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GROUP PROJECT BRIEF

INTEGRATING COMMERCIAL AND RECREATIONAL SECTORS IN FISHERY MANAGEMENT

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ON THE WEB AT http://fiesta.bren.ucsb.edu/~dap/index.html SPRING 2008

Introduction

Commercial fishing is frequently blamed for depleting fisheries and as a result has been targeted for management reforms.[1 2 3] However, in fisheries where a substantial portion of the total harvest is caught by recreational anglers, management reforms targeting only the commercial sector may not be sufficient to achieve the goals of management. This project examines how a fishery management system could be designed to integrate the commercial and recreational sectors of a fishery, and then analyzes the economic, environmental, social, and political impacts of these management systems.

This project focused on catch shares as a tool to reform fisheries management. Catch shares are market-based fishery management programs that provide an individual fisherman, cooperative, or community the exclusive privilege to harvest a specified quantity (quota) of fish at any time within the fishing season or exclusive privileges to harvest within a specified area. Catch shares have led to increased profits, decreased costs, a safer and more stable industry, a reduction in bycatch and ghost fishing, and an incentive to focus on the quality of the catch and the long-term sustainability of the fishery.[4 5 6 7]

Environmental Defense Fund, the client for this group project, recently completed a comprehensive analysis of the impacts of catch shares on commercial fisheries. Until this point, catch shares have been primarily focused on commercial fisheries, and there are few

Photo courtesy Bill DePriest/
Pacific Coast Sportfishing Magazine

Gopher rockfish, *Sebastes carnatus*
(photo courtesy Steve Lonhart / SIMoN NOAA)

analyses examining the impact, or potential impact, of catch shares in fisheries with substantial recreational sectors. While the operations and value-creating mechanisms of the recreational sector are different than those of the commercial sector, in reality, the two compete for the same resources.

This analysis focused on the Nearshore Fishery in the Santa Barbara Channel Region. The Nearshore Fishery includes 19 groundfish species and is managed under the Nearshore Fishery Management Plan. The Nearshore Fishery in California is an appropriate choice for this study because the fishery has been targeted for management reform.[8] In addition, the recreational and commercial sectors are currently managed separately, and in recent years the recreational sector has caught approximately 85-percent of the total harvest[8].

Methodology

This project had three distinct phases. First, we designed four fishery management scenarios that implement catch shares. These scenarios are on a continuum from an non-integrated system that manages recreational and commercial sectors separately to the most progressive scenario that fully integrates management of recreational and commercial sectors. Second, we analyzed whether there would be any shift in the distribution of catch in the four management scenarios as a result of the level of tradable catch shares. Third, we analyzed the predicted economic, environmental, social, and political impacts of the management scenarios and the predicted changes in distribution of catch. From this information, we made recommendations for the Santa Barbara Channel Nearshore Fishery.

Management Scenarios

All management scenarios analyzed in this project employed tag programs. Tag programs in fisheries allocate the owner of a tag the opportunity to catch and keep one fish of a designated species or complex at a specific time and place. Figure 1 illustrates the four management scenarios examined in this analysis.

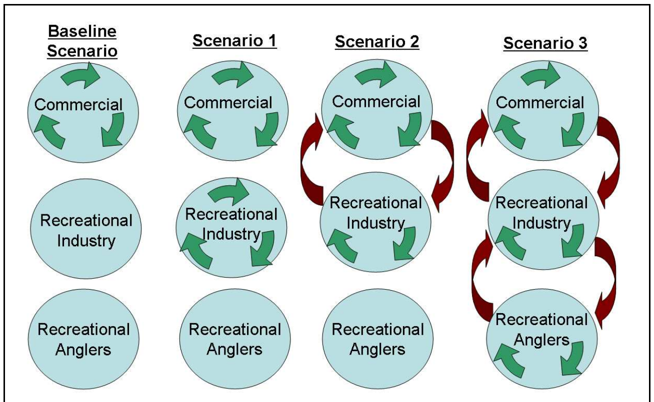

Figure 1. Management Scenarios.

For each scenario the sectors are represented by separate blue circles. The green arrows in each circle represent tags that can be traded within that sector only. Red arrows indicate tags that can be traded across sectors. In scenario 3, all sectors can trade.

In all scenarios, the total allowable catch for the entire sector remains at its current level of 279,625 fish. The commercial sector catches live fish using traps or hook and line and sells them to a fish market for profit. The recreational industry sector derives revenue from individuals who pay to go fishing and includes charter passenger fishing vessels. The recreational angler sector includes individual anglers who fish from shore or personal boats. Current distribution of catch among sectors is 15% by the commercial sector, 54% by the recreational industry sector, and 26% by the recreational angler sector.[9] In scenarios that implement tags, the number of tags allocated per sector is based on each sector's current percent of the total harvest.

Conceptual Model and Analysis Module

In addition to analyzing the impact of the four management scenarios, we created an analysis module that allows the same analysis to be carried out in other fisheries that are considering implementing catch shares to integrate management of commercial and recreational sectors. We created a software program in Excel VBA that runs the analysis module. The management scenarios input into the analysis module must be of the same general character as the four management scenarios described above.

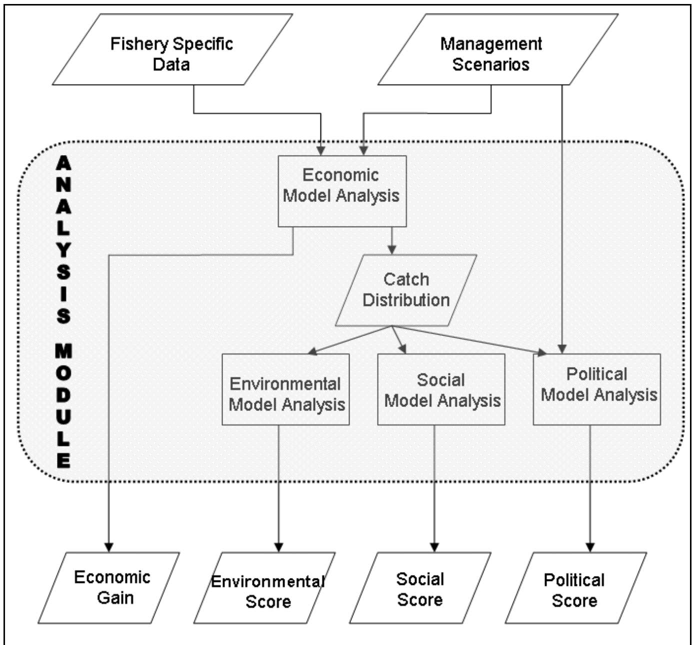

Figure 2. Conceptual Model of the Analytical Process.

The shaded area in the conceptual model is the analysis module and can be viewed as a black box that takes inputs, performs the designated analysis, and generates the results as outputs.

There are two inputs to the analysis module: fishery specific data and the management scenarios to be analyzed.

The output of the analysis module is a set of four numbers for each scenario. The suite of outputs for multiple scenarios can be compared and, based on the management goals for that fishery, can be used to inform the selection of a management scenario. For example, if economic gain is the highest priority, then a scenario with the highest economic gains would be a good candidate. However, if the environmental performance is more important, a scenario with the higher environmental score would be favorable.

Economic Model

The equimarginal principle in economics states that net benefits are maximized when the marginal benefits from an allocation of goods are equal for all users.[10] In the context of this project, if the sectors of the near-shore fishery have a different marginal value for tags, they will find it in their best interest to trade until all sectors have the same marginal value for tags. Furthermore, this trading will maximize the net benefits of the fishery. As a result of trade, the distribution of catch among sectors may shift, resulting in a change in the proportions of the total harvest caught by each sector. In order to employ the equimarginal principle, and determine whether there would be a change in the distribution of catch, we determined the demand for tags in each sector. In the commercial sector, data on the volume and market price for fish caught from the nearshore fishery was available from the California Department of Fish and Game. Cost data were used from a fishery with similar fishing techniques. From this information, we derived a marginal benefits curve, which we used as marginal demand for tags in the commercial sector.

The construction of demand curves for the recreational sectors requires data on anglers' marginal willingness to pay (WTP) for fish. Due to limitations in the existing literature, we conducted a contingent valuation survey in which we described the tag system, presented the respondents with a hypothetical tag price and asked individuals how many tags they would purchase at that price for the current day's trip. Using ordinary least squares (OLS) regression analysis, a model was created that predicted demand for tags in the recreational industry sector. The same data was used to create a similar regression model to determine the WTP for tags in the recreational angler sector.

$$Q_{D(recreational\ industry)} = f(\text{expected catch, age, annual number of charter trips, price per tag})$$

By employing the equimarginal principle, we predicted how the distribution of catch would change in each scenario, and what the economic impact would be from those changes:

- Scenario 1 will have no change in the distribution of catch among sectors and no gains from trade because there is no trade across sectors.
- Scenario 2 will have a 5% shift in the total harvest (14,213 tags) from the recreational industry sector to the commercial sector. The total gains from trade across sectors are $12,072, a 0.4% increase in the value of the fishery. Trade is voluntary, and both sectors benefit from trade: the commercial sector benefits from more catch and the recreational industry benefits from revenues from tag sales.
- Scenario 3 will have a 7% shift in the total harvest (20,447 tags). The total gains from trade across sectors are predicted to be $37,786, a 1.3% increase in the value of the fishery. Trade is voluntary, and all sectors benefit.

Multicriteria Analysis for Environmental, Social and Political Models

In the environmental, social, and political models, a Multicriteria Analysis (MCA) was used to compare management scenarios. In each model, we compiled a list of relevant stakeholders. Each stakeholder was assigned a weight to represent their proportional impact or vested interest in the criterion.

We selected elements of comparison that could serve as performance barometers, and that allowed us to compare management scenarios. Scores for performance were assigned based on how each element performed under each management scenario as compared to the baseline scenario. Scores were -1 for a negative performance compared to the baseline, 0 for no change in performance, or 1 for a positive performance compared to the baseline. Generally the scores were determined through scientific literature and observation of similar management practices implemented elsewhere.

<u>Environmental Model</u>

In the environmental model, the following elements were used as indicators of the environmental performance of each management scenario: biomass, size distribution, habitat impact, bycatch, and discards. In each scenario, each sectors received a score for each element. The scores in each element reflected the predicted impact of a sector on the environmental performance of the fishery based on the expected changes in the distribution of catch. The environmental analytical model predicted that all scenarios would have relatively small impacts on the environmental performance of the fishery as compared to the baseline. When aggregating the expected environmental performance across all sectors, scenario 2 has the greatest relative improvement in environmental performance as compared to the baseline. Scenario 1 has worse relative environmental performance, and scenario 3 has a slight improvement.

<u>Social Model</u>

In the social model, the following elements were used as indicators of the impact of each management scenario on society: jobs (number of jobs, quality of jobs, and wages), access and opportunity (access to boating infrastructure, presence of a working waterfront, opportunity for new anglers to enter the fishery, and access to charter fishing trips), and peripheral effects (fishing-related industry, tourist industry, fish markets, and community ideals). Each element received a weight based on its importance to the Santa Barbara Channel Nearshore Fishery. In each of the scenarios, each element received a score, which reflected the predicted impact of a management scenario on society. When aggregating the social impacts across all elements, scenario 2 has the greatest relative improvement as compared to the baseline. Scenarios 1 and 3 have relatively worse social performance compared to the baseline.

Political Model

The political model was further divided into a political acceptability model and a political readiness model. The political acceptability model analyzes the acceptability of each management scenario to five stakeholders (commercial sector, recreational industry sector, recreational angler sector, NGOs, and the regulatory body). Scores were based on how each management scenario and its impact on distribution of catch aligns with the priorities of each stakeholder. The political acceptability model predicted that all scenarios would be relatively acceptable to the regulatory body and the recreational industry sector. When aggregating the political acceptability across all stakeholders, scenario 3 has the greatest relative acceptability with scenario 2 close behind. Scenario 1 is relatively unacceptable.

The political readiness model analyzes whether the necessary infrastructure and management institutions currently exist to implement the management scenario. The output from this model is a percentage of how ready each stakeholder is to implement the management scenario. When aggregating the political readiness across all stakeholders, the total readiness is 46-percent in scenarios 1 and 2 and 33-percent in scenario 3.

Results and Discussion

This analysis indicates that a catch share fishery management system that integrates commercial and recreational sectors can result in greater benefits than a system that manages sectors separately. In the case of the Santa Barbara Channel Nearshore Fishery, this analysis predicts that in the most progressive scenario, 7-percent of the total harvest would shift between sectors. In general, we recommend using catch shares to integrate the management of the commercial and recreational sectors. The preferred management scenario depends on the priorities of the fishery. For the Nearshore Fishery, scenario 2 is predicted to outperform the baseline across all criteria. Economic gains and political acceptability further improve in scenario 3, but these improvements come with tradeoffs, namely negative social performance and reduced environmental benefits. As a result, stakeholders and fisheries managers must consider the specific goals of fisheries reform.

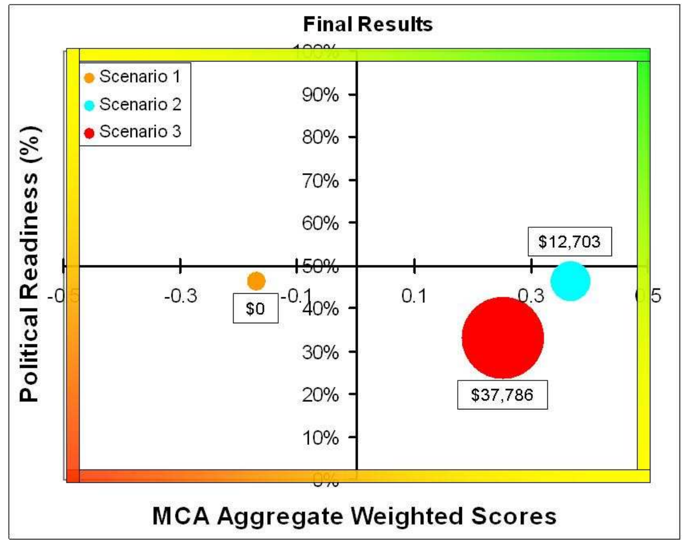

Figure 3. Results from all models

MCA scores for the environmental, social, and political models are on the left-hand axis. Gains from trade from the economic model are on the right-hand axis

Due to the relatively coarse resolution of this study, we were only able to calculate gains from trade *across* sector. However, if sectors are not operating efficiently, we found that tradable tags *within* sectors would generate gains from trade that could be equal to or greater than the gains from across-sector trade.

Our analysis indicates that a catch share management system that integrates commercial and recreational sectors *can* result in greater benefits, which suggests further research should examine *how* such a management system could be implemented.

This analysis was designed to be replicated in other fisheries where catch shares could be used to integrate the recreational and commercial sectors of a fishery; contact project members for more information about using the software tool.

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