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GROUP PROJECT BRIEF

Assessment of the California Spiny Lobster recreational fishery in the Santa Barbara region

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ON THE WEB AT HTTP://WWW.BREN.UCSB.EDU SPRING 2006

Introduction

Issues

- **Effective fishery management must consider all types of natural and fishery-related target species mortality.**
- **The commercial catch of the lobster fishery is well defined and regulated.**
- **The recreational fishery in terms of gear-type and landings is undefined, and harvest is not regulated.**
- **The sustainability of this fishery is dependent on the assessment and description of the recreational fishery.**

Rates of harvest from open access recreational fisheries are difficult to quantify due to the combination of diffuse participation, variations in local-scale regulation, and uncertainty in estimates of effort and catch. Estimate of recreational harvest account for as much as 64% of total landings for some marine fisheries. However estimates place other worldwide recreational landings at approximately 10% of total fish landed when large industrial fisheries (i.e. Pacific sardine) are excluded. The California spiny lobster, *Panulirus interruptus*, is the subject of a lucrative commercial fishery along the southern California mainland and islands. This species is also the target of an active recreational fishery that supports many commercial enterprises in the region. In 2004, the commercial fishery for *P. interruptus* landed 928,302 pounds at a value of $6,629,297. By area, ports in the Santa Barbara region landed 396,350 pounds at a value of $2,935,470; approximately 43% of the total California lobster fishery in 2004.

Little quantitative information is known regarding the recreational harvest of spiny lobster. Recreational harvest of *P. interruptus* can potentially have significant impacts on the population dynamics of spiny lobsters, through effects on the abundance, size-structure and reproductive capacity of lobster populations. The recreational fishery may have important impacts on the commercial fishery and vice-versa. A greater understanding of recreational harvest and the factors that influence its variation through space and time will assist management agencies, like the Department of Fish and Game, towards the goal of ecosystem-based management, and enhanced fishery sustainability.

Objectives

Primary objectives of our investigation are to estimate the harvest of the recreational fishery for Spiny lobster in the Santa Barbara Channel region, and to describe the fishery's behavioral dynamics (why, how, when participants fish for lobster). Our assessment will help marine resource management agencies to better understand and effectively manage the fishery and its ecosystem. Our investigation also aims to create a replicable data-gathering and analysis system that will further refine current descriptions of the fishery.

Scope

The geographic scope of our investigation is Santa Barbara County. However, because the Channel Islands are a primary recreational fishing area, we added Ventura County to our scope, so as to include all fishery participants originating from its ports. Our target population includes all fishery participants with respect to gear-type. The biological scope of our study is the California spiny lobster.

Significance

Little information is known about recreational spiny lobster fishery in California. It is generally agreed that recreational fisheries have significant impacts on the viability of harvested marine fish populations. It is imperative to the sustainability of our regional lobster fishery that the recreational component be described, quantified, and properly managed. The recreational harvest of lobster may substantially impact local spiny lobster population viability, and ecosystem health and dynamics. Fishery impacts on ecosystems are of direct interest to the Channel Island National Marine Sanctuary (CINMS) and the California Department of Fish and Game (CDFG), in their charge to manage the regions marine species and ecosystems. The CDFG is directly tasked with the management of the spiny lobster and as such has stock in our investigation in its quest to create methods for the proper description of the fishery.

Methods

To create a rigorous and replicable data-gathering, and analysis system as a tool to describe the fishery, we developed and tested a set of stated and revealed preference surveys. The surveys are the primary data-gathering tools of our system, yet the system is also made up of data-analysis methods, harvest quantification models, and a questionnaire designed to gauge the fishery's support for lobster conservation efforts (Lobster Stamp Program). As such, the data-gathering and analysis system serves to both collect data and synthesize it; creating a method by which to describe and quantify the fishery. Our investigation can thus be divided into four principal sections:

1. **Data-gathering and analysis system**
2. **Fishery Socio-economic and Behavioral Dynamics**
3. **Recreational Harvest**
4. **Lobster Stamp Program**

Data-gathering and analysis system

A data-gathering and analysis system will allow for the compilation of recreational fishery harvest and socioeconomic data to better describe the fishery. To measure the success of our survey implementation efforts we created an evaluation scheme to assess the effectiveness of each outreach method. Each survey outreach method was classified according to its respective rate of return from respondents. The effectiveness of each survey outreach method was given a qualitative ranking according to its approximate rate of return from respondents. An effectiveness level of "High" warranted a 40% return of surveys from respondents. A 20% - 40% return from respondents was given an effectiveness level of "Medium", and any method that returned less than 20% of the surveys was given an effectiveness level of "Low." The survey methods that were given a high effectiveness level were "In Person" administered surveys on charter boats and dive clubs. Other survey methods that were employed (intercept, workplace, e-mail, telephone, dive shops, online survey) returned medium to low return rates, and were subsequently removed from consideration as viable data-collection methods. The online survey, a viable method, will remain available to collect surveys in perpetuity.

Available: www.lobstersurvey.org

Socio-economic and Behavioral Dynamics

Dividing the fishery into its behavioral components can significantly add to current fishery descriptions. Knowing the behavioral tendencies of the recreational fisherman can provide the CDFG with a valuable tool to gain insight into the socioeconomic drivers of the fishery. This will create a better understanding among regulators on what motivates fisherman, and could potentially lead to better estimates of present and future recreational harvest and fishery participation.

The preliminary summary statistics results presented below yielded an initial socio-economic and behavioral description of the fishery:

Socioeconomic and Behavioral Parameters	Preliminary Findings
When	Visibility
How	Enjoyment
Why	Food
Where	Chances of Finding Lobsters
Years Fishing	11 years (mean)
Age	45-59 years old (40%)
Employment Status	Full Time (76%)
Income	Over $80,000 per yr. (31%)
Travel Distance	Under 10 miles (36%)

Table 1: A preliminary description of the fishery's Socio-economic and behavioral parameters.

Recreational Harvest

Due to uncertainties in estimates of participation for the California recreational fishery, and the pressures these fishing groups place on local populations, our investigation aimed to produce initial estimates of fishery size and harvest. Current approximations of the number of fishermen utilizing this resource (f) in the Santa Barbara region were based on fishery effort data provided by the Pacific States Marine Fisheries Commission (PSMFC) Recreational Fisheries Information Network (RecFIN) and DFG license sales statistics. Derived estimates ranged from 3,683 to 8,655 fishermen, with a predicted median of 6,109. Preliminary estimates of effort (τ_g) and fishing efficiency ($e_{\tau g}$) by gear type were derived from stated behavior based on the survey data collected in our investigation, allowing approximations of recreational harvest (H_{rec}) in this region based on a static model of recreational harvest. Surveys were predicted to display inherent bias toward fishermen taking a greater number of trips each season. Making the assumption of a direct relationship between the number of trips each season and the probability of sampling using the survey tools, quantitative methods were developed to account for survey bias. Two models were formulated (with and without incorporating bias) to predict annual rates of harvest generated by this fishery.

Over the range of estimates of fishery size, recreational harvest varied from approximately 5,000 to 15,000 lobsters harvested during the 2004/2005 season. Scuba divers accounted for the majority of harvest (73.8%), while users of free diving gear and hoop-nets respectively accounted for 16% and 10.2% of total harvest.

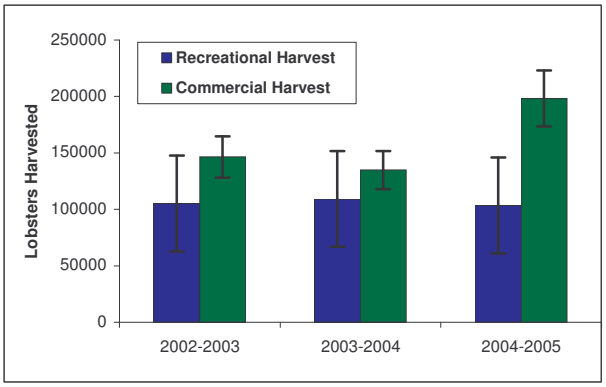

Figure 2: Temporal trend in recreational and commercial harvest in the Santa Barbara Channel region using the base model

When combined with commercial landings, recreational harvest may represent approximately 20% to 61% of total landings, however these figures are assumed to overestimate harvest since data is biased towards respondents by gear-type and towards fishermen taking a greater number of trips each season. Incorporating sampling bias into the recreational harvest model resulted in significant reductions in harvest estimates, as recreational fisheries were predicted to account for 8% to 22% of total harvest.

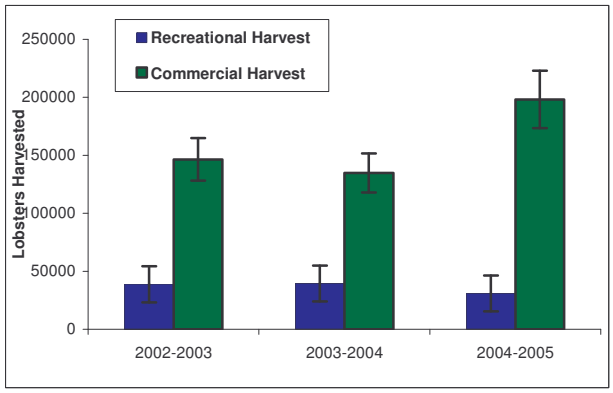

Figure 3: Temporal trend in recreational and commercial harvest in the Santa Barbara Channel region using the bias-incorporated model

The distribution of harvest by gear type also changed significantly when survey bias was considered. Scuba divers continued to account for the majority of harvest (67%), however harvest from free divers increased to 29% with hoop-net fishermen only accounting for approximately 4% of harvest. These results indicate that the base model overestimated harvest from hoop-net fishermen, while underestimating harvest from free divers. Using estimates from the model incorporating bias as current best estimates and impacts of recreational fisheries, the impact of the fishery's recreational component is potentially significant., and consistent with estimates of the impact from other recreational fisheries throughout the world, and deserves attention from management.

Conservation: A Lobster Stamp Program

Through the stated preference survey method the level of support for the lobster stamp program may be measured through future implementation of the replicable data-gathering and analysis system. Our results indicate that 64% of the survey participants support the implementation of the lobster stamp program, while 36% of respondents do not.

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The most cited reason for support was for the improvement of management (38% or respondents), while the largest reason for non-support for the lobster stamp program was due to the associated increased cost (14%). Additionally, the level of support can be measured through soliciting the value of the lobster stamp program to respondents by imploring their willingness to pay for such a program. The mean willingness to pay indicated by respondents for the lobster stamp program was $4 for all responses, while a mean willingness to pay value of $7 was calculated for all participants in support of the lobster stamp program.

Discussion and Conclusions

Results from our study suggest that the use of a general stated-preference survey will allow for a crucial course-scale description of the fishery. The stated preference survey can be used to create a fishery profile representative of all participants, which can provide useful information to help explain the socio-economic and behavioral drivers of fishery dynamics. Our data collection and analysis system creates a replicable system by which to derive estimates of fishery harvest; to compliment the aforementioned socio-economic and behavioral dynamics of the fishery. Further resolution and insight into fishery participant socio-economic descriptions, and fishery effort and harvest may be gathered through continued improvements to the data-gathering and analysis system's surveys, and its models and analysis methods. Such improvements will create a more rigorous method to describe and qauntify the fishery Finally, our investigation uncovered local support for lobster conservation efforts through the implementation of a lobster stamp program. Support for such a program is further affirmed by the fishery's willingness to pay for such a program.

The replicable data-gathering and analysis system was adjusted and corrected for sample and survey question bias. Our harvest models and analysis methods were modified in respect our findings. Our investigation has thus developed, tested and subsequently modifed a replicable fishery-description method complete with data-gathering and analysis methods. These have been assembled into a practical fishery management tool for the CDFG as a foundation to further investigate and describe the recreational spiny lobster fishery.

Recommendations

To properly assess the recreational harvest of spiny lobster and describe the socio-economic and behavioral dynamics of its fishermen, in order to assist marine resource management agencies to better understand and effectively manage the fishery and its ecosystem, our investigation has created a graduated system of recommended action alternatives to further our findings.

Recommended Action Alternatives

PLAN A: Further test results of lobster stamp data by incorporating a stamp-support question in the CRFS questionnaire. If this method suggests that a stamp program is supported by the fishery, implement the program and initiate our survey system to collect data from stamp purchasers. This plan would allow for the gathering of unbiased data covering the entire fishery and the use of our models to quantify harvest.

PLAN B: If support for a stamp cannot be confirmed, initiate our data-gathering and analysis system using the least bias methods (intercept and online surveys). This will allow for an extensive initial description of the fishery, and may prove support for the lobster stamp program.

PLAN C: If the data-gathering and analysis system and intercept surveys are too expensive, distribute the survey through the most economically efficient methods, which will yield some bias. Address bias through various methods such as bias-corrected calculations of f_i, focusing on particular attributes of the fishery. This plan will further our investigation's preliminary description of the fishery, and may lead management agencies towards improved fishery management.

Acknowledgments

We would like to thank our clients: Kristine Barsky, of the California Department of Fish and Game, Carrie Culver, of the California Sea Grant Extension Office, Sean Hastings and Chris LaFranchi, of the Channel Islands National Marine Sanctuary, our faculty advisor Hunter Lenihan, and professors Bruce Kendall, Jeff Dozier, Chris Costello, and Mike McGinnis of the UC Santa Barbara Donald Bren School, for their extensive guidance and contributions throughout our analyses.