



# ASSESSMENT OF THE CALIFORNIA SPINY LOBSTER RECREATIONAL FISHERY IN THE SANTA BARBARA REGION



## Introduction

The California spiny lobster is the target of lucrative commercial and recreational fisheries along the southern California mainland and islands. Little quantitative information is known regarding recreational harvest of this species. A greater understanding of the fishery's recreational harvest and dynamic drivers will move management agencies closer to an ecosystem-based management approach. Our investigation seeks to develop methods to describe the fishery to assist management agencies in their continued efforts to manage the sustainability of this fishery.

## Project Scope

Region	Target Species	Recreational Harvest Practices
	 California Spiny Lobster <i>Panulirus interruptus</i>	<ul style="list-style-type: none"> <li>Scuba Diving </li> <li>Free Diving </li> <li>Hoop-netting </li> </ul>

## Project Objectives

- Estimate the regional spiny lobster recreational harvest
- Describe the behavioral dynamics governing this fishery
- Evaluate the support and willingness to pay for lobster conservation efforts (Lobster Stamp Program).
- Design a replicable data gathering system

## Project Significance

- Little information is known about this recreational fishery.
- Worldwide, recreational fisheries can have a significant impact on the viability of harvested marine fish populations.
- Recreational harvest of lobster can cause complex effects on ecosystem processes.
- Fishery impacts on ecosystems is of interest to the Channel Island National Marine Sanctuary.
- Our project directly benefits the California Department of Fish and Game in its charge to manage the California spiny lobster and its ecosystem.

## Acknowledgements

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 Bruce Kendall—Bren School of Environmental Science & Management

## Methods

- Development of stated preference survey and subsequent revealed preference and online surveys
- Development of an outreach scheme
- Development of a recreational harvest model
- Development of fishermen behavioral and demographic profile
- Integration of all of the above into a replicable data gathering system

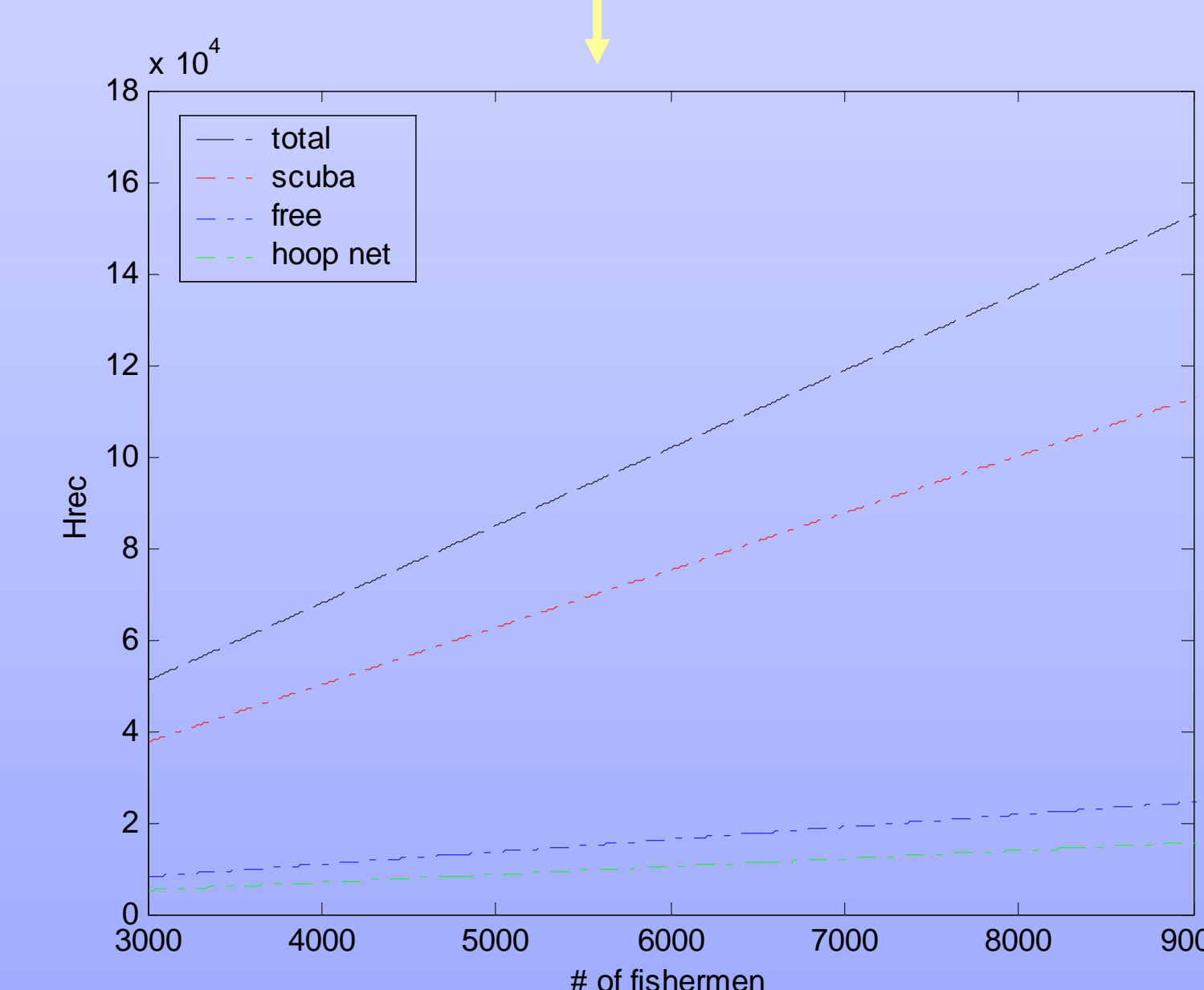
## Recreational Harvest Model

Static model of recreational harvest based on stated fishermen behavior:

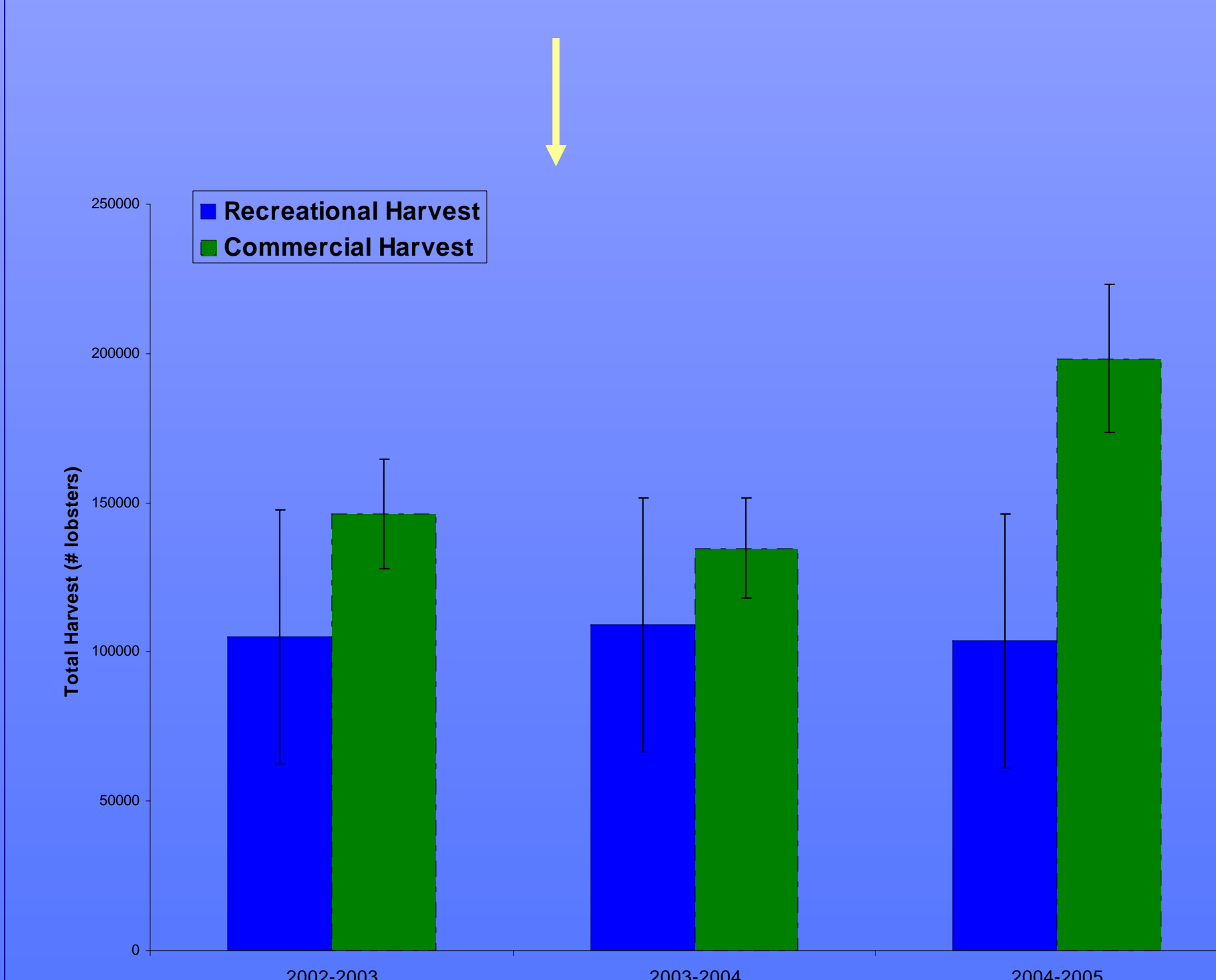
$$H_{rec} = \sum_{g=0}^i \sum_{\tau=0}^{\infty} f_{\tau g} \tau_g e_{\tau g}$$

Correcting for bias in the calculation of  $f_{\tau}$

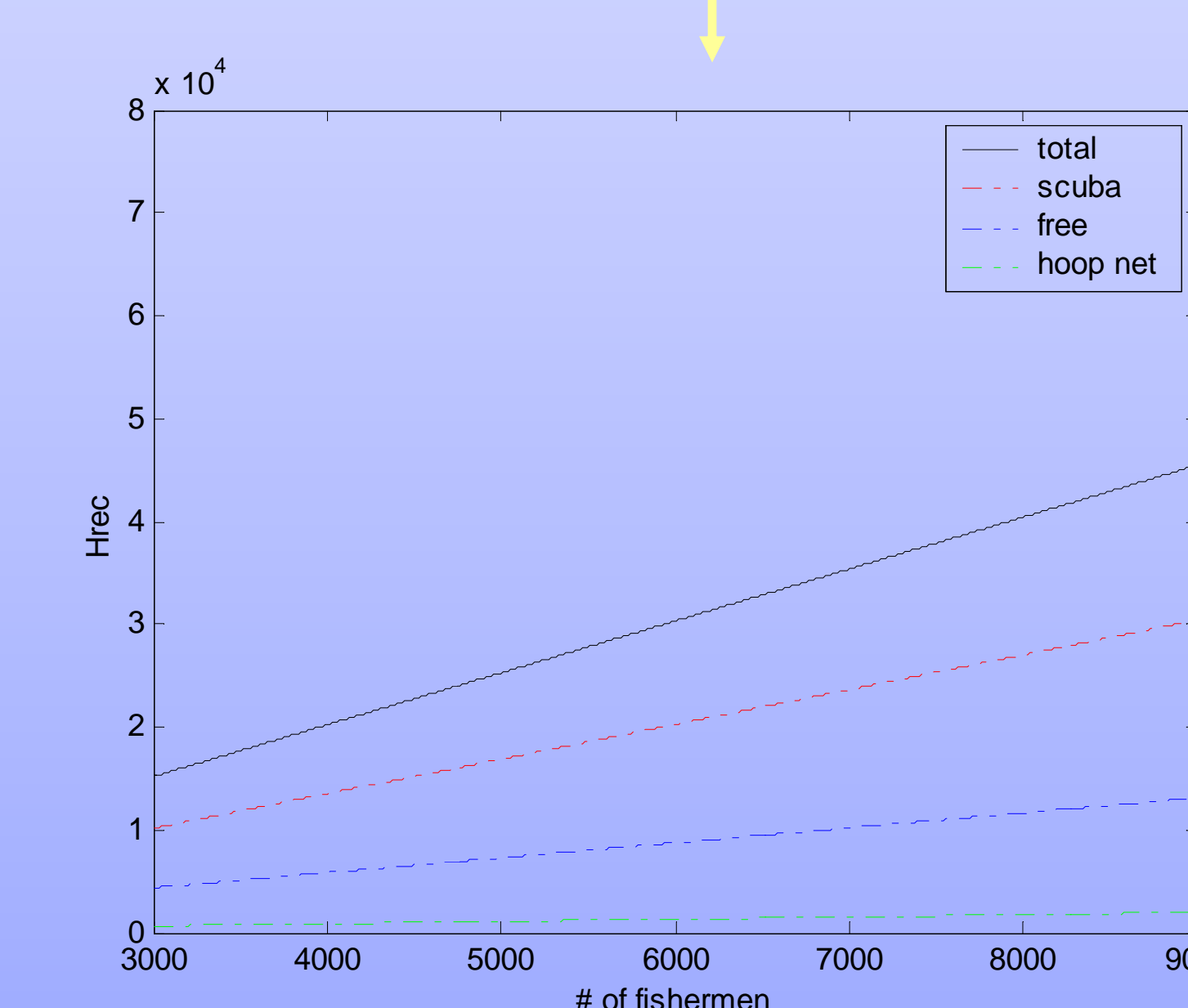
$$\Pr\{observation\} = \frac{f_{\tau} \tau}{\tau_{total}} = \frac{f_{\tau} \tau}{\sum_{\tau=1}^{\tau_{max}} f_{\tau} \tau}$$



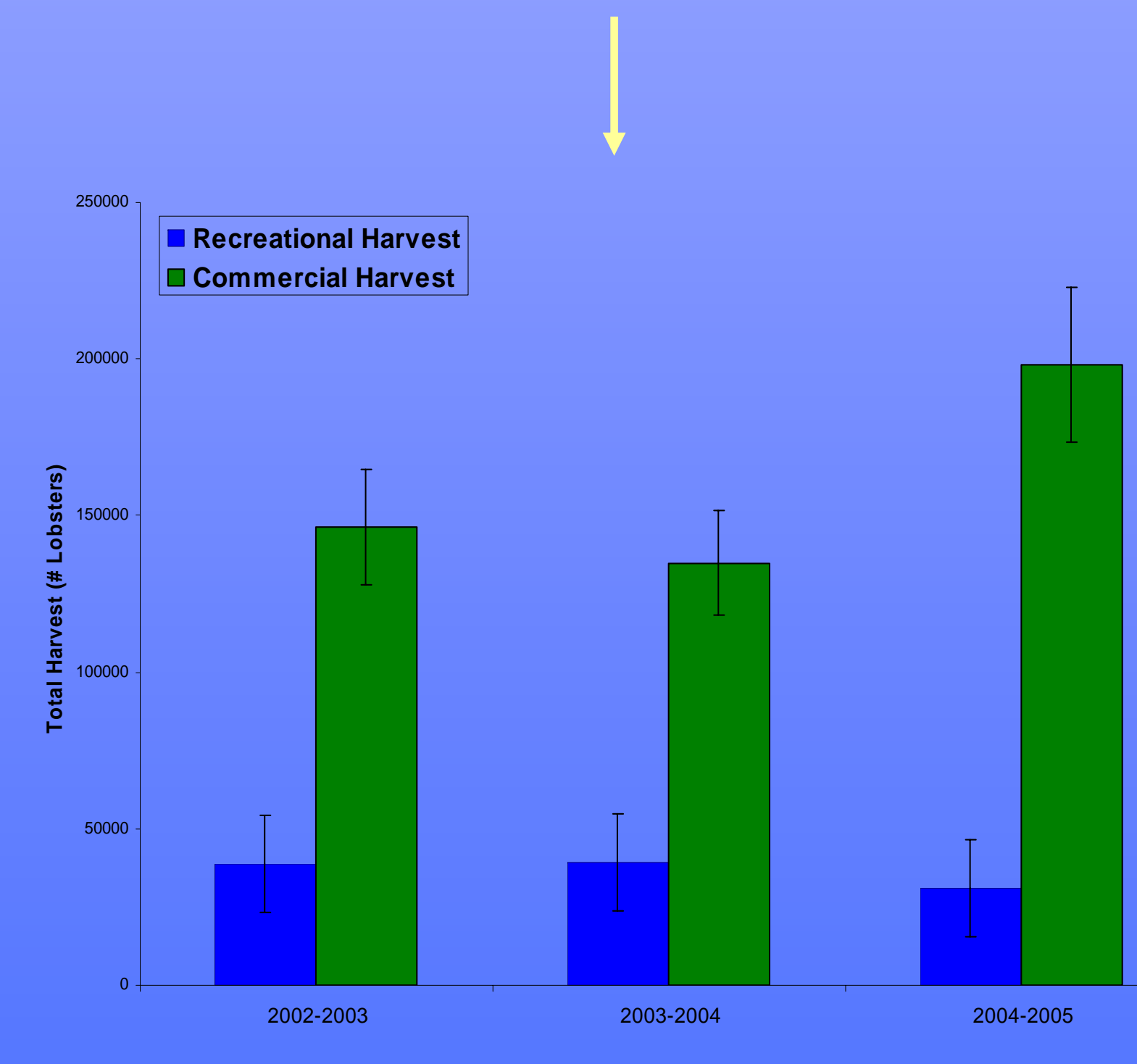
Predicted rates of harvest across values of  $f_{total}$



Temporal trend in recreational and commercial harvest



Predicted rates of harvest across values of  $f_{total}$



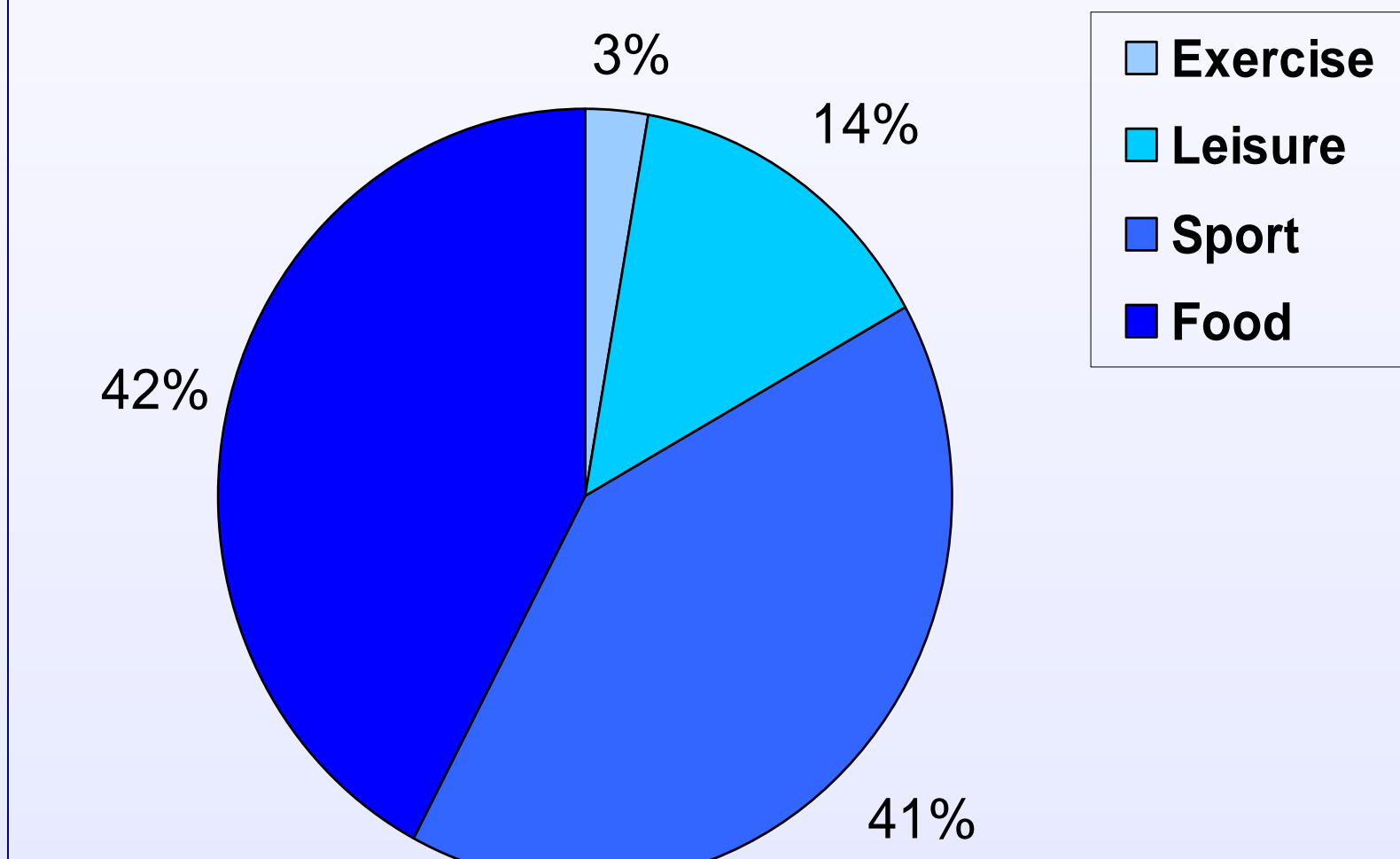
Temporal trend in recreational and commercial harvest

### Group Project Members

Tal Ben-Horin, Caroline De Zutter, Andrew Ma, and Geoffrey Ravenhill

## Fishery Behavioral Dynamics

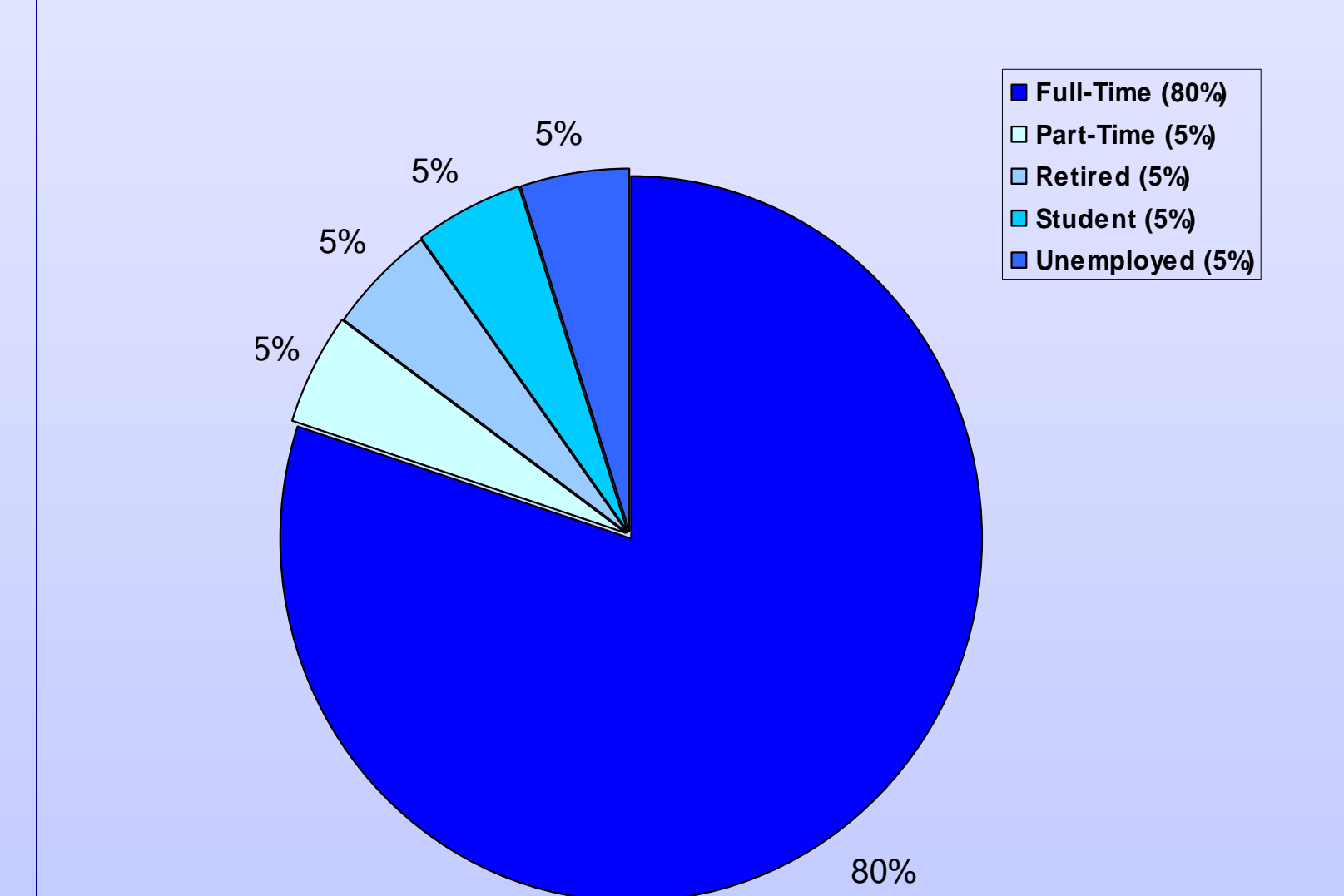
### 1. Behavioral Description



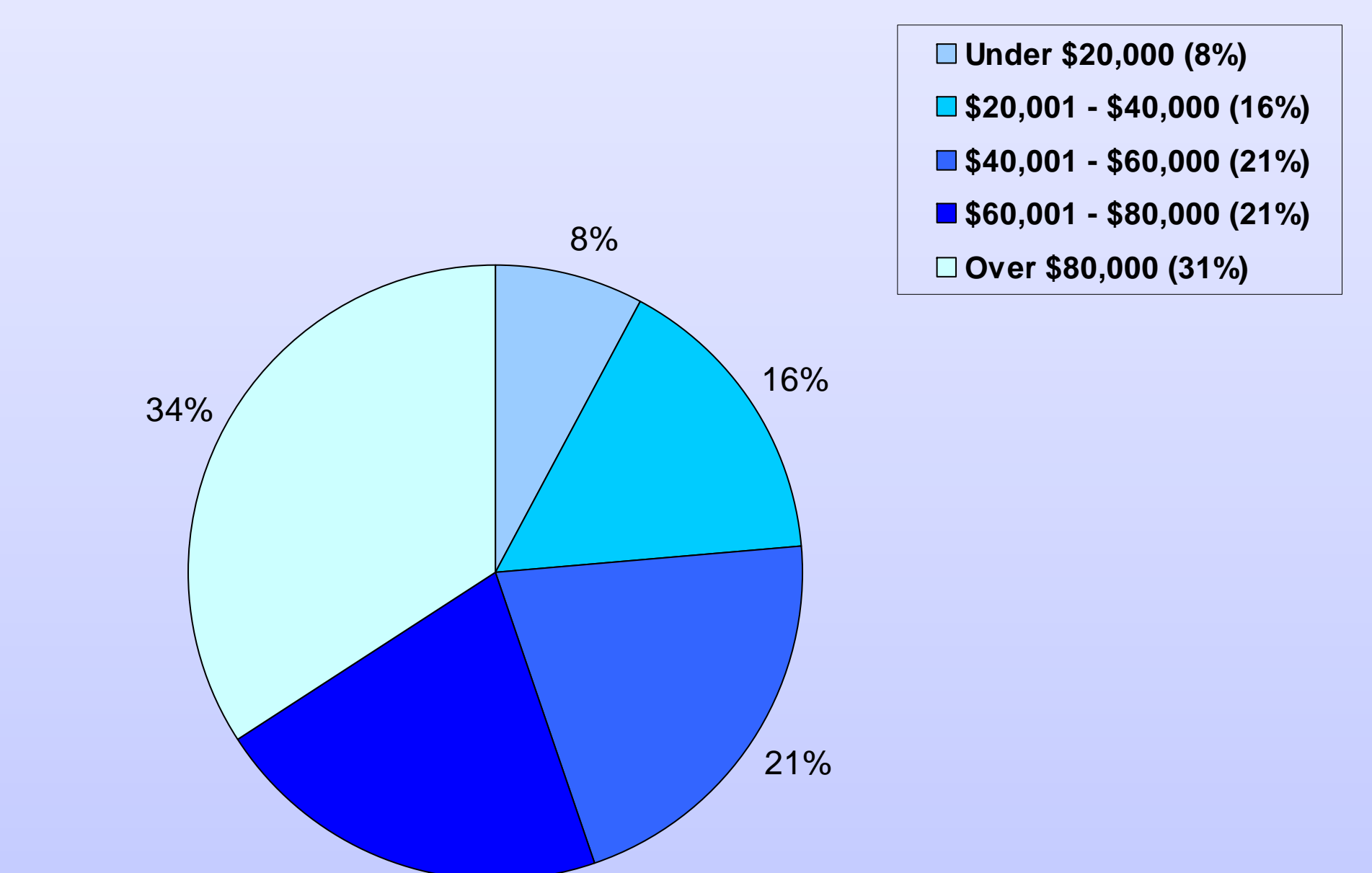
Factors that influence why people go fishing

**Where:** Chance of finding lobster  
**When:** Visibility  
**How:** Enjoyment  
**Why:** Food

### 2. Socio-Economic Profile

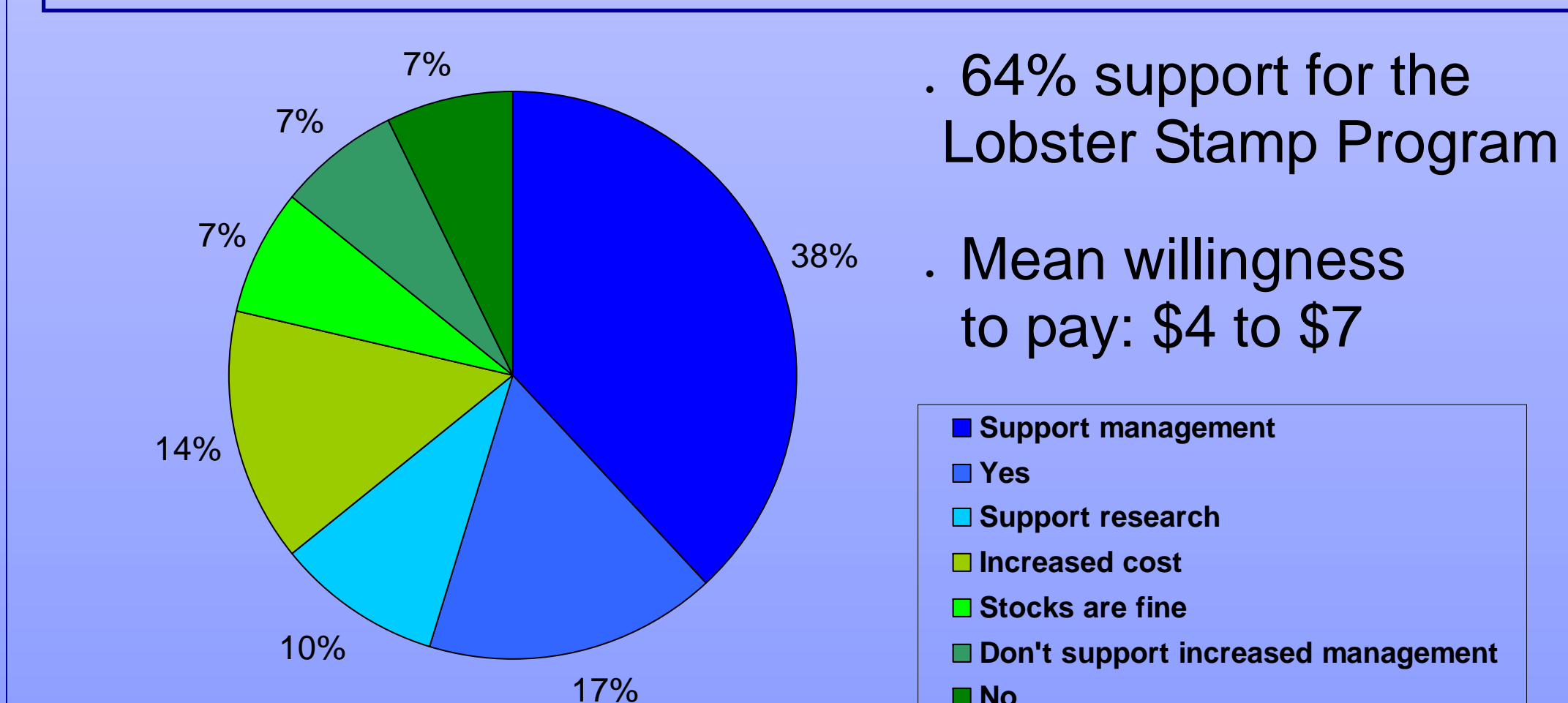


Employment status



Annual income

## Lobster Conservation Program



64% support for the Lobster Stamp Program  
 Mean willingness to pay: \$4 to \$7

**Lobster Stamp Program**  
 Implementation of a lobster stamp program will allow management agencies to directly quantify fishery participation and harvest, and define fishery behavioral dynamics. This will lead to a better understanding of the fishery and possible management improvements towards ecosystem-based management methods.

## Recommendations

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

**PLAN B:** If stamp support cannot be confirmed, initiate our data gathering 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 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  $f_{\tau}$ , 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.