GROUP PROJECT BRIEF

LOWERING BARRIERS TO ALTERNATIVE MANAGEMENT STRATEGIES AND COLLABORATIVE FISHERIES RESEARCH

CLIENT: ENVIRONMENTAL DEFENSE FUND

Project Members:
Ashley Apel
Kristine Faloon
Dave Panitz
Courtney Scarborough
Clare Shelton

Faculty Advisor:
Hunter Lenihan

ON THE WEB AT HTTP://FIESTA.BREN.UCSB.EDU/~FISHERIES SPRING 2009

Research Question

How can the MPA-based, Decision Tree management strategy be implemented to improve sustainability and profitability in the Santa Barbara nearshore finfish fishery by moving management beyond broad-scale, data-poor, precautionary methods?

Introduction

United States fisheries are vital economic, cultural, and consumptive resources, whose sustainability is threatened by management inefficiencies. These inefficiencies are a product of precautionary management due to a shortage of fisheries data, inappropriate scales of assessment and management, and a lack of collaboration between fishermen, scientists, and managers (Fig. 1). Traditional stock assessment methods demand large amounts of data over both time and space, resulting in considerable uncertainty and under-informed management decisions when data is unavailable. The Decision Tree, an alternative management strategy, taps fishermen as a resource for collecting scale appropriate fishery data at minimal cost and integrates marine protected areas (MPAs) into fisheries assessment (Fig. 2). This additional data effectively contributes to better informed decision making and management. Implementation of the Decision Tree management strategy can improve efficiency and encourage the integration of collaborative research with science-based management.

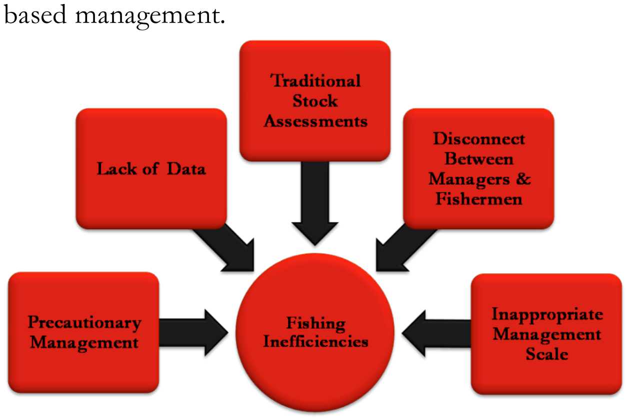

Figure 1: Problems associated with fishing inefficiencies

Santa Barbara Nearshore Fishery

The Decision Tree method is especially useful in fisheries that exhibit sub-population dynamics, such as the nearshore live finfish fishery in the Northern Channel Islands.

- Three primary methods used to fish grass rockfish and cabezon are sticks, rods and traps.
- In part due to stricter regulations, the number of fishermen fishing live fish has decreased in recent years, while the price per pound for fish has increased [1].
- 30% of active fishermen (17 individuals) in the South Coast nearshore fishery made landings in the Santa Barbara port complex in 2008 [2].
- Santa Barbara fishermen land 24% of grass rockfish and 11% of cabezon in California [2].
- Grass rockfish is considered a data poor fishery, while cabezon falls into the data moderate classification [3].

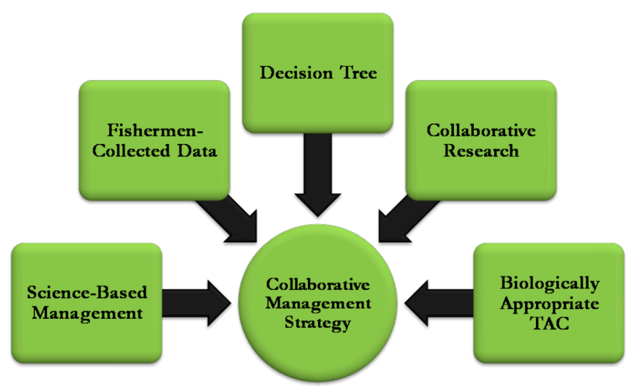

Figure 2: Solutions associated with a collaborative management strategy

Interviews

An interview-style survey was conducted with 7 fishermen (44% of the fishery) in the nearshore live finfish fishery in Santa Barbara. Much of the information used in the general analysis of fishery dynamics, as well as specific economic information, was garnered during these interviews. Survey goals were to:

- Obtain demographic information to characterize the fishery
- Gather input for data collection tools and techniques
- Build working relationships
- Gauge interest in collaborative management

All fishermen interviewed rely on fishing as their only source of income. However, local fishermen are spending less time fishing grass rockfish and cabezon than they have historically. On average they hold permits in 3 other fisheries, including lobster, southern rock crab, and urchin. Survey results indicate that fishermen:

- Are dissatisfied with management of the nearshore live finfish fishery (Fig. 3)
- Believe the information used to assess the stock and assign catch levels is inaccurate
- Would like to participate in fisheries management

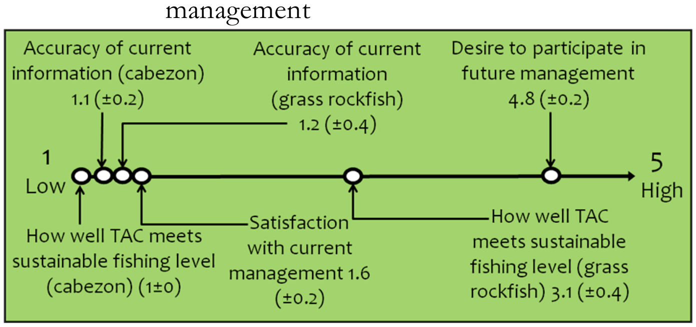

Figure 3: Average survey response (± standard error) regarding fishermen satisfaction with current management practices

The Decision Tree

The Decision Tree approach to stock assessment utilizes four stages of adaptive analysis to set and refine total allowable catch (TAC) estimates. This collaborative method utilizes fishermen-recorded location, fish size structure, and catch per unit effort (CPUE) data inside and outside of marine reserves, to inform managers on biologically significant scales. The Decision Tree management strategy has the capacity to:

- Increase data collection at biologically significant scales
- Minimize the cost of data acquisition by incorporating collection into fishermen workflow
- Integrate MPAs into fisheries assessment and management
- Enhance collaboration between fishermen, scientists, and managers
- Transition data-poor fisheries from precautionary to data-rich, science-based management

Data Collection Technology

This project developed a set of solutions designed to meet both fishermen requirements for data security and the Decision Tree's requirements for data volume, precision, and integrity. Our approach considers technological, cost, and manpower constraints at each stage of the data lifecycle.

Population size structure samples must include throwbacks, which represent a significant portion of overall catch. Size screening only happens on skiffs, making them a critical venue for recording throwback lengths. We thus developed two sampling technology/methodologies: one for skiffs, and another for boats.

Our skiff-based solution prioritizes ruggedness and time efficiency while minimizing footprint and cost. It eliminates paper catch logs by allowing fishermen to mark length, date, and time directly on the board's removable PVC insert. Inserts (one for each location) are transferred to the laboratory for length measurements, and coupled to GPS data collected with onboard GPS logging technology. Fixed cost for the fish board is minimal (~$30), while basic GPS logging technology costs less than $100. As of February 2009, this method is currently being field tested by two fishery members.

Our boat-based design prioritized workflow integration and minimal footprint/cost/effort/power draw. This inexpensive apparatus is mounted on the cabin roof ledge, facing downward to a worktable where fish are photographed prior to hull storage (Fig. 4). Species length, time, and location data are coupled to images manually, or automated with computer vision software and GPS logging technologies. Total one-time cost for the camera plus GPS logging hardware is approximately $500 per boat.

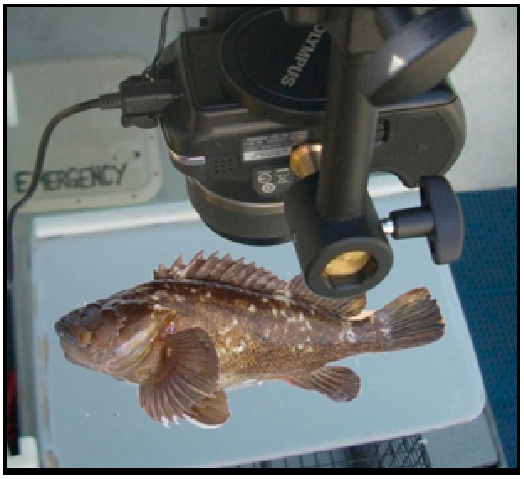

Figure 4: Mounted camera for recording catch data

Fishery Organization Scenarios

Effective implementation of the Decision Tree is most efficiently accomplished in conjunction with a cohesive fishery organization, conceptualized as an organic, step-wise process (Table 1).

University Funded Collaborative Research:

- UCSB is primary motivation and funding source for data collection.
- Collaborative research between UCSB and fishermen increases opportunities for knowledge-sharing and trust-building.
- Fisheries data gathered via port sampling (discarded fish are not documented) and onboard sampling (inside and outside marine protected areas).
- Data do not inform management decisions.

Association:

- Loose association of fishermen where individuals agree to collect data with UCSB researchers and conduct regular meetings with formal leadership.
- University researchers involved in port sampling, onboard sampling within reserves, and data analysis. Fishermen collect length, species, and location data during routine fishing trips.
- Organization not formally recognized by the California Department of Fish and Game (CDFG).
- Fishermen eligible to apply for a research set aside, where a portion of a fishery's TAC is set aside for research, in order to recoup the costs of data collection.

Cooperative:

- Most socially complex scenario as cooperative is recognized legally as a business or non-profit organization.
- Fishermen formally agree to collect data, pay dues, attend regular meetings with formal leadership, and work towards other goals defined by the cooperative.
- Potential benefits include a TAC allocation for the cooperative or the South Coast region due to an increase in fisheries population data.
- Provides the CDFG with an organization in which to place responsibility and assist with regional TAC management.

	University Funded Collaborative Research	Association	Cooperative
Knowledge Sharing	X	X	X
Spatially-Explicit Population Data	X	X	X
Throwback Data (onboard sampling)		X	X
Access to Outside Funding		X	X
Research Set-Aside		X	X
TAC Allocation			X
Resource Pooling			X
Recognition by CDFG			X
Data Collectors Benefit	X	X	X
Entire Fishery Benefits			X

Table 1: Benefits of three fishery organizations

Economic Analysis

In order to compare the three scenarios, we chose to look at the value of one hour of fishing time in this fishery and the cost of data collection within each scenario. We based on our analysis on several assumptions:

- Fisherman catch cabezon and grass rockfish on a 1:1 ratio
- Each fishing day is 10 hours long and 7 fish per hour are caught
- Each fish weighs 1.5 lbs, resulting in a total landed catch of 105 lbs of fish per day
- After cabezon limit is reached, the rest of that day is spent fishing, with fishermen throwing back cabezon and keeping only grass rockfish

- Costs and fish prices are constant over time

Using these assumptions, we determined the amount of each species a fisherman would catch annually, the total number of days fishing until their quota is filled, and the value of one hour of fishing time in this fishery. The time-value of one hour is $95.22. The one-hour designation is based on the assumption that onboard data collection takes approximately one hour per day. Fishermen will still fish for 10 hours, but they catch 9 hours worth of fish when collecting onboard data.

Scenario	Inside-Reserve Collection	Outside-Reserve Collection	Total Data Collection Costs
University Funded Collaborative Research	$24,000	$24,000	**$48,000**
Association	$24,000	$1,904.40	**$25,904.40**
Cooperative	$24,000	$1,904.40	**$25,904.40**

Table 2: Annual data collection costs

Based on an analysis by MacCall [4], the amount of data required to lower the covariance of CPUE to a level acceptable by CDFG is 20 samples inside reserves and 20 samples outside reserves (40 total trips) per year. 20 samples outside reserves (20 hours lost collecting data x $95.22 per hour) is a total cost to fishermen of $1,904.40 (Table 2). This amounts to 272 lbs of cabezon, which is only 0.46% of the total cabezon TAC for the state. CDFG can increase the current TAC by less than 1% to allow fishermen to recoup the costs of data collection outside reserves. Involving fishermen in onboard data collection will not only significantly lower costs of data collection, but also the data collected will provide a clearer picture of actual stock status.

Discussion

Historically, California fisheries have been managed within a rigid framework based on use of complicated and data-intensive stock assessments. Data collected via collaborative efforts has yet to be significantly incorporated into stock assessments or management decisions. While there is no precedent for employing alternative management strategies in California, acceptance of such methods is developing within the CDFG [5]. Reforming management to incorporate data on biologically appropriate scales is crucial to sustainable management of fisheries that exhibit sub-population dynamics. Furthermore, this integration will allow for the successful enactment of long-unfulfilled state and federal legal mandates.

There is an evident need for an alternative management strategy in the grass rockfish and cabezon fisheries. The Decision Tree is the most locally applicable and adaptable of these methods to date, and therefore appropriate to use in the Santa Barbara nearshore live finfish fishery. This approach not only aligns the scale of stock assessment with the scale of biological function, but also decreases data collection costs by using fishermen-collected data and integrates MPAs into fisheries assessment and management. Effective implementation of the Decision Tree is most efficiently accomplished in conjunction with a cohesive fishery organization. We conceptualized this as an organic, step-wise process from the current organizational structure under University Funded Collaborative Research, progressing in complexity to an Association, and finally a Cooperative. This organizational framework achieves data collection and assessment goals and distributes management responsibility between CDFG and local fishermen. The Decision Tree method has the capacity to transition the nearshore finfish fishery from precautionary to science-based management, simultaneously increasing collaboration between fishery stakeholders and improving economic and biological sustainability.

Acknowledgements

Jono Wilson
Santa Barbara Nearshore Fishermen
Lenihan Lab/CALobster
California Department of Fish and Game
MPA Density-Ratio Working Group
Donald Bren School Faculty & Staff

References

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[3] V.R. Restrepo *et al.*, "Technical Guidance On the Use of Precautionary Approaches to Implementing National Standard 1 of the Magnuson Stevens Fishery Conservation and Management Act" (NOAA Tech. Rep. NMFS-F/SPO-##, 1998).
[4] A. MacCall, paper presented to MPA Reference-Based Working Group, Santa Cruz, CA, July 2008.
[5] K.E. Phipps, R. Fujita, T. Barnes, in press. "From paper to practice: Incorporating new data and stock assessment methods into California fishery management."