no for question 2), were included in the visitation rate for "CINMS Including MPAs". In contrast, those passengers' responses were not included in the calculations for the "CINMS Excluding MPAs". During our travel cost analysis, we subtract the value of "CINMS Excluding

MPAs" from the value of "CINMS Including MPAs" to determine the value specifically attributable to the MPAs.

6.3.4.2 Results for the Pretest

Only 3 out of 58 RNC visitors answered positively to either of the MPA visitation questions; the remaining visitors did not specifically indicate that the existence of the MPAs was the primary reason for their visit. We expected this result, as the MPAs had only been established for 7 months when we conducted our pretest survey. We predict the number of visitors traveling to the area specifically because of the MPAs to be low for the first few years, and increase as knowledge of and ecological conditions within the MPAs increase. This method results in a conservative estimate for the value of the MPAs, since our survey does not capture the preference of visitors who may value recreating inside the MPAs, but do not consider it the primary purpose of their visit to the CINMS.

6.3.5 Passenger Survey Sampling Results

The passenger survey was pretested at Ventura, Channel Islands and Santa Barbara harbors in October and November 2003. Despite the presence of surveyors on location to answer questions, passenger responses were often incomplete or of poor quality when the passengers were given the survey to complete on their own. Therefore, our attempt to find a survey method more cost-effective than face-to-face interviewing yielded a quality of responses below our expectations. It should be noted, however, that the outgoing passengers were generally helpful and willing to take the time to complete the survey.

In total we surveyed 111 visitors traveling to the CINMS in November of 2003. However, we chose to restrict our sample size to in-state visitors who specifically came for recreational non-consumptive activities and thus narrowed our sample population to 58 visitors. The surveyed population revealed information on travel costs, demographics, recreational activities and knowledge of the MPAs and CINMS.

6.3.6 Recommendations for Future Use of the Passenger Survey

The passenger survey portion of this study is important for collecting data necessary to run the travel cost analysis, and separate the value of the CINMS from the MPAs. The passenger data is also useful to calculate summary statistics to understand the knowledge, perceptions, and demographics variables for visitors to the CINMS. The following recommendations address these uses of the passenger survey.

6.3.6.1 Recommendations for Survey Instrument Selection

Depending on the type of travel cost model that will be used, the researcher has a few options for sampling passengers:

- ZTCM only
- User Statistics combined with ZTCM
- ITCM

At a minimum, the simple zonal travel cost model (ZTCM) requires only a count of the total number of visitors, the visitors' origin zone, such as their zip code or county, whether visiting the CINMS was the primary purpose for their trip to the Santa Barbara/Ventura region, and if the primary reason for choosing to come to the CINMS was because of the MPAs. This information could be collected using a simple survey, or could potentially be collected by the charter operators themselves when passengers book trips. In addition to a simple ZTCM, future researchers may be interested in user statistics of the visiting population (such as knowledge of regulations of the CINMS and MPAs, preferred activities, recreational quality indicators, or demographics). In this case, we recommend using a simple survey inquiring about these characteristics in addition to information regarding the zone of origin. Finally, if the researcher is interested in conducting an individual travel cost model (ITCM), then a full survey must include more detailed information including full expenses, preferences, and historical visitation information (See Section 5.12).

We recommend using the appropriate survey for the monitoring purpose, which should be explicitly stated before the survey efforts begin. To collect accurate and high quality data while avoiding visitor survey fatigue, the shorter the survey, the better.

6.3.6.2 Sampling Methods

While testing a more efficient method for surveying passengers, we find a clear trade-off between sample size and response quality. We wanted to determine if it were possible to decrease the cost of surveying by gathering data in an onsite distributed survey form, rather than one-on-one interviews. However, due to the poor quality and/or incomplete responses we collected during the pretest, we recommend concentrating on gathering solid data in face-to-face interviews even though personal interviews take more time on a per survey basis. The concise surveys that we are recommending will allow the CINMS to conduct personnel interviews that obtain all necessary information in a relatively short period of time. However, additional time and funds may still be necessary to obtain an adequate quantity of quality responses.

Surveying passengers prior to their boarding of the charter vessel proved to be a successful method. Passengers waiting to board a vessel are a captive audience. We found that most passengers are willing to cooperate with the survey. Additionally, surveying prior to departure allows for information to be collected that more closely reflects the passenger's preferences when they chose to visit the CINMS while limiting bias that may be introduced by the actual conditions of their particular trip (weather, wildlife sightings, sea conditions, other passengers or crew bias, etc.). We recommend repeating this part of the methodology in future monitoring efforts.

During the course of our study, we considered other sampling methods besides surveying passengers prior to departure. Surveying passengers onboard the vessel may help address some of the biases we experienced, but we decided that using this method has the possibility to introduce disproportionately more biases. During the channel

crossing, passengers are likely to have free time to answer survey questions in an interview setting, and some vessel operators seem willing to allow surveyors on board if there is a commitment on the part of the surveyors to be non-intrusive in the passengers' experience of the crossing. However, this sampling method would require more extensive cooperation of the charter vessel operators as well as a larger time commitment from surveyors. Additionally, some of the smaller charter vessels may not have room for surveyors on board if they have fully booked their trips. Therefore, before using this method with our protocol, we recommend testing this method to check for effects on quantity and quality of responses as well as the introduction of additional biases. The new recommended survey should be short enough where considering this sampling method may be unnecessary.

6.3.6.3 Recommendations for Separating the Values of the CINMS and the MPAs

In our monitoring protocol, we recommend using only one question to separate the respondents valuing the CINMS and the MPAs. Asking two questions did not produce the results we expected; simplifying it to one question would ease data interpretation and analysis. In the new survey for the monitoring protocol, we include the following question: Did you choose to recreate in the CINMS because of the MPAs?

We believe that using this question alone will capture the visitors who came specifically to recreate in the MPAs. However, we predict there are a number of visitors who would be interested in recreation inside the MPAs, but may also be interested in activities within the CINMS as a whole. Being able to assign a partial visitation to the MPAs would capture these visitors and would more accurately represent the surplus associated with the MPAs. We are not able to tease out this partial visitation in this study. We recommend the examination of this issue in future studies, since the MPA surplus will often be underestimated using our method.

6.4 User Statistics

User statistics are an important part of any effective management protocol to help understand the interest and awareness of RNC passengers who visit the CINMS. These include questions that determine passengers' primary purpose for coming to the CINMS, the importance of particular factors in deciding to make the trip, and their level of understanding concerning the protections afforded by CINMS and the MPAs. Although there are a large variety of questions that can be answered from the data collected, the following questions have the greatest potential for providing useful information to the northern Channel Islands MPAs managers.

6.4.1 User Statistics Methods

We designed the pretest survey to provide information about the visitor population of the CINMS. The specific questions that we answer as well as the survey questions that we use to answer them are summarized in Table 6.1. The file we use to calculate all user statistics questions can be found on the attached CD in the Excel file *User Statistics_2003Pretest.xls* (See Monitoring Protocol CD, User Statistics folder, 2003

Pretest). For a detailed explanation of how each question was dealt with, refer to *Detailed Explanation of Model Construction_2003 Pretest.doc* (See Monitoring Protocol CD, Customer Information, 2003 Pretest folder).

Table 6.1: This table illustrates the user statistics questions that the survey was designed to answer, the importance of the question, and the survey questions used to answer it.

User Statistics Questions	Question Relevance	Survey Questions Used
❖ What factors are most important to users for an ideal recreational experience?	Illustrates the reasons why visitors choose to recreate in the CINMS.	[12:] (All associated subsections)
❖ Is there any perceived change in these factors since the establishment of the MPAs?	Illustrates the change in perceived quality that visitors believe has occurred since the MPAs have been implemented.	[14: EQ]; [17: QLV]
❖ Are recreational users aware of the existence of the MPAs?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[3: A]
❖ Are recreational users coming to the CINMS specifically to use the MPAs?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[11: MPA]
❖ Which activities are their primary reasons for coming to the CINMS?	Illustrates the importance of various RNC activities to visitors.	[10: PA]; [9: AT(OS)]
❖ Are recreational users aware of the level of protection afforded by MPAs?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[5: MP]
❖ Do recreational users think that the MPAs prohibit recreational activities?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[5: MP]
❖ Are recreational users aware of the level of protection afforded by the CINMS?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[6: SP]
❖ Do recreational users think that the primary protection CINMS affords is protection of most sea life from fishing/harvesting?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[6: SP]
❖ Do recreational users think the level of protection afforded by MPAs is the same as the protection afforded by CINMS?	Illustrates knowledge and/or perception of CINMS/MPA regulations.	[5: MP]; [6: SP]
❖ What percentage of visitors are non-residents?	Illustrates the proportion of visitors that travel from short/long distances to the CINMS.	[1: Zip code]; [0: Zip code]
❖ What is the average age of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[27: D(A)]
❖ What is the average annual income of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[26: HI]; [25: HS]
❖ What is the average education level of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[27: D(ED)]

Table 6.1: Continued		
User Statistics Questions	**Question Relevance**	**Survey Questions Used**
❖ What is the average male to female ratio of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[27: D(S)]
❖ What is the average employment status of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[27: D(EM)]
❖ What is the ethnic make-up of recreational non-consumptive users of CINMS?	Illustrates demographic information of visitor population.	[27: D(ET)]

6.4.2 User Statistics Results

In this section, we present the user statistics results from our pretest survey conducted in October/November 2003. We provide summary information on preferred recreational activities and quality factors, perceived changes in these factors since the establishment of the MPAs in April 2003, awareness of the levels of protection afforded within the CINMS, and some demographic generalities. Although we collect information on both consumptive and non-consumptive users, these results only incorporate responses from visitors that explicitly stated the purpose of their trip was non-consumptive in nature. In this section, we include all RNC visitors regardless of their trips primary purpose or state the trip originated from.

Due to the small pretest sample size (91 RNC visitors) that was limited to two months of the year, the following statistics should not be considered representative of the annual CINMS visitor population. In order to collect a more robust and representative sample, visitors need to be sampled throughout the year to incorporate seasonal recreation preferences. However, these results may provide an approximate illustration of the general knowledge, perception, and interests of CINMS visitors. All results can be found in the Excel file *User Statistics_2003Pretest.xls* (See Monitoring Protocol CD, User Statistics, 2003 Pretest folder).

6.4.2.1 Knowledge, Perceptions and Attitudes

Fewer than half of the RNC users surveyed (42%) are aware of the existence of the MPAs (Figure 6.1 and Table 6.2). Approximately 39% of these visitors are able to identify the general level of protection that the MPAs afford, while only 1% of the RNC visitors think that the MPA designation restricted recreational activities. Less than 9% of the users sampled are able to correctly identify the level of protection afforded by the CINMS and nearly 58% of them believe that the CINMS protects sea life from fishing and harvesting. In fact, over 25% of the respondents believe that the MPAs and the CINMS provide the same level of protection to marine life, when in fact the National Marine Sanctuary designation alone does not currently include restrictions on most consumptive recreation. As previously stated, the CINMS is a type of marine protected area that only regulates construction on and alteration to the ocean floor such as oil

exploration and extraction, protection of cultural resources as well as large vessel travel near the islands, over flights, and discharges.

As seen in Figure 6.2, the most popular recreational activity we document is wildlife viewing and photography (40%), followed by non-consumptive SCUBA diving (24%), and other activities/hiking (12%). Kayaking attracts 10% of the RNC visitors surveyed, and underwater photography/videography is the primary purpose of 9% of the visitors. Non-consumptive snorkeling represents only 2% of recreational activities in the CINMS.

Table 6.2: Legend for Figure 6.1
A. Are recreational users aware of the existence of the MPAs?
B. Are recreational users coming to the CINMS specifically to use the MPAs?
C. Are recreational users aware of the level of protection afforded by MPAs?
D. Do recreational users think that the MPAs prohibit recreational activities?
E. Are recreational users aware of the level of protection afforded by the CINMS?
F. Do recreational users believe that the primary protection that CINMS creates is protection of most sea life from fishing/harvesting?
G. Do recreational users think the level of protection afforded by MPAs is the same as the protection afforded by CINMS?

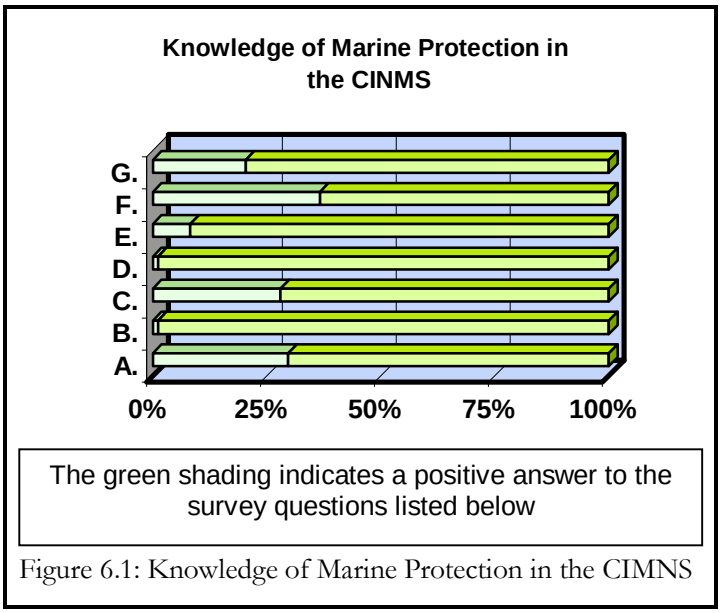


Figure 6.1: Knowledge of Marine Protection in the CIMNS

As seen in Figure 6.2, the most popular recreational activity we document is wildlife viewing and photography (40%), followed by non-consumptive SCUBA diving (24%), and other activities/hiking (12%). Kayaking attracts 10% of the RNC visitors surveyed, and underwater photography/videography is the primary purpose of 9% of the visitors. Non-consumptive snorkeling represents only 2% of recreational activities in the CINMS.

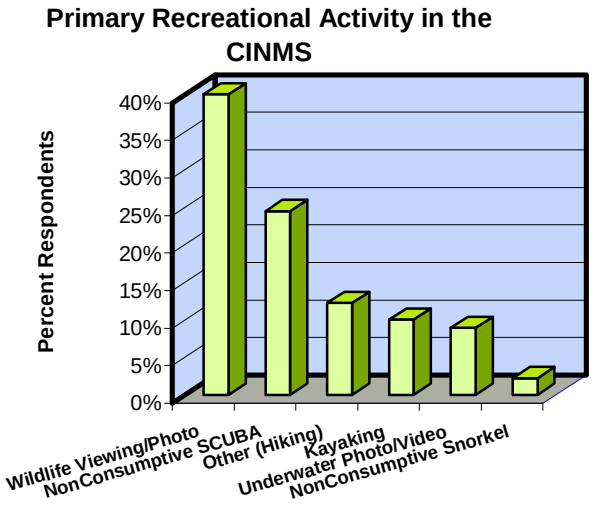


Figure 6.2: Primary Recreational Activity in the CINMS

Visitors were asked to rank the importance of several recreational factors on a scale of 1 to 5, 5 being the most important. Figure 6.3 and Table 6.3 illustrate the visitors' most important factors for a pleasant recreational experience. The highest rating factor is "diversity of sea life and fish to view" (rating of 4.09), closely followed by "abundance of sea life and fish" and "opportunity to view large wildlife such as whales, dolphins or seals" (ratings of 4.06 and 4.04 respectively). The following three factors listed are "Uncrowded Conditions" (3.69), "Existence of Marine Protected Areas" (3.61), and "Abundance of Kelp" (3.46).

Table 6.3: Legend for Figure 6.3
A: Diversity of sea life and fish to view
B: Viewing large wildlife (whales, etc)
C: Abundance of sea life and fish
D: Uncrowded conditions
E: Marine Protected Areas
F: Kelp

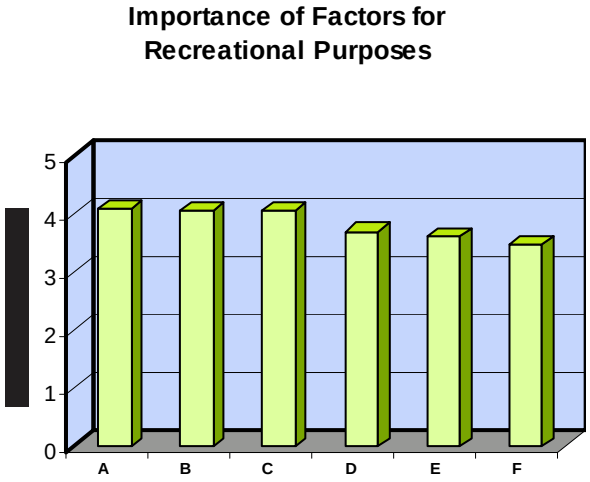


Figure 6.3: Importance of Factors for Recreational Purposes

For those visitors who identified making multiple trips to the CINMS in the past, we asked if they thought that the quality of recreational factors had changed in the CINMS over time. On average, visitors report that they expect the quality of their most important recreational factor to have slightly decreased since the last time they came (about 0.3 units on a scale from 1 to 5 (5 being the highest quality)).

6.4.2.2 Demographic Information

We also collected information on different demographic variables. The demographic variables include: gender, location of origin, age, income, employment status, ethnicity, and education level.

6.4.2.2.1 Resident vs. Non-Resident

More than 38% of the RNC visitors are resident of the region, with residency defined as living within 50 miles of the harbors. The non-residents could comprise a much larger portion of the total visitors during the peak of the season, considering our sampling time was slightly outside of the peak tourist season.

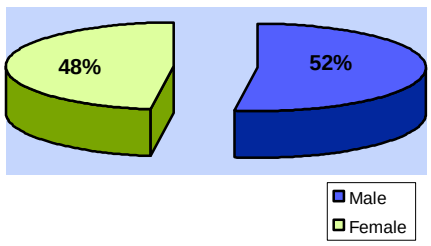


Figure 6.4: Sex ratio for CINMS visitors

6.4.2.2.2 Gender

Figure 6.4 shows the gender ratio of CINMS visitors, which is roughly 1:1, with a slightly higher percentage of males (52%).

6.4.2.2.3 Age & Income

The RNC visitors surveyed answered simple questions about their income and date of birth. Children under age 18 were not surveyed; therefore, the average age is likely an overestimate of the actual average age of the passengers on the boats that we surveyed. Table 6.4 shows the some demographic characteristics of our sample of RNC visitors to the CINMS:

Table 6.4: Visitor Demographics

Average Age	Average Annual Income
43	$56,000

6.4.2.2.4 Education

Information of the highest level of education was collected. The results show that the majority of the visitors have acquired graduate or undergraduate degrees (Figure 6.5).

6.4.2.2.5 Ethnicity

Detailed information on ethnicity was also collected in the surveys. Figure 6.6 shows the distribution of the ethnicities of visitor surveyed. A large majority of recreational users are white which accounts for 80% of the respondents.

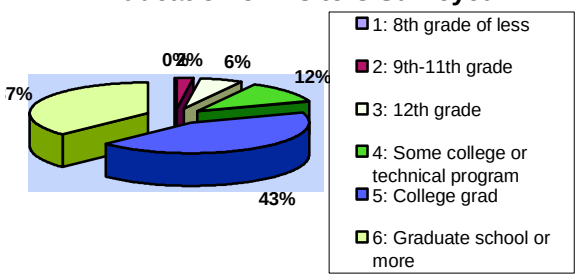


Figure 6.5: Education of Visitors Surveyed

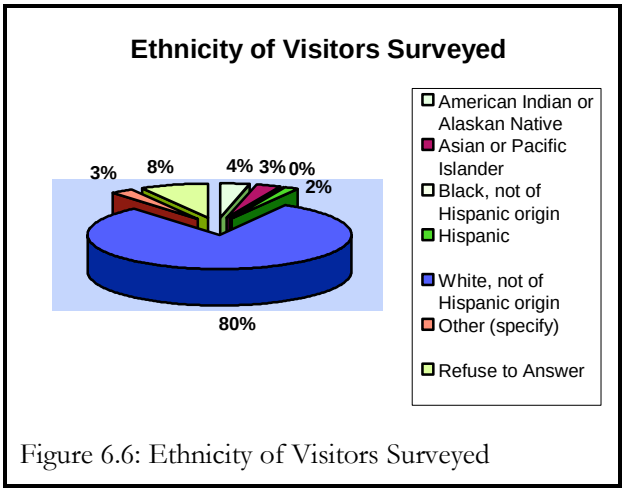


Figure 6.6: Ethnicity of Visitors Surveyed

6.4.2.2.6 Employment Figure 6.7 shows the distribution of employment status for the recreational users surveyed. The majority of visitors are employed, whether full-time (66%) or part-time (16%). The remaining visitors are retired (11%), students (3%) or unemployed/homemaker (1% each).

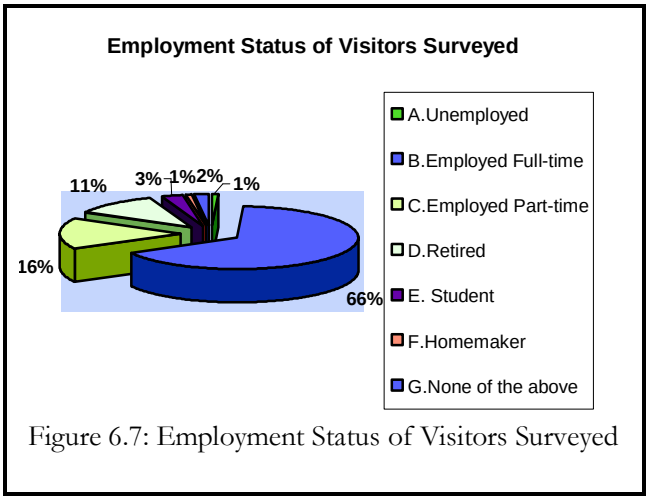


Figure 6.7: Employment Status of Visitors Surveyed

6.4.2.3 Trends in Awareness of MPAs

In addition to demographic variables, we investigated using a logistic regression whether local residents had more awareness of the existence of the MPAs than non-residents. There is no significant relationship between location of origin and awareness of the existence of MPAs (t-value = 0.9710817). However, we find a significant relationship between age of the visitor and awareness of the existence of MPAs using a logistic regression (t-value = 2.609443). The probability of a visitor being aware of the existence of the MPAs is shown in Equation 6.1:

$$\Pr(Awareness) = \frac{e^{\alpha+\beta Age+\gamma Employment}}{1+e^{\alpha+\beta Age+\gamma Employment}} \qquad \text{(Equation 6.1)}$$

Where the coefficient results are:

α = -3.51106
β = 0.058694
γ = 0.948646

This probability function is plotted (Figure 6.8) using Age as a discrete variable ranging from 18 to 100, and Employment as a dummy variable where 1 = Employed and 0 = Unemployed. The results of this logistic regression show that older visitors are more likely to be aware of the existence of the MPAs.

6.4.2.4 Operator Information

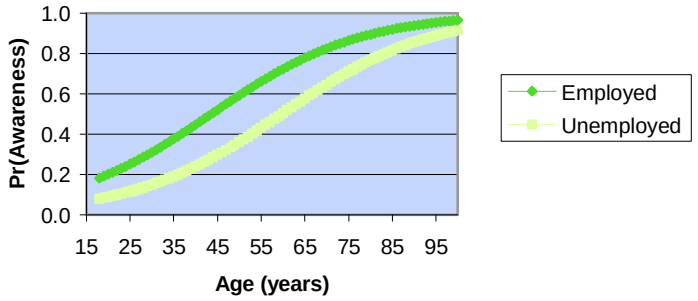


Figure 6.8: Probability of Awareness of Existence of MPAs, for employed and unemployed visitors

We analyzed the passenger information provided by the operators of charter vessels. The information collected was for the year 2002, which was identified by the operators as a "representative" year for business. The operators do not always differentiate between RNC activities preferred by each customer; therefore, we are not able to generate summary user statistics for every RNC activity. However, we present the variation of number of trips per month for the "wildlife viewing" category, which is the most popular activity of the Channel Islands visitors we surveyed. July and August were the busiest months of the year with over 60 trips each month, followed by January through March with 45 to 52 trips. The distribution of the number of trips, and hence the number of visitors, throughout the year show two strong peaks in the winter and summer months, with low visitation in the spring and fall seasons (see Figure 6.9).

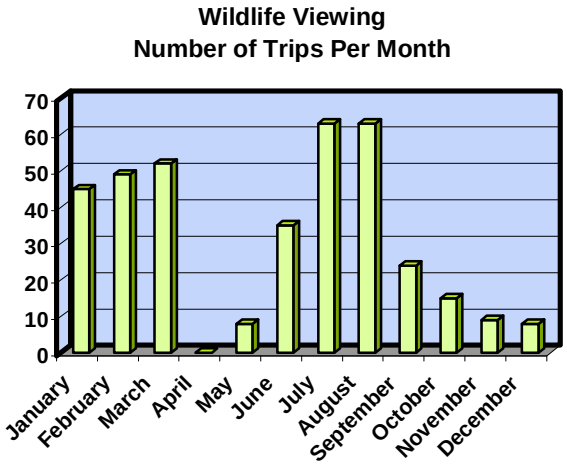


Figure 6.9: Number of Trips per Month for Wildlife Viewing in 2002

6.4.3 User Statistics Discussion and Recommendations

The level of awareness of the existence of, and protection offered by MPAs may have a significant impact on the public's attitude about the MPAs. In New Zealand, Taylor and Buckenham (Taylor and Buckenham, 2003) have shown that a greater awareness of MPAs heightened the level of attractiveness to potential visitors. Davis et al. (1995) have also shown that awareness of the existence of MPAs alone can increase visitor satisfaction. An increase in the numbers of RNC visitors could increase the economic value of the MPAs as well as benefit the local charter operators.

In Section 6.4.2, we demonstrate the lack of awareness of the existence of, and of the level of protection afforded by MPAs in the northern Channel Islands. Roughly 40% of the RNC users of CINMS did not know of the existence of MPAs, nor of the level of protection offered by those MPAs. Since the survey respondents were sampled from a population of CINMS visitors in particular, it is likely that the percentage of the general population that is aware of the existence of the MPAs is in fact much smaller.

The link between the existence of MPAs and ecological quality of the marine environment within the MPAs may prove to be significant over time. For example, an increase in "ecological quality" of the environment within the MPA may attract more RNC visitors to the Channel Islands over time. This may be a result of either actual or perceived ecological quality. *Actual* ecological quality would be documented by scientific monitoring studies, while *perceived* ecological quality would be the quality people expect in the MPAs based on word-of-mouth, marketing, or other non-scientific means. If people perceive an increase in quality, even if there is no actual evidence of it, they may be more inclined to visit the MPAs. Therefore, increased awareness of the existence of MPAs could benefit the RNC industry and users as long as the perceived *or* actual ecological quality is high. In addition, if visitors' preference of visiting the MPAs is not based on expectations of ecological quality, then the mere awareness of the existence of MPAs is likely to increase RNC demand of the MPAs over time.

In this study, we show that the level of awareness about the existence of the MPAs does not correlate with any of the demographic variables studied except for age. There is no significant correlation between the origin of the visitors surveyed (defined by whether they lived within 50 miles of the harbors or further), and their awareness of the MPAs. Instead, the awareness of the existence of MPAs varies with respect to age: older visitors are more likely to be aware of the existence of MPAs than younger visitors. While the sample size is too small to draw general conclusions about the visiting population of the MPAs, we can infer from the overall lack of correlation between awareness of MPAs and any variable other than age that there is no particular demographic or geographic group of individuals that education and outreach efforts should target more heavily. Therefore, the focus of outreach efforts should be placed on RNC users of the CINMS in general.

Pomeroy, Parks and Watson (Pomeroy et al., 2002) identify strategies to maximize the potential of increased value of MPAs by RNC users. In this case, the increased

awareness of MPAs may result in an increased rate of visitation to the CINMS for the purpose of visiting the MPAs. Moreover, Agardy (1997) mentions that one of the keys to marine conservation successes is to use MPAs to raise awareness about the degradation of the marine environment. Efforts could be made to develop increased understanding of marine ecology in the RNC visitors of the MPAs. In addition to a potential increase in visits from RNC users to the Channel Islands MPAs, outreach efforts may benefit marine conservation efforts in general.

We encourage the CINMS, California Department of Fish and Game, and National Park Service, to increase education and outreach efforts, without a specific target group but with the intent to raise the awareness of MPAs in the general population. The outreach effort should focus on educating visitors about the existence of the MPAs, as well as the level of protection of the MPAs and how that differs from the protection afforded by the CINMS. Taylor and Buckenham (2003) have stated that the link between tourism and education should be taken into account.

Examples of possible outreach and education efforts:

- The charter vessel operators could be encouraged to show the location of the MPAs on the maps they make available to their customers, as well as list the appropriate behavior in those areas (possible map donation from the CINMS)
- A brochure specifically aimed at RNC users could be created, focusing on the positive aspects of the MPAs (i.e. what you can do in the MPAs instead of what you cannot).
- Send Sanctuary representatives to periodically inform/educate instructors from other local marine education organizations about the CINMS and the newly designated MPAs within them. Examples of organizations like this include Catalina Islands Marine Institute (CIMI at Toyon Bay, Fox Landing, and Cherry Cove), the Ocean Institute, and Ocean Futures Society's Catalina Environmental Leadership Program (CELP). We find that even local marine environmental educators do not have a good understanding of the goals and protections afforded by the CINMS and the MPAs.
- Flyers could be posted around the harbors, targeting RNC users with private boats to inform them of the locations and regulations of MPAs.

6.5 Individual Travel Cost Model (ITCM)

This section briefly describes the construction of our ITCM, both the intuition and logistics, presents the major results of the ITCM, and discusses the relevance of these results. When the methods used in the ITCM are the same as the ZTCM, we refer to them in Section 6.6 (ZTCM). For a detailed explanation of how the model was constructed, refer to *Detailed Explanation of Model Construction_2003 Pretest.doc* (See Monitoring Protocol CD, Customer Information, 2003 Pretest folder).

6.5.1 ITCM Methods

In this section we translate the travel cost theory presented in Section 5.1.2 into the construction of our Microsoft Excel Model used to value the CINMS and MPAs.

6.5.1.1 Observed Visits

In our analysis we measure demand for recreational services based upon the number of observed visits to the CINMS. To calculate observed number of visits, we ask each respondent how many times he/she visits the CINMS in a given year.

6.5.1.2 Additional Travel Cost Methods

With the exception of the calculation of onsite travel costs, the remaining methods are the same for ITCM and ZTCM. For a description of the following methodologies, please refer to sections 6.6.1.2-6.6.1.4 of the Zonal Travel Cost Methods. In our calculation of Roundtrip Travel Costs and Opportunity Cost of Travel Time, we use individual responses in lieu of zonal census data.

- Roundtrip Travel Costs
- Opportunity Cost of Travel Time
- Opportunity Cost of Onsite Time
- Multi-destination Trips
- Substitute Sites

Onsite Travel Costs

In an ITCM, onsite costs can also be included in the price an individual pays to visit the CINMS. We quantify the onsite cost of the site in Equation 6.2. To be consistent with recreation demand literature, we omit both food and lodging from onsite costs.

Onsite Cost = (fee for charter + fee for guide + Fishing/lobster diving permit + recreational equipment purchased + recreational equipment rented + guidebooks/souvenirs) (Equation 6.2)

6.5.2 Estimating Demand

To quantify the recreational non-consumptive (RNC) value of the CINMS and the MPAs, we use a two-step methodology. First, we run a linear regression to estimate a demand function for recreational experiences (Hackett 2000). The regression constructs a relationship describing the how the individual visits to the CINMS are related to total travel cost, substitute sites and individual demographic characteristics.

6.5.2.1 Linear Regression

In our linear regression, we estimate visits to the CINMS as shown in Equation 6.3:

$$VR_i = f(TTC_i, Substitutes_i, Income_i, Demographics_i)$$

(Equation 6.3)

6.5.2.2 Consumer Surplus

To find the surplus, we first calculate the average onsite cost each visitor incurred in traveling to the CINMS. Then we find the choke price, or price at which the visitation rate equals zero. After finding both the choke price and average price, we calculate the

area under the demand curve between these two prices. We separate the value of the MPAs from the CINMS as a whole using the methodology described in section 6.6.2.2.

6.5.2 ITCM Results, Discussion and Recommendations

All results can be found in the Excel file *Individual travel Cost Model_2003Pretest.xls* (See Monitoring Protocol CD, Customer Information, 2003 Pretest Folder)

This ITCM analysis presents a statistically flawed regression. In constraining our sample size to on-site visitors, we essentially assume that every individual visits the CINMS and the MPAs. To address the "zero" population, we must include individuals that did not visit the CINMS in our sample population. At this point, the ITCM becomes logistically difficult. We need to include accurate demographic and travel cost information for individuals that chose to not visit the CINMS. However, unless we explicitly sample non-visitors or perform a statistical modification beyond our training, we cannot defensibly or accurately analyze the consumer surplus.

While the ITCM may present a more comprehensive valuation instrument, the implementation of this model proves economically costly and time intensive. The ITCM relies on an exhaustive survey that requires respondents to answer questions on individual demographic information, multi-destination trips, explicit on-site costs, travel costs, and opportunity costs. The length of the ITCM survey deters many individuals from completing the survey and the detail required of an ITCM survey often results in confusing questions or questions that required a lengthy explanation.

6.6 Zonal Travel Cost Model

In this section we present the approach, results and discussion of the ZTCM as a valuation technique for the CINMS and the MPAs. We will review the construction of our zonal model, both the intuition and logistics, present the major results of the ZTCM and lastly discuss the relevance of these results. For a detailed explanation of how the model was constructed, refer to *Detailed Explanation of Model Construction_2003 Pretest.doc* (See Monitoring Protocol CD, Customer Information, 2003 Pretest folder).

6.6.1 Zonal Travel Cost Methodology

In this section we translate the travel cost theory presented in Section 5.1.1 into the construction of our Microsoft Excel Model used to value the CINMS and MPAs.

6.6.1.1 Zonal Observed Visitation Rate

We measure demand for recreational services based upon visitation rate. To calculate an appropriate visitation rate, we divide the number of surveyed visitors from a given zone by the zonal population. Before we can generate an equation that predicts visitation rate, we must calculate the observed zonal visitation rate.

In our study, we define zones at the county level and estimate the population using Census 2000 data (available online at: http://www.census.gov). We bound our sample by

the state of California and restricted our zonal population to individual between the ages of 18-74.

6.6.1.2 Zonal Total Travel Cost

The factors we include in the calculation of zonal total travel cost represent a modified or abridged version of the costs included in individual total travel costs. For a general discussion of the economic literature describing zonal total travel cost, refer to Section 5.1.1.

Onsite Travel Costs:

In our ZTCM, we omit onsite expenditures.

Roundtrip Travel Costs:

The costs that individuals incur in traveling to the CINMS and MPAs partially reflect the value they attribute to the site. To calculate this we assign a price to the distance traveled to reach the CINMS site, as seen in Equation 6.4.

Roundtrip Travel Costs = distance traveled *(cost per mile of transportation)

(Equation 6.4)

Though we are aware that automobiles vary in the fuel efficiency and the quality of gasoline required and that drivers vary in driving speed, we assume that each visitor faces the same direct cost of transportation. We use a value of $0.31 per mile, which we obtained as the 1999 cost of vehicle operation from the Department of Transportation. We choose to use 1999 values to remain consistent with the census data. Future studies should periodically update this value after new census data is published.

Secondly, we assume that all visitors face the same direct transportation costs regardless of the mode of transportation in the roundtrip travel cost calculation. We assume that a person chooses to fly or drive independently of the choice of the site, and that this choice falls outside the bounds of the inherent travel cost (Troung and Hensher, 1985; Bhat, 1998).

To calculate the distance traveled and the travel time incurred in traveling from the destination to CINMS, we measure the distance from the center of each zone to a destination located between the three harbors (Santa Barbara, Ventura and Channel Islands harbors in Figure 6.10) sampled in our survey. We chose Carpinteria, CA, a location approximately equidistant from all three harbors as our "harbor" location. Using this location may introduce a bias of 12-15 miles driving distance between the visitor's actual destination harbor and the destination we selected. This bias may be positive or negative, depending on their zone of origin and intended harbor. Since the bias was non-directional (i.e. it could be either positive or negative) and the distance was minimal, we make the assumption that the error introduced is negligible.

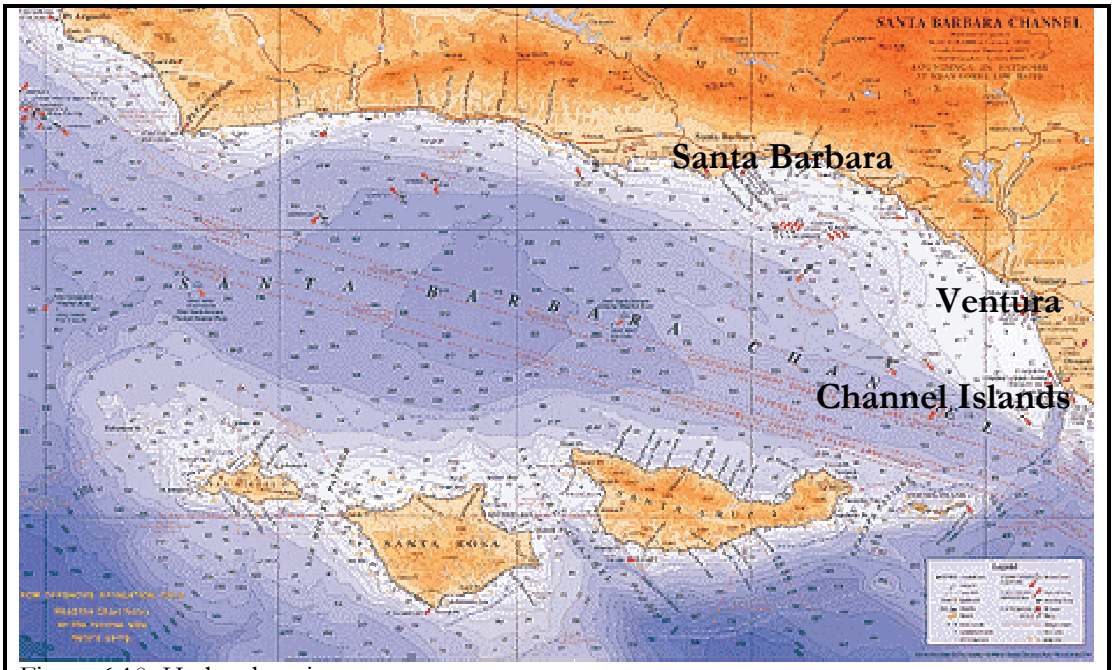


Figure 6.10: Harbor locations

Opportunity Cost of Travel Time

To be consistent with the economic literature (Liston-Heyes and Heyes, 1999; Englin and Shonkwiler, 1995), we calculate the opportunity cost of time as 1/3* hourly wage rate (Eq. 6.5). We calculate hourly wage rate by dividing the annual income by 2000 hours.

Opportunity Cost of Travel Time = (1/3* hourly wage rate) * Roundtrip Distance Traveled (Equation 6.5)

Additionally, we assume value of utility gained from travel of zero. Refer to Section 5.1.1.1, *Utility of Travel* for an explanation.

Opportunity Cost of Onsite Time:

Due to the unavailability of a systematic approach and the wide magnitude of benefits from recreating in the CINMS, we chose to exclude the opportunity cost of onsite time from our model.

6.6.1.3 Multi-destination Trips

Ideally we would have liked to incorporate the multi-destination approach developed by Loomis et al. (1997) into a TCM. However, both time and resource constraints made the calculation of multi-destination trips difficult. Rather, we assume that all visitors to the CINMS represent single destination users. To confidently make this assumption, we follow an earlier approach (Loomis and Walsh 1997) and restrict our sample size to the

geographical boundary of California. In other words, we predict that individuals within California will travel to CINMS and MPAs for the sole purpose of visiting them. By contrast, it is likely that individuals outside of California will travel to the CINMS in addition to other locations within California. In omitting non-California residents, we are more likely to limit our sample size to single-purpose visitors.

6.6.1.4 Substitute Sites

We chose biological, ecological, and recreational conditions as our three criteria in choosing an appropriate substitute site. We can assume that biological, ecological, and recreational conditions will most likely influence an individual's decision to recreate in the CINMS. In turn, a site that demonstrates similar biological, ecological, and recreational conditions as the CINMS will serve as the best substitute for an analysis attempting to quantify RNC values. Based on these criteria, we selected Catalina Island, off the coast of Los Angeles, California, as an appropriate substitute.

In our model, we incorporate substitute sites by assuming the value an individual attributes to an alternative site can be quantified as the roundtrip travel costs associated with reaching the substitutes site (Fix and Loomis, 1997). Specifically, we measure the distance in miles that an individual travels to participate in RNC activities in another location, in this case Catalina Island. In incorporating a substitute in our TCM, we include both the roundtrip transportation costs and opportunity cost of time associated with traveling from the destination of origin to Catalina Island. We calculate the distance and costs associated with traveling from a central point in a zone (county) to the gateway to Catalina Island (Long Beach Harbor). Our zonal model of substitute sites is developed and calculated using the same logic discussed in Section 5.1.

6.6.1.5 Shared Expenses

Incorporating shared expenses in a ZTCM is difficult. Explicitly, if we survey a visitor revealing shared expenses and include the partial costs in the zonal model, then we assume that every visitor from that zone also displays shared visitation costs. To overcome this problem, our ZTCM assumes that each visitor incurs the full roundtrip transportation costs and opportunity costs of time.

6.6.1.6 Income and Demographic Variables

The ZTCM assumes that each individual traveling to the CINMS is representative of the zone of origin. Rather than using individual demographic data as revealed by the visitor, the ZTCM averages across the zonal population to determine a single demographic variable for the entire zone. In our model we include the zonal income value as the only explanatory demographic variable.

6.6.2 Estimating Demand

To quantify the RNC value of the CINMS and the MPAs, we run a grouped logit regression to estimate a demand function for recreational experiences, as done previously by Hackett (2000). The regression analysis constructs a relationship describing

the how the probability that an individual visits the CINMS (in this case: visitation rate) relates to total travel cost, substitute sites and zonal income (Ward and Beal, 2000:182).

6.6.2.1 Grouped Logit Regression

We find that a grouped logistic method offers the most statistically accurate model to predict the relationship between visitation rate and independent variables. The grouped logit model significantly differs from other models (explained in Section 6.6.3.1) in that it allows us to include counties revealing a visitation rate of zero in our estimation of a demand curve. In omitting "zero counties" or counties with an observed visitation rate of zero, we truncate the sample based upon a value of the dependent variable.

A group logistic or grouped logit model assumes that the dependent variable takes on a value of either 1 or 0 (Greene, 2000: 214). In our model, each person in a given county chooses whether or not to visit the CINMS; we can count each person from a given county visiting the CINMS as a "1" and every other county resident that does not visit the CINMS as a "0". A grouped model then extends the individual logit by observing the response or visitation rate of a county population given that all individuals face the same independent variables (Greene, 2000: 835). In our group logit model, the dependent variable is the proportion or probability of the zonal population who visits the CINMS.

We first assume that the probability of an individual visiting the reserves functions as a cumulative distribution function, as shown in Equation 6.6:

Cumulative distribution function = $$P_i = \frac{1}{1 + e^{-VR_i}}$$ (Equation 6.6)

Where:

$$VR_i = \alpha + \beta_1(TTC_i) + \beta_2(Substitutes_i) + \beta_3(Income_i) + \varepsilon_i$$ (Equation 6.7)

The probability or the predicted visitation rate is an estimate of the population quantity (π) in which $\pi_i = F(B'x_i)$. The output or F is based upon the inverse of the logistic function described in Equation 6.8:

$$\pi_i = \frac{e^{(B'x_i)}}{1+e^{(B'x_i)}}$$ (Equation 6.8)

Where:

π is the population quantity
B' is the coefficients of the independent variables
X_i represents the independent variables

And the log likelihood function for a binary choice model with grouped data is described in Equation 6.9:

$$\log L = \sum_{i=1}^{n} n_i \left[P_i \log F(B' x_i) + (1 - P_i) \frac{F(B' x_i)}{1 - F(B' x_i)} \right] x_i = 0 \qquad \text{(Equation 6.9)}$$

The probability that an individual facing a given total travel cost travels to the CINMS and the MPAs is the average demand curve. In other words, the predicted probability given a particular travel cost is equal to the fitted visitation rate.

6.6.2.2 Consumer Surplus

To find the surplus, we first calculate the average price each visitor from each zone incurred in traveling to the CINMS. Specifically, we take the total travel cost associated with each zone as the average travel price. We then need to find the choke price, or price at which the visitation rate would equal zero. However, in using a grouped logistic regression we cannot calculate a zero visitation rate. It follows that as visitation rate approaches zero, the natural log and affiliated total travel cost approaches infinity. To derive a choke price in a semi-log regression, studies commonly use the visitation rate associated with the most distant zone of origin as the choke price or zero visitation rate (Ward and Beal, 2000: 134). Based on this logic, we chose the most distant county in California (Del Norte County) as the choke price site. After finding both the choke price and average price, we integrate between these two bounded prices to determine the access value.

We sum the total surplus over all visitors to calculate the total surplus for the CINMS Including MPAs. We then divide the surplus by the predicted number of visitors to calculate the per visitor surplus attributed to the CINMS Including the MPAs. We repeat the same process for the predicted number of visitors to the CINMS Excluding MPAs. To estimate the difference in visitation attributable to the MPAs, we calculate the demand curve and consumer surplus for two scenarios:

- CINMS Including MPAs (includes all visitors, including those who stated their primary purpose was the MPAs)
- CINMS Excluding MPAs (does not include visitors who stated their primary purpose was the MPAs)

The difference between these two demand curves is the consumer surplus specifically attributable to the MPAs.

6.6.3 Preliminary ZTCM 2003 Pretest Results

In general, our results confirm that the ZTCM model we develop appropriately depicts the relationship between total travel cost, substitute sites, and visitation rate. Our model predicts a total consumer surplus for the CINMS at approximately $253,000 and approximately $14,000 for the MPAs. However, since the number of surveys we conducted for this pretest is not a representative sample of annual RNC visitors to the CINMS, our reported results may not accurately represent the actual current value of the

CINMS and MPAs. This section serves as the economic and statistical defense of our model as a valuation tool for the CINMS.

6.6.3.1 Linear and Semi-log Regressions

We run several different types of regression on the pretest data to identify the most appropriate approach. The models using linear and semi-log regressions present statistically flawed regressions. In including only counties with an observed visitation rate in the derivation of the predicted demand curve, we overlook the contribution of individual's choosing not to visit the CINMS or the MPA. Essentially, in the linear and semi-log regressions we generate a truncated regression line in that we fail to incorporate zero visitation rate counties. Based upon this result, we are not confident that a linear or a semi-log regression model accurately describes an individual's decision to visit the CINMS or the MPA.

6.6.3.2 Demand for Recreational Sites

In the grouped logit regression, we use the observed total travel cost, the observed substitute travel cost, the observed zonal income and the observed visitation rate to derive the probability that an individual visited either the CINMS or the MPAs. In Figure 6.11, we graphically illustrate the relationship between predicted number of visitors (x-axis) and the total travel cost (y-axis).

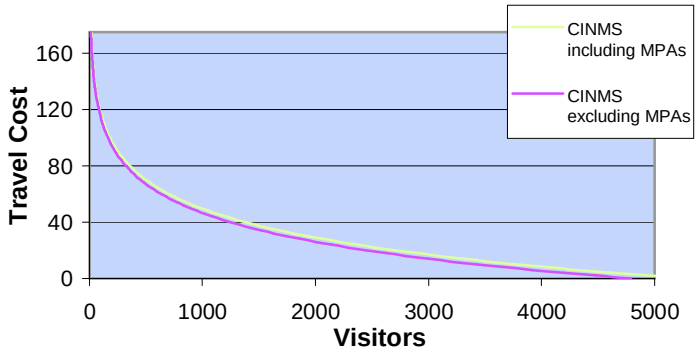


Figure 6.11: RNC Demand Curve for CINMS

We find that total travel cost and substitute costs significantly influence visitation rate (Table 6.5). More specifically total travel cost negatively effects visitation while substitute sites positively effects visitation rate. As the distance from a destination of origin to the CINMS increases, thereby increasing the total travel cost, the predicted visitation rate decreases. By contrast, as the distance to a substitute site increases, thus increasing total travel cost to the substitute site, visitation rate to the CINMS increases. Table 6.5 presents the coefficient estimates and significance values (in other words the probability that the coefficient describing a given variable is different than zero) describing the relationship between each independent variable and visitation rate.

Table 6.5: Output Statistics for the Grouped Logit Regression				
	CINMS Including MPAs	Likelihood Ratio	CINMS Excluding MPAs	Likelihood Ratio
Variable	*Coefficients*		*Coefficient*	
X Variable 1 (TTC)	-0.034	P<0.001	-0.034	P<0.001
X Variable 2 (Substitutes)	0.022	P<0.001	0.022	P<0.001
X Variable 3 (Zonal Income)	6.0E-06	0.25<P<0.5 (Not significant)	1.3E-05	0.5<P<0.75 (Not significant)

Based upon the predicted visitation function, we estimate a number of visitors to CINMS. Our predicted number of visitors to the CINMS closely mirrors the observed number of visitors (Table 6.6). Specifically, we observe 58 visitors to CINMS Including the MPAs and 55 visitors to CINMS Excluding the MPAs and we predict 51 and 48 visitors respectively. This finding suggests that our model predicts a visitation rate that closely conforms to the actual visitation rate.

Table 6.6: Actual Vs. Predicted Visitors		
	CINMS Including MPAs	CINMS Excluding MPAs
Observed Number of Visitors	58	55
Predicted Number of Visitors	51	48

In Figure 6.12, we illustrate the predicted annual number of visitors from each county in California. This illustration shows that our results adhere to standard travel cost theory, which predicts visitation to increase with lower travel costs. Counties closer to the destination have a lower total travel cost, and thus a higher number of predicted visitors.

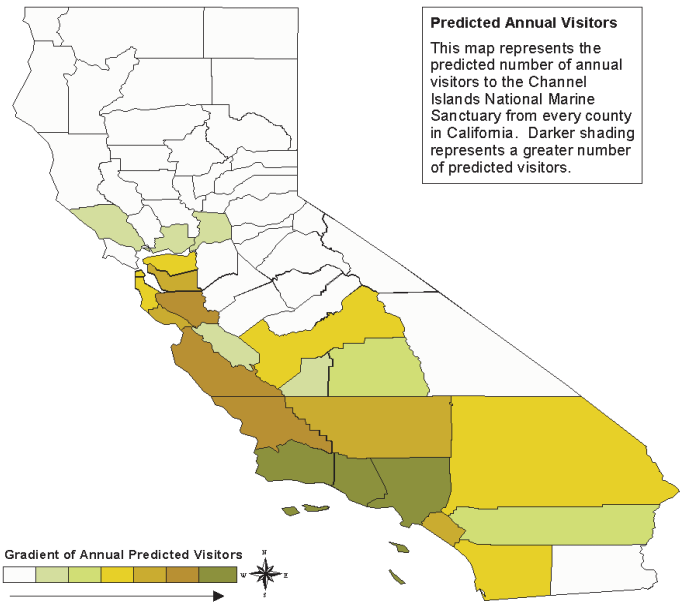


Figure 6.12: Predicted Relative Variation of Annual Visitors in each California County between counties

We also evaluate the relative sensitivity of each independent variable in Table 6.7. In other words, we analyze how visitation rate will change with a change in TTC, substitute costs, and income. For example, if Santa Barbara County was 100 miles farther from the CINMS, we predict its annual

visitation to the CINMS would drop 87%. By contrast, if a substitute site were 100 miles closer to Santa Barbara County, the predicted number of visitors would decrease by 74%.

Lastly if the county of Santa Barbara had a zonal income of Santa Clara, the county with the highest income, we would expect a 17% increase in predicted visitors. We find that visitors indeed respond to changes in total travel costs and substitute proximity. By contrast we find that visitation rate is relatively insensitive to income.

Table 6.7: Sensitivity Analysis of Santa Barbara County

Variable	Measurement : if Santa Barbara were …	% Change in Predicted Visitors
Total Travel Cost	100 miles farther from CINMS	87% reduction
Substitute Travel Cost	100 miles closer to Catalina	74% reduction
Income	$27,500 per person wealthier	17% increase

To calculate the consumer surplus of the CINMS, we find the area under the "CINMS Including MPAs" curve illustrated in Figure 6.11. Our model predicts total consumer surplus for the CINMS at approximately $253,000. Individual consumer surplus values for the CINMS range from $0-$15 and are greater for individuals living closer to the CINMS (See Figure 6.13).

As described in the methodology section, a primary intention of our analysis is to isolate the value attributable to the MPAs. As shown in Table 6.6 we predict separate number of visitors to the CINMS Including MPAs and CINMS Excluding MPAs. This difference in predicted visitation rate results in separate surpluses attributable to CINMS Including the MPAs and CINMS Excluding the MPAs (See Table 6.8). In taking the difference between the two surpluses, we find that our pretest result of charter industry based RNC surplus attributable to the MPAs is approximately $14,000.

Table 6.8: Consumer Surplus

Total Surplus (CINMS Including MPAs)	**$253,000**
Total Surplus (CINMS Excluding MPAs)	**$239,000**
RNC Surplus Attributable to MPAs	**$14,000**

6.6.4 ZTCM Discussion and Recommendations

In general, from the results of the ZTCM we are confident in the reliability of our model as an instrument to measure the CINMS and MPAs. The ZTCM produces a generalized estimate of the consumer surplus of the recreational site. It should be noted however that it overlooks the influence of demographics on visitation rate.

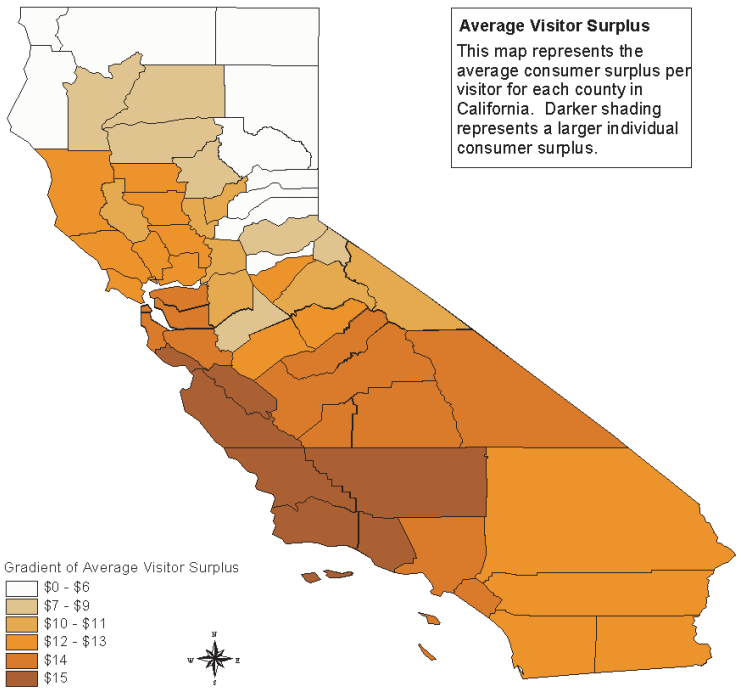


Figure 6.13: Predicted Average Surplus per Visitor per Trip for each California County

6.6.4.1 ZTCM Discussion

Based upon our results, we conclude that our ZTCM model presents an appropriate valuation tool to predict demand for visitation to CINMS and the MPAs.

First, as the distance from a zone to the CINMS increases, total travel cost increases and thus we expect fewer visitors to travel to the CINMS. The results of our model confirm that increases in travel cost are a significant variable dissuading individuals from traveling to CINMS. Second as the distance from a California county to a substitute site increases (thus increasing travel cost to the substitute site), individuals will be less likely to visit the substitute site and more likely to visit the CINMS. Our results indicate that substitute distance significantly influence individuals decision to recreate in the CINMS and that the more distant a substitute site, the more likely an individual is to visit the CINMS. In finding that the explanatory variables significantly influenced visitation rate in a pattern similar to that predicted in economic theory, we could test how representative our model was in predicting visitation to CINMS.

The objective of our model was to best describe the factors contributing to an individual's decision to visit the CINMS. To test how closely our model mirrored reality, we predicted a number of visitors to CINMS based upon the reported total travel costs and substitute. In predicting the number of visitors, we compare how closely our model

estimates that actual number of visitors. We found that our predicted number of visitors closely approximated the actual number of visitors. Based on this result, we conclude that our model describes the factors and their proportional influence in contributing to an individual's decision to recreate in the CINMS and the MPAs.

In the ZTCM, we have produced a cost-effective monitoring tool that can monitor the value of a recreational site over time, while simultaneously valuing the area at any one time. Given the needs of our client for a time and cost-effective monitoring tool, we conclude that the ZTCM presents the most appropriate methodology we tested. And while the ZTCM suffers from a handful of limitations that will be made explicit, it nonetheless provides an effective method to monetize the CINMS.

To date NOAA has undertaken exhaustive and comprehensive valuation studies that collect in-depth information on all visitors traveling to recreational site. In conducting these studies, NOAA can predict an accurate and precise value for marine Sanctuaries and MPAs. However, implementing these detailed studies requires significant commitments of both time and money. Based upon the time and funding demands of these individual travel cost studies, it is often the case that only a one time, single study is completed.

By contrast, we present a time and cost effective strategy to value marine sites, including MPAs and Sanctuaries. Though the ZTCM does not present as detailed an analysis as the previously implemented ITCM models, we are confident that our model gives an accurate overview of the consumer surplus of a recreational site. Additionally, since our study demands minimal time and financial resources, our methodology serves as an instrument to continually monitor the value of a recreational site. While calculating a precise consumer surplus of a site is of high importance, it is just as important to monitor the change in value of a site over time. Our methodology, in presenting a time and cost effective protocol, provides a tool to monitor the value of a recreational site over time while simultaneously valuing the site at any one time.

This study provides survey tools, sampling methods, databases, and analytical methods that have been pretested, edited, and will be packaged as a monitoring protocol that will be given to the CINMS for future use. The following recommendations should assist the CINMS or any research group who uses this protocol for monitoring the RNC value of the MPAs in the CINMS. Moreover, this protocol could be applied to socioeconomic monitoring of other marine protected areas worldwide.

6.6.4.2 ZTCM Potential Additions

This Section describes additional components that could be added onto future zonal travel cost models that may help describe a more accurate surplus associated with the MPAs.

6.6.4.2.1 Partial Visits Attributed to MPAs

As discussed in Section 6.3.4, complications arise in trying to separate the visitation rates of "CINMS Excluding MPAs" from "CINMS Including MPAs" since the MPAs are part of the CINMS.

Future studies may wish to address this problem and examine the possibility of attributing partial trip values for passengers who came specifically for the MPAs but also state that they would have come to the CINMS even if the MPAs did not exist. This will help attribute a more accurate surplus to the MPAs in future analyses.

6.6.4.2.2 Hybrid Travel Cost Model

One of the premises of a zonal travel cost model is that every passenger surveyed is representative of their zone. This is an important assumption that enables the use of census data. However, we found that the average annual income for RNC visitors to the CINMS was more than $23,000 more than their particular zonal averages (See Monitoring Protocol CD, Customer Information, 2003 Pretest folder, *Zonal Travel Cost Model_2003Pretest.xls*, Income Worksheet). This indicates that the average visitor to the CINMS may not be representative of their particular zone. Therefore, a hybrid travel cost model that incorporates individual demographic variables with zonal travel cost and substitute costs estimates may have the potential to illustrate a more realistic representation of independent variables such as income and demographic variables.

7. Future Actions and Recommendations

The following section provides large-scale recommendations that may be incorporated into future monitoring efforts.

7.1 Ongoing Monitoring

There is general agreement that socioeconomic monitoring is an essential part of managing a new MPA (Agardy, 2000; Pomeroy et al., 2002; Taylor and Buckenham, 2003). Two different outcomes of the existence of marine protected areas (MPAs) in the northern Channel Islands with respect to recreational non-consumptive (RNC) use may occur:

1. In the Channel Islands, ecological conditions including size and abundance of marine organisms inside the MPAs may increase over time due to the establishment of the MPAs (PISCO, 2002:4). As a result, demand for RNC activities inside the MPAs may also increase over time (Murray et al., 1999; Leeworthy and Wiley, 2002). In this case there would be a positive correlation between increased ecological quality and economic value of MPAs.

2. The visitors to the MPAs may believe that the ecological quality of the sites has increased because of the special conservation status of those areas. This perception of increased quality may not reflect actual ecological conditions documented by scientific studies. Nevertheless, RNC users may choose to visit the northern Channel Islands MPAs based on their perception on the ecological quality. Taylor and Buckenham have shown that higher awareness of the existence of MPAs may result in increased interest on the part of recreational visitors (Taylor and Buckenham, 2003). RNC users may value the existence of MPAs regardless of the actual quality of the marine environment within those MPAs. In this case, the value of MPAs could either increase immediately or over time as visitors begin to perceive a higher environmental quality.

The demand for, and hence value of, RNC use of the MPAs may change over time regardless of the ecological quality of the marine environment within the MPAs. Monitoring RNC values over time will reveal whether RNC users value the idea/existence of a MPA or if they value the expected increase in ecological quality that is likely to occur. If RNC users value the idea of a MPA regardless of the quality, then the economic value of the MPAs should be realized in the first few years before real ecological improvement occurs. By contrast, if users value the increase in habitat and marine life quality that is expected to occur (PISCO, 2002:4), then the value to the recreational industry and users should increase over time as the actual ecological conditions improve.

In order to detect a change in economic value due to a change in perceived or actual ecological quality, this protocol should be used in an ongoing monitoring program aimed at quantifying the economic value of the MPAs. We recommend that the governmental agencies in charge of MPAs management should use this protocol in their MPAs monitoring efforts. Ideally, this protocol would be conducted in conjunction with a more comprehensive monitoring program including all aspects of biological and socioeconomic monitoring as identified at the Marine Protected Areas Monitoring Workshop (NOAA, 2003). Understanding how recreational users value the MPAs will aide the Channel Islands National Marine Sanctuary (CINMS) and the California Department of Fish and Game (CDFG) in understanding the economic benefits and costs associated with MPA designation.

7.1.1 Accounting for Seasonal Variation

As seen in Figure 6.9, there can be a strong variation of the number of visitors to the CINMS during a given year. While the data in this graph refers specifically to wildlife viewing passengers, the seasonal trend may be representative of the charter industry as a whole with respect to RNC use. We expect an increase in non-local visitors during the tourist season of the summer months. Moreover, there is a peak of visitation shown by an increase in number of charter vessel trips during the winter months. It can be assumed that the visitors to the CINMS at different times of the year have different preferences for recreation, and therefore different criteria for choosing to recreate in the

MPAs. Adequate sampling of the MPAs visitor population would require to "catch" all the peaks in visitation for various recreational activities. This information could be compiled from the results of the operator questionnaire for each recreational activity. Once the management agency decides on a total number of passenger surveys to be collected, it can spread that number over the entire year to hit all the peaks and troughs of recreation. This would provide the management agencies with a detailed picture of the variation in recreational use of the MPAs over the course of a given year.

Therefore, surveying regularly throughout the year could ensure that a representative sample of the visitor population is collected. We recommend the passenger survey be conducted at multiple times throughout the year as well as during the week and the weekend to account for seasonal and temporal variation in the type of passengers and their desired activities.

7.2 Supplemental Studies

This monitoring protocol is designed to derive a value of RNC visitors for the CINMS and for the MPAs. In this section, we identify and explain additional studies that can be used to supplement this protocol.

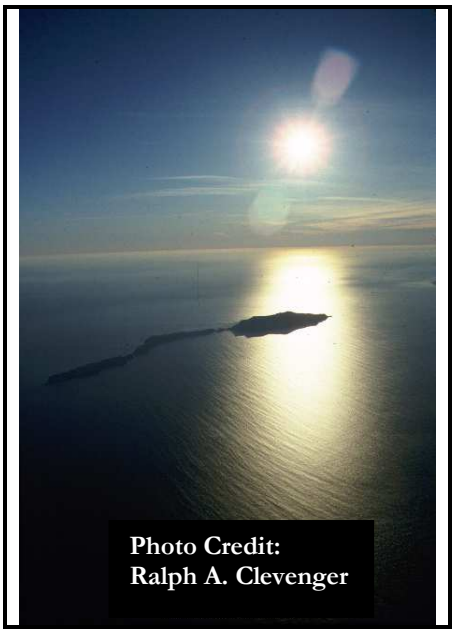


Photo Credit:
Ralph A. Clevenger

7.2.1 Costs, Earnings, and Investments

We did not repeat the entire Kolstad study (Leeworthy and Wiley, 2002) in our operator questionnaire since it was not necessary for our Travel Cost analysis. However, his work to determine the costs, earning, and investments of the charter vessel companies could be incorporated in a complete RNC monitoring protocol to obtain comprehensive data of the economic impact of the MPAs on the charter industry.

7.2.2 Community Economic Impact and User Satisfaction

The Florida Keys National Marine Sanctuary (FKNMS) study (Leeworthy and Wiley [a], 1997; Leeworthy and Wiley [b], 1997) from which we adapted our passenger survey also included additional mail-back expenditure and satisfaction surveys. These additional studies provided information on the community economic impact and the passengers' satisfaction after their trip was complete. This extensive level of surveying may require a substantial incentive for passenger participation, such as a chance to win a free trip to the destination of recreation, as in the FKNMS study.

7.2.3 Other Aspects of RNC Monitoring

During the MPAs Monitoring Workshop in March 2003, the participants identified other RNC activities likely to be impacted by the creation of MPAs (NOAA, 2003). Those RNC categories are:

- Private Boats Study
- Research and Education Study
- Contingent Valuation of Non-Use

Although these categories may make up a substantial portion of the total RNC value that can be attributed to the MPAs, due to time restriction we chose not to address any of these other activities in our study. To measure the value of the MPAs for private boaters and non-users, extensive survey efforts covering a wide geographic area should be developed. Unlike charter vessel passengers, private boaters and non-users do not aggregate in specific areas at specific times. This results in the need to design a comprehensive, challenging sampling scheme. A complete monitoring program designed to assess the total socioeconomic impact of MPAs would need to address these additional RNC categories.

7.2.4 Ecological Link

The RNC value associated with the CINMS and the MPAs could be qualitatively linked by examining correlations between the change in RNC value and of actual ecological quality (sea life size, abundance, and diversity) through time. This correlation will help to resolve the question of whether a change in RNC value is a function of an actual change in quality through time or a perceived change in quality largely resulting from the name designation alone.

Potential methods could include asking visitors to identify their expectations of ecological quality from a series of representative photographs of varying levels of size, abundance, and diversity of sea life in a "typical" recreation area in the CINMS. A rough version of this is illustrated as Appendix E (Please note: We do not recommend using this particular appendix for future surveys. This appendix was created only to illustrate a possible methodology to quantify quality. A more accurate representation would have to be created for use in a full-scale future survey.) This information could then be regressed as an independent variable that helps to describe why and how often an individual may visit the CINMS (See Section 5.2.2).

In addition, contingent valuation questions could also help to project how potential changes in quality may relate to future changes in RNC value. Questions such as "How much more would you be willing to pay for a trip to the CINMS if the ecological quality defined above improved by x%?" This would require a new Office of Management and Budget (OMB) clearance number to be approved before any surveys were administered. Both of these potential tools would likely require use of an individual travel cost model

(ITCM). Complexities involved with this model are addressed in Section 5.1.2 and would have to be addressed by a more specifically focused future study.

7.3 Future Projects

This project provided the beginning of a fruitful relationship between CINMS and graduate students of the Donald Bren School of Environmental Science and Management (Bren School). As this experience was mutually beneficial, we encourage the pursuit of more cooperative projects between the CINMS and Bren School students. Several types of partnerships can be developed, and are briefly presented below.

7.3.1 Bren School Group Projects

Other aspects of RNC monitoring mentioned in Section 7.2.3 could be addressed in future Group Thesis Projects. While we have laid the groundwork for a partnership with the CINMS during our Group Project, there remains years of work to design and implement a comprehensive socioeconomic monitoring program for the MPAs. Bren School students could benefit from the experience of working with a federal agency involved in environmental protection and conservation and the agency could benefit from the development of a socioeconomic monitoring protocol at low cost to the government.

7.3.2 Assistance with Monitoring

The implementation of this and other monitoring protocols will require an extensive survey effort on the part of the management agencies. Surveying RNC users or charter vessel operators will be needed in the implementation of this protocol. Moreover, there may a need for additional data collection for other potential protocols such as those designed to monitor private boat use, education and research use, and non-use of the MPAs. Bren School students may find that assisting the CINMS, as intern or volunteer, with the collection of survey information is a valuable experience.

8. Conclusion

Socioeconomic monitoring of the northern Channel Islands marine protected areas (MPAs) can provide an understanding of the costs and benefits to different user groups and how these costs and benefits may change over time. Increased recreational non-consumptive (RNC) activities in the Channel Islands National Marine Sanctuary (CINMS) and the MPAs represent a potential positive economic impact of the MPAs.

Several experts encourage socioeconomic monitoring as an integral part of MPA management. Steven Palumbi of the Pew Oceans Commission (2002:37) strongly argues that "continuing research on MPAs should include social and economic effects of MPAs as well as their effect of their impact on the regional marine ecosystem". The success of MPAs depends heavily on the accurate identification of user groups and their inclusion in the management process including monitoring (Agardy 2000). Agardy (2002) has also

stated "the most crucial information for MPAs is inherently societal rather than scientific". In addition, Luttinger (1997) has proposed that socioeconomic monitoring identifying benefits to tourism is more likely to increase public support.

While the importance of socioeconomic monitoring can been demonstrated, it is also important to recognize that monitoring adds to the costs of MPA management (Sanchirico et al., 2002). Therefore, developing a monitoring program to work within allotted budget of management agencies is critical. Through this study, we have produced a cost-effective monitoring tool that can be used to measure the change in charter vessel RNC value of the CINMS and the MPAs over time. Based upon the results of our model, we are confident that we constructed an effective methodology and economic model to value the charter vessel RNC value that can be attributed to the CINMS and the MPAs. By conducting a pretest, we have determined that our economic model provides an accurate instrument to measure the value RNC users attribute to the CINMS and the MPAs. We have intentionally kept the surveys and analytical methods as simple as possible without sacrificing accuracy to allow the monitoring protocol to be implemented regularly, with a relatively low time and financial commitment.

It should be re-emphasized that the results for the value of the CINMS and the MPAs presented in this report are likely a significant underestimate of the actual value. First, our methodology is designed conservatively to give a lower bound estimate of the actual value. Secondly, the number of surveys we conducted for this pretest was adequate only to test our methodology and model, and is not a representative sample of annual RNC visitors to the CINMS. It was important for us to conduct a pretest and develop accurate methodology before incurring the time and expenses of a full-scale study necessary to capture the precise value of the CINMS and MPAs. Nevertheless, we report that the pretest consumer surplus calculated for the CINMS is $239,000 and for the MPAs $14,000.

The MPAs in the state waters surrounding the northern Channel Islands are the first significant network of MPAs in the western United States. In several ways, the Channel Islands MPAs can be considered a test case for the future use of MPA networks as a marine management strategy. Using this monitoring protocol to understand the potential change in RNC value of the MPAs will provide one small piece of the puzzle to evaluate MPA effectiveness. In addition, the use of this protocol in conjunction with a comprehensive ecological and socioeconomic monitoring program could help policy makers evaluate whether MPA networks are an effective management tool that could potentially be implemented worldwide.

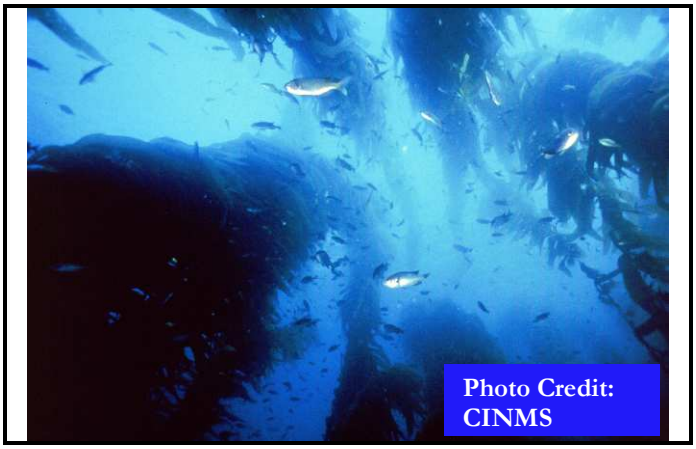


Photo Credit:
CINMS

P. Monitoring Protocol

This monitoring protocol is designed to guide any user through the steps necessary to complete a travel cost analysis. It explains how to complete a survey of recreational non-consumptive (RNC) users of the Channel Islands National Marine Sanctuary (CINMS) and northern Channel Islands marine protected areas (MPAs). The primary purpose of this protocol is to measure the value of the MPAs to RNC charter vessel passengers. In the protocol, we provide step-by-step instructions on how we recommend conducting a monitoring study, from surveying through analysis. For more details regarding background theory or assumptions, refer to the previous sections of this final report.

We provide a monitoring protocol CD containing digital copies of all the files discussed in the following methodology sections. These files include the actual surveys and databases used in our 2003 pretest, as well as recommended surveys and databases to be used for future monitoring. In several cases, we have made adjustments to our original files to improve them for future use in ongoing monitoring. Included within each folder and sub-folder of the monitoring protocol CD is a file called *DescriptionOfFiles_FolderName.doc* that describes the contents of each folder and briefly summarizes the purpose of each file.

The following sections act as a "how to" manual to guide future researchers through conducting surveys and using the travel cost model we developed. By comparing results from year to year, this protocol can be used as an ongoing travel cost analysis to monitor for change over time in economic value of the CINMS and the MPAs.

P.1 Operator Information

We developed two operator surveys, based on previous studies conducted for NOAA: a complete survey and a seasonality survey. Both surveys use the same OMB (Office of Management and Budget) clearance number. The current OMB number will expire in 2006 (OMB# 0648-0408 Expiration Date: 08/31/2006), at which point the survey will need to receive an extension before it can continue to be used.

The *CharterSurvey_Complete.doc* (See Appendix PA, or Monitoring Protocol CD, Operator Information folder) can be used to run a study of the economic impact of the MPAs on the charter industry. We did not run the complete economic impact analysis during our pretest since financial data can be difficult to obtain from the charter operators, and it was not essential for the purposes of this study. The *CharterSurvey_SeasonalityOnly.doc* (See Appendix PB, or Monitoring Protocol CD, Operator Information folder) can be used to collect information on the seasonal variation in number of passengers and types of activities offered. We used this survey for our 2003 pretest. We describe our recommended sampling procedures below.

P.1.1 Operator Sampling Procedures

We have provided a list of all known charter operators conducting trips for the purpose of RNC activities in the CINMS in *Operator_List.xls*. (See Monitoring Protocol CD, Operator Information folder) We recommend this database be updated prior to each new survey year to ensure all operators are included in the database. We recommend that all charter operators be included in the operator study, however, it appears that a small percent of the operators run a majority of the trips. We feel that while obtaining a complete census of all operators would be preferable, surveying the largest operators would likely give a fair representation of visitation and recreation in the CINMS.

Based on our pretests, we are recommending one-on-one surveying, preferably in person. The researcher should walk the respondent through the survey, ensuring that they understand the questions, and are responding to them accurately. For example, since some operators run trips that do not enter the Sanctuary waters, it is important to ensure that they are only recording information on the questionnaire for trips that visit the CINMS. Specifically, whale watching vessels should most likely not include trips for the Gray Whale's northern migration when the whales are close to the mainland, and the charter vessels do not enter Sanctuary waters. It is also important to note that trip information is collected for the previous year, not a 12-month period prior to the survey date. (For example, we collected number of trips and passengers from 2002 for our 2003 study.)

We recommend calling the operators to explain the study and schedule an appointment to complete the questionnaire. The operators need to be aware that they may need to prepare some information in order to answer the questions. For our study, some operators had to spend time tabulating their logbooks to be able to provide us with monthly visitor totals for each activity. Additionally, we want to stress the importance of maintaining a good working relationship with the operators since their cooperation is both essential and beneficial to the CINMS.

P.1.2 Changes to Survey

Each year the operator survey is conducted, a few changes will need to be made to the survey. The researcher should change the year of desired data (question #5), and the year for the maps (questions #2 and #3). It will likely only be necessary to ask the operators to complete one map, denoting areas of activity for the previous year. We conducted our pretest with two maps since our study period spanned the time before and after MPAs were established.

P.1.3 Operator Database

We determined that the Access database originally developed (as discussed in section 5.2.2), may not be the best method for entering the operator data. Please refer to the file *Operator_ScalingData.xls* on the Monitoring Protocol CD, Operator Information, 2003 Pretest folder to see an alternative data entry system we used where we could simultaneously analyze the data. We designed a template version of this file for future

monitoring efforts (See Monitoring Protocol CD, Operator Information, *Operator_ScalingData_Protocol.xls*).

P.1.4 GIS and Spatial Analysis

We were not able to complete a spatial analysis during this study. However, we collected spatial data from the operators who completed our pretest questionnaire. Their responses could still be used for future studies to compare the location of operation for different activities. For future monitoring, we recommend that the maps continue to be included in the questionnaire. The researcher can add the data into a GIS to create a spatial representation of where operators are running certain activities. This spatial analysis may be able to answer questions regarding change in use of certain areas of the CINMS.

P.1.5 Use of Operator Data

The operator survey data is important to understand the seasonal variation in the number of passengers and desired activities, and to allow the visitation to be scaled up for annual visitation.

P.1.5.1 Seasonal Variation

As discussed in Section 7.1.1 of the final report, the customer survey must account for seasonal variation. For example, our pretest survey of charter vessel passengers occurred primarily during the months of October and November 2003. Using the data collected from the operators, we were able to see that only ~9% of the industry's annual visitors came during our sample period. (See Monitoring Protocol CD, Operator Information, 2003 Pretest folder, *Operator_ScalingData.xls*) Therefore, for a full-scale study, it may not be reasonable to assume that the visitors during the months of October and November were representative of visitors for the entire year. The operator data will allow the researcher to identify peak visitation periods for different activities and ensure that visitor surveying occurs during a sample of those peak periods.

P.1.5.2 Scaling to Annual Consumer Surplus

The operator data is also important to scale the final consumer surplus value from the travel cost analysis up to represent annual consumer surplus. Scaling to annual surplus provides a consistent time period (annual visitation) from which to compare all future travel costs analysis in the CINMS. This addresses the problem that future surveys may not occur during the same sampling period or capture the same number of respondents.

If a complete census of operators is not achieved in the during the operator questionnaire, then the total annual passengers for all RNC activities will need to be considered a low bound for true annual visitation. This will be important to note when using the scaling factor since you are only scaling up to annual visitation of the operators who participated in the survey.

The calculations necessary to determine a scaling factor have all been entered in a blank template (See Monitoring Protocol CD, Operator Information,

Operator_ScalingData_Protocol.xls) where future researchers can simply enter the operator data, and the calculations should automatically occur. The steps to calculate the scaling factor are explained below.

To use the operator data to scale visitation, first the researcher must calculate the total number of passengers per month per activity by multiplying the stated number of trips/month by the stated number of passengers/trip. Then calculate the total number of passengers per month by adding passengers per month for each activity. Be sure to only include RNC passengers. If some companies run mixed-use trips, the researcher may need to scale down the monthly visitors to include only RNC visitors.

Once the researcher has calculated the total number of passengers per month for all activities, they need to determine what percent of annual visitors were surveyed. First calculate what percent of visitors were surveyed during the sample period, and what percent of annual visitors the sample period represents. From this information, the researcher should be able to determine what scaling factor is necessary to make the sample equal 100% of total annual visitors by dividing 100% of visitors by the total percent of visitors surveyed. The resulting number is the scaling factor.

The scaling factor should be applied to the absolute consumer surplus (not per person surplus) that is calculated by completing the group logit regression in the TCM. Simply multiply the absolute consumer surplus by the scaling factor to give you a value for annual surplus.

P.2 Customer/Passenger Information

The customer survey is necessary to collect the information to run the travel cost model. Based on our pretest results, we are recommending different surveys and sampling methods than those used in our 2003 study. The new surveys, data tally sheets, and recommended sampling procedures are outlined below.

P.2.1 Customer Sampling Procedures

We have divided our survey into two parts: a *simple* survey and a *user statistics* survey. The two surveys can be conducted separately or simultaneously. The simple survey should be conducted regularly to be able to monitor for a change in the RNC value of the MPAs. However, it is not necessary to conduct the user statistics survey as frequently if there are budget or time constraints. The user statistics survey could be run every other time in conjunction with the simple survey, or as needed. The customer survey should be conducted using a sampling period that accounts for seasonal variation and sampling biases as discussed in 7.1.1 of the final report.

Both surveys use the same OMB (Office of Management and Budget) clearance number. The current OMB number will expire in 2006 (OMB# 0648-0408 Expiration Date: 08/31/2006), at which point the survey will need to receive an extension before it can continue to be used.

P.2.2 Simple Survey for a Zonal Travel Cost Model

To run a simple zonal travel cost model, the researcher only needs to use the survey entitled *Customer_SimpleSurvey.doc.* (See Appendix PC, or Monitoring Protocol CD, Customer Information folder). The survey should be conducted as a one-on-one interview, and should take only a couple of minutes. Ideally, the researcher should laminate a copy of the survey and show it to the respondent as they conduct the survey. The researcher should guide the respondent through each question, ensuring that they understand the questions and are answering them accurately. The researcher should record the responses themselves on the *Customer_SimpleTallySheet.doc.*(See Appendix PD, or Monitoring Protocol CD, Customer Information folder).

The researcher should be sure to record the date and charter company on the tally sheet. They should also assign each respondent a number used later in creating unique IDs in the database. For the residence, record the appropriate number for the respondent's county. If the respondent is from outside California, record the two-letter state code. Record a "Y", "N", or "DK" for the visit and MPA purpose questions. Record the appropriate letter for the activity purpose question.

P.2.3 Supplementary Survey for User Statistics

Additionally, we have developed a survey called *Customer_UserSurvey.doc* (See Appendix PE, or Monitoring Protocol CD, Customer Information folder) to capture user demographic information as well as knowledge, attitudes and perception. This survey is not designed to stand alone, and should be used in conjunction with the *Customer_SimpleSurvey.doc.* When conducting both surveys, the researcher should use only the *Customer_CompleteTallySheet.doc.*(See Appendix PF, or Monitoring Protocol CD, Customer Information folder) to record all of the answers for both surveys.

Once again, the researcher should laminate a copy of each survey and show it to the respondent as they conduct the survey. The researcher should guide the respondent through each question, ensuring that they understand the questions and are answering them accurately. The researcher should be sure to record the date and charter company on the tally sheet. They should also assign each respondent a number used later in creating unique IDs.

For every question, the researcher should record the appropriate letter or number. For the importance ratings, it will be important to ensure the category and respondent's number are correctly matched. For the "Most Important Factor", record the letter in front of the importance factors on the previous question. The next two quality questions refer specifically to the respondent's chosen most important activity. For the "Quality Previous", the researcher should be sure that the respondent is referring to a visit prior to the establishment of the MPAs in April 2003. If the respondent has not visited prior to April 2003, record "NA" and skip to the next question.

P.3 Instructions for Answering User Statistics Questions

User statistics can help understand the interests and awareness of RNC passengers who visit the CINMS. These questions we included determine passengers' primary purpose for coming to the CINMS, the importance of particular factors in deciding to make the trip, and their understanding of the levels of protection afforded by CINMS and the MPAs.

In this protocol, we have developed a template spreadsheet for calculating all of the user statistics. We recommend pasting the survey results from the Access database into the appropriate columns in the Excel spreadsheet. Most calculations should occur automatically, but we have described the steps for running the calculations below. Some changes will need to be made to the Excel spreadsheet template to adjust for the number of total survey responses. The first worksheet "All Visitors Surveyed" can be used to calculate the user statistics. To determine the user statistics for only the RNC visitors, follow the instructions on the second sheet "RNC Visitors Only".

The following section uses the following conventions:

- Access Database refers to file: *Customer_database.adp* (See Monitoring Protocol CD, Customer Information folder)
- Excel Spreadsheet refers to file: U*ser_Statistics_Protocol.xls* (See Monitoring Protocol CD, User Statistics folder)
- Paste survey responses from the Access database into the Excel spreadsheet
- The heading code from the Access database that the researcher should use for each question is identified in brackets (i.e. [HEADING CODE])
- The heading code corresponds with the columns in the Excel spreadsheet where the data should be pasted
- We have designed the spreadsheet so the necessary calculations occur automatically, but some adjustments will need to be made to account for the number of survey responses
- We have provided a column with red "answer" cells for each question, where the result of the question can be pasted. This allows all results to be visible at the top of the spreadsheet, which eases data analysis.
- For most heading or result cells, we have included a comment (identified by a red flag in the upper right corner of the cell), which explains the purpose of the column or cell. View the comment by holding the cursor over the cell.

P.3.1 Reasons for Visiting the CINMS

This section address several questions aimed at determining the visitors' reasons for visiting the CINMS and the MPAs. The specific question being addressed is identified in quotes.

P.3.1.1 "What factors are most important to users for an ideal recreational experience?"

This question is addressed by passengers rating the importance of particular factors that contributed to their decision to recreate in CINMS. The following columns need to be

pasted from the Access database into their respective positions in the "Important Factors" heading: [KELPAB], [FISHAB], [VIEWDV], [CATCHDV], [WILDVIEW], [CROWD], and [PROT].

Average the total score for each recreational factor. The average importance of each factor (reported in red) can be used to rank the recreational factors for an average passenger (ranking highest average to lowest average). We have created a column containing red cells where the final average for each factor can be pasted for easier comparison. We also added a comment in each red cell to identify which factor should be pasted into the cell.

P.3.1.2 "Are recreational users coming to the CINMS specifically to use the MPAs?"
To answer this question, paste in column [MPAPP] from the Access database. Then dummy the variable, giving a value of 1 for "yes", and 0 for "no". Average the dummy column. (We have provided a red cell to paste the average for easier use.) The result is the percent of recreational users surveyed who came specifically because of the MPAs.

P.3.1.3 "Which activities are their primary reasons for coming to the CINMS?"
Paste column [APP] from the Access database into the corresponding column in "Primary Purpose" in the Excel spreadsheet. Dummy the variable for each activity, giving a value of 1 if the activity was listed. Average each activity, and paste the result into the corresponding red answer cell. The result is the percent of visitors whose primary purpose for visiting the CINMS was the corresponding specific activity.

P.3.2 Knowledge and Perceptions
The survey includes several questions aimed at determining the visitors' knowledge and perceptions of the CINMS and MPAs. The specific question being addressed is identified in quotes.

P.3.2.1 "Is there any perceived change in these factors since the establishment of the MPAs?"
Paste columns [QDAY] and [QPREV] into their respective columns in "Perceived Change", in the Excel spreadsheet. Calculate the difference between previous and current perceived quality for each respondent. Average the total differences, and paste the result into the red answer cell. A positive value indicates that on average, passengers expect the quality of their most important factor to be greater than when they last visited CINMS (before April 2003, when the MPAs were implemented). A negative number indicates that passengers expect the quality of that factor to be worse since their last visit (before April 2003, when the MPAs were implemented).

P.3.2.2 "Are recreational users aware of the level of protection afforded by MPAs?"
Paste column [MPAKN] into the corresponding column in "Protection: MPA1" in the Excel spreadsheet. Dummy the variable, giving a value of 1 for the answer "A", and 0 for any other answer. Average the dummy column. Paste the result into the red answer

cell. Since "A" is the correct answer to the survey question, the result is the percentage of recreational users that are aware of the level of protection afforded by the MPAs.

P.3.2.3 "Do recreational users think that the MPAs prohibit recreational activities?"
Paste column [MPAKN] into the corresponding column in "Protection: MPA2" in the Excel spreadsheet. Dummy the variable, giving a value of 1 for the answer "C", and 0 for any other answer. Average the dummy column. Paste the result into the red answer cell. The result is the percentage of recreational users that think the MPAs prohibit recreational activities.

P.3.2.4 "Are recreational users aware of the level of protection afforded by the CINMS?"
Paste column [CIKN] into the corresponding column in "Protection: CINMS1" in the Excel spreadsheet. Dummy the variable, giving a value of 1 for the answer "B", and 0 for any other answer. Average the dummy column. Paste the result into the red answer cell. Since "B" is the correct answer to the survey question, the result is the percentage of recreational users that are aware of the level of protection afforded by the CINMS.

P.3.2.5 "Do recreational users think that the primary protection CINMS affords is protection of most sea life from fishing/harvesting?
Paste column [CIKN] into the corresponding column in "Protection: CINMS2" in the Excel spreadsheet. Dummy the variable, giving a value of 1 for the answer "A", and 0 for any other answer. Average the dummy column. Paste the result into the red answer cell. The result is the percentage of recreational users that think the CINMS protects most sea life from fishing/harvesting.

P.3.2.6 "Do recreational users think the level of protection afforded by MPAs is the same as the protection afforded by CINMS?"
Paste columns [MPAKN] and [CIKN] into their corresponding columns in "Protection: CINMS = MPAs" in the Excel spreadsheet. Dummy [MPAKN], giving a value of 1 for the answer "A" and 0 for any other answer. Dummy [CIKN], giving a value of 1 for the answer "A", and 0 for any other answer. Check to see if the respondent's answers were the same by running an "if" statement, giving a value of 1 if the answers were the same. Average the equal column and paste the result into the red answer cell. The result is the percentage of recreational users that think that the level of protection afforded by MPAs is the same as the protection afforded by CINMS (That both areas restrict fishing and harvesting).

P.3.3 Demographic Information
The survey includes several questions aimed at determining the visitors' demographic information. The specific question being addressed is identified in quotes.

P.3.3.1 "What is the average age of recreational non-consumptive users of CINMS?"
Paste column [YEAR] into the corresponding column in "Average Age" in the Excel spreadsheet. Enter the year in which the survey is administered into the yellow highlighted cell below "Survey Year". Subtract the respondent's year of birth from the survey year to determine the respondent's age. Average the ages and paste the result into the red answer cell. The result if the average age of RNC users of the CINMS.

P.3.3.2 "What is the average annual income of recreational non-consumptive users of CINMS?"
Paste column [INCOME] into the corresponding column in "Average Income" in the Excel spreadsheet. A complex "if" statement in the following two columns translates the respondent's answer into average income. The average is the middle of the income range of their answer. Average the column "average Income" and paste the result into the red answer cell. The result is the average individual income of RNC users.

Note: we used median income instead of average income to avoid skew by respondents with income over $150,000. A simple histogram may be useful to illustrate the relative number of individuals that fall into each income bracket.

P.3.3.3 "What is the distribution of education levels of recreational non-consumptive users of CINMS?"
Paste column [EDU] into the corresponding column in "Average Education Level" in the Excel spreadsheet. Translate the column into numerical responses by giving "A" a value of 1, "B" a value of 2, "C" a value of 3, "D" a value of 4, "E" a value of 5, and "F" a value of 6. Average the "Translate" column and paste the answer into the red answer cell. The result is the average educational level of recreational users surveyed. Since each number corresponds to a different education level, the number must be matched up with the categories to make sense. The corresponding categories are all described in the worksheet. For example, a value of 4.25 would equate to the average user have some college completed but not a college graduate.

Next, dummy a column for each grade level, giving a value of 1 if the respondent listed that grade level as their top education completed (see "if" statements in the grade level columns). Sum the number of responses in each grade level column. Then sum all of the responses for a "grand total". Calculate the percent of each grade level by dividing the sum by the grand total.

To produce a more accurate representation of percent users with various education levels, use the percents for each grade level to create a pie chart.

P.3.3.4 "What is the average male to female ratio of recreational non-consumptive users of CINMS?"
Paste column [SEX] into the corresponding column in "Male: Female Ratio" in the Excel spreadsheet. Dummy the columns, giving "Male" a value of 1 and "Female" a

value of 0. Average the variable dummy and paste the answer into the red answer cell. This is the percent males. To calculate the percent females, subtract the percent males from 1.

P.3.3.5 "What is the distribution of ethnicity of recreational non-consumptive users of CINMS?"

Paste column [ETHN] into the corresponding column in "Ethnicity" in the Excel spreadsheet. Create a dummy column for each ethnicity, giving a value of 1 if the respondent listed the corresponding letter for the ethnicity. Sum the number of respondents for each ethnicity, and sum the total ethnicity responses. Average each ethnicity by dividing the sum of each ethnicity by the total sum of all ethnicities. Paste the result in the corresponding red answer cells. The result is the percent of each ethnicity observed.

To produce a more accurate representation of percent users that identify with each ethnicity, use the averages for each ethnicity to create a pie chart.

P.3.3.6 "What is the distribution of employment status of recreational non-consumptive users of CINMS?"

Paste column [EMPLOY] into the corresponding column in "Employment" in the Excel spreadsheet. Create a dummy column for each employment status, giving a value of 1 if the respondent listed the corresponding letter for the employment status. Sum the number of respondents for each employment status, and sum the total employment responses. Average each employment status by dividing the sum of each employment status by the total sum of all employment responses. Paste the result in the corresponding red answer cells. The result is the percent of each employment status observed.

To produce a more accurate representation of percent users in each of these categories, use the average for each employment status to create a pie chart.

P.4 Analysis Instructions for Zonal Travel Cost Model (ZTCM)

In order to calculate the consumer surplus attributable to the MPAs with this analysis, the researcher will need to use data from three sources:

- The Operator Scaling Data spreadsheet (file)
- The Customer Access database (file)
- Census data (provided in file name)

In this protocol, we designed a template spreadsheet for ZTCM calculations. We recommend pasting the survey results from the Access database into the appropriate columns in the Excel spreadsheet. Most calculations should occur automatically, but we have described the steps for running the calculations below. Some changes will need to be made to the Excel spreadsheet template to adjust for the number of total survey responses. Justification for our methodology choices can be found in the final report.

In this protocol, we attempt to follow the pretest as much as possible, so the researcher has an example of how each step was previously preformed. However, we have changed some column names and places in the protocol version to make it more efficient.

For the following sections, we used the following conventions:

- Access Database refers to file: *Customer_database.adp* (See Monitoring Protocol CD, Customer Information folder)
- Excel Spreadsheet refers to file: *Zonal Travel Cost Model Protocol.xls* (See Monitoring Protocol CD, Customer Information folder)
- Paste survey responses from the Access database into the Excel spreadsheet
- The Excel spreadsheet is divided into a number of different worksheets that allow the user to calculate the surplus on a step-by-step basis
- Each worksheet is subdivided into major sections by vertical borders and a different color heading for a visual differentiation
- The heading code from the Access database that the researcher should use for each question is identified in brackets (i.e. [HEADING CODE])
- The heading code corresponds with the columns in the Excel spreadsheet where the data should be pasted
- We have designed the spreadsheet so the necessary calculations occur automatically, but some adjustments will need to be made to account for the number of survey responses
- For most heading cells, we have included a comment (identified by a red flag in the upper right corner of the cell), which explains the purpose of the column or cell. View the comment by holding the cursor over the cell.

P.4.1 Formats

This worksheet explains the color codes used throughout the remainder of the worksheet.

Yellow:	Important columns or cells that highlight information helpful in understanding the methodology
Blue:	Primary columns that were used in a proceeding worksheet
Orange:	Data that is provided from a preceding worksheet
Purple:	Census data
Green:	Zones that have had survey information collected from them for use in the regression
Dark Gray:	Columns of data that are found to not be significant in the regression
Red:	Surplus values are highlighted in red.

Note: Each of the following sections under this subheading correspond to a separate worksheet in the Excel spreadsheet

P.4.2 Passengers (Pre-sorted)

This sheet is divided into four color-coded sections:

1. Visitor Information

This section is composed of the passenger identification number [ID] and the county of their primary residence [CTY]. Paste in both of these columns from the corresponding columns in the Access database.

2. Purpose

This section is designed to sort passengers into two categories:

- Those whose primary purpose for their trip to the Santa Barbara/Ventura area is RNC activities in the CINMS
- Those whose primary purpose for their trip is for something other than a visit to the CINMS, or whose trip is consumptive in nature.

Paste columns [APP] and [VPP] from the Access database and pasted into their respective columns in the Excel spreadsheet. Dummy [APP], giving it a value of 0, if the respondent listed consumptive snorkeling or consumptive diving as their primary activity. Dummy [VPP], giving "yes" a value of 1. These two dummy variables determine if these individuals will be included in the analysis. (This analysis includes only non-consumptive passengers whose primary purpose was to come to the CINMS.)

3. CINMS Including MPAs

This section uses the information from the previous section to identify those passengers whose primary purpose is non-consumptive recreation in the CINMS and who do not report the MPAs as their primary reason for coming. This calculation should occur by multiplying the "RNC Dummy" and "PP Dummy" from the "Purpose" section.

No new data needs to be input into this section. The column entitled "Total Person/Trips per Zone" should be left blank, since it will not be used until a different spreadsheet.

4. CINMS Excluding MPAs

This section further subtracts out the number of passengers whose primary reason for deciding to come to the CINMS was due to the MPAs. This leaves only the number of visitors who would have come if the MPAs were never implemented (those passengers stating they came explicitly for the MPAs). For this section, paste [MPAPP] into the appropriately marked column. Dummy the variable by giving a value of 1 to "yes", and 0 to any other answer.

The two remaining columns are not used until a later spreadsheet and can be left blank.

P.4.3 Passengers (Sorted)

All of the data in the worksheet "Passengers Pre-sorted" must now be copied and pasted to the worksheet "Passengers Sorted". In the "Passengers Sorted" spreadsheet, highlight all of the data except the colored headings; sort the data alphabetically by county. (Note: be very careful to select ALL of the data except for the headings. If the researcher is not familiar with the "sort" function in Excel, we recommend they get assistance to avoid scrambling the data.)

Visually separate each group of passengers from the same county into their corresponding zones by adding a line across the bottom of each zonal group. Now the researcher wants to determine the total number of passengers to include in the analysis, based on the exclusion principles of being a RNC visitor whose primary purpose is to visit the CINMS. In column "Person/Trips per Zone" in the section "CINMS Including MPAs", sum the Exclusion dummy from each zone and enter the value into the bottom cell for each zone. (for example, if Alameda County had 5 respondents whose values in Exclusion dummy column read 0, 1, 1, 0, 1, enter the value "3" in the bottom row of the Alameda zone in the column "Person/Trips per Zone".)

Repeat this process in section heading "CINMS Excluding MPAs" by summing the MPAPP dummies, putting the sum in the bottom row for each zone of the "MPA Preference" column. This calculates the number of person-trips per zone from passengers who would visit the CINMS regardless of the existence of the MPAs.

Calculate the "Total CINMS person trips per zone" by subtracting the "MPA preference trips per zone" from "Total Person/Trips per zone".

P.4.4 Distance and Time Calculations

This worksheet calculates the average driving distance and driving time from each zone. The information on this sheet should not need to be changed.

P.4.5 CINMS TC

This worksheet calculates the total travel cost and the visitation rate for each zone. This first part of this worksheet should not require any changes since driving distances, times, and travel costs should all stay the same from year to year. However, the census data (zonal income and zone population) should be updated periodically to reflect changing demographics. The 2000 U.S. Census data is the most current at time of printing.

To calculate the "Visitation Rate", paste the total number of trips per zone, as calculated in "CINMS Including MPAs" and "CINMS Excluding MPAs" sections in the "Passengers Sorted" worksheet into the corresponding "Person trips per zone" columns under the "CINMS Including MPAs" and "CINMS Excluding MPAs" sections in the "CINMS TC" worksheet. Remember to paste in only <u>one</u> value per zone.

P.4.6 Substitute TC

This worksheet calculates the total travel cost from each zone to the substitute site. This sheet should not require any changes since driving distances, times, and travel costs should all stay the same from year to year. However, the census data (zonal income and zone population) should be updated periodically to reflect changing demographics. The 2000 U.S. Census data is the most current at time of printing.

P.4.7 Consumer Surplus

This worksheet is used to calculate the consumer surplus for the CINMS Including MPAs, CINMS Excluding MPAs, and for the MPAs alone.

First,

- Paste the two columns of visitation rates calculated in the "CINMS TC" worksheet into the corresponding columns in this worksheet ("Observed Visitation Rate CINMS Including MPAs", "Observed Visitation Rate CINMS Excluding MPAs").
- Paste in "TTC" from worksheet "CINMS TC", column "Total Travel Cost" under heading "Total Travel Cost." Paste in "Substitute TTC" from worksheet "Substitute TC", column "Total Travel Cost" under heading "Total Travel Cost."
- The zonal income and population size columns should be updated to reflect the most current Census data.

Next the researcher needs to find the coefficients to maximize the log-likelihood function. (This equation predicts the coefficients that best describe the relationship between independent variables and visitation rate. For a detailed explanation, see Section 6.6.2 in the final report.) Find the log-likelihood function by scrolling right to the blue column "Log Likelihood Function CINMS Including MPAs", and look at the bottom yellow cell (sum of all zonal log-likelihood functions). Run Excel Solver and maximize this cell by changing cells B7 thru B10.

Repeat the above process to maximize the log-likelihood of "CINMS Excluding MPAs", by changing cells B25 thru B28.

The result of running Solver to maximize the log-likelihood functions (Including and Excluding MPAs) will predict the coefficients for the demand equation, which will fill in the cells for the remainder of this spreadsheet.

The consumer surplus results will be found in the red answer cells on the left side of the worksheet. Paste in scaling factor calculated in Section P.1.5.2. (In file: Operator_ScalingData_Prolotocol.xls)

The total surplus is calculated by multiplying the sum of all zonal surplus values by the scaling factor. The average surplus per visitor is calculated by dividing the total surplus by the predicted number of visitors. This can be done for CINMS Including MPAs and CINMS Excluding MPAs. The surplus value for the MPAs alone is then calculated by subtracting "Excluding" from "Including".

P.4.8 Likelihood Calculations: Total Travel Costs, Substitutes, Income

These worksheets are used as an intermediate step between calculating consumer surplus and determining the likelihood results. In these sheets, the researcher will be able to determine if the independent variables are significant.

First, in worksheet "Likelihood Calcs TTC", paste the two columns of visitation rates calculated in the "CINMS TC" worksheet into the corresponding columns in this worksheet ("Observed Visitation Rate CINMS Including MPAs", "Observed Visitation Rate CINMS Excluding MPAs"). Paste in "TTC" from worksheet "CINMS TC", column "Total Travel Cost" under heading "Total Travel Cost." Paste in "Substitute TTC" from worksheet "Substitute TC", column "Total Travel Cost" under heading "Total Travel Cost."

Find the log-likelihood function by scrolling right to the blue column "Log Likelihood Function CINMS Including MPAs", and look at the bottom yellow cell (sum of all zonal log-likelihood functions). Run Excel Solver and maximize this cell by changing cells B7 thru B9. Repeat the above process to maximize the log-likelihood of "CINMS Excluding MPAs", by changing cells B25 thru B27.

Repeat this entire process in worksheets "Likelihood Calcs Substitutes" and "Likelihood Calcs Income".

P.4.9 Likelihood Results

Paste only the values (choose paste special → values) from columns AD-AG from the Consumer Surplus sheet into the corresponding columns in the "Consumer Surplus" section of this sheet. (Be careful to only paste the values from the previous sheet.)

Paste only the values (choose paste special → values) from columns AD-AG from the Consumer Surplus sheet into the corresponding columns in the "Likelihood Calcs TTC" section of this sheet. (Be careful to only paste the values from the previous sheet.)

Paste only the values (choose paste special → values) from columns AD-AG from the Consumer Surplus sheet into the corresponding columns in the "Likelihood Calcs Substitutes" section of this sheet. (Be careful to only paste the values from the previous sheet.)

Paste only the values (choose paste special → values) from columns AD-AG from the Consumer Surplus sheet into the corresponding columns in the "Likelihood Calcs Income" section of this sheet. (Be careful to only paste the values from the previous sheet.)

The likelihood ratios on the left side of the worksheet should be automatically calculated. Consult a standard statistics textbook chi-squared distribution tables to check the statistical significance of the likelihood ratios (Degrees of freedom = 1). If $P<0.05$, we assume that the variables significantly affect Visitation Rate.

P.5 Conclusion

This protocol is designed to provide the CINMS or an outside researcher with the ability to conduct a start-to-finish valuation of the CINMS and the northern Channel Islands

MPAs. In this protocol, we provide the surveys, databases, economic models and instructional manual necessary to estimate the RNC consumer surplus of charter vessel passengers. Additionally, we include a survey, database, model and manual to calculate the user statistics, demographics, and CINMS/MPAs awareness of visitors to the CINMS.

In order to detect a change in economic value, we recommend this monitoring protocol as an ongoing program aimed at quantifying the RNC value of the CINMS and MPAs. The ecological quality of the MPAs is predicted to change over the course of several years. Since the demand for recreation in the MPAs may reflect changes in ecological quality, monitoring can determine whether the value of the MPAs increases in conjunction with ecological change. Implementing this protocol in combination with a comprehensive ecological and socioeconomic monitoring program could help policy makers evaluate the effectiveness of MPA networks as a management tool.

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APPENDIX A: Glossary of Terms and Acronyms

Many terms were borrowed from the Socioeconomic Research and Monitoring Recommendations for Marine Protected Areas in the Channel Islands National Marine Sanctuary (NOAA 2003).

Actual Ecological Quality
Ecological quality of an MPA that can be documented by scientific monitoring studies.

Baseline Conditions
The environmental conditions that exist before a proposed action is implemented. The baseline is used in environmental impact analysis to define the environment that may be impacted due to a proposed action.

CINMS
Channel Islands National Marine Sanctuary.

CDFG
California Department of Fish and Game.

Consumer's Surplus (net economic user value)
The amount that a person is willing to pay for a good or service over and above what they actually have to pay for a good or service. The value received is a surplus or net benefit. In the case of natural resources, for which no one owns the resources and can't charge a price for use of the resources, consumer's surplus is referred to as a non-market economic value since the goods and services from the natural resources are not traded in markets. Consumer's surplus is applicable to both use and nonuse or passive use value.

Consumptive Use
Any activity within the marine reserves which results in a taking. This includes, but is not limited to, all forms of fishing, marine life collection, etc.

Ecological quality
For the purposes of this report, ecological quality is defined as perceived recreational attributes of a site including abundance, diversity, and conditions.

Economic Impact
Measures the importance of an industry, resource, regulation, policy decision, etc. in terms of the employment it provides and the goods and services it consumes, both directly, indirectly, and induced (see *multiplier effect*)

Economic Value
The amount of consumer satisfaction directly or indirectly obtained from a good, service, or resource.

Existence Value
The value to people who never plan to visit, but would be willing to pay an amount to ensure the resource exists in a certain protected condition.

ITCM
Individual Travel Cost Method/Model. The ITCM is a type of travel cost method that uses individual visitor preference as the basic unit of observation.

Marine Conservation Area
A "marine conservation area," is a non-terrestrial marine or estuarine area, not limited to state waters, that is designated so the managing agency may achieve one or more of the following:
Protect or restore rare, threatened or endangered native plants, animals or habitats in marine areas;
Protect or restore outstanding, representative or imperiled marine species, communities, habitats and ecosystems;
Protect or restore diverse marine gene pools;
Contribute to the understanding and management of marine resources and ecosystems by providing the opportunity for scientific research in outstanding, representative or imperiled marine habitats or ecosystems;
Preserve outstanding or unique geological features; or
Provide for sustainable living marine resource harvest.
Restrictions: it is unlawful to injure, damage, take or posses any specified living, geological or cultural marine resources for certain commercial, recreational, or a combination of commercial and recreational purposes. In general, the designating entity or managing agency may restrict any commercial and/or recreational uses that would compromise protection of the species of interest, natural community, habitat or geological features.

Allowable uses: research, education and recreational activities, and certain commercial and recreational harvest of marine resources may be permitted.

Marine Life Reserve
A marine protected area in which all extractive activities, including the taking of marine species, and, at the discretion of the commission and within the authority of the commission, other activities that upset the natural ecological functions of the area, are prohibited. While, to the extent feasible, the area shall be open to the public for managed enjoyment and study, the area shall be maintained to the extent practicable in an undisturbed and unpolluted state.

Fish and Game Code Section 2860 (b) further clarifies permissible activities in "marine life reserves":

"Notwithstanding any other provision of this code, the taking of a marine species in a marine life reserve is prohibited for any purpose, including recreational and commercial

fishing, except that the commission may authorize the taking of a marine species for scientific purposes, consistent with the purposes of this chapter, under a scientific collecting permit issued by the department."(Emphasis added)

Marine Protected Area
"Marine protected area" (MPA) means a named, discrete geographic marine or estuarine area seaward of the high tide line or the mouth of a coastal river, including any area of intertidal or subtidal terrain, together with its overlying water and associated flora and fauna that has been designated by law, administrative action, or voter initiative to protect or conserve marine life and habitat. MPA classifications include marine life reserves (the equivalent of the State Marine Reserve classification), State Marine Parks, which allow recreational fishing and prohibit commercial extraction, and State Marine Conservation Areas, which allow for specified commercial and recreational activities, including fishing for certain species but not others, fishing with certain practices but not others, and kelp harvesting, provided that these activities are consistent with the objectives of the area and the goals and guidelines of this chapter. MPAs are primarily intended to protect or conserve marine life and habitat, and are therefore a subset of marine managed areas (MMAs), which are broader groups of named, discrete geographic areas along the coast that protect, conserve, or otherwise manage a variety of resources and uses, including living marine resources, cultural and historical resources, and recreational opportunities. Marine managed area classifications include State Water Quality Protection Area, State Marine Cultural Preservation Area, and State Marine Recreational Management Area.

MPA(s)
Marine Protected Area(s)

Marine Reserve
A "marine reserve," is a non-terrestrial marine or estuarine area that is designated so the managing agency may achieve one or more of the following: protect or restore rare, threatened or endangered native plants, animals or habitats in marine areas;
protect or restore outstanding, representative or imperiled marine species, communities, habitats and ecosystems; protect or restore diverse marine gene pools; or contribute to the understanding and management of marine resources and ecosystems by providing the opportunity for scientific research in outstanding, representative or imperiled marine habitats or ecosystems.
Restrictions: it is unlawful to injure, damage, take or possess any living, geological or cultural marine resource, except under a permit or specific authorization from the managing agency for research, restoration or monitoring purposes. While, to the extent feasible, the area shall be open to the public for managed enjoyment and study, the area shall be maintained to the extent practicable in an undisturbed and unpolluted state. Therefore, access and use (such as walking, swimming, boating and diving) may be restricted to protect marine resources.

Allowable uses: research, restoration and monitoring may be permitted by the managing

agency. Educational activities and other forms of non-consumptive human use may be permitted by the designating entity or managing agency in a manner consistent with the protection of all marine resources.

MRWG
Marine Reserves Working Group. The CINMS Sanctuary Advisory Council created the MRWG in 1999. It included a representative group of stakeholders united to seek a consensus agreement on recommendations for marine reserves within the CINMS.

Monitoring
Differs from assessments in that detailed and specific data is necessary to observe and keep track of socioeconomic or biological changes attributed to Marine Protected Areas.

Multi-destination trip
A multi-destination trip describes a trip in which the individual visits multiple sites during a single trip.

Multi-purpose trip
A multi-purpose trip describes a trip planned by the individual for more than one purpose during a single trip.

Non-Consumptive Use
Use that does not involve a taking of marine life. This includes, but is not limited to whale-watching, swimming, photography, snorkeling and diving (when no species are harmed, disturbed, or taken), etc.

NPS
National Park Service

OMB
Office of Management and Business. Part of the executive branch of the U.S. Federal Government.

Onsite Travel Cost
Onsite travel cost is the sum of some or all of the following costs: fee for charter, fee for guide, fishing/lobster diving permit, recreational equipment purchased, recreational equipment rented, guidebooks/souvenirs.

Opportunity Cost of Travel Time
The opportunity cost of travel time accounts for the benefit, monetary or not, that could have been gained from an alternative activity during the time spent traveling to the recreation site.

Perceived Ecological Quality
Ecological quality that people expect to be found in the MPAs based on word-of-mouth, marketing, or other non-scientific means. The perceived ecological quality may or may not be equal to the actual ecological quality.

Public Good
Goods that may be enjoyed by any number of people without affecting other people's enjoyment. For example, an aesthetic view is a pure public good. No matter how many people enjoy the view, others can also enjoy it.

Roundtrip Travel Cost
The roundtrip travel cost is the cost that visitors incur to travel from their place of origin to the CINMS.

SAC
Sanctuary Advisory Council. The SAC is a body of volunteer stakeholders from the community created in 1998. It provides a public forum for consultation and deliberation and offers community-based advice to the CINMS Manager. This is a community-based participatory process that assures continued public input to management decision-making, while at the same time expanding public awareness about the CINMS and challenging marine resource management issues.

Socioeconomics
The study of society as it relates to the economic structure, including such factors as labor categories, employment, and income of a particular area.

Stakeholder
Refers to anyone who has an interest in or who is affected by management actions.
State Marine Park: A "marine park," is a non-terrestrial marine or estuarine area, restricted to state waters, that is designated so the managing agency may provide opportunities for spiritual, scientific, educational, and recreational opportunities, as well as one or more of the following: Protect or restore outstanding, representative or imperiled marine species, communities, habitats and ecosystems;
Contribute to the understanding and management of marine resources and ecosystems by providing the opportunity for scientific research in outstanding, representative or imperiled marine habitats or ecosystems; Preserve cultural objects of historical, archaeological and scientific interest in marine areas; or Preserve outstanding or unique geological features. *Restrictions:* it is unlawful to injure, damage, take or possess any living or nonliving marine resources for commercial exploitation purposes. The designating entity or managing agency may restrict any human use that would compromise protection of the species of interest, natural community or habitat, or geological, cultural or recreational features.

Allowable uses: all other uses are allowed, including scientific collection with a permit, research, monitoring, and public recreation (including recreational harvest, unless otherwise restricted). Public use, enjoyment and education are encouraged, in a manner consistent with protecting resource values

Take
Under the Endangered Species Act, any action that may harass, harm, pursue, hunt, wound, shoot, kill, trap, capture, or collect a listed species or attempts to engage in any such activities (16 U.S.C. 1532).

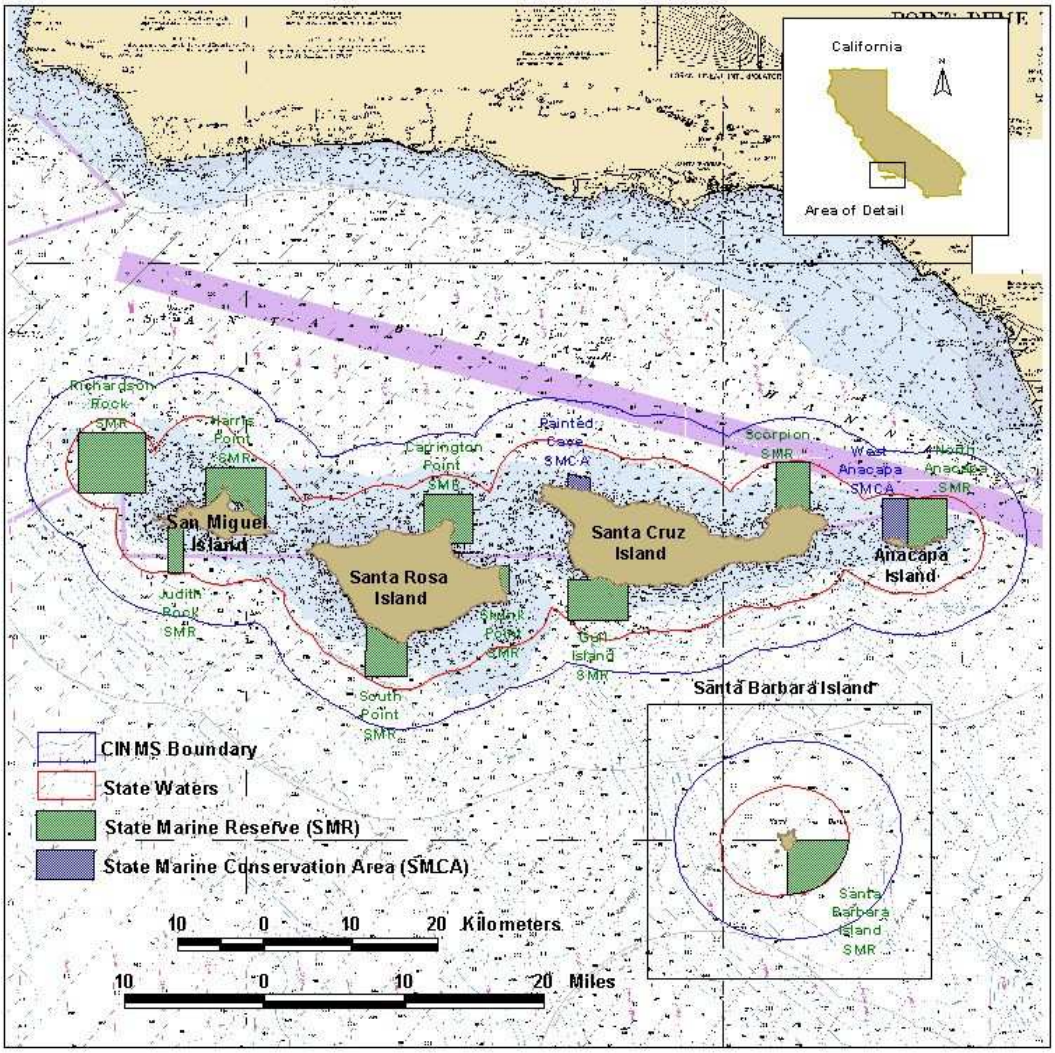
Total Travel Cost
The total travel cost is the sum of the travel costs, the on-site costs and the opportunity cost of time incurred by a visitor to the MPAs.

TCM
Travel Cost Method/Model. The TCM is an economic method designed to assign a value to a non-market good, such as a public good. It operates under the premise that the costs of travel incurred by a visitor to a recreational site can be used to estimate the value attributed to the site by the visitor.

Willingness To Pay
The amount – measured in goods, services, or dollars- that a person is willing to give up to get a particular good or service.

ZTCM
Zonal Travel Cost Method/Model. The ZTCM is a type of travel cost method that uses geographic zones as the basic units of observation.

APPENDIX B: MPA Preferred Alternative Recommendation and Current Location



Source: California Department of Fish and Game

APPENDIX C – Customer Survey Used in the 2003 Pretest OMB#: 0648-0408 Expiration: 08/31/2006

Date:_____ Boat:_____

1. Where is your primary residence?

City State Zip Code

Country

2. Is recreation in the Channel Islands National Marine Sanctuary the primary purpose of your trip to the Santa Barbara/Ventura area?

YES □
NO □

3. When you decided to make this trip, were you aware of the newly established Marine Protected Areas (MPAs) *within* the Channel Islands National Marine Sanctuary?

YES □ → Go to question 4
NO □ → Go to question 6

4. Would you have come to the Channel Islands National Marine Sanctuary today, if there were no Marine Protected Areas?

YES □
NO □

5. Which **one** of the following best describes your understanding of what protection the new Channel Islands Marine Protected Areas provide for marine resources?

A. Protects most marine life from fishing/harvesting
B. Prohibits anchoring and boating
C. Prohibits recreational activities
D. Don't Know

6. Which **one** of the following best describes your understanding of what protection the Channel Islands National Marine Sanctuary provides for marine resources?

A. Protects most marine life from fishing/harvesting
B. Protects seafloor from oil/gas development
C. Prohibits anchoring and boating
D. Don't Know

7. Including this visit, how many **times (total)** will you have been to the Channel Islands National Marine Sanctuary, in the past 12 months?

Times:_____

8. At the end of this trip, how many **days (total)** will you have spent in the Channel Islands National Marine Sanctuary during the past 12 months?

Days:_____

ACTIVITIES AND INTERESTS

9. Please put a check mark next to the activities you **plan to participate in** during this visit to the Channel Islands National Marine Sanctuary. Then, please indicate **how much time** you plan to participate in each of the activities. Please do not include travel time into the Sanctuary.

- Please include total time for all the days of your trip.
- If you are doing two activities simultaneously, (e.g. SCUBA and underwater photography), please split the total time between the two activities.
- Use decimals for minutes. (e.g. 15 min = 0.25)

	ACTIVITY	TIME
☐	a) SCUBA diving (*no-take*)	Hours:_____
☐	b) SCUBA diving (*to take plants or animals*) TARGET SPECIES: (please specify):_____	Hours:_____
☐	c) Snorkeling/Skin Diving (*no take*)	Hours:_____
☐	d) Snorkeling/Skin Diving (*to take plants or animals*) TARGET SPECIES: (please specify):_____	Hours:_____
☐	e) Wildlife Viewing/Photography	Hours:_____
☐	f) Underwater Photography/Videography	Hours:_____
☐	g) Kayaking	Hours:_____
☐	h) Fishing	Hours:_____
☐	i) Other (please specify):_____	Hours:_____

10. Which of the above activities (from Question 9) is the **primary purpose** for your visit to the Channel Islands National Marine Sanctuary? Activity (letter) : _____

11. Did you choose to recreate in the Channel Islands National Marine Sanctuary specifically because of the new Marine Protected Areas?

☐ YES
☐ NO
☐ Don't know what they are

12. Please read each statement and rate the IMPORTANCE of each item as it contributes to recreation in the Channel Islands National Marine Sanctuary. If an item does not apply to your trip, please circle N/A.	Not Applicable	Not Important	Somewhat Important	Important	Very Important	Extremely Important
a) Amount (Abundance) of kelp	N/A	1	2	3	4	5
b) Amount (Abundance) of fish and sea life	N/A	1	2	3	4	5
c) Many different kinds (Diversity) of fish and sea life to *view*	N/A	1	2	3	4	5
d) Many different kinds (Diversity) of fish and sea life to *catch*	N/A	1	2	3	4	5
e) Opportunity to view large wildlife (whales, dolphins, sea lions, etc)	N/A	1	2	3	4	5
f) Uncrowded conditions	N/A	1	2	3	4	5
g) Specially protected areas, such as Marine Protected Areas	N/A	1	2	3	4	5

13. Which of the items in Question 12 is the most important to you? (Please write the corresponding letter) Item letter: _____

14. On a scale of 1 to 5, what do you **expect the quality** of that item (Question 13) to be **TODAY**? (relative to your perception of the quality of that item in Channel Islands National Marine Sanctuary over the past 20 years)

Poor	Below Average	Average	Above Average	High
1	2	3	4	5

15. Had you visited Channel Islands National Marine Sanctuary before April 2003?
□ Yes → Go to question 16
□ No → Go to question 18

16. When was your last visit? Month:_____ Year:_____

17. On a scale of 1 to 5, how would you rank the **quality** of that item (Question 13) to be **DURING YOUR LAST VISIT**? (relative to your perception of the quality of that item in Channel Islands National Marine Sanctuary over the past 20 years)

Poor	Below Average	Average	Above Average	High
1	2	3	4	5

EXPENSES AND DESTINATIONS

18. During this trip to the Channel Islands National Marine Sanctuary, were you giving up any income-earning activities? (e.g. Work that you were not paid for)
YES □→ Go to Question 19
NO □→ Go to Question 21

19. How much income, before taxes, do you estimate you **lost per day** of this trip to the Channel Islands National Marine Sanctuary? (Do not include paid vacation.) $_____

20. How many **days** did you give up income-earning activities? (e.g. Days of work, but do not include weekends/days you would not normally have worked.) Days:_____

21. On this trip are you paying your own expenses or are you sharing expenses?
□ Own expenses
□ Shared expenses → If Shared, with how many *other* people are you sharing expenses? _____

22. Please complete the following table indicating **total expenditures** (*total for you and who ever you are sharing expenses with*) for **all of the days** during which you will spend time recreating in the Channel Islands National Marine Sanctuary (Please estimate any future or remaining expenses for this trip).

Item		Expenses ($)
Fee for Charter/Party/Sightseeing Boat		$
Fee for Guide Service (e.g. kayak or dive guide)		$
Transportation costs: (please also mark which modes you used)	☐ Airplane ☐ Rental Car ☐ Bus ☐ Taxi ☐ Other:_____	$_____ $_____ $_____ $_____ $_____
Gas/Fuel		$
Lodging Costs		$
Fishing/lobster diving permit		$
Recreational equipment purchased specifically for this trip (e.g. snorkel, dive, photography, fishing gear, kayak gear or supplies)		$
Recreational equipment rental		$
Guidebooks/Informational Items/Souvenirs		$
How far did you travel from last night's lodging to this harbor for today's activities?	Hours of travel:_____ City:_____State:_____	

23. If you are spending **more than one day** recreating in the Sanctuary, please complete the following section. (*If not, go to question 24.*)

How many **total days** will you spend in the Marine Sanctuary during this trip? Days:_____

How far did you drive from your home/primary residence to this area? (Please indicate miles or home location)

Hours of travel:_____
City:_____State:_____

24. If you are on a **vacation with multiple destinations** (*visiting the Sanctuary and other destinations*), please complete the following section. (*If not, go to question 25.*)

What was your **last** major destination **prior** to the Sanctuary (during this vacation)?

Destination:_____
City:_____State:_____

What is your **next** major destination (during this vacation)?

Destination:_____
City:_____State:_____

Would your travel plans/total driving distance have changed if you had not visited the Sanctuary?

YES ☐
NO ☐

BASIC DEMOGRAPHICS

25. Please indicate the number of wage earners in your household. # Wage-earners:_____

26. Please circle the letter that best describes the category for your annual household income

A. Less than $5,000	F. $25,000 to $29,999	K. $50,000 to $59,999
B. $5,000 to $9,999	G. $30,000 to $34,999	L. $60,000 to $74,999
C. $10,000 to $14,999	H. $35,000 to 39,999	M. $75,000 to $99,999
D. $15,000 to $19,999	I. $40,000 to $44,999	N. $100,000 to $149,999
E. $20,000 to $24,999	J. $45,000 to $49,999	O. $150,000 or more
☐ Don't Know		☐ Refuse to Answer

27. Please complete the chart below by circling the appropriate letter for each category:

YEAR OF BIRTH		19 __ __
SEX	M.	Male
	F.	Female
ETHNICITY	A.	American Indian or Alaskan Native
	B.	Asian or Pacific Islander
	C.	Black, not of Hispanic origin
	D.	Hispanic
	E.	White, not of Hispanic origin
	F.	Other (specify)
	G.	Refuse to Answer
EDUCATION COMPLETED	A.	8th grade or less
	B.	9th-11th grade
	C.	12th grade
	D.	Some college or technical program
	E.	College Grad
	F.	Graduate School or more
EMPLOYMENT	A.	Unemployed
	B.	Employed full-time
	C.	Employed part-time
	D.	Retired
	E.	Student
	F.	Homemaker
	G.	None of the above

APPENDIX D: Introductory Letter for the Customer Survey Pretest of 2003

Dear Visitor,

We would greatly appreciate your cooperation in completing the following recreational survey.

The survey is a key component of a socioeconomic monitoring study coordinated through the Donald Bren School of Environmental Science and Management, UCSB and the Channel Islands National Marine Sanctuary. This project is part of a larger monitoring effort by the Channel Islands National Marine Sanctuary and the California Department of Fish and Game on the ecological and socioeconomic impact of the Marine Protected Areas in the Channel Islands.

Your answers are voluntary and confidential. Please record your answers accurately and legibly. This survey should be self-explanatory and will take **approximately 10 minutes** to complete. If you need clarification on any of the questions, please direct them to the surveyors at the table. Questions regarding details of the project will be answered after your survey is complete.

Your answers represent many other people not included in this survey effort, so it is very important that you complete this survey questionnaire as accurately as possible.

THANK YOU!
For Participating in this Recreation Survey

Sincerely,
Hélène Scalliet
Survey Coordinator
Donald Bren School of Environmental Science and Management
Email: hscalliet@bren.ucsb.edu

OMB #: 0648-0408
Expiration Date: 08/31/2006

APPENDIX E: Operator Questionnaire from the 2003 Pretest

User Identification

Thank you for agreeing to help us with this questionnaire. Please refer to the introductory letter you received for a description of the purposes of this study.

We want to assure you that NO data you provide will ultimately be associated with your name, the name of your business, your address, the name of your boats, or other similar identifying information. The information recorded on this first page of the survey will be used to update what we have on file for your business. This first sheet will be removed and destroyed before any of the additional survey data is made available to Sanctuary personnel or the public.

Your Name: _____

Business/Operator Name: _____

Mailing Address: _____

Phone #: _____

Email: _____

Please list the names and ports for the vessel(s) you operated in 2002?

Vessel Name	Port
1.	
2.	
3.	

To remind you, this sheet will be separated from the rest of your answers and NEVER used to identify you with any of the data you provide in this survey.

Activities

1. *Please complete the following chart by selecting a two-letter code from the following list to indicate the activities/purposes for your company. Be sure to include activities for all your vessels. Please also indicate the percentage of your business that is due to each activity. If more than one vessel has the same activity, please list the percentages for each vessel separated by a comma. Do not include trips that never enter the Sanctuary, for example northern gray whale migration.*

Activity/Purpose:

WW	Whale Watching/Wildlife Viewing
SF	Sportfishing
ND	Nonconsumptive Diving (no taking of any plants, animals or other materials)
CD	Consumptive Diving (some taking of plants, animals, or other materials)
SL	Sailing
KA	Kayaking
Other	(please specify)

	Activity/Purpose Code	% of business for activity
Activity #1:		
Activity #2:		
Activity #3:		
Activity #4:		
Activity #5:		

2. For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where in the Sanctuary you operated in 2002. Please use a different map for each activity.
(Sanctuary maps will be distributed)

3. For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where you have operated since the establishment of the MPAs in April 2003 (if different from 2002). Please use a different map for each activity.

If the location of your operation has not changed since the establishment of the MPAs in April 2003, please check here:
(Sanctuary maps will be distributed)

4. If you believe the establishment of the MPAs has affected your business by either raising or lowering your costs and/or increasing or decreasing the number of customers you will have in a year, please indicate those changes in percentage terms below. Please use a two-letter code from above for each activity.

Activity/Purpose	***Percent change in cost per customer (± %)***	***Percent change in customers per year (± %)***

Monthly Use by Activity

5. For each of your activities/purposes <u>in **2002**</u>, please complete the following table. Please complete a different table for each activity.

Activity #1:						
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Max # of passengers possible per trip	Notes
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

Activity #2:						
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Max # of passengers possible per trip	Notes
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

Activity #3:						
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Max # of passengers possible per trip	Notes
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

If you have any further comments, please use the space below.

APPENDIX F: Visual Aid for Ecological Quality Survey Questions

Note: Photos represent only an approximate visualization to help participants estimate the actual value given below the photos. Units are in *organisms per meter square*

Kelp Density

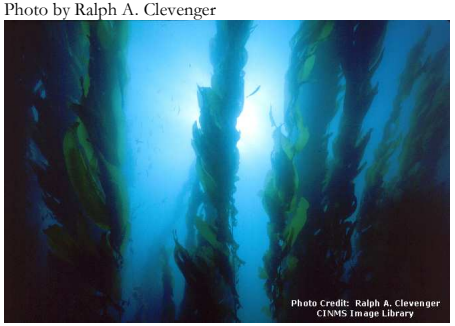
Photo by CINMS

(0.5)A

Photo by Robert Yin

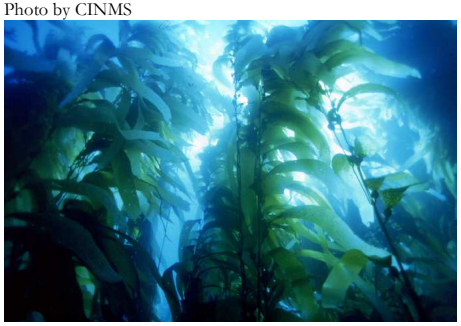
(2.5)B

Photo by Ralph A. Clevenger



(4.5)C

Photo by CINMS



(6.5)D

Fish Abundance

Photo by Daniel W. Gotshall

(0.5)A

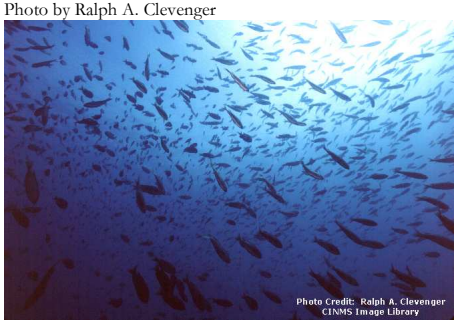
Photo by CINMS

(1.5)B

Photo by Ralph A. Clevenger

(2.5)C

Photo by Ralph A. Clevenger



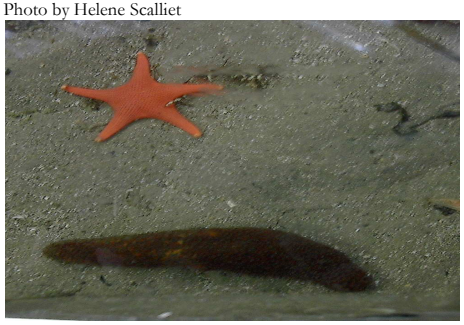
(3.5)D

Sea Life Diversity

Photo by Helene Scalliet

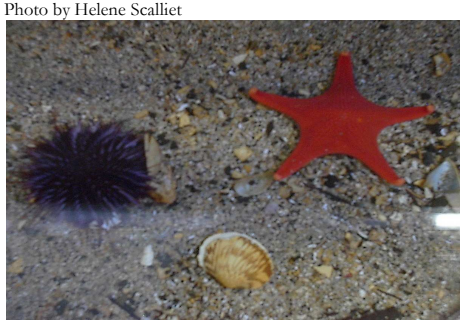
(6)A

Photo by Helene Scalliet



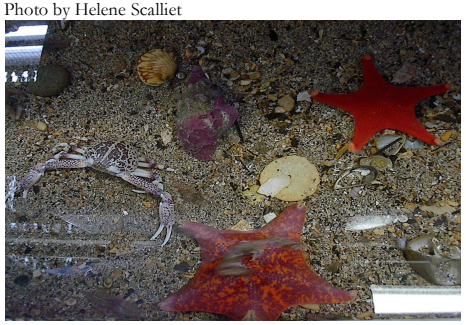
(8)B

Photo by Helene Scalliet



(10)C

Photo by Helene Scalliet



(12)D

APPENDIX PA: Charter Vessel Operator Questionnaire

CHANNEL ISLANDS NATIONAL MARINE SANCTUARY CHARTER BOAT SURVEY
OMB#
Expiration Date

User Identification

Thank you for agreeing to help us with this survey. The attached one-page description describes the purposes of the survey.

We want to assure you that NO data you provide will ultimately have your name, the name of your business, your address, the name of your boats, or other similar identifying information. The information recorded on this first page of the survey will be used to update what we have on file for your business. This first sheet will be removed and destroyed before any of the additional survey data is made available to Sanctuary personnel or the public.

Your Name: _____

Business/Operator Name: _____

Address: _____

Phone #: _____

Email: _____

What is/are the name of the boat(s) that you operated in 2002?

Boat(s)
1.
2.
3.

To remind you, this sheet will be separated from the rest of your answers and NEVER used to identify you with any of the data you provide in this survey.

APPENDIX PA: Charter Vessel Operator Questionnaire

Activities

1. *What port(s) did you operate from in 2002?*

Port
1.
2.
3.

2. *Please complete the following chart by selecting a two-letter code from the following list to indicate the* ***primary*** *activity/purpose for each of your boats. Please also indicate the months that trips for each activity were run. If you operate out of more than one port, please treat list the activity and months twice.*

Activity/Purpose:	
WW	Whale Watching
SF	Sportfishing
ND	Nonconsumptive Diving (no taking of any plants, animals or other materials)
CD	Consumptive Diving (some taking of plants, animals, or other materials)
SL	Sailing
Other	(please specify)

	Activity/Purpose Code	Months trips run for each activity
Activity #1:		
Activity #2:		
Activity #3:		
Activity #4:		

3. For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where in the Sanctuary you operated in 2002. Please use a different map for each activity.
(Sanctuary MAPS)

4. For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where you have operated since the establishment of the MPAs in April 2003 (if different from 2002). Please use a different map for each activity.
(Sanctuary MAPS w/reserves)

5. If you believe the establishment of the MPAs has affected your business by either raising or lowering your costs and/or increasing or decreasing the number of customers you will have in a year, please indicate those changes below. Please use a two-letter code from above for each activity.

Activity/Purpose	***Change in cost per person-trip (± %)***	***Change in customers per year (± %)***

6. *For each of your primary activities/purposes in* ***2002****, please complete the following table. Please complete a different table for each activity.*

Primary Activity #1:					
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Notes
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

Primary Activity #2:					
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Notes
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

Primary Activity #3:					
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Notes
January					
February					
March					
April					
May					
June					
July					
August					
September					
October					
November					
December					

APPENDIX PA: Charter Vessel Operator Questionnaire

Business Data

Was 2002 a typical year, financially?	Yes No → Go to question

If not, why?	

What would be your gross revenue for activities as issue here during a typical year?	***$***_____

Prices and Revenue

For each activity previously identified, what were your prices and revenues in 2002? (You may include a price list in lieu of identifying the fee structure.) If prices changed during 2002, please indicate old and new prices and date of change.

Activity	2002 Gross Revenue	Fee Structure
1.		
2.		
3.		

What were your total operating costs in 2002? (Operating costs include wages, employee benefits, salaries of owners, fuel, contract labor, interest payments on loans, building rental, and equipment rental, boat rental, or leasing. Basically, anything that is not depreciated on your income tax return.)	
Total Operating Costs:	***$***_____

Please provide a dollar figure for the following five categories of operating expenses:	
Wages, salaries, and benefits	***$***_____
Fuel and lubricants	***$***_____
Purchased repair and maintenance	***$***_____
Equipment rental and leasing	***$***_____
Interest Payments	***$***_____

What was the total market value and how much did you owe in your capital equipment in 2002? (Capital equipment includes buildings, boats, or other equipment that that you use and own, not counting what you rent or lease.)	
Total market value of capital equipment in 2002:	$_____
On this capital, how much did you owe?	$_____

What was your profit or loss from the activities you have identified during 2002? (Profits or losses can be thought of as the taxable income you reported to the IRS. We are only interested in the profits or losses related to the activities we have been asking about.)	
Profits or losses for 2002:	$_____

If you previously indicated that 2002 was not a typical year, what would be your total profits/loss in a typical year?	
Profits or losses for a typical year:	$_____

If you have any further comments, please use the space below.

CHANNEL ISLANDS NATIONAL MARINE SANCTUARY
CHARTER VESSEL QUESTIONNAIRE

OMB#: 0648-0408
Expiration Date: 08/31/2006

User Identification

Thank you for agreeing to help us with this questionnaire. Please refer to the introductory letter you received for a description of the purposes of this study.

We want to assure you that NO data you provide will ultimately be associated with your name, the name of your business, your address, the name of your boats, or other similar identifying information. The information recorded on this first page of the survey will be used to update what we have on file for your business. This first sheet will be removed and destroyed before any of the additional survey data is made available to Sanctuary personnel or the public.

Your Name: _____

Business/Operator Name: _____

Mailing Address: _____

Phone #: _____

Email: _____

Please list the names and ports for the vessel(s) you operated in 2002?

Vessel Name	Port
1.	
2.	
3.	

To remind you, this sheet will be separated from the rest of your answers and NEVER used to identify you with any of the data you provide in this survey.

Activities

1. *Please complete the following chart by selecting a two-letter code from the following list to indicate the activities/purposes for your company. Be sure to include activities for all your vessels. Please also indicate the percentage of your business that is due to each activity. If more than one vessel has the same activity, please list the percentages for each vessel separated by a comma. Do not include trips that never enter the Sanctuary, for example northern gray whale migration.*

Activity/Purpose:

WW	Whale Watching/Wildlife Viewing
SF	Sportfishing
ND	Nonconsumptive Diving (no taking of any plants, animals or other materials)
CD	Consumptive Diving (some taking of plants, animals, or other materials)
SL	Sailing
KA	Kayaking
Other	(please specify)

	Activity/Purpose Code	% of business for activity
Activity #1:		
Activity #2:		
Activity #3:		
Activity #4:		
Activity #5:		

2. For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where in the Sanctuary you operated in 2002. Please use a different map for each activity. ***(Sanctuary maps will be distributed)***

3. *For each activity/purpose please indicate (by shading in the 1x1 minute cells) on the attached maps where you have operated since the establishment of the MPAs in April 2003 (if different from 2002). Please use a different map for each activity.*

If the location of your operation has not changed since the establishment of the MPAs in April 2003, please check here:
(Sanctuary maps will be distributed)

4. If you believe the establishment of the MPAs has affected your business by either raising or lowering your costs and/or increasing or decreasing the number of customers you will have in a year, please indicate those changes in percentage terms below. Please use a two-letter code from above for each activity.

Activity/Purpose	Percent change in cost per customer (± %)	Percent change in customers per year (± %)

Monthly Use by Activity

***5.** For each of your activities/purposes **in 2002**, please complete the following table. Please complete a different table for each activity.*

Activity #1:						
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Max # of passengers possible per trip	Notes
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

Activity #2:						
Month	# trips run	# trips that could have been run if operating at full capacity	Average # days per trip (e.g. half day, full day, 2 days)	Average # passengers per trip	Max # of passengers possible per trip	Notes
January						
February						
March						
April						
May						
June						
July						
August						
September						
October						
November						
December						

If you have any further comments, please use the space below.

APPENDIX PC: Customer Simple Survey

Residence (CTY)
Where is your primary residence? County (record appropriate number) or State (if not CA)

1	Alameda	21	Marin	41	San Mateo
2	Alpine	22	Mariposa	42	Santa Barbara
3	Amador	23	Mendocino	43	Santa Clara
4	Butte	24	Merced	44	Santa Cruz
5	Calaveras	25	Modoc	45	Shasta
6	Colusa	26	Mono	46	Sierra
7	Contra Costa	27	Monterey	47	Siskiyou
8	Del Norte	28	Napa	48	Solano
9	El Dorado	29	Nevada	49	Sonoma
10	Fresno	30	Orange	50	Stanislaus
11	Glenn	31	Placer	51	Sutter
12	Humboldt	32	Plumas	52	Tehama
13	Imperial	33	Riverside	53	Trinity
14	Inyo	34	Sacramento	54	Tulare
15	Kern	35	San Benito	55	Tuolumne
16	Kings	36	San Bernardino	56	Ventura
17	Lake	37	San Diego	57	Yolo
18	Lassen	38	San Francisco	58	Yuba
19	Los Angeles	39	San Joaquin		
20	Madera	40	San Luis Obispo		

Visit Purpose (VPP)
Is recreation in the Channel Islands National Marine Sanctuary the primary purpose of your trip to the Santa Barbara/Ventura region?

YES □
NO □

MPA Purpose (MPAPP)
Did you choose to recreate in the Channel Islands National Marine Sanctuary specifically because of the new Marine Protected Areas?

□ YES
□ NO
□ I Don't know what they are

Activity Purpose (APP)
Which of these activities is the **primary purpose** for your visit to the Channel Islands National Marine Sanctuary?

a) SCUBA diving (*no-take*)
b) SCUBA diving (*to take plants or animals*)
c) Snorkeling/Skin Diving (*no take*)
d) Snorkeling/Skin Diving (*to take plants or animals*)
e) Wildlife Viewing/Photography
f) Underwater Photography/Videography
g) Kayaking
h) Fishing
i) Hiking/Island visit

APPENDIX PD: Customer Simple Tally Sheet

Date: _____ Charter Company: _____

OMB#: 0648-0408
Expiration: 08/31/2006

Customer #	Residence (CTY)	Visit Purpose (VPP)	MPA Purpose (MPAPP)	Activity Purpose (APP)

APPENDIX PE: Customer User Survey

Channel Islands National Marine Sanctuary – Customer Survey

OMB: 0648-0408
Expiration: 08/31/2006

CINMS Knowledge (CIKN)

Which **one** of the following best describes your understanding of what protection the Channel Islands National Marine Sanctuary provides for marine resources?

A. Protects most marine life from fishing/harvesting
B. Prohibits anchoring and boating
C. Prohibits recreational activities
D. Don't Know

MPA Knowledge (MPAKN)

Which **one** of the following best describes your understanding of what protection the Channel Islands Marine Protected Areas provide for marine resources?

A. Protects most marine life from fishing/harvesting
B. Protects seafloor from oil/gas development
C. Prohibits anchoring and boating
D. Don't Know

Importance Ratings Please rate the IMPORTANCE of each factor as it contributes to recreation in the Channel Islands National Marine Sanctuary.	Not Applicable	Not Important	Somewhat Important	Important	Very Important	Extremely Important
a) Amount (Abundance) of kelp	0	1	2	3	4	5
b) Amount (Abundance) of fish and sea life	0	1	2	3	4	5
c) Many different kinds (Diversity) of fish and sea life to *view*	0	1	2	3	4	5
d) Many different kinds (Diversity) of fish and sea life to *catch*	0	1	2	3	4	5
e) Opportunity to view large wildlife (whales, dolphins, sea lions, etc)	0	1	2	3	4	5
f) Uncrowded conditions	0	1	2	3	4	5
g) Specially protected areas, such as Marine Protected Areas	0	1	2	3	4	5

Most Important Factor (FACTIMP)

Which of the recreational factors in the previous question is the most important to you? (Please say the corresponding letter)

Item letter: _____

APPENDIX PE: Customer User Survey

Quality Today (QDAY)
On a scale of 1 to 5, what do you **expect the quality** of your "Most Important Factor" (from previous question) to be **today**?

(relative to your perception of the quality of that factor in Channel Islands National Marine Sanctuary over the past 20 years)

Poor	Below Average	Average	Above Average	High
1	2	3	4	5

Had you visited Channel Islands National Marine Sanctuary before April 2003?
(If no, record 'NA' and skip to the next question.)

Quality Previous (QPREV)
On a scale of 1 to 5, how would you rank the **quality** of your "Most Important Factor" to be **during your most recent visit before April 2003**?

(relative to your perception of the quality of that factor in Channel Islands National Marine Sanctuary over the past 20 years)

Poor	Below Average	Average	Above Average	High
1	2	3	4	5

Individual Income (INCOME)
Please say the letter that best describes the category for your annual individual income

A. Less than $5,000	F. $25,000 to $29,999	K. $50,000 to $59,999
B. $5,000 to $9,999	G. $30,000 to $34,999	L. $60,000 to $74,999
C. $10,000 to $14,999	H. $35,000 to 39,999	M. $75,000 to $99,999
D. $15,000 to $19,999	I. $40,000 to $44,999	N. $100,000 to $149,999
E. $20,000 to $24,999	J. $45,000 to $49,999	O. $150,000 or more
☐ Don't Know		☐ Refuse to Answer

Year of Birth (YEAR)
In what year were you born? 19 __ __

Sex (SEX)	M.	Male
	F.	Female
Ethinicity (ETHN) Please say the letter that best describes your ethnicity	A.	American Indian or Alaskan Native
	B.	Asian or Pacific Islander
	C.	Black, not of Hispanic origin
	D.	Hispanic
	E.	White, not of Hispanic origin
	F.	Other (specify)
	G.	Refuse to Answer

Education Completed (EDU) Please say the letter that best describes your highest education completed	A.	8th grade or less
	B.	9th-11th grade
	C.	12th grade
	D.	Some college or technical program
	E.	College Grad
	F.	Graduate School or more
Employment (EMPLOY) Please say the letter that best describes your employment status	A.	Unemployed
	B.	Employed full-time
	C.	Employed part-time
	D.	Retired
	E.	Student
	F.	Homemaker
	G.	None of the above

APPENDIX PF: Customer Complete Tally Sheet

Date:_____ Charter Company:_____

Customer #																			
Residence (CTY)																			
Visit Purpose (VPP)																			
MPA Purpose (MPAPP)																			
Activity Purpose (APP)																			
CINMS Knowledge (CIKN)																			
MPA Knowledge (MPAKN)																			
Imp. Ratings	(KELPAB)																		
	(FISHAB)																		
	(VIEWDV)																		
	(CATCHDV)																		
	(WILDVIEW)																		
	(CROWD)																		
	(PROT)																		
Most Imp. Factor (FACTIMP)																			
Quality Today (QDAY)																			
Quality Previous (QPREV)																			
Individual Income (INCOME)																			
Year of Birth (YEAR)																			
Sex (SEX)																			
Ethnicity (ETHN)																			
Education (EDU)																			
Employment (EMPLOY)																			