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

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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 and Objectives

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.


Photo Credit: William Dewey 1989

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 pre-test, 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).

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In April of 2003, twelve MPAs were established in the state jurisdictional waters (0-3 nautical miles) surrounding the northern Channel Islands (see Figure 1). 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].

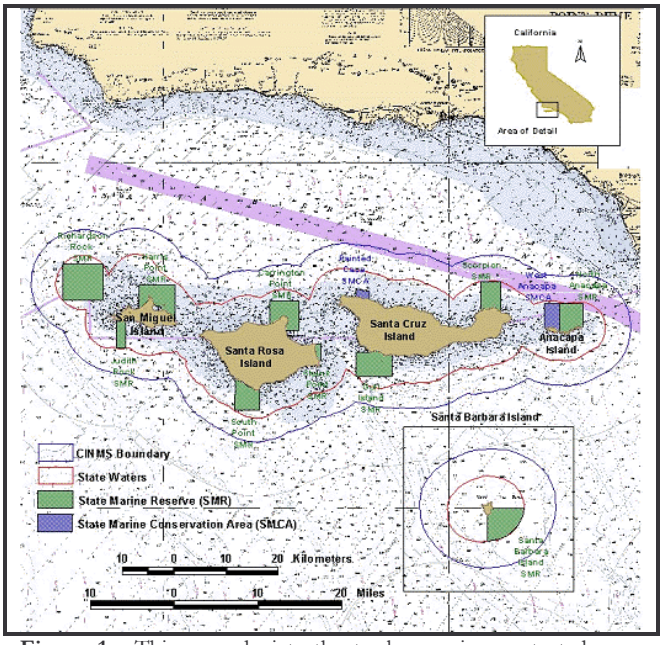

Figure 1. This map depicts the twelve marine protected areas established in state waters surrounding the northern Channel Islands in April 2003. The green areas are no-take State Marine Reserves, while the two purple areas represent State Marine Conservation Areas.

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 natural 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 the 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 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.

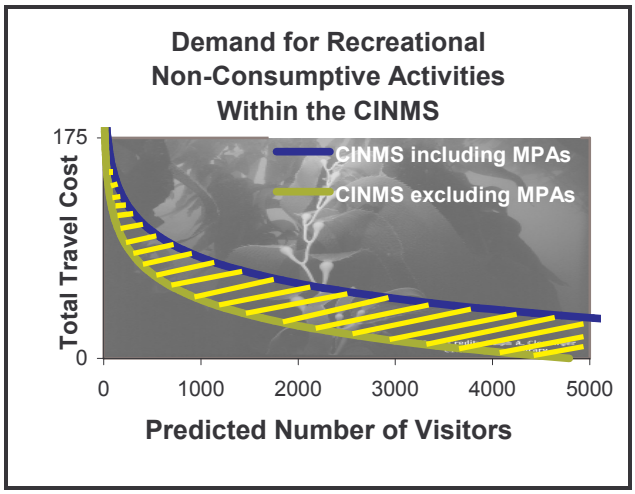

Figure 2. This graphs shows estimated demand curves for recreation in the CINMS including the MPAs and the CINMS if it didn't include the MPAs. The difference in consumer surplus (represented by the yellow shaded area) is the value for the MPAs. Please note the area between the curves has been exaggerated to illustrate the methodology.

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 that 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 pre-test 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 and is greater for individuals living closer to the CINMS (see Figure 3).

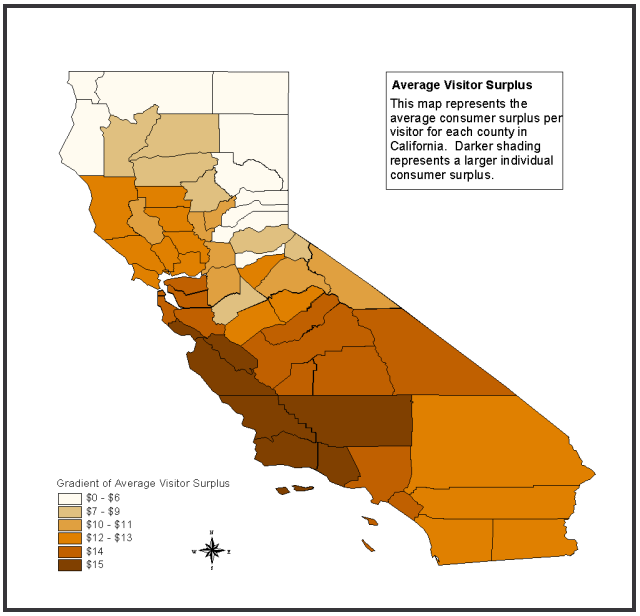

Figure 3. Average Visitor Surplus

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.

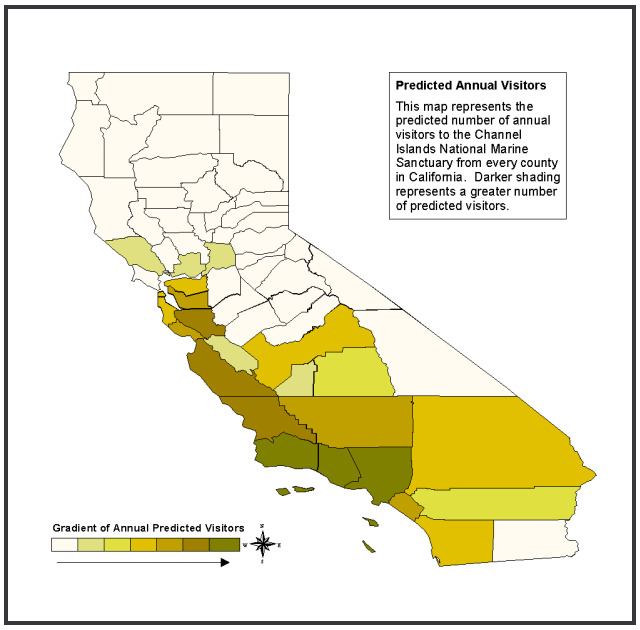

Figure 4. Predicted Annual Visitors

User statistic results illustrate that of the surveyed visitors, only 40% are aware of the existence of the MPAs and 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. Due to the

brevity of our sampling period, we recognize that our sample may not be representative of the annual visitor population. Therefore, our reported results likely underestimate the actual value of the CINMS and MPAs. 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.

Through this study, we have produced a cost-effective monitoring protocol that can value a recreational site over time, while simultaneously valuing the site at any one time. Based upon the results of our model, we are confident that we constructed an effective methodology and economic model to determine 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 a change in economic value 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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