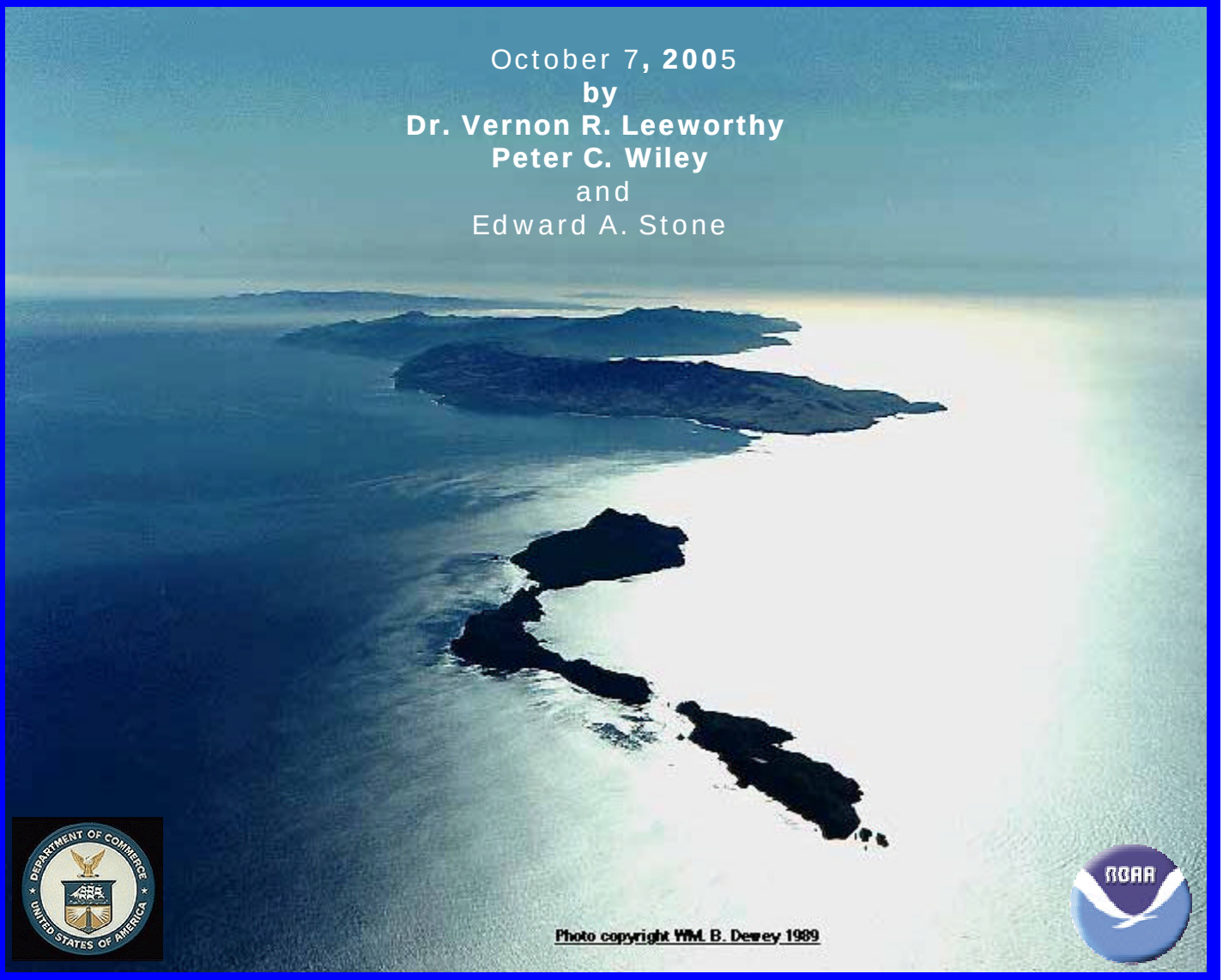
Socioeconomic Impact Analysis of Marine Reserve Alternatives for the Channel Islands National Marine Sanctuary



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Introduction

Purpose. The purpose of this document is to provide a complete socioeconomic impact analysis for the proposed network of marine reserves (no take areas) in the Channel Islands National Marine Sanctuary (CINMS). The report provides analyses for three alternative networks, and within each alternative, three areas: 1) Existing State, 2) Additional State and 3) Federal. The jurisdiction results have been mislabeled as Phase 1 and Phase 2 in some preliminary work. The original intent of this labeling was to distinguish administrative processes that would each be on separate time paths. However, the term phasing has socioeconomic implications and we have dropped the use of the term phases when what is really meant are the jurisdictions (State and Federal). The Existing State areas went into effect April 9, 2003. Phasing has socioeconomic significance because it is a strategy that can be used to minimize socioeconomic impacts by giving displaced users more time to adapt. The analysis presented here will eventually be incorporated into the NEPA, Regulatory Impact Review (RIR), and Regulatory Flexibility Act Analyses.

Background. Much of the detailed data gathered to support the analyses presented here was gathered as part of the process initiated by the CINMS and the CDFG in 1999. CINMS and CDFG designed a two-year stakeholder process with the objective of coming up with recommendations for marine reserves (no-take areas) in the CINMS. A Marine Reserve Working Group (MRWG) was formed which included representatives of different groups which depend on the CINMS for their livelihoods, non governmental organizations (potentially representing National interests—i.e., people that might have values to see protection of the CINMS ecosystem even though they don't directly use it, nonuse or passive economic use values), scientists and government agencies that have management responsibilities in the CINMS.

The MRWG was provided with both a Natural Science Panel and a Socioeconomic Panel to provide information and analyses to help in designing the no-take areas. Original guidance to the Socioeconomic Panel was that only complete no-take areas would be considered (i.e., no consumptive activities would be allowed in any of the areas) and the no-take areas would not extend outside the current boundaries of the CINMS. The socioeconomic data collection was designed with these two criteria. The MRWG, CINMS and CDFG did not constrain themselves in the alternatives they designed, so the socioeconomic information could not always address various exemptions in the conservation areas. This was most difficult to address for recreational consumptive activities.

Over the two-year MRWG process and in subsequent efforts before the process by the State of California to put in place the existing state reserves and conservation areas, we analyzed over forty alternatives. Many of these were done at the request of commercial fishermen and were never published. We did publish analyses of six alternatives in Leeworthy and Wiley (2002) and Leeworthy and Wiley (2003), which included the alternative adopted by the State of California for the existing marine reserves and conservation areas in the CINMS.

The analyses in Leeworthy and Wiley (2002) and Leeworthy and Wiley (2003) was based on best available information about the levels of activities that would be sustainable in the future and would therefore serve as the baseline from which we would judge socioeconomic impact of various alternatives. For the commercial fisheries, the 1996-1999 averages for ex vessel value of landings were used as the baseline, while 1999 was used for recreation activities. Several regulatory actions have been taken since the time of the original analyses, which indicate that the baselines used in previous analyses were not sustainable in the future. These actions include the Rockfish Conservation Areas, Groundfish closure areas, and the prohibition of trawling for spot prawn. The effect is that the analyses included in Leeworthy and Wiley (2002) and Leeworthy and Wiley (2003) overestimated the negative socioeconomic impacts of the marine reserves and conservation areas on consumptive users of these resources. In addition, ISP Alginates has announced that they will be shutting down operations in California and will no longer be harvesting kelp. Current expectations are that harvesting will end by the end of December 2005. Also, the Existing State Reserves have not had any effect on ISP Alginates, as they were able to harvest all they needed to meet demand from remaining open areas. Thus, again our analyses overstate the impact of the Existing State Reserves. (Source: personal communication, Dave Glantz, ISP Alginates).

There have also been delays from the time the original analyses were done and the completion of the regulatory process for the Federal portions of the marine reserves and conservation areas. During this time period, there have been reviews and discussions with the Pacific Fishery Management Council (PFMC), Scientific and Statistical Committee (SSC) about the socioeconomic impact analysis data and methods. The SSC asked NOS economists if they could update some of the data and methods. Below we summarize some key data updates and changes in methods.

Updated Information and Methods:

1. Commercial fisheries. Data was updated for catch and ex vessel value of catch for years 2000 through 2003 from CDFG trip ticket data. Updated information included catch and ex vessel value of catch by CDFG 10-minute by 10-minute block, species, port where landed, month, gear type, and vessel identification. Vessel identification was encoded to protect the privacy of fishermen; however CDFG also coded these identifications so we could track the same vessel over time. This will support future monitoring efforts. Trends were then updated for catch both from the CINMS and the entire State of California (1988 through 2003). This information was used to establish best estimates of commercial fishing ex vessel value of catch that would be sustainable in the future (new baselines for analysis). For 10 of the 14 species/species groups included in the analyses, the 1996-2003 averages are now used. For three species/species groups 2003 values are used (e.g. rockfish, tuna and prawn). All three of these species/species groups showed steep declines in catch (pounds) and ex vessel value of catch both in the CINMS and for the entire State of California for the time period 2000 through 2003. For rockfish and prawn, new regulatory actions are in place. By using 2003 values as baselines for these two species groups, we may again be overestimating future impacts. It is an implicit assumption that the regulatory actions will end these steep declines and the 2003 values best represent what is sustainable in the foreseeable future. For tuna, the 2003 ex vessel value of landing was $3,085. Commercial tuna catch is now insignificant in the CINMS. For one species, CA Sheephead, we are using the 2000-2003 average for the baseline. Catch and ex vessel of catch for CA Sheephead seemed to have leveled off during the 2000-2003 period. So we are using these estimates as the best estimate of what is sustainable in the future.

2. Recreational Charter/Party Boat Fishing. In 1999, a survey was conducted of all for hire operations that operated in the CINMS, and included both consumptive and nonconsumptive recreation. Many operators served both consumptive and nonconsumptive recreators. The 1999 study achieved a census i.e., all those that operated in the CINMS were identified and completed the survey. There was anecdotal information collected by United Anglers of Southern California showing steep declines in charter/party boat fishing business subsequent to implementation of the Rockfish Conservation Areas and the Groundfish Closures. Trends in the overall Southern California recreational fishery show increases in number of fishing trips. CDFG logbook data was obtained for years 1999 through 2003. CDFG logbooks only include information on consumptive recreation. Although the CDFG logbook data shows significantly greater amounts of consumptive activities then the original 1999 survey, the data shows an extremely steep decline from 1999 to 2003. The 2003 value is slightly below that of the original 1999 study. This supports the conclusion of a decline in charter/party boat fishing activity shown in the United Anglers of Southern California collected information and runs counter to the overall trends in Southern California. We decided to use the 2003 amount of fishing effort as the best estimate of the baseline for assessing future impact of the reserves and conservation areas.

3. Recreation Industry Economic Impact Model. In Leeworthy and Wiley (2002) and Leeworthy and Wiley (2003), the economic impact model used wages-to-sales ratios, wages-to-employment ratios by industry mapped to recreational spending categories along with other ratios to adjust for proprietor's income and employment and a range of income and employment multipliers to estimate the economic impact of alternatives. The models have been replaced by using the latest version of the input-output model IMPLAN.

4. Recreational Fishing Value. NMFS-MRFSS did an economic add-on in 1998, which included information to estimate a random utility model (RUM). RUM allows for the estimate of recreational fishing value (consumer's surplus) for access to the fishery and for changes in values for changes in catch rates. Values can be generated for closing different areas of access. Overall results are available for the model for closing off access to all of Southern California. However, the CINMS accounts for an extremely small portion of all Southern California's recreational fishing activity and any alternative for the marine reserves and conservation areas are a small percent of the CINMS. Currently, we have not figured out a way we can use that information. So we are still using the values from Leeworthy and Wiley (2003), which we still believe overestimate the impact on lost recreational fishing value.

5. Recreational Fishing from Private Boats. Since Leeworthy and Wiley (2003), there has been a change in the program to collect information on catch and effort in the recreational fishery of California. The new California Recreational Statistics Survey (CRSS) replaced the NMFS-MRFSS. CRSS includes spatial use information. We have attempted to obtain the data and assess whether it could be used to update estimates of both total use in the CINMS and the spatial distribution of the use. So far we have not been able to obtain the data to assess it's use.

All other information and methods used the analyses presented here, except those mentioned above, are the same as presented in Leeworthy and Wiley (2003). All data and methods used in these analyses are documented here.

Approach. Analyses are provided in two steps. Step 1 analyses are very quantitative and many detailed tables are produced. ***Step 1 analyses*** simply add-up all the activities displaced from marine reserve areas, with the assumption that all is lost, i.e., there is no mitigation or off-sets through behavioral responses. Substitution/relocation, replenishment effects, the effects of other regulations, the current and future status of fishing stocks, and the benefits of marine reserves are not addressed in Step1 analyses. We have generally labeled the Step 1 analyses as "***maximum potential loss***". In cases where congestion effects occur due to displacement and relocation of fishing effort, losses could exceed our estimates of maximum potential loss.

It is rare, however, for there not being some possibilities for substitution and relocation to mitigate or off-set impacts. Human beings have proven to be quite ingenious, adaptive and resilient in the face of change and often surprise us with solutions that the rest of us could never have imagined. ***Step 2 analyses*** are by their nature less quantitative. We simply are not capable of forecasting all the human responses as well as the ecological-biological responses, and the interaction of these systems that will result from the network of marine reserves. All the benefits and costs of marine reserves cannot be quantified, and so a formal benefit-cost analysis is not conducted. Instead, we use the benefit-cost framework and list all the potential benefits and costs, and quantify them where we can. Where we can't quantify benefits or costs, we discuss them qualitatively and in what direction we believe benefits or costs will move (under various conditions), from the point of our estimate of losses from Step 1 analyses.

Our socioeconomic impact analysis will surely seem weighted more heavily toward the economic and less towards the social impacts. We provide extensive profiles of commercial fishermen, measures of their dependency on CINMS resources, the extent of impacts on samples of individual fishermen, and information relevant to assessing the ability to adapt to change. We attempt to provide some interpretation in a rudimentary social impact analysis. For the recreation industry, there is much less information on the social side. The recreation industry is diverse and employs many people spread across many industries. Profiles of the direct recreational users and all the suppliers of recreational services were not available.

The analyses of the impacts of marine reserves are generally about what will happen in the future. So by its nature, our analyses will be characterized by great ***uncertainty***. Although we have assembled considerable information and our Step 1 analyses yield good starting points to assess the potential impacts, the uncertainties of human and biophysical responses, and the interaction between them, make the results of the Step 2 analyses less certain. We have used theoretical models from socioeconomic literature to guide us

through Step 2 analyses and establish under what conditions and which direction we could expect benefits and/or costs to go.

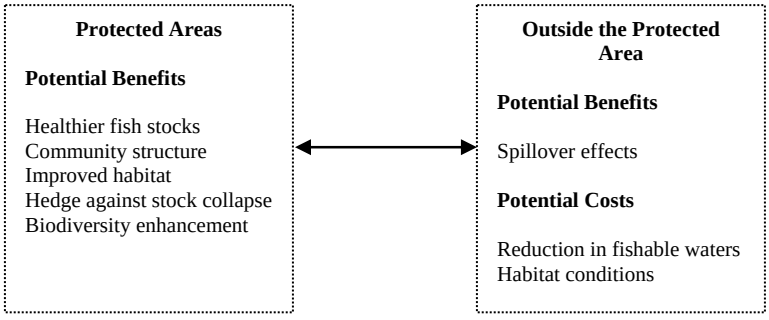
The information and analyses presented here provide critical baseline information to contribute to the adaptive management of the Channel Islands National Marine Sanctuary. The use of ***monitoring*** to address uncertainty is fundamental to the practice of ***adaptive management***. We regard the information and analyses presented here as a first step in the adaptive management process.

In 2003 a workshop was held at which recommendations were made for a socioeconomic research and monitoring program for the CINMS. Much of the focus was on the impacts of marine reserves. Efforts began in September 2005 to work with user groups to prioritize recommendations (NOAA, 2003) and develop a plan to start implementing the "highest" priorities that can be implemented under different scenarios of available funds.

Benefits and Costs of Marine Reserves (no take areas)

There are two perspectives on identifying the benefits and costs of marine reserves. The first focuses on the potential biophysical benefits and costs. Sanchirico (2000) has provided a simple summary of these benefits and costs (Figure 1). These are issues for which the Science Panel for the Marine Reserves of the CINMS has summarized the literature supporting the biophysical benefits and costs. A key distinction is the closed areas themselves versus the areas outside the closed areas, and the linkages between the areas. As Sanchirico and Wilen (2001) have shown, the biophysical benefits and costs are contingent on socioeconomic behavioral responses. So even though socioeconomic benefits and costs are dependent on the biophysical benefits and costs, the biophysical benefits and costs are predicated on socioeconomic behavioral responses. The determination of final outcomes is dependent upon both how both the natural environment and humans respond to the protection strategy.

Figure 1. Potential Ecological/Biological Benefits and Costs of Marine Reserves



The boundaries of the two areas are drawn with dashed lines to symbolize the openness of the marine ecosystem. The link between the two areas is formally defined by the migration/dispersal patterns of fish stocks residing within and outside the protected areas along with the geographic or oceanographic characteristics of the marine environment. In general, fish migration patters depend upon currents, temperatures, prevailing winds, and behavioral characteristics. The term "community structure" refers to the potential benefits in age/size structure of the fish stock and in trophic levels present in the protected area.

Source: Sanchirico (2000)

The second perspective on benefits and costs of marine reserves is the socioeconomic benefits and costs. As stated above, they are both contingent on the biophysical benefits and costs and on socioeconomic behavioral responses. In addition, there is a time dimension to benefits and costs. For purposes of our analyses, the short-term is defined as one to five years and the long-term, beyond five years. Below we list each potential benefit and cost along with each user group that would receive each benefit and/or cost and what measurement we would use to quantify or describe qualitatively the benefit and/or cost.

Potential Benefits

1. Non-consumptive Users (sport divers and wildlife viewers)

Since marine reserves will continue to allow non-consumptive activities, these user groups are potential beneficiaries. Over time it is expected that the closed areas will increase in quality. Marine reserves also may reduce conflicts with consumptive users. This will attract additional non-consumptive users, which will increase demand for services and have impacts on the local economies. In addition, the quality increase is expected to increase the net user value (consumer's surplus) per unit of use (measured as person-days). Consumer's surplus or net user value by non-consumptive users is also sometimes referred to as non-market economic use value. Below is a list of potential benefits to non-consumptive users.

- Increased sales and income to businesses directly providing goods and services to non-consumptive users.
- Secondary increases in sales/output, income, jobs and tax revenues in the local economies (through economic multiplier impacts).
- Increase in Consumer's surplus or net economic user value (non-market economic use value).

2. Nonusers or Passive Users

Economists have long recognized a special class of non-market economic values for natural resources and the environment referred to generally as nonuse or passive use economic value. See Kopp and Smith (1993) for a detailed discussion. These values are widely accepted as legitimate values to include in benefit-cost analyses of environmental regulations and in damage assessment cases. The term passive use, instead of nonuse, has become more popular because it is recognized that for people to have value for something they must have some knowledge about what they are valuing. People learn about natural resources or the environment they are asked to value through books, newspapers, magazines, newsletters, radio, television and other media sources. The people don't actually visit the sites and directly use the resources protected themselves, they consume them passively through the many indirect sources. The values have been referred to in the literature as option value, bequest value and existence value to clarify people's underlying motives for their willingness to pay.

Definitions

Consumer's Surplus: The amount that a person is willing to pay for a good or service over and above what they actually have to pay for a good or service. The value received is a surplus or net benefit. And, for natural resources, for which no one owns the resources and can't charge a price for use of the resources, consumer's surplus is referred to as a non-market economic value since the goods and services from the natural resources are not traded in markets. Consumer's surplus is applicable to both use and nonuse or passive use value.

Option Value: The value to current non-users who would be willing to pay an amount to ensure possible future use. This value is based upon uncertainty about both their future demand and the state of future supply. One can think of this like buying an insurance policy for future use. Weisbrod (1964) first introduced the concept of option value. Bishop (1982) extends and further clarifies this concept.

Quasi-Option Value: The value of preserving options for future use given some expectation of the growth of knowledge. Quasi-option value is positive when there are uncertainties about the future benefits of preservation and negative when the uncertainties are about future development issues. Examples are issues about future scientific discoveries or commercial applications that might arise from future study. Fisher and Hanemann (1987) discuss and clarify this concept. To the extent that consumptive uses might eliminate certain resources, this concept becomes an important potential benefit of marine reserves.

Bequest Value: The value to people that never plan to visit, but would be willing to pay an amount to ensure that future generations can experience the area in a certain protected condition.

Existence Value: The value to people who never plan to visit, but would be willing to pay an amount to ensure the resource exists in a certain protected condition. Krutilla (1967) first introduced the concepts of bequest and existence values. Brookshire, Eubanks and Randall (1983) discuss important issues in estimating these values.

Economic Rent: A return on investment over and above a normal rate of return on investment. A normal rate of return on investment is that rate of return in which incentives are such that capital will neither outflow or inflow into the industry.

For nonconsumptive users and passive users, the conditions of the ecosystem are important for determining the benefits of marine reserves. Marine reserves are known to change the status of the habitats protected

and often result in changes in community structure and increased biodiversity. Also, one of the main benefits is the possibility of protecting a different functioning ecosystem (i.e., a more natural system with minimum influence by man). These may be conditions for which these user groups would have a willingness to pay.

2. Commercial Fishing and Kelp Harvesting

Commercial fishing and kelp harvesting are displaced activities from marine reserves and so these user groups would be expected to suffer losses and can therefore be placed under potential costs. However, if marine reserves result in benefits to surrounding unprotected sites, i.e., increases in biomass and aggregate harvests, the commercial fishing industry will be a beneficiary. The benefits of marine reserves are usually stated as long-term benefits given the time frames necessary for habitats and fish stocks to improve. Below is a list of expected long-term benefits to commercial fishing.

- Long-term increases in harvest revenue and income to fishermen.
- Long-term increases in secondary output/sales, income, jobs and tax revenues in local economies. (Through economic multiplier impacts).
- Long-term increases in Consumer's Surplus to consumers of commercial fishing products (if prices to consumers decline with increased harvests).
- Long-term increases in Economic Rents (may or may not exist in open access fisheries)[1].

3. Recreational Fishing and Consumptive Diving

Just as with commercial fishing, recreational fishing and consumptive diving are displaced activities from marine reserves, and so these groups associated with these activities are expected to suffer losses, which constitute negative potential impacts or potential costs. However, if marine reserves result in benefits to surrounding unprotected sites, i.e., increases in biomass and aggregate harvests, the recreational fishermen and consumptive divers, and supporting industries will be beneficiaries. The basis for these benefits is the potential increase in quality of the experience including the number and size of catch and possibly reduced conflicts with other users. The benefits of marine reserves are usually stated as long-term benefits given the time frames necessary for fish stocks to improve. Below is a list of expected long-term benefits to recreational fishing and consumptive diving.

- Long-term increases in sales and income to businesses that directly provide goods and services to recreational fishermen and consumptive divers.
- Long-term increases in secondary output/sales, income, jobs and tax revenues in local economies (through economic multiplier impacts).
- Long-term increase in Consumer's Surplus.
- Long-term increases in Economic Rent (may or may not exist in open access fishery).

4. Scientific and Education Values

Marine reserves provide a multitude of scientific and educational values. Sobel (1996) provides a list of these benefits. Scientific and education values were categorized by Sobel into those things reserves provide that increase knowledge and understanding of marine systems. Sobel provided the following list of benefits:

Scientific

- Provides long-term monitoring sites
- Provides focus for study
- Provides continuity of knowledge in undisturbed sites
- Provides opportunity to restore or maintain natural behaviors
- Reduces risk to long-term experiments

- Provides controlled natural areas for assessing anthropogenic impacts, including fishing and other impacts

Education

- Provides sites for enhanced primary and adult education
- Provides sites for high-level graduate education

In addition, just like other activities, science and education generate spending through grants and contracts and these have economic impacts on local and regional economies. In the recommendations for socioeconomic research and monitoring for the CINMS it was recommended that this impact be quantified.

A. Potential Costs

1. Commercial Fishing and Kelp Harvesting

As mentioned above, commercial fishing is one of the displaced activities from marine reserves. Sanchirico and Wilen (2001) discuss the biophysical and socioeconomic conditions under which commercial fisheries might benefit or suffer costs from marine reserves. There are sets of conditions under which they predict would result in short-term and/or long-term costs.

- Lost harvest revenue and income to fishermen and processors.
- Secondary losses in output/sales, income, jobs and tax revenues in local economies (through economic multiplier process).
- No loss in harvest but increased cost of harvesting resulting in lost income to fishermen.
- Losses in Consumer's Surplus to consumers of commercial seafood products (if prices rise for fishery products due to reductions in harvests).
- Overcrowding, User conflicts, Possible Overfishing or Habitat destruction in remaining open areas due to displacement. This could raise costs and/or lower harvests.
- With displacement, loss of site-specific harvest knowledge that supports sustainable fishing practices.
- Social disruptions from losses in incomes and jobs.

The extent to which these costs are realized in the short-term or long-term depends greatly on the off-site impacts of the protected areas as listed in Figure 1, but also on the status of the fish stocks, fishery management regulations (are current harvest levels sustainable?), and the behavioral responses and economic conditions of the fishing industry. It is not always true that there will even be short-term losses (Leeworthy, 2001a).

2. Recreational Fishing and Consumptive Diving

As mentioned above, recreational fishing and consumptive diving would be displaced from marine reserves. Sanchirico and Wilen (2001) discuss the biophysical and socioeconomic conditions under which these user groups might benefit or suffer costs from marine reserves. There are sets of conditions under which they predict would result in short-term and/or long-term costs.

- Lost sales revenue and income to businesses that directly provide goods and services to recreational fishermen and consumptive divers.
- Secondary losses in output/sales, income, jobs and tax revenues in local economies (through economic multiplier impacts).
- Losses in Consumer's Surplus (if consumptive users are forced to substitute to less valued locations or if they are crowded into remaining open areas where they experience congestion effects or if it costs more to relocate to other areas).
- Losses in Economic Rent (may or may not exist in open access environment).

As with the commercial fisheries, whether any of the above costs are short-term or long-term depends greatly on the off-site impacts of the protected areas as listed in Figure 1, but also status of the fish stocks, fishery management regulations (are current harvest levels sustainable?), and on the behavioral responses and economic conditions of the consumptive recreational industry. It is not always true that there will even be short-term losses if there are adequate substitute sites.

Ports and Harbors. Those involved in managing ports and harbors have expressed concern with respect to both boundary expansion and marine reserves in the CINMS may have a negative impact on ports and harbors, if these actions result in decreases in business volume. The concern goes beyond the impacts described above and is focused on the issue of how the Federal government (the U.S. Army Corps of Engineers and Congress) make decisions about funding for dredging to maintain ports and harbors. Our economic impact estimates do provide some details on ports and harbors and can be used to assess these indirect effects. As with the above, there might be short-term gains and losses in business volume (gains to nonconsumptive users and losses to consumptive users) and there might be long-term gains for all users. Thus, there is a possibility of both benefits and costs to ports and harbors.

Outline of the Report

In Chapter 1, we provide a socioeconomic overview of the study area. There we define the various study areas and background socioeconomic descriptions of the study area. Also provided are baseline estimates of commercial fishing activity and recreational activities and how they are connected to the local economies. Here we also show what we were able to quantify in our Step 1 analyses and document our data and models.

Chapter 2 includes our Step 1 analyses of the marine reserve alternatives. Results are generated at very detailed levels, so we include summary tables in the chapter and place the tables with greater details in appendices.

Chapter 3 includes our Step 2 analyses of alternatives. Here we attempt to assess how likely the losses estimated in our Step 1 analyses are to occur. We also include an assessment of the potential benefits of the marine reserves and a summary net assessment.

Appendix G – This appendix was added in Leeworthy and Wiley (2003) and is maintained here. It was added to address an analysis conducted by Robert Southwick of Southwick and Associates for the American Sportfishing Association (ASA). The ASA criticizes our previous step 1 analyses for MRWG options A through D arguing that our analyses are flawed and underestimate the impact to recreational support industries. Our expenditure profiles for recreational fishermen were the major criticism - that we used older outdated data and did not include equipment purchases. The inclusion of all major equipment expenditures in the ASA report would not be appropriate for analyzing the impacts of marine reserves. We provide updated estimates using the new trip expenditures and explain the reason the ASA approach is flawed.

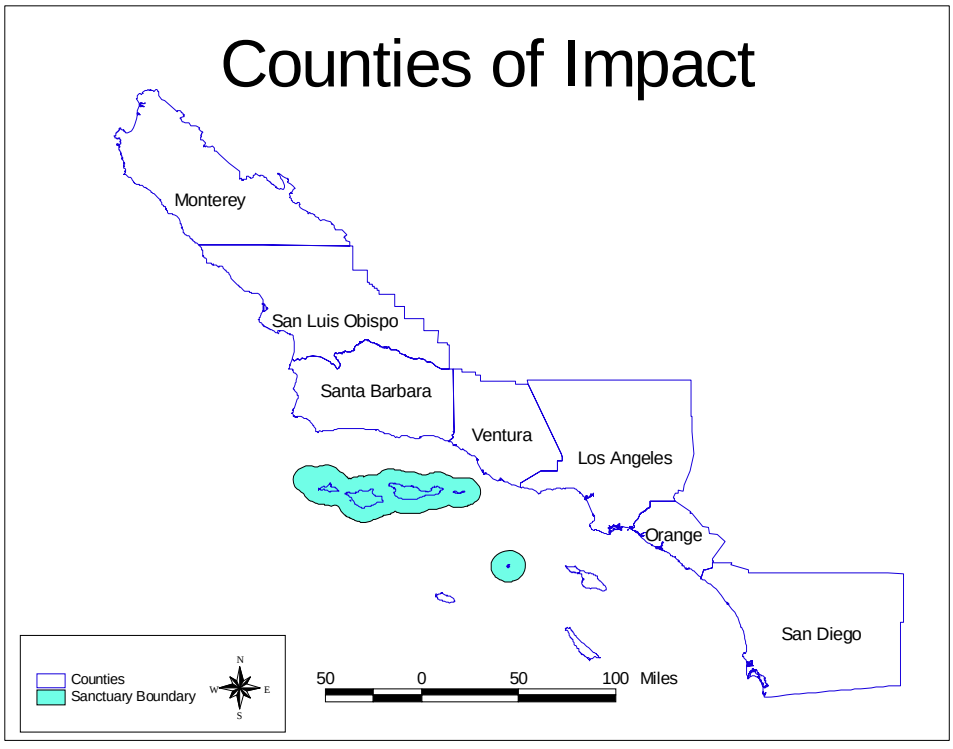
Chapter 1

A Socioeconomic Overview of the Study Area

Study Areas and Economic Dependence on the CINMS

There are two fundamental definitions of the study area. First is the where the activities take place that use the natural resources and the second is the place where the economic and social impacts take place. For the first area, the definition is the area within the boundaries of the CINMS or six nautical miles seaward of the Channel Islands (see maps in Appendix C). For the second area, we relied on several sources of information: 1) California Department of Fish and Game (CDFG) commercial fishing data that shows for each area where fish are caught, the ports where the fish are landed, 2) data from contractor Pomeroy's research on the squid/wetfish fishery on the spatial organization of squid processing (see also Pomeroy and Fitzsimmons 2001), 3) kelp harvesting and processing information was obtained form ISP Alginates, 4) data from our surveys of recreational for-hire operators on their base of operations and 5) National Marine Fisheries Service, Marine Recreational Fishing Statistics Survey for intercept/access points for those fishing from private household boats. Appendix B includes a report that details our data collection and estimation methods. Figure 2 shows a map of the seven-county area we defined as the area of socioeconomic impact. All seven counties are impacted by commercial fishing activities and five counties (e.g., Santa Barbara, Ventura, Los Angeles, Orange and San Diego) are impacted by recreational activities, though relatively little recreational fishing activity in the CINMS originates in Orange and San Diego counties.

Figure 2. Socioeconomic Impact Area for the Channel Islands National Marine Sanctuary (CINMS)



The seven-county impact area had a 2000 population of over 16.98 million. Between 1990 and 2000, the population of the study area grew at a slower pace than the entire State of California or the U.S. (Table 1.1). The seven-county area had a much higher population density and higher poverty rate than either the State of California or the U.S. The higher population densities are mostly influenced by the inclusion of Los Angles and Orange counties, which have extremely high population densities, while the relatively high poverty rate is due to Los Angeles County. For per capita income, the seven-county area is higher than the U.S. but lower than the State of California.

Table 1.1 Selected Socioeconomic Measures for Description of Impact Areas

County	2000 Population	Population Change 1990-2000	Population Density[1]	1999 Per Capita Income	1997 Persons Below Poverty
Monterey	401,762	13.0%	120.9	$29,393	15.4%
San Luis Obispo	246,681	13.6%	74.7	$25,888	12.9%
Santa Barbara	399,347	8.0%	145.9	$30,218	14.6%
Ventura	753,197	12.6%	408.2	$29,639	10.3%
Los Angeles	9,519,338	7.4%	2,344.1	$28,276	20.5%
Orange	2,846,289	18.1%	3,607.5	$33,805	11.0%
San Diego	2,813,833	12.6%	670.0	$29,489	14.2%
All Counties	16,980,447	10.4%	838.2	$28,932	17.0%
California	33,871,648	13.6%	217.2	$29,856	16.0%
U.S.	281,421,906	13.1%	79.6	$28,546	13.3%

1. Number of people per square mile.

Source: U.S. Department of Commerce, Bureau of the Census, State and County QuickFacts. (http://quickfacts.census.gov)

Before we can analyze the impact we need to establish the baseline relationship between the local economies (county economies) and the use of the CINMS. Table 1.2 shows personal income and employment by county for the seven-county impact area. Personal income is presented from two perspectives, by place of work and by place of residence. This is an important distinction because many county economies are less dependent on sources of income from work related activities in the county, i.e., they derived their incomes from sources outside the county. Sources of incomes from outside the county include retirement pensions, dividends and interest from investments and from work in other counties (commuters). All seven counties in the impact areas have larger personal incomes by place of residence than by place of work.

Table 1.2 Personal Income and Employment by County 2002

County	Personal Income By Work 000's $	Personal Income By Residence 000's $	Employment Number Full and Part time Jobs
Monterey	$9,355,753	$13,091,490	235,299
San Luis Obispo	$4,765,471	$7,598,506	147,468
Santa Barbara	$9,510,574	$13,701,154	254,600
Ventura	$17,215,448	$27,006,291	420,712
Los Angeles	$254,950,305	$300,898,080	5,554,695
Orange	$88,310,525	$112,266,897	1,901,499
San Diego	$79,407,259	$101,292,563	1,806,321
Region Total	$463,515,335	$575,854,981	10,320,594

Source: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Information Management System (http://www.bea.gov)

We have estimated the economic impact of each of the activities in the CINMS on each of the seven counties in the impact area. The economic models are discussed in a latter section of this chapter. In 2002, all activities in the CINMS generated just over $100 million in personal income (Table 1.3). Our estimate of employment (number of full and part-time jobs) is about 3.3 thousand. These estimates include the multiplier impacts in each county. However, the estimates are underestimates because we were not able to find any information on the amount of nonconsumptive recreation from private household boats. Including private household nonconsumptive recreation would probably result in estimates of between $110 and $120 million in income and between 4 and 4.5 thousand jobs that depend on the uses of the CINMS. A two-year study is now underway to estimate the amount of nonconsumptive recreation from private household boats and the distribution of that use in the CINMS.

Table 1.3 Local/Regional Economic Dependence on CINMS: Baseline Personal Income

County		Commercial Fishing	Consumptive Recreation	Total Consumptive Activities	Nonconsumptive Recreation[1]	All Activities
Monterey		$6,728,959	$0	$6,728,959	$0	$6,728,959
	%[2]	0.0514	0.0000	0.0514	0.0000	0.0514
San Luis Obispo		$76,970	$18,111	$95,081	$0	$95,081
	%	0.0010	0.0002	0.0013	0.0000	0.0013
Santa Barbara		$9,198,223	$2,661,635	$11,859,858	$1,175,291	$13,035,149
	%	0.0671	0.0194	0.0866	0.0086	0.0951
Ventura		$35,829,050	$22,071,373	$57,900,423	$2,488,506	$60,388,929
	%	0.1327	0.0817	0.2144	0.0092	0.2236
Los Angeles		$10,328,981	$1,522,518	$11,851,499	$68,424	$11,919,923
	%	0.0034	0.0005	0.0039	0.0000	0.0040
Orange		$13,005	$88,591	$101,596	$0	$101,596
	%	0.0000	0.0001	0.0001	0.0000	0.0001
San Diego		$9,474,771	$54,329	$9,529,100	$0	$9,529,100
	%	0.0094	0.00005	0.0094	0.0000	0.0094
All Counties		$71,649,948	$26,416,557	$98,066,505	$3,732,222	$101,798,727
	%	0.0124	0.0046	0.0170	0.0006	0.0177

1. Nonconsumptive recreation and All Activities are under estimated because no information was available for nonconsumptive recreation using private household boats to access the CINMS.
2. Percents are the percent of the total economy of each county, or for all counties, the percent of the regional totals for all seven counties. For the total economy, year 2002 was used (latest year available).

Significance. The term "significant impact" is highly charged and is often misunderstood or purposely misused to marginalize a particular group. In socioeconomic impact analysis, we have to be very careful how and when we use this descriptor. The term "significant," can only be interpreted for each context of use.

There exist some administrative definitions of significance. Presidential Executive Order 12866 defines a significant impact for Federal Regulations as any impact of $100 million or more. When the impact of a Federal Regulation is expected to have impacts of $100 million or more, then the requirement is that the Federal agency proposing the regulation must conduct a benefit-cost analysis of the regulation. As we shall show below, none of the three alternatives analyzed here results in that level of impact.

Another Federal law (Magnuson-Stevens Fishery Conservation and Management Act, Section 303, a), specifies 10 National Standards. National Standard 9 deals with impacts on the fisheries, which are addressed in this report, and National Standard 8 deals with impacts on fishing communities (not addressed in this report). Although the Act did not explicitly define a fishing community, several court cases have resulted in the National Marine Fisheries Service (NMFS) adoption of criteria to define communities and further fishing communities. Census Designated Places or cities define communities. Counties are

considered too large for identifying communities. Census Designated Places or CDPs are officially recognized by the U.S. Bureau of the Census and have Federal Information Processing System (FIPS) codes for organizing socioeconomic information on CDPs or cities, as do counties and states. Fishing communities are CDPs or cities that depend directly or indirectly on the recreational and commercial fisheries for at least 20 percent of either their income or employment, or in which 20 percent of the population living in the community is directly or indirectly dependent on the fisheries. Once a community is identified as a "fishing community", National Standard 8 requires a detailed Social Impact Analysis (SIA). Impacts of five (5) percent of a community's income or employment are considered significant by NMFS. NMFS currently recommends following the guidelines issued by the International Association for Impact Assessment (1993) for SIAs. We were not able to identify any communities in the study area that would meet the definitions of a fishing community and therefore there is no need for further community and social impact analysis than is presented here.

In Tables 1.3 and 1.4, we show our estimates for personal income and employment generated from each activity in each county. These estimates are for the baseline, i.e., the amount of activity that we are estimating can be sustained in the future. The local economy for percentage comparisons is the latest year available (2002). Directly under each estimate is the percent of the total personal income or employment that a given activity accounts for in each county's economy. Across all activities, we show that our estimate of personal income impact of about $101.8 million was less than two one-hundredths of one percent (a small fraction of one percent) of the entire seven-county area. If all the activities in the CINMS were prohibited, it would not have significant impact on the total economy of the seven-county region. Here the use of significant impact is limited to the relationship between the activities in the entire economy of the region. If all the consumptive activities in the CINMS were prohibited, the economic impact would fall just short of the $100 million mark above which a benefit-cost analysis is required.

Table 1.4 Local/Regional Economic Dependence on CINMS: Baseline Employment

County		Commercial Fishing	Consumptive Recreation	Total Consumptive Activities	Nonconsumptive Recreation[1]	All Activities
Monterey		199	0	199	0	199
	%[2]	0.0846	0.0000	0.0846	0.0000	0.0846
San Luis Obispo		3	0.9	3.9	0	3.9
	%	0.0020	0.0006	0.0026	0.0000	0.0026
Santa Barbara		299	118.9	417.9	62	479.7834081
	%	0.1174	0.0467	0.1641	0.0243	0.1884
Ventura		1,090	944	2,034	135	2,168
	%	0.2591	0.2243	0.4833	0.0320	0.5153
Los Angeles		273	67.6	340.6	4	344.1874439
	%	0.0049	0.0012	0.0061	0.0001	0.0062
Orange		0	4.5	4.5	0	4.5
	%	0.0000	0.0002	0.0002	0.0000	0.0002
San Diego		92	2.8	94.8	0	94.8
	%	0.0051	0.0002	0.0052	0.0000	0.0052
All Counties		1,956	1,138	3,094	200	3,294
	%	0.0190	0.0110	0.0300	0.0019	0.0319

1. Nonconsumptive recreation and All Activities are under estimated because no information was available for nonconsumptive recreation using private household boats to access the CINMS.
2. Percents are the percent of the total economy of each county, or for all counties, the percent of the regional totals for all seven counties. For the total economy, year 2002 was used (latest year available).

A review of Tables 1.3 and 1.4 will reveal that the inclusion of Orange County may bias our assessment of the significance, since Orange County has a relatively large economy and very little activity in the CINMS impacts Orange County. However, none of the seven counties in the seven-county impact area is significantly impacted by the activities in the CINMS. The highest impact is in Ventura County, which

depends on activities in the CINMS for about one quarter of one percent of its income and about one half of one percent of the county's employment.

From Tables 1.3 and 1.4, we can conclude that any impacts from marine reserves, which would only impact some fraction of the activities in the CINMS, that the economic impact in any local economy will not be significant. By this we mean to limit this conclusion as to the total incomes, employment and tax revenues in each county. Thus we predict that there will be ***no significant macroeconomic or fiscal impacts from marine reserves in the CINMS.***

As we have demonstrated above, the limitation of activities in the CINMS from marine reserves will not have significant impacts on the local economies. However, that is the limit of our abilities to make judgements about the significance of socioeconomic impacts. We are ***not able to conclude that there would or wouldn't be significant impacts on certain individuals or groups.*** Certainly if you are among those who are impacted it is significant to you. We have no basis for judging significance in this context. All we can do is provide our best estimates of what we think are the extent of potential impacts. We make no judgements as to their significance.

Conclusions about the County Economies. Much of the impacts from activities in the CINMS take place in Ventura and Santa Barbara counties. Appendix A includes a shortened version of a paper we produced in June 2000 entitled "A Socioeconomic Overview of the Santa Barbara and Ventura Counties as it relates to Marine Related Industries and Activities". This report was developed at the beginning of the CINMS management plan revision process. Some of the data has been updated and changed as a result of further research. The original report is still posted in portable document format (downloadable pdf) on the CINMS World Wide Web site (http://www.cinms.noaa.gov/Semembreserves.html).

Appendix A provides much greater detail on the populations and economies of Ventura and Santa Barbara counties. Generally, these areas can be characterized as growing, dynamic and diverse areas with both healthy and diverse economies.

Commercial Fishing Industry and Kelp Harvesting

Here we provide a baseline socioeconomic profile of the commercial fishing industry and kelp harvesting/processing. Figure 3 summarizes the economic impact model used for the commercial fisheries in the CINMS.

Economic Impact Model. The top box in Figure 3 refers to the maps of ex vessel value (revenue received by fishermen) by species/species group. We compiled commercial fishing catch data from 1988 – 2003 by species and California Department of Fish and Game (CDFG) 10-by-10 mile blocks. The definition of blocks most closely approximating the CINMS was comprised of 22 CDFG blocks (see Appendix C for a map showing the blocks used for defining the CINMS). There are many species, and from previous reports and our own judgement, we formed 27 species groups. Some such as herring roe, surf perch, grenadiers and octopus that were prominently noted in previous reports did not prove to be very significant. The definitions of the species groups are also included in Appendix C.

Table 1.5 shows the average ex vessel value of the commercial fisheries in the CINMS for years 1996-2003. For the years 1996-2003, the top 14 species/species groups accounted for 99.47 percent of the commercial landings from the CINMS.

The top 14 species/species groups are included in our analyses for the commercial fisheries along with Kelp. Kelp was treated differently because only one company harvests it, ISP Alginates located in San Diego, California. Harvested value equivalent to ex vessel value was not available. Instead, ISP Alginates supplied us with the processed value of kelp (1996-2003 average of $5,991,367). We constructed a separate economic impact model for kelp with the help of Dale Glantz of ISP Alginates. All the economic impact from kelp takes place in San Diego County where it is landed and processed.

After reviewing the trends in CINMS catch and value from 1988 – 2003, we decided that the average of years 1996-2003 would be the most representative estimate for extrapolating future impacts. The trends in catch, value of catch and prices for CINMS and for the State of California are included in Appendix C. We also reviewed the information in the "Annual Status of the Fisheries Report through 2003" (CDFG, 2004). One can see in Table 1.5 that squid is the dominant fishery in the CINMS as well as the State of California. But squid catch is sensitive to El Nino events. In 1998, squid catch plummeted, then rebounded to a record catch in 1999. The 1996-2003 average accounts for this time variability.

Figure 3. Economic Impact Model for Commercial Fisheries in the CINMS

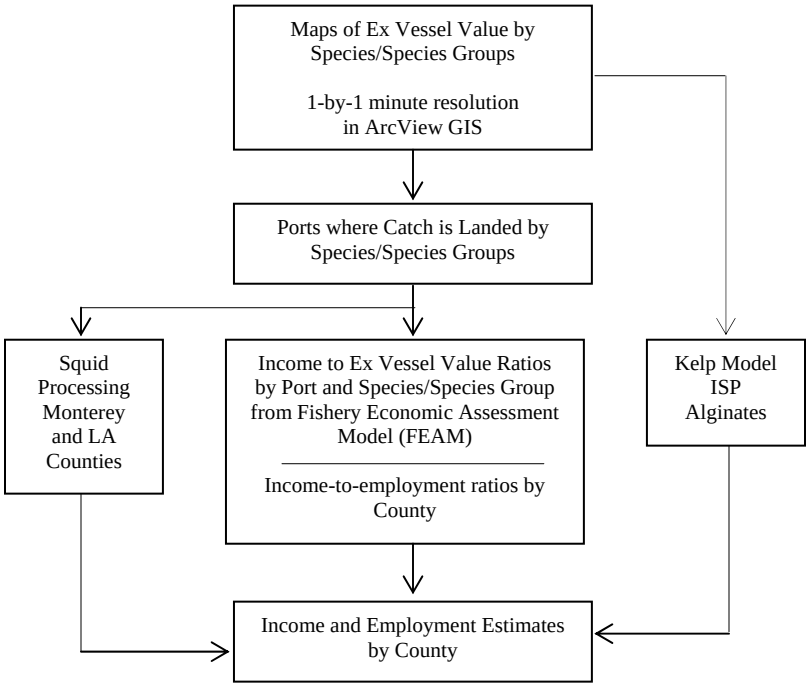


Table 1.5 Commercial Fishing, Marine Reserve Study Area Totals: Average Annual Ex Vessel Value 1996-2003

Species/Species Group	Value	Percent	Excluding Kelp Value	Excluding Kelp Percent
Squid	10,788,355	44.52	10,788,355	59.14
Kelp	5,991,367	24.72	0	0.00
Urchins	4,320,544	17.83	4,320,544	23.68
Spiny Lobster	1,024,536	4.23	1,024,536	5.62
Prawn [1]	210,978	0.87	210,978	1.16
Rockfish [1]	152,892	0.63	152,892	0.84
Crab	414,732	1.71	414,732	2.27
Tuna [1]	3,085	0.01	3,085	0.02
Wetfish	474,251	1.96	474,251	2.60
CA Sheephead [2]	155,290	0.64	155,290	0.85
Flatfishes	218,328	0.90	218,328	1.20
Sea Cucumbers	222,007	0.92	222,007	1.22
Sculpin & Bass	93,203	0.38	93,203	0.51
Shark	34,397	0.14	34,397	0.19
sub-total (counted)	24,103,965	99.47	18,112,598	99.29
Others Not Included				
Abalone [3]	0	0.00	0	0.000
Swordfish	50,087	0.21	50,087	0.275
Roundfish	32,736	0.14	32,736	0.179
Others	22,493	0.09	22,493	0.123
Yellowtail	8,066	0.03	8,066	0.044
Shrimp	3,505	0.01	3,505	0.019
Mussels & Snails	5,819	0.02	5,819	0.032
Salmon	5,119	0.02	5,119	0.028
Rays & Skates	993	0.00	993	0.005
Surf Perch	412	0.00	412	0.002
Grenadiers	106	0.00	106	0.001
Octopus	105	0.00	105	0.001
sub-total (not counted)	129,441	0.53	129,441	0.710
sub-total, excluding Abalone	129,441	0.53	129,441	0.710
Total All Species/Species Groups	24,233,406	100.00	18,242,039	100.000
Total All Species/Species Groups, excluding Abalone	24,233,406	100.00	18,242,039	100.000

1. Prawn, Rockfish and Tuna values are 2003 values due to steep declining trends.
2. CA Sheephead value is the 2000-2003 average.
3. Abalone value is the 2000-2003 average since Abalone harvest has been prohibited since 1997.

For the top 14 species/species groups included in our analyses, we hired two contractors, Dr. Craig Barilotti and Dr. Caroline Pomeroy, to gather socioeconomic data on the fishermen who fish in the CINMS and their distribution of catch at the 1-by-1 nautical mile unit of resolution within the boundaries of the CINMS. We use the control totals from CDFG and PacFIN trip ticket information for total catch. The report detailing our data collection and estimation methods is included here as Appendix B. The ex vessel value landing data is organized in a geographic information system called ArcView. We built an economic model using the spreadsheet software Microsoft Excel.

The commercial fishery economic impact model translates ex vessel value of landings into total income and employment impacts on the local economies. This is done by first using the distributions of catch by species/species group from the CINMS and port where landed (see Appendix C for the port/species distributions). Then multipliers are used that translate ex vessel value of landings by species/species groups at a given port to total income generated in the local county economy where the port where the catch was landed is located. These multipliers were obtained from the Fishery Economic Assessment Model (FEAM).

Two economists under contract to the Pacific Fishery Management Council developed FEAM. FEAM is based on Input-Output models detailing inter-industry relationships. FEAM was designed for regional economic analysis and processing of the landings is assumed to take place within the county where the port is located. The assumption is that for regional analysis the cross-county effects cancel each other out.

For squid, the socioeconomic panel decided that the squid processing had effects large enough to warrant special treatment. Multipliers from FEAM were adjusted downwards for ports where squid was sent to another county for processing. The 1996-1999 average distributions for processing squid from port to county of processing were used. Generally, multipliers were reduced by 1.5 (if multiplier was 4.5 it was reduced to 3.0) at the port where landed and thus the impact in the county where landed and increased by 1.5 in the county where processed. Monterey and Los Angeles counties were the primary places for processing squid. Squid accounts for the relatively large income impacts estimated for Monterey and Los Angeles counties even though very little squid is landed in Monterey County.

The income-to-ex vessel value multipliers from FEAM are not the standard economic multipliers one sees in most local and regional economic analysis. However, the multipliers are derived from the standard economic multipliers in the input-output models for each county. FEAM was used to estimate the income generated from ex vessel value reported at each port for each species/species group. We took the average of the income-to-ex vessel value for years 1994 -1998 and applied these multipliers to the ex vessel value from the CINMS at each port. Table 1.6 provides the Ventura County Port multipliers as an example. Full details are available from the authors upon request.

Table 1.6 Income-to-Ex Vessel Value Multipliers: Ventura Harbor

Species/Species Groups	Income-to-Ex Vessel Multipliers
Squid [1]	3.2
Urchins	2.1
Spiny Lobsters	2.0
Rockfishes	1.6
Prawn	2.0
Crab	2.8
Wetfish	1.6
CA Sheepshead	1.6
Flatfish	1.6
Sculpin & Bass	1.6
Tuna	1.7
Shark	2.3

1. For squid, 24.45 percent was trucked to Monterey County for Processing and 64.98 percent was trucked to Los Angeles County for processing. The remaining 10.57 percent was Processed in Ventura County. The multiplier for squid is adjusted downwards by 1.5 to account for processing in Monterey and Los Angeles counties.

Employment impacts are estimated by dividing the total income estimated in each county by the ratio of total income to employment in each county. Total income and total employment impacts fully account for all the multiplier impacts. Because of the FEAM assumptions about processing, the results are more reliable at the total region level.

Baseline 1996-2003 Economic Impacts. Table 1.7 summarizes the baseline annual averages for total income and employment generated from commercial fishing and kelp from the CINMS. These baselines are the same as those found in Table 1.3. The economic impacts of alternatives presented here are based on the baseline estimates. Percents of a user group ex vessel revenue or total income and employment impacted by an alternative are percents of these baselines.

Table 1.7 Economic Impact of Commercial Fishing and Kelp Harvesting: Baseline Annual Average

County	Total Income	Employment
Monterey	$6,728,959	199
San Luis Obispo	$76,970	3
Santa Barbara	$9,198,223	299
Ventura	$35,829,050	1,090
Los Angeles	$10,328,981	273
Orange	$13,005	0
San Diego	$9,474,771	92
All Counties	$71,649,959	1,956

Ports and Harbors. The analyses include detail about species/species groups landed at each port or harbor. Table 1.8 shows the baseline ex vessel value of landings by port and the percent of total port landings accounted for by catch from the CINMS. Ports in Santa Barbara, Ventura Harbor, Port Hueneme, and Channel Islands/Oxnard are the most dependent on catch from the CINMS. Details by species/species groups for ex vessel value of landings from the CINMS and the income generated by those landings can be found in this report.

Table 1.8 Commercial Fishing: Study Area Totals - Ex Vessel Value by Port

Port	Value	%[1]
1. Moss Landing	$873	0.01
2. Morro Bay	$24,450	1.16
3. Avila/Port San Luis	$10,744	0.86
4. Santa Barbara	$4,533,549	60.95
5. Ventura Harbor	$2,926,906	60.25
6. Channel Islands	$1,892,045	47.45
7. Port Hueneme	$7,116,801	69.25
8. San Pedro	$840,497	7.34
9. Terminal Island	$725,340	5.41
10. Avalon & Other LA	$13,472	1.01
11. Newport Beach	$6,235	0.65
12. San Diego	$16,143	0.64

1. Percents are the amount of ex vessel value as a percent of the total ex vessel value of landings at the Port (1996-2003 Average Annual Value), for all species groups, except Prawn, Rockfish and Tuna, which were valued using 2003 value of landings and CA Sheephead that was valued using the 2000-2003 average value of landings.

Recent Trends in Vessels Operating In the CINMS and Dependence on CINMS. In 1999, there were 737 permitted vessels operating and reporting catch from the CINMS (Leeworthy and Wiley, 2003). In 2000, the number of permitted vessels reporting catch in the CINMS declined to 543, and in 2001 declined to 448 (Table 1.9). There are many permitted vessels that report catching small amounts of catch in the CINMS. In 1999, 18 percent of the permitted vessels accounted for 82 percent of the total ex vessel value of landings from the CINMS (Leeworthy and Wiley, 2003). In 2003, 23 percent of the permitted vessels accounted for 78 percent of the total ex vessel value of landing from the CINMS. In 2003, 90 vessels

(20.4%) reported catching less than $1,000 worth of total landings from the CINMS and 179 vessels (40.59%) reported catching less than $5,000 worth of landings from the CINMS (Table 1.10).

Dependence on CINMS, measured as percent of total fishing revenues from the CINMS, has declined since 2000. In 2000, the vessels reporting catch from the CINMS caught over 79 percent of the total value of their landings from California from the CINMS. This percentage declined to less than 36 percent in 2001 and rose again to over 47 percent in 2002 and 2003 (Table 1.9). In 2000, 47.7 percent of vessels that reported catch from the CINMS depended on the CINMS for 100 percent of their total fishing revenues. The percentage has steadily declined from 2000 to 2003, and in 2003, only about 15 percent of vessels reported catching 100 percent of their fishing revenues from the CINMS (Table 1.11).

Table 1.9. Commercial Fishing Revenue from CINMS: 2000 - 2003

Year	Number of Operations[1]	Value from CINMS ($)	Value from ALL CA ($)	% of Value from CINMS
2000	543	21,627,775	27,257,770	79.35
2001	448	13,000,830	36,493,318	35.63
2002	458	12,074,375	35,029,852	34.47
2003	441	17,274,785	36,230,249	47.68
2000-2003 Average	473	15,994,441	33,752,797	47.39

1. Number of Fishing Operations are number of different vessel identification numbers in the CDFG trip ticket database.

Table 1.10 All Species in Channel Islands National Marine Sanctuary - 22 Block Definition, 2003

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	441	100.00	17,276,739	100.00
GE $500,000	3	0.68	1,617,339	9.36
GE $100,000	43	9.75	9,272,657	53.67
GE $50,000	102	23.13	13,488,582	78.07
GE $20,000	175	39.68	16,026,395	92.76
LT $20,000	266	60.32	1,250,344	7.24
LT $10,000	223	50.57	596,145	3.45
LT $5,000	179	40.59	271,006	1.57
LT $1,000	90	20.41	38,316	0.22

Table 1.11. Percent of Commercial Fishing Revenue from CINMS: 2000 - 2003

Percent of Fishing Revenue [1]	2000 % of Fishermen [2]	2001 % of Fishermen	2002 % of Fishermen	2003 % of Fishermen
Less than or Equal (LE) to 5%	2.21	12.02	18.12	18.30
Greater than 5% & LE 10%	2.58	5.90	5.68	8.48
Greater than 10% & LE 20%	2.21	9.75	10.48	10.71
Greater than 20% & LE 40%	6.63	7.03	13.54	9.15
Greater than 40% & LE 60%	3.87	10.88	9.83	7.59
Greater than 60% & LE 80%	9.58	11.56	6.55	10.49
Greater than 80% & LT 100%	25.23	21.77	16.59	20.09
100%	47.70	21.09	19.21	15.18

1. LE = less than or equal to and LT=less than.
2. Fishermen are permitted number of vessels in CDFG trip ticket database.

Socioeconomic Profiles of Fishermen. Two separate samples of fishermen were surveyed (details are included in Appendix B). The first sample is sometimes referred to as the Pomeroy Sample and includes fishermen in the squid/wetfish fishery. The second sample is sometimes referred to as the Barilotti Sample and includes fishermen in all other fisheries, except squid and wetfish. It is important to note that both samples can be characterized as being involved in multi-species fisheries. Tables 1.12, 1.13 and 1.14 provide socioeconomic profiles for both samples of fishermen and demonstrate that each sample depends on multiple species. Often the multiple species dependence is seasonal and important in supplying income flows over the course of a year. Small percents of dependence on a particular species/species group may involve a week or a month of income at a time when the opportunity to catch the main species/species groups fished are not available and participation in other fisheries are the only source of income. In our Step 1 analyses, we take this kind of dependence into account. Here we provide a baseline profile of fishermen of the CINMS and compare them with some profiles of fishermen obtained from a study of Tri-County fishermen (e.g., Santa Barbara, Ventura and San Luis Obispo counties).

Table 1.12 Commercial Fishing: Multi-Species Fishery, Barilotti Sample

	N	Mean	Range
Number of Species/Species Groups Caught in CINMS	56	2.59	1 - 13
	Number	Percent	Cumulative Percent
	1	48.2	48.2
	2	25.0	73.2
	3 - 4	12.5	85.7
	5	5.4	91.1
	GT 5	8.9	100.0
Number of Species/Species Groups Caught Anywhere	N	Mean	Range
	58	3.41	1 - 14
	Number	Percent	Cumulative Percent
	1	39.7	39.7
	2	22.4	62.1
	3 - 4	12.0	74.1
	5	6.9	81.0
	GT 5	19.0	100.0

Table 1.13 Socioeconomic Profiles: Commercial Fishermen, Barilotti Sample

	N	Mean	Range
EXPERIENCE			
Years Commercial Fishing	58	20.16	8 - 32
Years Fishing IN CINMS	57	19.11	4 - 32
AGE	58	44.83	30 - 64
EDUCATION			
Years of Schooling	57	12.89	0 - 17
DEPENDENCY ON FISHING			
Percent of 1999 Income from Fishing	57	90.02	10 - 100
Percent of 1999 Household Income from Fishing	57	83.49	10 - 100
Percent of Fishing Outside CINMS	55	17.71	0 - 97
Percent of 1999 Fishing Revenue from CINMS			
Urchin	40	73.76	0 - 100
Spiny Lobster	10	58.39	0 - 100
Sea Cucumbers	13	71.88	0 - 100
Rockfish	17	20.42	0 - 100
Crab	17	35.85	0 - 100
Flatfish	11	10.47	0 - 52.16
CA Sheepshead	16	49.27	0 - 100
Sculpin & Bass	6	10.02	0 - 37.74
Shark	8	4.72	0 - 18.93
Other (those not listed above)	17	52.92	0 - 100
All Species/Species Groups	**57**	**71.46**	**2.8 - 100**
PEOPLE DIRECTLY EMPLOYED AND FAMILY MEMBERS SUPPORTED			
Number of Crew	55	1.36	0 - 11
Number of Crew with Skipper's Licenses	55	1.29	0 - 11
Number of Family Members Supported by Captains/Owners, not including self	58	2.1	0 - 5
OWNERSHIP/INVESTMENT			
Boat Ownership (Percent Yes)	88.3		
Replacement Value of Boat	57	120,930	0 - 1,400,000
Replacement Value of Electronic Equipment	53	11,126	0 - 90,000
Replacement Value of Fishing/Diving Gear	54	16,231	1,000 - 110,000
Replacement Value Boat, including Equipment and Gear	50	128,104	1,500 - 660,000

Table 1.13 (continued)

RESIDENCE/MAIN LANDING PORT	Percent
State	
California	100
City	
Arroyo Grande	1.8
Atascadero	3.5
Carpenteria	5.3
Goleta	3.5
La Conchita	1.8
Morro Bay	1.8
Newbury Park	1.8
Ojai	1.8
Oxnard	7.0
Oak View	1.8
San Pedro	1.8
Santa Barbara	52.6
Simi Valley	1.8
Tarzana	1.8
Ventura	12.3
Main Landing Port	
Channel Islands Harbor	13.8
Santa Barbara	63.8
San Pedro	1.7
Ventura Harbor	15.5
Multiple	5.1

The commercial fishermen other than squid/wetfish or the Barilotti Sample included 59 fishermen. The squid/wetfish or Pomeroy Sample included 29 purse seine boat's skippers and 8 light boat's skippers. Profiles of purse seine boat's skippers and light boat's skippers are presented separately. Not every fisherman supplied complete information so sample size (N) or the number responding to each item is reported in Tables 1.12, 1.13 and 1.14. Measurements included: 1) Experience (Years of Commercial Fishing and Years Commercial Fishing in the CINMS and Age of the fisherman interviewed), 2) Education (Years of Schooling of the fisherman interviewed), 3) Dependency on Fishing (Percent of Income from Fishing, Percent of Fishing Revenue from CINMS and Number of Crew and Family Members Supported directly by the fishing operation), 4) Ownership/Investment (Boat Ownership and Replacement Value of Boats and Equipment), 5) Residence (State and City) and 6) Ports Used (Home Port, Main tie-up Port, and Main Landing Port). More detail was available from the squid/wetfish fishermen (Pomeroy Sample) than the other commercial fishermen (Barilotti Sample).

Although our samples of commercial fishermen accounted for 79 percent of the total ex vessel of catch from the CINMS, they represent only 13 percent of the total number of fishermen reporting catch in the CINMS. In 1999, there were 737 fishing operations reporting some catch from the CINMS. Nineteen (19) percent accounted for 82 percent of the total ex vessel value, with each of these operations receiving at least $50,000 per year in ex vessel value (141 operations). Almost 64 percent of fishing operations (469) received less than $20,000 per year and accounted for only about 6 percent of total ex vessel value from the CINMS, and 23 percent (170 operations) earned less than $1,000, which was 0.20 percent of the total ex vessel value from the CINMS (see Appendix C for details). For analyzing catch distributions, we believe the information is highly reliable. We do not think, however, that the profiles of the sample fishermen are "representative" samples of the commercial fishing population and our profiles information cannot be extrapolated to population totals. Our sample does provide a broad range of types of fishermen (who happen to catch most of the fish) and can be used for assessing adverse impacts and difficulties of adapting to change[2].

Table 1.14 Socioeconomic Profiles: Squid/Wetfish Fishermen, Pomeroy Sample

	Purse Seine Boats		Light Boats	
EXPERIENCE				
	Mean	Range	Mean	Range
Years Commercial Fishing	26.28	9 - 56	19.12	8 - 28
Years Fishing in CINMS	17.00	4 - 45	13.62	6 - 27
AGE	44.18	29 - 61	37.00	26 - 44
EDUCATION				
Years of Schooling	11.78	0 - 16	12.56	10 - 15.5
DEPENDENCY ON FISHING				
Percent of 1999 Income				
From CINMS Squid	70.34	32 - 100	86.90	65 - 100
From Other CINMS Fisheries	3.88	0 - 25	6.62	0 - 25
From Fisheries Outside CINMS	23.33	0 - 60	5.84	0 - 27
From Non Fishing Work	0.38	0 - 10	0.00	0
From Investments	2.07	0 - 17	0.63	0 - 5
Percent of Average Annual 1996-99 Fishing Revenue1				
Squid fishing in CINMS/All Squid Fishing	71.07	25.39 - 98.47	14.63	0.96 - 44.44
Wetfish in CINMS/All Wetfish Fishing	22.10	0 - 100	3.77	0 - 15.08
Tuna in CINMS/All Tuna Fishing	3.79	0 - 100	14.59	0 - 25.73
Other Finfish in CINMS/All Other Finfishing	6.90	0 - 100	38.67	0 - 70.72
Shellfish in CINMS/All Shellfishing	3.45	0 - 100	41.97	0 - 100
All CINMS Fishing/All Fishing	60.93	11.95 - 94.60	13.71	5.20 - 22.29
People Directly Employed and Family Members Supported				
Number of Crew on Main Vessel	5.00	3 - 9	0.875	0 - 2
Number of Relief Skippers	0.31	0 - 1	0.375	0 - 1
Number of Captain/Owners Family Members, including self	3.64	1 - 6	2.75	1 - 5
Number of Family Members Supported by Crew, including crew	18.54	3 - 54	2.375	0 - 8
Total Supported, except Relief Skipper Family	22.12	5 - 59	5.5	2 - 12
OWNERSHIP/INVESTMENT				
Boat Ownership	***Percent***			
Sole Owner	27.6		25.0	
Owns with Other Family Member	44.8		12.5	
Owns with Partner	13.8		50.0	
Market owns	3.4		0.0	
Other owns	10.3		12.5	
	Mean	Range	Mean	Range
Length of Ownership	19.04	4 - 37	11.19	0 - 23
Number of Boats Owned	0.86	0 - 3	0.88	0 - 3
Replacement Value of Main Boat, including all equipment	$778,793	75,000 - 2,000,000	$210,000	70,000 - 485,000
Replacement Value of All boats, including all equipment	$917,931	275,000 - 2,800,000	$272,500	120,000 - 600,000
RESIDENCE/HOME PORT/MAIN LANDING PORT	Percent		Percent	
Residence				
State				
California	93.1		100	
Washington	6.9		0	

Tri-County Fishermen. The socioeconomic panel obtained summary tables of information from a study done by Utah State University researchers (Ron Little and Joanna Endter-Wada) under contract to the U.S. Department of the Interior, Minerals Management Service. The Tri-county area includes San Luis Obispo, Santa Barbara, and Ventura counties. In 1996, the Utah State University researchers conducted a survey of 248 commercial fishermen who live in the Tri-County area. 95 of their 248 fishermen fished in the CINMS. 60 of the 96 fishermen in our samples lived in the Tri-county area. Very few of the squid/wetfish

fishermen from our samples lived in the Tri-County area. A comparative profile was constructed comparing some common measurements taken in our two studies (Table 1.15).

Table 1.15 Comparative Profiles: Tri-County Fishermen [1]

	All Tri-County Fishermen [2]	Tri-County Fishermen that Fish in CINMS	Tri-County Fishermen NOAA Samples [3]
EXPERIENCE			
Years Commercial Fishing	Percent	Percent	Percent
1 to 10	26.1	27.4	6.3
11 to 20	32.2	39.0	36.1
21 to 30	29.8	26.3	41.3
31 to 40	6.2	6.3	6.3
Greater than 40	5.7	1.0	0.0
N	245	95	63
Mean	N/A	17.53	20.75
AGE	Percent	Percent	Percent
25 to 29	3.0	5.4	0.0
30 to 39	27.2	36.9	25.0
40 to 49	37.5	36.9	43.8
50 to 59	20.4	15.3	29.6
60 to 69	7.3	3.3	1.6
Greater than 69	4.8	2.2	0.0
N	235	92	60
Mean	N/A	42.98	45.28
EDUCATION			
Years of Schooling	Percent	Percent	Percent
Less than 12	8.1	7.6	12.7
12	24.6	21.7	30.2
Greater than 12	67.3	70.7	57.1
N	236	92	63
DEPENDENCY ON FISHING			
Percent of Income from Fishing	Percent	Percent	Percent
0 to 19	19.5	10.8	0.0
10 to 29	12.2	8.7	1.6
30 to 49	6.1	5.4	4.8
50 to 69	11.3	15.1	6.4
70 to 89	12.6	12.9	8.0
90 to 99	10.8	12.9	9.6
100	27.7	34.3	69.8
N	231	93	63

Table 1.15 (continued)

Number of Crew	All Tri-County Fishermen [2] Percent	Tri-County Fishermen that Fish in CINMS Percent	Tri-County Fishermen NOAA Samples [3] Percent
0	20.8	12.2	13.1
1	43.3	42.2	55.7
2	27.3	35.6	16.4
3 to 4	7.8	8.9	13.2
5 to 6	0.8	1.1	0
Greater than 6	0	0	1.6
N	231	90	61
Mean	N/A	1.48	1.52
BOAT OWNERSHIP	Percent	Percent	Percent
Owner	95.7	95.7	84.3
Non Owner	4.3	4.3	15.7
N	237	93	57
RESIDENCE/HOME PORT			
County of Residence	Percent	Percent	Percent
Ventura	27.7	47.3	39.1
Santa Barbara	32.8	44.8	54.7
San Luis Obispo	39.5	8.8	6.3
N	238	91	64
Home Port	Percent	Percent	Percent
Port Hueneme	2.5	2.2	7.8
Channel Islands/Oxnard	16.9	29.3	15.6
Ventura Harbor	9.1	16.3	14.1
Santa Barbara	30.9	48.9	57.8
Port San Luis/Avila Beach	15.6	1.1	0
Morro Bay	23	2.2	0
Other	2	0	4.7
N	243	92	64

1. Tri-County area is San Luis Obispo, Santa Barbara and Ventura Counties.
2. All Tri-County Fishermen and Tri-County Fishermen that Fish in CINMS are from a study funded by the U.S. Dept. of Interior, Minerals Management Service to Utah State University researchers Ron Little and Joanna Endter-Wada.
3. NOAA Samples are the ones derived from contracts with Dr. Craig Barilotti and Dr. Caroline Pomeroy.

No difference was found between the two studies samples for Experience, Age, or Number of Crew. Our samples had lower levels of education, a lower percentage of boat ownership, a higher proportion of our samples lived in Santa Barbara and also reported Santa Barbara as their Home Port, and our sample was more dependent on fishing for their income.

Consumer's Surplus. In the section above that discussed the benefits and costs to each user group, we discussed the possibility of there being losses to consumers if the supply of commercial seafood products were reduced enough to have impacts on prices to consumers or a gain to consumers, if marine reserves

resulted in increased supplies and lower prices to consumers. To estimate consumer's surplus requires access to econometric demand and supply models for each of the fisheries. We were not able to find any such research for California seafood products, except urchins (see Reynolds 1994). One problem with the Reynolds paper was that all the information required to utilize the model was not included in the report. Therefore, we are not able to provide estimates of impacts on consumers from possible price changes.

Although we cannot estimate consumer's surplus, we can assess whether the amount of supply from the CINMS is a significant portion of total supply and therefore whether reductions in the supply might affect prices. Table 1.16 summarizes CINMS landings, U.S. landings, and U.S. Supply and the proportions of CINMS supply relative to that of the U.S., for eight of the species/species groups. The information is from the National Marine Fisheries Service for 1999. It appears that squid and urchins are the only species/species groups for which significant proportions of U.S. landings come from the CINMS. Eliminating the total catch from the CINMS might have impact on prices. However, squid and urchins are primarily sold in foreign markets, therefore the world supply is probably more relevant for determining whether supply from the CINMS would have price effects. The United Nations, Food and Agricultural Organization (FAO) reports a 1999 world commercial catch of squid of 3,373,463 metric tons or 7,438.486 million pounds. CINMS landings were only 2.15 percent of world supply and 1999 was a record year for squid in the CINMS. FAO also reports the 1999 world commercial catch of urchins of 118,750 metric tons or 261.844 million pounds. CINMS landings were 2.24 percent of world supply. Given the small proportions of world supply accounted for by CINMS squid and urchin catches, any changes in supply from marine reserves would not be expected to change prices to consumers and thus there are no likely impacts on consumer's surplus.

Table 1.16 Relative Supply of Selected CINMS Commercial Species, 1999

	Landings		Landings		Landings		Supply	
	CINMS 1999	CINMS 1999	U.S. 1999	U.S. 1999	CINMS/U.S. 1999	CINMS/U.S. 1999	U.S. 1999	CINMS/U.S. 1999
Species/Species Group	(Millions lbs)	(Millions $)	(Millions lbs)	(Millions $)	% of lbs	% of $	(Millions lbs)	% of lbs
Squid	159.564	26.545	258.198	71.172	61.80	37.30	N/A	N/A
Urchins	5.855	5.969	33.55	35.647	17.45	16.74	N/A	N/A
Spiny Lobster	0.121	0.951	6.692	29.754	1.81	3.20	90.586	0.13
Prawn & Shrimp	0.178	0.726	304.173	560.501	0.06	0.13	1,083.60	0.01
Crab	0.247	0.313	458.307	521.237	0.05	0.06	N/A	N/A
Rockfishes	0.192	0.553	60.223	30.436	0.32	1.82	N/A	N/A
Flatfishes	0.121	0.324	411.548	214.642	0.03	0.15	N/A	N/A
Tuna	0.168	0.054	58.12	86.254	0.29	0.06	N/A	N/A

Sources: Current Fishery Statistics No. 2000, Fisheries of the United States, 2000. National Marine Fisheries Service and California Department of Fish and Game, Marine Fisheries Statistical Unit.

Economic Rent. Another measured listed as a possible benefit or cost was economic rent. To estimate economic rents requires detailed information on the costs and returns on investment by fishermen. Although both contractors sought to obtain this information, many fishermen were reluctant to reveal their full costs and earnings. This prevents us from evaluating the existence or extent of impact on economic rents.

In open access fisheries, economic rents are generally predicted to be dissipated by new entrants into the fishery (Smith, 1968)[3]. Entry stops when average cost per unit of catch equals the price per unit of catch and economic rents are eliminated (i.e., every fisherman is earning a normal return on investment). Some economists have noted certain conditions under which economic rents could exist even under open access conditions. Economic rents could exist if there were many fishermen but only one buyer (Worcester, 1969). The buyer would have monopoly power and could limit the amount of catch purchased from fishermen and claim all the economic rents. Under this condition, the fishermen are not earning economic rents, instead the buyer due to his monopoly position is able to capture all the economic rents. Another possibility is that certain contractual arrangements between buyers and fishermen could lead to them gaining some monopoly power. In the squid fishery, there might be relationships between light boats, purse seine boats and buyers such that they are able to gain some monopoly power (Pomeroy and Fitzsimmons 2001). The result may be what economists have called "inframarginal" rents (Johnson and Libecap, 1982). These are above normal

returns to a few fishermen, who have these special relationships, which are not generally available to new entrants. These types of rents don't get dissipated with new entrants.

Lutz and Pendleton (2001) and Pendleton, Cai and Lutz (2001) have conducted studies of the San Pedro squid/wetfish fleet. Part of this fleet fish in the CINMS. The researchers were able to get more complete costs and earnings and investment information than we were able to get from the Pomeroy and Barilotti samples. The more complete information supported an assessment of economic rents in this fishery. Generally, the San Pedro squid/wetfish fleet seemed to be earning less than even normal returns to investment. The authors concluded that although there may not be sufficient evidence of biological overfishing for squid, there is some evidence of economic overfishing. This is a condition under which we might expect some exit from the industry[4]. In 1999, there were 169 vessels reporting catch of squid from the CINMS. This declined to 82 vessels in 2003.

All of the commercial fisheries in the CINMS can currently be characterized as open access fisheries. The squid/wetfish fishery is currently considering implementing a limited entry program in the current draft management plan. However, we have not seen any analysis of whether the limits would lead to economic rents in the fishery. We are not able to make any estimates of the impacts of marine reserves on economic rents.

Ethnographic Data Survey. At the beginning of the CINMS five-year management plan revision process, the CINMS conducted an ethnographic data survey (Kronman et al, 2000). Fifteen professional fishermen were interviewed about their opinions on the current status of various species and habitats, whether the status of the species and habitats have changed, environmental cycles observed, changes in climate, changes in equipment used for fishing, changes in regulations and when and/or if they affected their operations, changes in domestic and/or export markets for their products or changes in distributions of boats and fisheries and when and/or if these changes affected their operations.

The ethnographic information was used in developing some of our catch distributions (see Appendix B). We also used some of the information in our Step 2 analyses.

Moral Hazard Problem. In the original data collection to support the MRWG process, we delayed the data collection 6 months to allow more commercial fishermen to provide their data. The reason for the delay was that once the MRWG started putting down lines on maps for alternative configurations of the MPAs, the data collection had to stop to avoid the moral hazard problem. The moral hazard problem is that those impacted by a proposed change in a regulation have an incentive to make the regulation appear to have more impact on them than is actually the case. In this case, they would not provide their true distribution of catch, but instead over report catch in areas being considered to be closed to their activities. A subsequent effort to use ethnographic methods with a sample of fishermen to re-do the distributions used in this analysis suffers from the moral hazard problem. That effort predictably found that the alternatives proposed by the CINMS and CDFG had greater impact than reported in Leeworthy and Wiley (2003).

Recreation Industry

Here we provide the baseline economic measures for the recreation industry. Recreation is divided into consumptive activities and nonconsumptive activities. Consumptive recreation includes recreational fishing from a charter/party boat, fishing from a private household/rental boat, consumptive diving from a charter/party boat and consumptive diving from a private household/rental boat. Nonconsumptive recreation includes nonconsumptive diving, whale watching, sailing and kayaking/sightseeing from for hire or charter/party boats. We were not able to find any information on nonconsumptive activities from private household/rental boats, so ***nonconsumptive uses are undercounted***. As mentioned in the section on benefits and costs, the consumptive recreation users potentially are both sufferers of costs and well as beneficiaries of marine reserves under various conditions. Nonconsumptive recreationists are potential beneficiaries of marine reserves. Because nonconsumptive users accessing CINMS from private household/rental boats are not counted, nonconsumptive benefits of marine reserves are underestimated. 1999 is the baseline year used for extrapolating future impacts.

Table 1.17 Number of Marine Recreational Fishing Trips in Southern California: 1993 - 2002 (thousands)

Year	Total	Private/ Rental Boat	Charter/ Party Boat	Shore
1993	4,037	1,625	1,174	1,238
1994	4,749	1,932	1,201	1,616
1995	4,301	1,701	1,129	1,471
1996	3,768	1,478	889	1,401
1997	3,232	1,275	788	1,169
1998	2,973	1,325	674	974
1999	2,437	1,019	617	801
2000	3,786	1,721	1,015	1,050
2001	4,050	1,742	994	1,314
2002	4,311	1,830	1,155	1,326
Percent Change 1993 - 1999				
	-39.6	-37.3	-47.4	-35.3
Percent Change 1999 - 2002				
	76.9	79.6	87.2	65.5

Source: National Marine Fisheries Service, Marine Recreational Fisheries Statistics Survey (MRFSS) (http://www.st.nmfs.gov/st1/recreational/data.html)

In our previous assessment of recreational fishing (Leeworthy and Wiley, 2003), we had summarized information available for years 1993 to 2000 from the National Marine Fisheries Service, Marine Fishing Statistics Survey (MRFSS). MRFSS data was showing a downward trend in fishing trips and catch for Southern California over this period. Total trips had declined 39.6 percent. For the top 20 species, in terms of total number of fish caught, 10 had downward trends, 7 had no trend and 3 had upward trends (Table 1.18). These trends were contrasted with the trends between 1991 and 1996, for all of California, based on the U.S. Fish and Wildlife Survey of Fishing, Hunting and Wildlife Associated Recreation (USFWS, 1991 and 1996). This latter survey showed a slight decrease in the number of recreational anglers (-0.76 percent), but an increase in the number of angler days (27.88 percent). Although the definitions of the populations covered are different between the surveys, we were not able to reconcile the differences in trends because the MRFSS Northern California data also showed a downward trend.

We were able to update the number of fishing trips for Southern California through year 2002. From 2000 to 2002, total trips started on an increasing trend (Table 1.17). The top 20 species for catch has changed significantly from the 1993 to 1998 period to the 1999 to 2002 period. Species like California Halibut, White Seabass (reported separately in 2000, but aggregated in Other Croakers in 2002), and Pacific Barracuda, which were not among the top 20 species between 1993 and 1998, had moved up into the top 20. The most noticeable change is that all the rockfish species dropped out of the top 20 species in the 1999 – 2002 period (Table 1.19).

Table 1.18 Summary of Trends in Marine Recreational Catch in Southern California: 1993 - 1998

Ranking 1993	Ranking 1998	Species	Number	Mean Length
1	1	Chub Mackerel	down	no trend
2	2	Kelp Bass	down	no trend
3	3	Barred Sand Bass	down	no trend
4	5	White Croaker	down	no trend
5	6	Pacific Bonito	down	up
6	4	Barred Surf Perch	up	up
7	7	Vermillion Rockfish	down	no trend
8	13	Bocaccio	down	no trend
9	8	Pacific Sanddab	no trend	no trend
10	9	California Sheepshead	no trend	no trend
11	18	Chilipepper Rockfish	down	no trend
12	11	Copper Rockfish	no trend	no trend
13	10	Yellowfin Tuna	no trend	down
14	15	Lingcod	no trend	up
15	14	Dolphin	no trend	up
16	17	Brown Rockfish	down	no trend
17	16	Gopher Rockfish	up	no trend
18	12	Blue Rockfish	no trend	no trend
19	20	Canary Rockfish	down	up
20	19	Yellowtail Rockfish	up	up

Source: National Marine Fisheries Service, Marine Recreational Fisheries Statistics Survey (MRFSS) (http://www.st.nmfs.gov/st1)

Table 1.19 Changes in Top 20 Species in Marine Recreational Catch in Southern California, 2002

Ranking 1999	Ranking 2002	Species
1	1	**Other Tunas/Mackerels**
10	2	**Other Fishes**
2	3	**Pacific Barracuda**
25	4	**Sanddabs**
3	5	**California Halibut**
32	6	**Queenfish**
9	7	**California Scorpionfish**
22	8	**Spotted Sand Bass**
16	9	White Croaker
41	10	**Other Flounders**
7	11	**Other Croakers**
21	12	**Halfmoon**
23	13	**Herrings**
17	14	**Skates/Rays**
15	15	Barred Surfperch
59	16	**Other Drum**
11	17	California Sheephead
27	18	**Jacksmelt**
39	19	**Other Surfperch**
13	20	**Other Sharks**

1. Species in bold were not among the top 20 1993 through 1998.
Source: National Marine Fisheries Service, Marine Recreational Fisheries Statistics Survey (MRFSS) (http://www.st.nmfs.gov/st1)

As mentioned in the introduction, we were not able to update all recreational data for this assessment. For the CINMS, we were able to update the charter/party boat fishing and consumptive diving estimates of use using the CDFG logbook database for the period 2000 through 2003. For charter/party boat fishing and consumptive diving, the baseline uses the 2003 value due to steep declining trends in use measured as person-days. These trends are counter to the overall trends in Southern California. For all other recreational uses, we are still using the 1999 estimates for the baseline, since no other information is currently available.

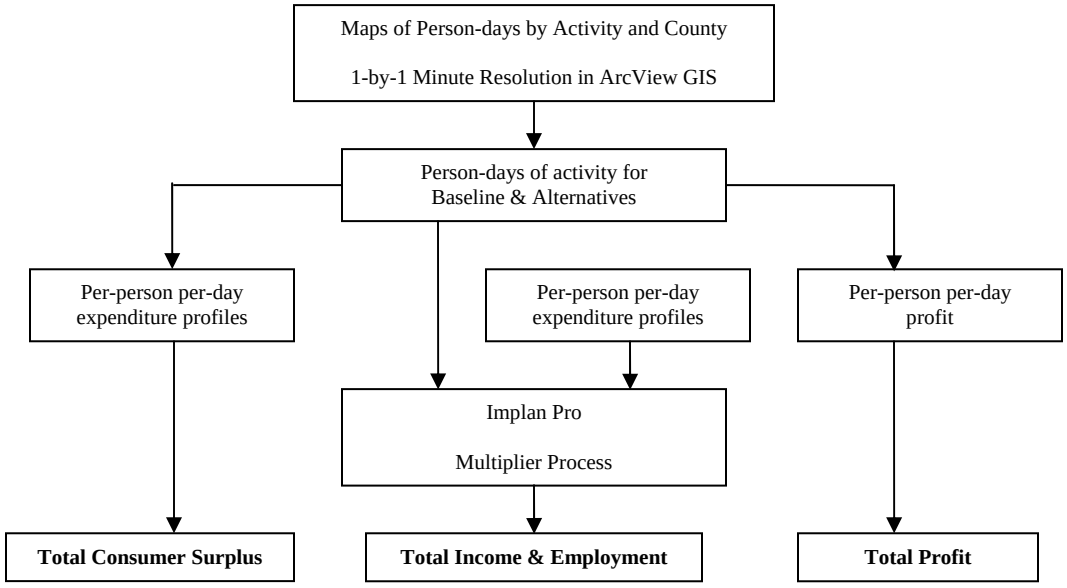
The confusing trends present a problem in choosing a baseline for extrapolating about future possible impacts. If the downward trends continue, then using the 1999 baseline estimates would overstate future impacts. If the trends were to start on an increasing path, then using the 1999 baseline estimates would understate impacts. One year of information is not enough to declare a reversal of trends, so we believe our use of baseline 1999 for extrapolating about future impacts is the most reasonable choice.

Economic Impact and Valuation Model.. For the recreation industry, economic impact was estimated using IMPLAN Professional Social Accounting and Impact Analysis Software, Version 2.0. The model starts with the estimates of person-days of activity for each of the consumptive and nonconsumptive creation activities for year 2003 for charter/party boat fishing and charter/party boat consumptive recreation and 1999 for the remaining activities, for which updates were not available. The person-days are mapped in 1-by-1 minute grid cells for the area within the CINMS. The mapped data is in a geographic information system (GIS) using ArcView. All the maps are included in Appendix C. All data collection and estimation methods are described in Appendix B. IMPLAN estimates for the baseline are included in Appendix C.

Definition: ***Person-day***: is one person undertaking an activity for any part of a day or a whole day.

For the baseline, we estimated 448,054 total person-days of consumptive recreation in the CINMS (Table 1.20). Fishing from a private household boat was the top activity with over 214 thousand person-days (47.8% of the consumptive recreation activity) followed by about 151 thousand person-days of fishing from charter/party boats (33.7% of the consumptive recreation activity). Consumptive diving accounted for the remaining 18.5 percent of consumptive recreation activity. If we use 2002 estimates of fishing trips in Southern California and our baseline estimates for CINMS, in the baseline, 12 percent of the private household boat fishing and about 13 percent of the charter/party boat fishing in Southern California was done in the CINMS.

Figure 4. Economic Impact Model and Valuation Model for the Recreation Industry in the CINMS



In 1999 (baseline), we estimated 42,008 person-days of nonconsumptive recreation from "for hire" operations in the CINMS. As mentioned above, we were not able to estimate the amount of nonconsumptive recreation activity from private household boats. Whale-watching was the top nonconsumptive recreational activity with about 26 thousand person-days (62% of all nonconsumptive recreation activity) followed by nonconsumptive diving with almost 11 thousand person-days (26% of all nonconsumptive recreation activity). Sailing and Kayaking/Island Sightseeing accounted for the remaining 13 percent of nonconsumptive recreation activity (Table 1.20).

Table 1.20 Baseline Person-days of Recreation Activity in the CINMS

	Person-days (number)	Person-days (percent)
Consumptive Activities		
Charter/Party Boat Fishing	150,872	33.7%
Charter/Party Boat Consumptive Diving	35,977	8.0%
Private Boat Fishing	214,015	47.8%
Private Boat Consumptive Diving	47,190	10.5%
Total Consumptive	448,054	100.0%
Non-consumptive Activities		
Whale Watching	25,984	61.9%
Non-consumptive Diving	10,776	25.7%
Sailing	4,015	9.6%
Kayaking/Island Sightseeing	1,233	2.9%
Total Non-consumptive	42,008	100.0%

In the baseline, the recreation industry included a total of 490,062 person-days of consumptive and nonconsumptive recreation. Consumptive recreation was 91.4 percent of all recreation activity in the CINMS. The "for hire" industry accounted for almost 46.7 percent of all the person-days of recreation activity. This is important because the estimates of use from this industry were based on a census, not a sample, of all operators who operate in the CINMS. Table 1.21 shows the total number of operators, person-days, revenues, costs and profits for this industry from activities in the CINMS. It is important to note that adding up the number of operators across activities would add to more than 26 because some operators provide services for multiple activities.

Table 1.21 Charter/Party Operations in the CINMS

	Number of Operators	Total Person-days	Total Revenue	Total Cost	Total Profit
Consumptive Activities					
Charter/Party Boat Fishing	n/a[2]	150,872	$ 7,309,953	$ 6,952,371	$ 357,582
Charter/Party Boat Consumptive Diving	n/a[2]	35,977	$ 2,186,180	$ 2,097,909	$ 88,271
Total Consumptive	n/a[2]	186,849	$ 9,496,133	$ 9,050,281	$ 445,852
Non-consumptive Activities					
Whale Watching	8	25,984	$ 1,508,049	$ 1,498,828	$ 9,221
Non-consumptive Diving	7	10,776	$ 687,585	$ 641,272	$ 46,313
Sailing	8	4,015	$ 264,700	$ 246,618	$ 18,082
Kayaking/Island Sightseeing	4	1,233	$ 125,558	$ 116,337	$ 9,221
Total Non-consumptive	26	42,008	$ 2,585,892	$ 2,503,055	$ 82,837

1. The totals do not equal the sums of the individual activities because operators have customers who participate in more than one activity
2. Commercial Passenger Fishing Vessel (CPFV) data was not organized by operation, or by permit.

Expenditure Profiles. The next step in the economic impact model was the development of expenditure profiles for each recreation activity. The expenditure profiles used for charter/party boat and private boat fishing were taken from Gentner, Price and Steinback (2001). A review of the literature revealed that most of the studies containing expenditure profile data were related to fishing in Southern California with one study for all of California party boat fishing (NMFS, 1980; Wegge, Hanemann and Strand, 1983; Rowe, Morey, and Ross, 1985; Hanemann, Wegge and Strand, 1991; and Thompson and Crooke, 1991). For consumptive diving and the non-consumptive activities, we supplemented this information with a visitor's study for Santa Barbara County (Santa Barbara County Conference & Visitors Bureau and Film Commission, 1999) for lodging and food and beverage expenditures, and a study on diving in Northwest Florida for some dive related costs (Bell, Bonn and Leeworthy, 1998). Also, from the charter/party operations, we derived the boat fee per person-day by county. From all this information we constructed expenditure profiles for these activities. Because we relied on mostly regional studies, the expenditure profiles do not differ by county except for the charter/party boat fees category.
Table 1.22 shows the expenditure profiles we developed for each activity/boat mode. Low food, beverage and lodging costs would indicate a low percentage of users being overnight visitors or dominated by local users. In 1999, coastal residents accounted for 86.7% of charter/party boat trips and 96.86% of private household boat trips for fishing in Southern California (NMFS, MRFSS 1999). Not all the profiles we found had consistent categories, sometimes food and beverage was reported separately and sometimes they were aggregated together. When reported separately, we used the separated categories in the impact analysis.

The next step for calculating economic impact was to multiply the person-days of activity by the expenditures per person-day to get total direct sales impact. These direct sales estimates by expenditure category were mapped into the appropriate standard industry and fed into IMPLAN. The IMPLAN model then estimates direct wages and salaries, direct employment, total income and total employment impacts in each county.

Residents vs. Nonresidents. In local or regional economic impact analysis, the inclusion of resident spending impact is usually not done because it is already accounted for in the multiplier analyses of basic o export industries. Although data exists on the proportion of residents and nonresidents who access the

Table 1.22 Expenditure Profiles for Recreation Activities in the CINMS, 1999

Expenditure	Expenditures Per Person-day (1999 $) Fishing Charter/Party Boat	Fishing Private Boat	Diving Charter/Party Boat	Diving Private Boat
Boat Fees[1]	$47.62 - 60.74	n/a	$40.21 - 92.56	n/a
Boat Fuel	n/a	$ 12.74	n/a	$ 19.00
Food, Bev, Lodging	n/a	n/a	$82.00	$ 11.00
Food	$ 15.47	$ 7.60	n/a	n/a
Lodging	$ 8.65	$ 1.20	n/a	n/a
Transportation	n/a	n/a	$10.00	$ 9.00
Private Transportation	$ 16.64	$ 8.90	n/a	n/a
Public Transportation	$ 33.07	$ 1.89	n/a	n/a
Equipment/Equip. Rental	$ 6.01	$ 0.91	n/a	$ 5.00
Miscellaneous	n/a	n/a	$15.00	$ 10.50
Access/Boat Launch Fees	$ 1.18	$ 1.52	n/a	n/a
Air Refills	n/a	n/a	n/a	$ 7.00
Bait/Ice	$ 0.52	$ 6.77	n/a	$ 2.50
Total[2]	$129.16-$142.28	$ 41.53	$132.21-$184.56	$64.00

Expenditure	Whale Watching Charter/Party Boat	Non-consumptive Diving	Sailing Charter/Party Boat	Kayaking/Island Sightseeing
Lodging	$ 53.00	$ 53.00	$ 53.00	$ 53.00
Eating & Drinking	$ 29.00	$ 29.00	$ 29.00	$ 29.00
Transportation	$ 10.00	$ 10.00	$ 10.00	$ 10.00
Charter Boat Fee[1]	$53.43-60.19	$40.56-81.78	$61.99-177.61	$50.77-104.67
Miscellaneous	$ 15.00	$ 15.00	$ 15.00	$ 15.00
Total[2]	$160.43-167.19	$147.56-188.78	$168.99-284.61	$157.77-211.67

1. Boat fees used were actual by county and activity from the Kolstad survey. They are:

	SB	Ventura	LA
Charter/Party Boat Fishing	$ 60.74	$ 47.62	$ 59.95
Charter/Party Boat Diving	$ 40.21	$ 64.50	$ 92.56
Whale Watching	$ 53.43	$ 60.19	n/a
Non-Consumptive Diving	$ 40.56	$ 81.78	$ 48.48
Sailing	n/a	$ 61.99	$ 177.61
Kayaking/Island Sightseeing	$ 104.67	$ 50.77	n/a

2. The total varies because we used the actual charter/party boat fee by activity

Channel Islands, we did not have the proportion of residents of each county in the study area who accessed the Channel Islands from their county of residence. In this analysis we used the assumption that 50% of those who participated in recreation activities are residents of the county from which they accessed the Channel Islands. This assumption still most likely overstates the impacts from recreational uses given that coastal residents do 87% of charter/party boat fishing and 97% of private household/rental boat fishing in Southern California. But as we noted above, we don't have precise enough information on county of residence.

Import Substitution/Double Counting Economic Impact. Nonresident fishermen that bring new dollars into a county spend money, which is received by local businesses and they spend it on inputs of production, including wages and salaries for labor and a return to the business as profit. These workers and business owners spend a portion of their incomes in the local economy and thus the ripple or multiplier impacts. Some of the workers and business owners that received income through this multiplier impact will spend it locally on fishing trips in the CINMS. So this portion of resident spending would be double-counted.

We recognize that by including resident spending impacts, even only the direct impacts, does involve double counting. The reason for including it has to do with the "***import substitution***" argument. Import substitution means that the multiplier impact would be reduced from all basic or export industry spending,

if the fishermen would substitute to fishing sites outside the local county. The multiplier impacts would be less without this spending. Local businesses have an incentive to keep this activity in the local area. So, this is another reason that supports our calling our Step 1 analysis estimates "maximum potential loss".

There is a gray area where resident direct impacts may not be double counting and which may not require the assumption of import substitution to count the impact. This would be the case of income earned from sources unrelated to work in the county of residence and spending. A good example is retirement and pension income. This source of income represents new dollars into the community and is thus a basic or export industry. Dollars of spending here have their own multiplier impacts that are not double counted. To the extent that local residents are spending from these sources of income for recreational fishing in the CINMS it is appropriate to include not only the direct impacts, but also the multiplier impacts of such spending.

As mentioned above, our Step 1 analyses simply add up the activity currently taking place within the proposed marine reserve areas and apply the assumption that all is lost. No account is taken of people's ability to substitute or relocate their fishing activities to other fishing sites. Under Alternative 2, only 25% of the CINMS waters are included in the proposed network of marine reserves leaving 75% of the CINMS plus all the areas outside the CINMS for people to find other fishing sites. Additionally, there will be those who decided to participate in some other activity – these users would still be spending money in the local economy and therefore the income and employment dependent on this spending would not be lost. Thus, we would expect that our Step 1 estimates are overestimates of impact. We don't have a model to tell us how much substitution might take place, and what the net impact will be either in the short or long term. However, some substitution is likely, and to the extent people are able to find suitable substitute fishing sites, this will lower estimates of impact that we make in our Step 1 analyses.

As the above discussion indicates, our Step 1 analyses will tend to overestimate economic impacts of marine reserves on the recreational fishing community and associated industries in the local and regional economies. This is true even with our assumption of 50% local residency. The baselines for the recreation industry are summarized in Tables 1.23 and 1.24. Greater detail can be found in Appendix C.

Table 1.23 Baseline level of Consumptive Recreation Activity - Study Area Total

	Charter Boat Fishing	Charter Boat Diving	Private Boat Fishing	Private Boat Diving
Person-days	150,872	35,977	214,015	47,190
Market Impact				
Direct Sales	$ 19,632,128	$ 5,786,598	$ 20,177,334	$ 3,020,161
Direct Wages and Salaries	$ 7,443,728	$ 2,113,480	$ 8,001,923	$ 1,130,245
Direct Employment	457	131	334	50
Total Income	$ 10,630,288	$ 3,057,483	$ 11,155,937	$ 1,572,849
Total Employment	525	151	403	59
Non-Market Impact				
Consumer's Surplus	$ 5,242,348	$ 1,250,111	$ 7,724,656	$ 1,703,276
Profit[1]	$ 447,585	$ 76,584	n/a	n/a

1. Profit is used as a proxy for producer's surplus.

Table 1.24 Baseline level of Non-consumptive Recreation Activity - Study Area Total

	Whale Watching	Non-Consumptive Diving	Sailing	Kayaking/Sightseeing
Person-days	25,984	10,776	4,015	1,233
Market Impact				
Direct Sales	$ 4,288,380	$ 1,840,581	$ 711,267	$ 257,487
Direct Wages and Salaries	$ 1,561,168	$ 669,425	$ 258,440	$ 93,189
Direct Employment	104	45	18	7
Total Income	$ 2,255,682	$ 967,704	$ 373,781	$ 135,056
Total Employment	119	52	20	8
Non-Market Impact				
Consumer's Surplus	$ 902,867	$ 374,425	$ 139,496	$ 42,844
Profit[1]	$ 275,878	$ 195,922	$ 137,119	$ 2,672

1. Profit is used as a proxy for producer's surplus.

Consumer's Surplus. We conducted a review of literature for studies that have estimated the consumer's surplus values for the various recreational uses in the CINMS. We were able to obtain five studies for California or Southern California, however only one of these provided enough information on values that could be used (the values were for fishing) (Table 1.25). As noted in the introduction, there is an updated study for Southern California that was done in 1998. However, the results are not available in a manner that they could be used for this application. The average value in 1999 dollars for charter/party boats was $36.09 per person-day and the average value for private boats was $34.75 per person-day. The values represent loss of access to all of Southern California. Using these values for the CINMS overstates the values for the CINMS, since values would be expected to decline as the scope of access is reduced. This will also apply to different marine reserve alternatives. Those alternatives with larger geographic scope will have larger values. We use these values for all consumptive and nonconsumptive recreation activities and note that they are only rough approximations. The fact that there is no differentiation between consumptive and nonconsumptive recreation activities for this measurement limits our ability to analyze trade-offs in maximizing the economic value of CINMS resources. This would not be adequate information for a formal benefit-cost analysis.

Table 1.25 Consumers' Surplus Estimates for Recreation Activities

Mode	Activity	Geographic Coverage	Method	Per day Value	
	Fishing	Northern border of San Luis Obispo			
Charter/Party Boat		County to Mexican border and 40 miles inland (by zip code).	TC[2]		
				Charter boat-day trip	
				Boat Owners (1984$)	$ 22.00
				Do not own boat (1984$)	$ 49.00
				Charter boat-more than one day[3]	
				Boat Owners (1984$)	$ 12.35
				Do not own boat (1984$)	$ 15.25
			CV[2]	Charter boat-all trips[4] (1984$)	
					$ 13.97
				Average[5] (1984$)	
					$ 22.51
				Adjusted to 1999 dollars	
					$ 36.09
Private Boat			TC[2]		
				Private boat-day trip	
				Boat Owners[5] (1984$)	$ 24.67
				Do not own boat[5] (1984$)	$ 20.33
			CV[2]	Private boat-all trips (1984$)	
					$ 20.00
				Average[6] (1984$)	
					$ 21.67
				Adjusted to 1999 dollars	
					$ 34.75

1. Source: Wegge, et. al. 1984 (see the References section for full citations).
2. TC=Travel Cost Model, CV=Contingent Valuation Method
3. Travel cost values given for multi-day trip estimates in the report were person-trip estimates. TC multi-day estimates were translated into person-day estimates by dividing by the multi-day average number of trips (4.13).
4. We did not have the breakdown of length of trips associated with this estimate, therefore we assumed that half of trips were day trips and half were multi-day trips and calculated a weighted average. This is consistent with our assumption that half of the consumptive users are residents and half are from out of the study area.
5. Length of trip for private trips was given in terms of hours fished, with an average of 22. We assumed the length of an average day was 6 to 8 hours and so divided these person-trip estimates by three (3) to get a person days estimate.
6. The report also included travel cost values based on a time demand model. We did not include these here because the method of incorporating the value of time did not perform will and had a large influence on the results.

Ethnographic Data Survey. As noted in the section above on the commercial fisheries, the CINMS had an ethnographic data survey conducted prior to the beginning of their management plan revision process (Kronman et al, 2000). The number of people surveyed included four (4) operators of commercial passenger-carrying fishing vessels (what we call here the "for hire" industry or charter/party boat operators), four (4) operators of commercial passenger-carrying dive vessels, five (5) recreational fishermen, five (5) recreational divers, one (1) kayaker, two (2) operators of commercial passenger-

carrying whale watching vessels, one (1) surfer and one (1) birdwatcher. Information from this survey provides some information that will aid in Step 2 analyses.

Chapter 2

Step 1 Analysis of Alternatives

Description of Alternatives

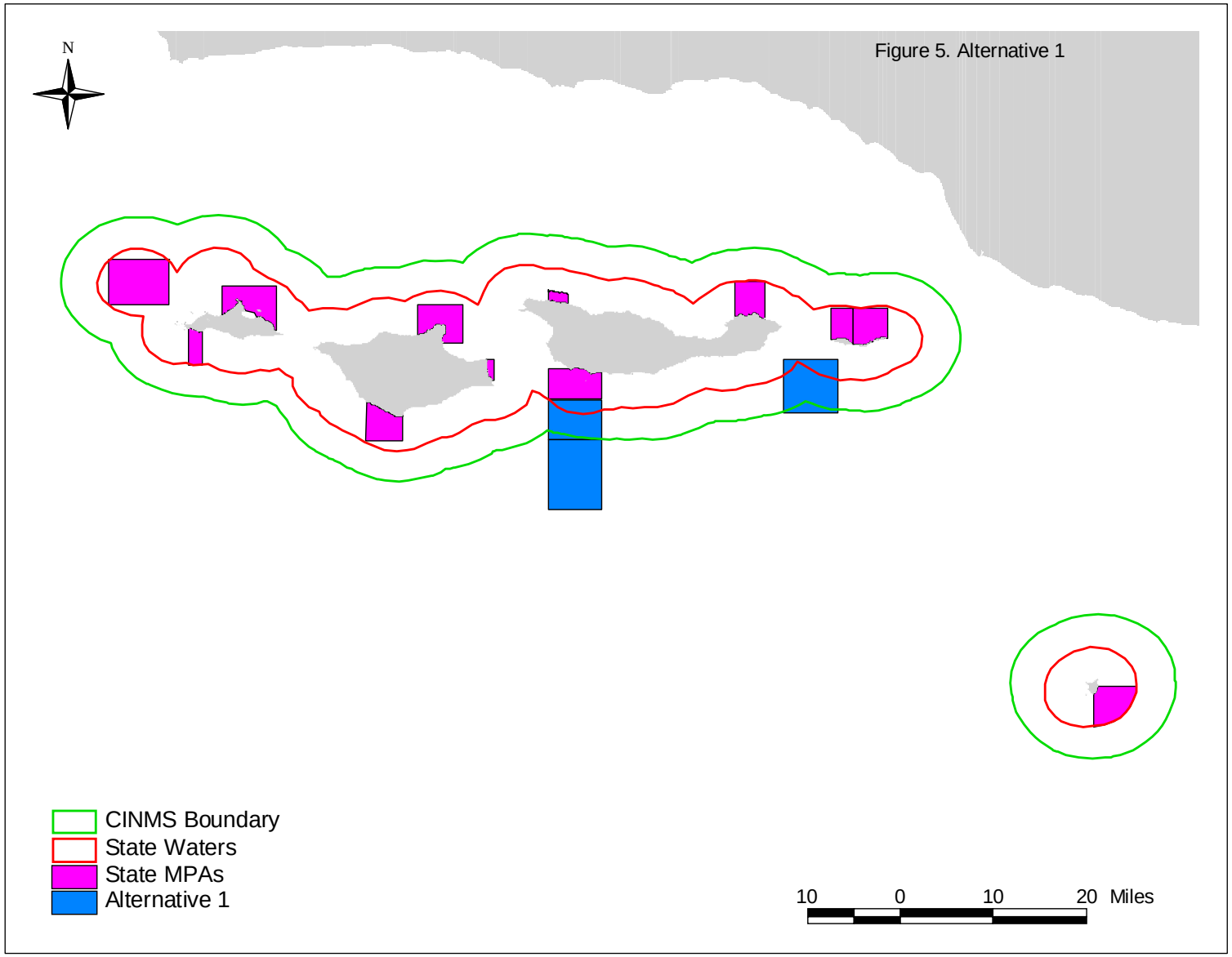
> **Definitions:**
>
> ***Marine Reserve***: No take area. All consumptive uses are displaced.
>
> ***Marine Conservation Area***: These areas do not allow the taking of living or non-living marine resources with certain exceptions (found at the bottom of this page).

The CINMS is considering three alternatives for extending the network of marine protected areas in the sanctuary. These additional areas include both Federal waters and additional state waters. Those areas which are extensions of existing state MPAs will have the same regulations as those state areas. Marine reserves are "no take areas", while marine conservation areas allow some consumptive activities. The analyses are broken out by additional state MPAs (under state jurisdiction), MPAs in Federal waters (under Federal jurisdiction), and existing state MPAs (for the purpose of capturing the cumulative total). Actually, the jurisdictional issue is more complicated in that there are multiple-jurisdictions over the same areas. The first nautical mile from the shoreline seaward on most islands is under the jurisdiction of the National Park Service, the State of California and the CINMS. The next two nautical miles seaward are under the joint jurisdiction of the State of California and the CINMS. From three nautical miles out to six nautical miles seaward are under the jurisdiction of CINMS and for purposes of Federal fishing regulations, the Pacific Fishery Management Council and the National Marine Fisheries Service. To complicate matters further, some species of fish are managed by the State of California in Federal waters (e.g. squid and some rockfishes), some are managed by the Federal government (Pacific Fishery Management Council and NMFS) in state waters (e.g. sardine and other rockfishes), and still others are managed by both state and federal authorities. We are not able to provide details on all these complex relationships. We simply distinguish between state and Federal waters and provide separate estimates of activity within State and Federal waters.

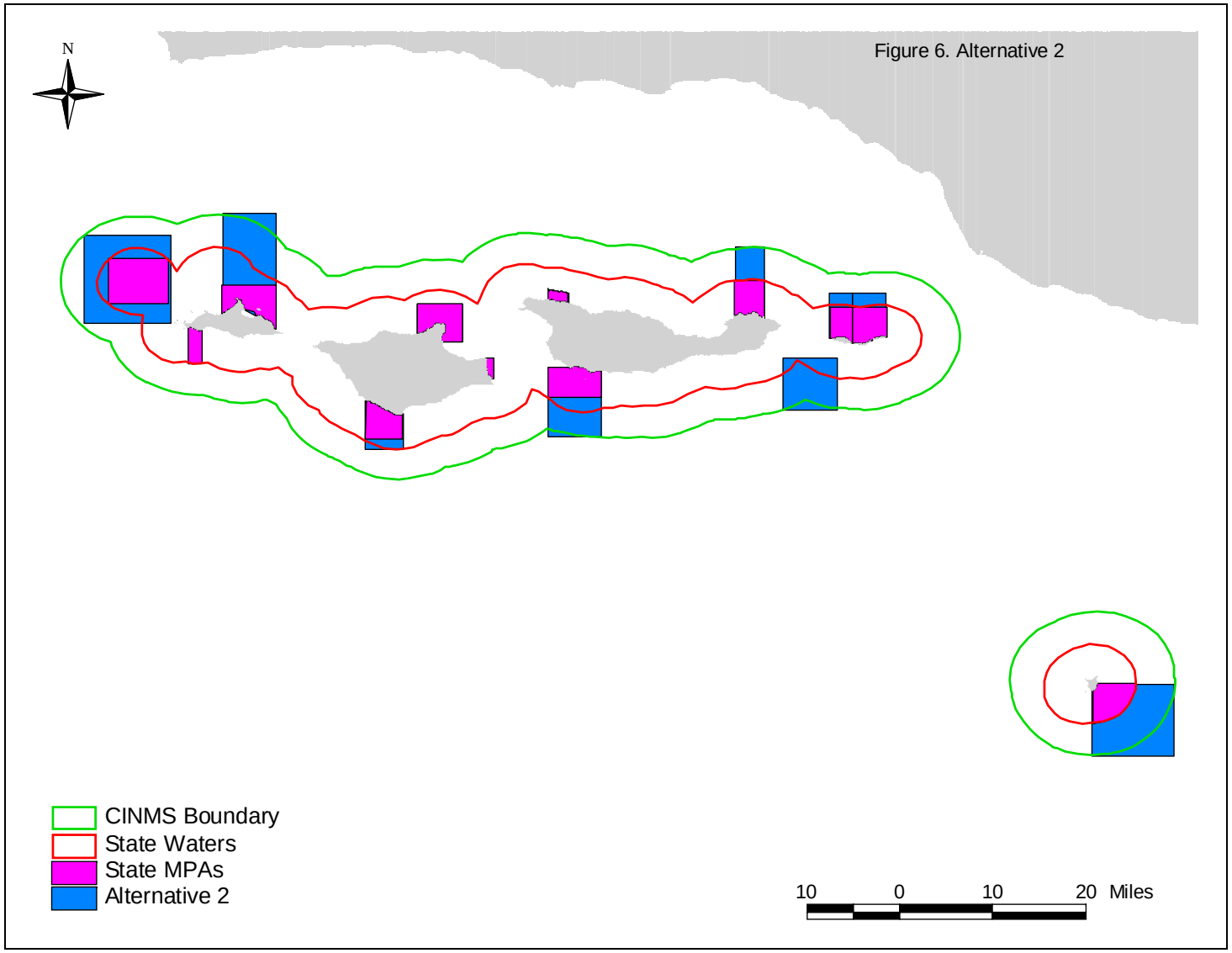
In general, the proposed MPAs have the same regulations as the existing state reserve of which they are an extension. Exceptions to this rule include the two MPAs in Alternative 1. The following areas are closed to fishing, except as noted:

- Painted Cave State Marine Conservation Area (All Alternatives): No take of living or non-living resources is allowed except: recreational take of spiny lobster and pelagic finfish.
- Anacapa Island State Marine Conservation Area (All Alternatives): No take of living or non-living resources is allowed except: recreational take of spiny lobster and pelagic finfish and commercial take of spiny lobster.
- Gull Island Marine Conservation Area (Alternative 1): Allows all legally sanctioned pelagic fishing, spot prawn fishing, white sea bass fishing and squid fishing. The only species protected by this regulatory alternative are rockfish and bottom fish.
- Footprint Marine Conservation Area (Alternative 1): Allows all legally sanctioned pelagic fishing, spot prawn fishing, white sea bass fishing and squid fishing. The only species protected by this regulatory alternative are rockfish and bottom fish.

Alternative 1 – This alternative is comprised of two areas in addition to the existing state boundaries and is approximately 63 nautical square miles in size, which is approximately 5 percent of all CINMS waters. This alternative includes only marine conservation areas. About 14 percent of the marine reserves are additional State waters and 37 percent are in Federal waters inside the sanctuary boundary and 49 percent are in Federal waters outside the sanctuary boundary. The existing state reserves are approximately 142 nautical square miles in size, which is about 11 percent of all CINMS waters. Under this alternative approximately 205 nautical square miles would be included in total, which is about 16 percent of all CINMS waters (Figure 5).



Alternative 2 – This alternative is comprised of nine areas in addition to the existing state boundaries (one of which is not an extension of an existing state boundary) and is approximately 139 nautical square miles in size, which is approximately 11 percent of all CINMS waters. This alternative includes eight marine reserves and one marine conservation area. Overall, about 18 percent of the MPAs are additional State waters and 70 percent are in Federal waters inside the sanctuary boundary and 11 percent are in Federal waters outside the sanctuary boundary. The existing state reserves are approximately 142 nautical square miles in size, which is about 11 percent of all CINMS waters. Under this alternative approximately 281 nautical square miles would be included in total, which is about 22 percent of all CINMS waters (Figure 6).



Alternative 3 – This alternative is comprised of 11 areas in addition to the existing state boundaries (one of which is not an extension of an existing state boundary) and is approximately 186 nautical square miles in size, which is approximately 15 percent of all CINMS waters. This alternative includes eight marine reserves and one marine conservation area. Overall, about 16 percent of the MPAs are additional State waters and 74 percent are in Federal waters inside the sanctuary boundary and 11 percent are in Federal waters outside the sanctuary boundary. The existing state reserves are approximately 142 nautical square miles in size, which is about 11 percent of all CINMS waters. Under this alternative approximately 328 nautical square miles would be included in total, which is about 26 percent of all CINMS waters (Figure 7).

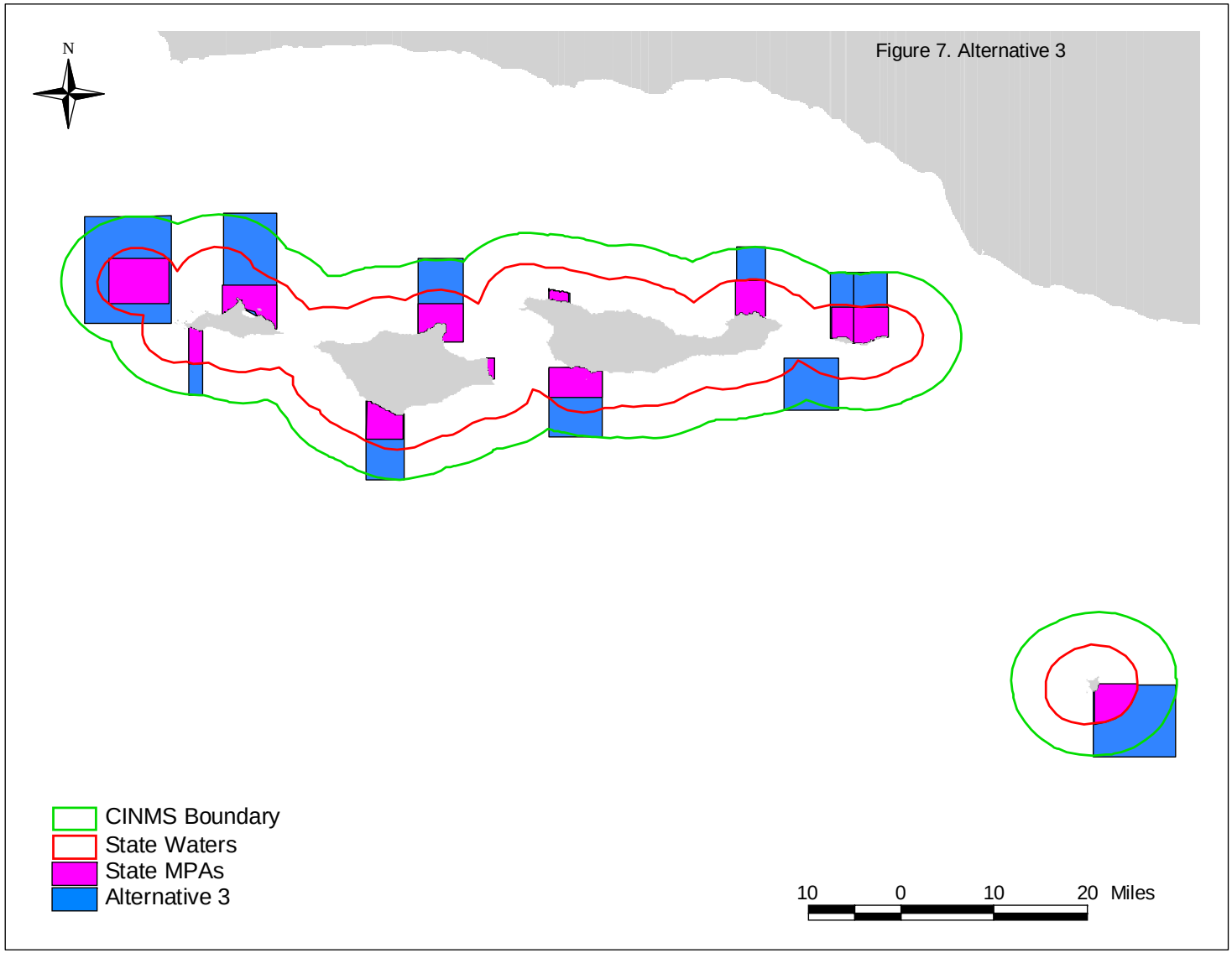


Figure 7. Alternative 3

Introduction - Step 1 Analysis

In the introduction, we discussed what is included and not included in Step 1 of our two step analyses. As a reminder, Step 1 of our analyses adds up the activities that are impacted by the various proposed marine reserve alternatives and translates these activities into the socioeconomic measures via the models outlined in Chapter 1. The assumption of Step 1 Analyses is that all revenues associated with the areas closed are lost. Any factor that could mitigate, offset, or increase the level of impact on any use is not addressed. In most cases, Step 1 impacts are thought of as "***maximum potential losses***" because humans have proven to be very adaptive, resilient and quite ingenious in responding to changes and rarely does society fail to at least mitigate or off-set most losses. Also, Step 1 analyses are limited to the cost side of the benefits and costs ledger. The "***potential"*** costs, or the impacts on current users/uses that will be displaced are the focus of Step 1. The benefits of marine reserves that were outlined in the introduction, along with the factors that might mitigate, offset or increase these potential costs are addressed in our Step 2 analyses.

Step 1 Analyses are presented here for the six alternatives described above. One alternative not specifically included in any tables is the "***no action alternative*** " or the status quo. The way to interpret the no action alternative is to assess it with respect to the other alternatives. Any costs of an alternative are costs avoided or benefits of the no action alternative. Likewise any benefits of an alternative are costs or opportunities lost by the no action alternative.

As part of the two-year Marine Reserve Working Group (MRWG) process of designing a network of marine reserves, we have analyzed many alternatives. Analyses for six of these alternatives are posted on the CINMS World Wide Web site in portable document format (downloadable pdfs). The alternatives were A, B, C, D, E, and I. Alternative A was the Science Panel's 50 percent alternative and Alternative B was the Science Panel's 30 percent alternative. Alternatives C, D, E, and I were developed by or presented to the MRWG. See http://www.cinms.nos.noaa.gov/MRWGsocioec/panel.html. We also conducted a day long workshop in Santa Barbara with commercial fishermen and some representatives of environmental groups that constructed five alternatives (most were some variant of Alternative C, which is posted on the Web site), for which we provided Step1 analyses at that time. We have also conducted Step 1 analyses for many other alternatives, some of which were referenced by letters (e.g., G and J) and others that did not have letters to guide where they fit in chronology. We have archived all the results of alternatives we have analyzed for different groups and the results are available from the authors upon request.

Commercial Fishing and Kelp – Step 1 Analysis

Given the three alternatives, 14 species/species groups, two jurisdictions (State waters and Federal waters), 12 ports of landing and seven counties in the impact area, Step 1 analyses produce many tables with a great deal of detail. We try to provide information that will fairly represent each user group and provide detail for management and policy decision-makers that must address the concerns of their constituencies. Here we present only summary results. More detailed tables and documentation can be found in Appendices C and D. Definitions of all terms and baseline estimates for the entire CINMS were included in a previous section of this report and are not repeated here. Most of the percents presented in the tables for ex vessel revenue, income or employment are the amount of impact as a percent of the CINMS baseline. For ex vessel revenue by port, the percents are the impacted amounts as a percent of the entire port 1996-2003 annual average of ex vessel revenue from catch from all areas, not just the CINMS. This was done to help the ports address their concern about loosing dredging appropriations based on reduced amounts of commercial fishing.

Alternative 1. This regulatory alternative has zero additional impact on the commercial fisheries. This alternative includes only marine conservation areas, which allow all legally sanctioned pelagic fishing, spot prawn fishing, white sea bass fishing and squid fishing. The only species protected by this regulatory alternative are rockfish and bottom fish. Our data showed no rockfish or bottom fish having been caught from the newly proposed marine conservation areas, nor any of the other species/species groups included in our analyses.

Table 2.1 Commercial Fishing: Alternative 1 Study Area Totals - Ex Vessel Value by Species Groups

	Alt. 1									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Species/Species Group	Value	%	Value	%	Value	%	Value	%	Value	%
Squid	0	0.00%	0	0.00%	0	0.00%	1,355,606	12.57%	1,355,606	12.57%
Kelp	0	0.00%	0	0.00%	0	0.00%	328,568	5.48%	328,568	5.48%
Urchins	0	0.00%	0	0.00%	0	0.00%	656,403	15.19%	656,403	15.19%
Spiny Lobster	0	0.00%	0	0.00%	0	0.00%	167,242	16.32%	167,242	16.32%
Prawn	0	0.00%	0	0.00%	0	0.00%	6,431	3.05%	6,431	3.05%
Rockfish	0	0.00%	0	0.00%	0	0.00%	20,278	13.26%	20,278	13.26%
Crab	0	0.00%	0	0.00%	0	0.00%	58,924	14.21%	58,924	14.21%
Tuna	0	0.00%	0	0.00%	0	0.00%	50	1.62%	50	1.62%
Wetfish	0	0.00%	0	0.00%	0	0.00%	35,564	7.50%	35,564	7.50%
CA Sheephead	0	0.00%	0	0.00%	0	0.00%	26,645	17.16%	26,645	17.16%
Flatfishes	0	0.00%	0	0.00%	0	0.00%	23,760	10.88%	23,760	10.88%
Sea Cucumbers	0	0.00%	0	0.00%	0	0.00%	37,030	16.68%	37,030	16.68%
Sculpin & Bass	0	0.00%	0	0.00%	0	0.00%	8,360	8.97%	8,360	8.97%
Shark	0	0.00%	0	0.00%	0	0.00%	4,431	12.88%	4,431	12.88%
Total	0	0.00%	0	0.00%	0	0.00%	2,729,295	11.32%	2,729,295	11.32%

Table 2.2 Commercial Fishing: Alternative 1 Study Area Totals - Ex Vessel Value by Port

	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Port	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]
1. Moss Landing	$0	0.00	$0	0.00	$0	0.00	$98	0.00	$98	0.00
2. Morro Bay	$0	0.00	$0	0.00	$0	0.00	$1,460	0.07	$1,460	0.07
3. Avila/Port San Luis	$0	0.00	$0	0.00	$0	0.00	$1,561	0.12	$1,561	0.12
4. Santa Barbara	$0	0.00	$0	0.00	$0	0.00	$684,042	9.20	$684,042	9.20
5. Ventura Harbor	$0	0.00	$0	0.00	$0	0.00	$364,564	7.50	$364,564	7.50
6. Channel Islands	$0	0.00	$0	0.00	$0	0.00	$271,390	6.81	$271,390	6.81
7. Port Hueneme	$0	0.00	$0	0.00	$0	0.00	$873,265	8.50	$873,265	8.50
8. San Pedro	$0	0.00	$0	0.00	$0	0.00	$106,625	0.93	$106,625	0.93
9. Terminal Island	$0	0.00	$0	0.00	$0	0.00	$91,824	0.68	$91,824	0.68
10. Avalon & Other LA	$0	0.00	$0	0.00	$0	0.00	$1,845	0.14	$1,845	0.14
11. Newport Beach	$0	0.00	$0	0.00	$0	0.00	$374	0.04	$374	0.04
12. San Diego	$0	0.00	$0	0.00	$0	0.00	$2,677	0.11	$2,677	0.11

1. Percents are the amount of ex vessel value as a percent of the total ex vessel value of landings at the Port (1996-2003 Average Annual Value), for all species groups, except Prawn, Rockfish and Tuna, which were valued using 2003 value of landings and CA Sheephead that was valued using the 2000-2003 average value of landings.

Table 2.3 Commercial Fishing: Alternative 1 Study Area Totals - Total Income By County

County		Total Income				
		Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey		$0	$0	$0	$845,526	$845,526
	%	0.0000	0.0000	0.0000	0.0065	0.0065
2. San Luis Obispo		$0	$0	$0	$6,412	$6,412
	%	0.0000	0.0000	0.0000	0.0001	0.0001
3. Santa Barbara		$0	$0	$0	$1,387,502	$1,387,502
	%	0.0000	0.0000	0.0000	0.0101	0.0101
4. Ventura		$0	$0	$0	$4,483,234	$4,483,234
	%	0.0000	0.0000	0.0000	0.0166	0.0166
5. Los Angeles		$0	$0	$0	$1,298,161	$1,298,161
	%	0.0000	0.0000	0.0000	0.0004	0.0004
6. Orange		$0	$0	$0	$811	$811
	%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego		$0	$0	$0	$522,749	$522,749
	%	0.0000	0.0000	0.0000	0.0005	0.0005
All 7 Counties		$0	$0	$0	$8,544,396	$8,544,396
	%	0.0000	0.0000	0.0000	0.0015	0.0015

Percents are percent of county economy totals for 2002.

Table 2.4 Commercial Fishing Impacts of Alternative 1 on Total Employment By County

County		Total Employment				
		Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey		0	0	0	25	25
	%	0.0000	0.0000	0.0000	0.0106	0.0106
2. San Luis Obispo		0	0	0	0	0
	%	0.0000	0.0000	0.0000	0.0002	0.0002
3. Santa Barbara		0	0	0	45	45
	%	0.0000	0.0000	0.0000	0.0177	0.0177
4. Ventura		0	0	0	136	136
	%	0.0000	0.0000	0.0000	0.0324	0.0324
5. Los Angeles		0	0	0	34	34
	%	0.0000	0.0000	0.0000	0.0006	0.0006
6. Orange		0	0	0	0	0
	%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego		0	0	0	5	5
	%	0.0000	0.0000	0.0000	0.0003	0.0003
All Counties		0	0	0	246	246
	%	0.0000	0.0000	0.0000	0.0024	0.0024

Percents are percent of county economy totals for 2002.

Alternative 2. This regulatory alternative potentially impacts about $283.7 thousand in ex vessel value of catch or 1.18% of the annual ex vessel value of catch from the CINMS. There are zero additional impacts to kelp harvesters/processors under this alternative. In terms of absolute annual dollar amounts or ex vessel revenue, the largest potential impacts are on harvesters of squid, wetfish, urchins, prawn and rockfish; and the smallest impacts are on harvesters of CA Sheephead, tuna, sea cucumbers, and sharks (see Table 2.5). This regulatory alternative affects less than one percent of the ex vessel value of all catch landed at each port, except Port Hueneme (1.15%) and Channel Islands (1.04%) (see Table 2.6).

The potential losses in annual ex vessel revenue translate into a maximum potential loss of about $939 thousand dollars in annual income and 28 full and part-time jobs in the seven-county regional economy. These amounts are tiny fractions of the seven-county regional economy (0.0002% for income and 0.0003% for employment, see Tables 2.7 and 2.8).

Impact by Jurisdiction. There is a disproportional impact by jurisdiction (Additional State versus Federal waters) since, for most species/species groups, density of commercial fishing activity increases as one moves towards the islands. Additional State waters accounted for 20.39% of the Alternative Two MPA area, while the remaining 79.61% is in Federal waters. However, 56.39% of the maximum potential loss for new MPAs in Alternative Two occurs in State waters, compared with 43.61 % in Federal waters.

Cumulative Impact. Although this regulatory alternative only potentially impacts 1.18% of the annual ex vessel value of catch and harvest of kelp in the CINMS, the existing State MPAs potentially impact 11.32% of the annual ex vessel value of catch and harvest of kelp. Cumulatively, about $3 million in ex vessel value of catch and harvest of kelp or 12.5% of the total ex vessel value of catch and harvest of kelp in the CINMS is potentially lost. In terms of absolute amount of annual dollars lost, the largest impacts are to harvesters of squid, urchins, spiny lobsters and wetfish, while the smallest losses are to harvesters of tuna, shark and sculpin & bass. In terms of percentage of total ex vessel value of catch or harvest of kelp, the greatest potential impacts are on rockfish (23.93%), prawn (20.44%), and wetfish (19.04%), while the smallest impact was on kelp (5.48%). According to ISP Alginates, the impacts on kelp harvesting from Existing State Reserves have not occurred, and since ISP Alginates is closing operations, there will be no future impact. If we remove kelp from our analysis, the potential impact is reduced by $328,588 to $2,400,727 for the Existing State Reserves and a total cumulative impact of $2,684,406 or 14.8% of the total commercial fishing harvest in the CINMS ($2,684,406 / $18,112,598) without kelp.

The impact on ports and harbors is estimated to be concentrated in the ports in Santa Barbara, Ventura Harbor, Channel Islands, San Pedro and Terminal Island. In terms of percent of all ex vessel value of catch landed at the ports, the ports of Santa Barbara would be impacted the most (9.91%) followed by Port Hueneme (9.65%), Ventura Harbor (8.37%) and Channel Islands (7.85%). Only an estimated 1.04% of San Pedro's ex vessel value of landings would be potentially impacted and only 0.77% of Terminal Island's ex vessel value of landings would be potentially impacted (Table 2.6).

The potential losses in annual ex vessel revenue translate into a maximum potential loss of about $9.5 million in annual income and 274 full and part-time jobs in the seven-county regional economy. These amounts are tiny fractions of the seven-county regional economy (0.0016% for income and 0.0027% for employment, see Tables 2.7 and 2.8). Among counties, Ventura County would be the county with the largest potential impact. Ventura County would potentially lose about $5.1 million in annual income and about 156 full and part-time jobs. Again, these amounts are tiny fractions of one percent of the Ventura County economy (0.0189% of income and 0.037% of employment).

Table 2.5 Commercial Fishing: Alternative 2 Study Area Totals - Ex Vessel Value by Species Groups

	Alt. 2									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Species/Species Group	Value	%	Value	%	Value	%	Value	%	Value	%
Squid	70,603	0.65%	42,362	0.39%	112,965	1.05%	1,355,606	12.57%	1,468,572	13.61%
Kelp	0	0.00%	0	0.00%	0	0.00%	328,568	5.48%	328,568	5.48%
Urchins	38,247	0.89%	0	0.00%	38,247	0.89%	656,403	15.19%	694,650	16.08%
Spiny Lobster	8,474	0.83%	0	0.00%	8,474	0.83%	167,242	16.32%	175,716	17.15%
Prawn	19,694	9.33%	16,995	8.06%	36,689	17.39%	6,431	3.05%	43,120	20.44%
Rockfish	7,250	4.74%	9,054	5.92%	16,304	10.66%	20,278	13.26%	36,582	23.93%
Crab	1,767	0.43%	0	0.00%	1,767	0.43%	58,924	14.21%	60,692	14.63%
Tuna	39	1.27%	304	9.86%	343	11.13%	50	1.62%	393	12.75%
Wetfish	9,603	2.02%	45,114	9.51%	54,717	11.54%	35,564	7.50%	90,281	19.04%
CA Sheephead	195	0.13%	0	0.00%	195	0.13%	26,645	17.16%	26,840	17.28%
Flatfishes	1,157	0.53%	3,826	1.75%	4,983	2.28%	23,760	10.88%	28,743	13.17%
Sea Cucumbers	690	0.31%	0	0.00%	690	0.31%	37,030	16.68%	37,720	16.99%
Sculpin & Bass	1,891	2.03%	5,300	5.69%	7,191	7.72%	8,360	8.97%	15,551	16.69%
Shark	345	1.00%	770	2.24%	1,115	3.24%	4,431	12.88%	5,546	16.12%
Total	159,955	0.66%	123,725	0.51%	283,680	1.18%	2,729,295	11.32%	3,012,974	12.50%

Table 2.6 Commercial Fishing: Alternative 2 Study Area Totals - Ex Vessel Value by Port

	Alt. 2									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Port	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]
1. Moss Landing	$10	0.00	$20	0.00	$30	0.00	$98	0.00	$128	0.00
2. Morro Bay	$1,801	0.09	$1,557	0.07	$3,358	0.16	$1,460	0.07	$4,817	0.23
3. Avila/Port San Luis	$103	0.01	$91	0.01	$195	0.02	$1,561	0.12	$1,756	0.14
4. Santa Barbara	$42,955	0.58	$10,111	0.14	$53,066	0.71	$684,042	9.20	$737,108	9.91
5. Ventura Harbor	$24,255	0.50	$17,848	0.37	$42,104	0.87	$364,564	7.50	$406,668	8.37
6. Channel Islands	$26,072	0.65	$15,597	0.39	$41,669	1.04	$271,390	6.81	$313,059	7.85
7. Port Hueneme	$52,329	0.51	$65,951	0.64	$118,280	1.15	$873,265	8.50	$991,545	9.65
8. San Pedro	$6,232	0.05	$6,098	0.05	$12,330	0.11	$106,625	0.93	$118,955	1.04
9. Terminal Island	$5,307	0.04	$5,655	0.04	$10,962	0.08	$91,824	0.68	$102,786	0.77
10. Avalon & Other LA	$317	0.02	$333	0.02	$650	0.05	$1,845	0.14	$2,495	0.19
11. Newport Beach	$448	0.05	$386	0.04	$834	0.09	$374	0.04	$1,208	0.13
12. San Diego	$87	0.00	$79	0.00	$166	0.01	$2,677	0.11	$2,842	0.11

1. Percents are the amount of ex vessel value as a percent of the total ex vessel value of landings at the Port (1996-2003 Average Annual Value), for all species groups, except Prawn, Rockfish and Tuna, which were valued using 2003 value of landings and CA Sheephead that was valued using the 2000-2003 average value of landings.

Table 2.7 Commercial Fishing: Alternative 2 Study Area Totals - Total Income By County

	Alt. 2 Total Income				
County	Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey	$44,045	$26,433	$70,477	$845,526	$916,003
%	0.0003	0.0002	0.0005	0.0065	0.0070
2. San Luis Obispo	$4,305	$3,675	$7,981	$6,412	$14,393
%	0.0001	0.0000	0.0001	0.0001	0.0002
3. Santa Barbara	$82,763	$12,207	$94,970	$1,387,502	$1,482,473
%	0.0006	0.0001	0.0007	0.0101	0.0108
4. Ventura	$296,062	$336,617	$632,678	$4,483,234	$5,115,913
%	0.0011	0.0012	0.0023	0.0166	0.0189
5. Los Angeles	$71,559	$59,808	$131,366	$1,298,161	$1,429,528
%	0.0000	0.0000	0.0000	0.0004	0.0005
6. Orange	$900	$783	$1,683	$811	$2,494
%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego	$153	$139	$292	$522,749	$523,041
%	0.0000	0.0000	0.0000	0.0005	0.0005
All 7 Counties	$499,787	$439,661	$939,448	$8,544,396	$9,483,844
%	0.0001	0.0001	0.0002	0.0015	0.0016

Percents are percent of county economy totals for 2002.

Table 2.8 Commercial Fishing Impacts of Alternative 2 on Total Employment By County

	Alt. 2 Total Employment				
County	Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey	1	1	2	25	27
%	0.0006	0.0003	0.0009	0.0106	0.0115
2. San Luis Obispo	0	0	0	0	1
%	0.0001	0.0001	0.0002	0.0002	0.0004
3. Santa Barbara	3	0	3	45	48
%	0.0011	0.0002	0.0012	0.0177	0.0189
4. Ventura	9	10	19	136	156
%	0.0021	0.0024	0.0046	0.0324	0.0370
5. Los Angeles	2	2	3	34	38
%	0.0000	0.0000	0.0001	0.0006	0.0007
6. Orange	0	0	0	0	0
%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego	0	0	0	5	5
%	0.0000	0.0000	0.0000	0.0003	0.0003
All Counties	15	13	28	246	274
%	0.0001	0.0001	0.0003	0.0024	0.0027

Percents are percent of county economy totals for 2002.

Alternative 3. This regulatory alternative potentially impacts about $392.6 thousand in ex vessel value of catch or 1.63% of the annual ex vessel value of catch from the CINMS. There are zero additional impacts to kelp harvesters/processors under this alternative. In terms of absolute annual dollar amounts or ex vessel revenue, the largest potential impacts are on harvesters of squid, prawn, wetfish and urchins; and the smallest impacts are on harvesters of CA Sheephead, tuna, sea cucumbers, and sharks (see Table 2.9). This regulatory alternative affects less than one percent of the ex vessel value of all catch landed at each port, except Port Hueneme (1.56%), Channel Islands (1.61%), and Ventura Harbor (1.43%) (see Table 2.10).

The potential losses in annual ex vessel revenue translate into a maximum potential loss of about $1.3 million in annual income and 39 full and part-time jobs in the seven-county regional economy. These amounts are tiny fractions of the seven-county regional economy (0.0002% for income and 0.0004% for employment, see Tables 2.11 and 2.12).

Impact by Jurisdiction. Even though there is an almost equivalent amount of ex vessel revenue potentially lost from both the Additional State waters and Federal waters, there is a disproportional impact by jurisdiction (Additional State versus Federal waters) since, for most species/species groups, density of commercial fishing activity increases as one moves towards the islands. Additional State waters accounted for 17.58% of the Alternative Three MPA area, while the remaining 82.42% is in Federal waters. However, 49.89% of the maximum potential loss for new MPAs in Alternative Three occurs in State waters, compared with 50.11 % in Federal waters.

Cumulative Impact. Although this regulatory alternative only potentially impacts 1.63% of the annual ex vessel value of catch and harvest of kelp in the CINMS, the existing State MPAs potentially impact 11.32% of the annual ex vessel value of catch and harvest of kelp. Cumulatively, about $3.1 million in ex vessel value of catch and harvest of kelp or 12.95% of the total ex vessel value of catch and harvest of kelp in the CINMS is potentially lost. In terms of absolute amount of annual dollars lost, the largest impacts are to harvesters of squid, urchins, kelp, spiny lobsters and wetfish, while the smallest losses are to harvesters of tuna, shark and sculpin & bass. In terms of percentage of total ex vessel value of catch or harvest of kelp, the greatest potential impacts are on prawn (37.13%), rockfish (23.93%), sculpin & sea bass (21.03%), and wetfish (19.53%), while the smallest impact was on kelp (5.48%). Again, according to ISP Alginates, the impacts on kelp harvesting from Existing State Reserves have not occurred, and since ISP Alginates is closing operations, there will be no future impact. If we remove kelp from our analysis, the potential impact is reduced by $328,588 to $2,400,727 for the Existing State Reserves and a total cumulative impact of $2,793,310 or 15.42% of the total commercial fishing harvest in the CINMS ($2,793,310 / $18,112,598) without kelp.

The impact on ports and harbors is estimated to be concentrated in the ports in Santa Barbara, Ventura Harbor, Channel Islands, San Pedro and Terminal Island. In terms of percent of all ex vessel value of catch landed at the ports, Port Hueneme would be impacted the most (10.05%) followed by the ports of Santa Barbara (9.97%), Ventura Harbor (8.93%) and Channel Islands (8.41%). Only an estimated 1.08% of San Pedro's ex vessel value of landings would be potentially impacted and only 0.80% of Terminal Island's ex vessel value of landings would be potentially impacted (Table 2.10).

The potential losses in annual ex vessel revenue translate into a maximum potential loss of about $9.85 million in annual income and 285 full and part-time jobs in the seven-county regional economy. These amounts are tiny fractions of the seven-county regional economy (0.0017% for income and 0.0028% for employment, see Tables 2.11 and 2.12). Among counties, Ventura County would be the county with the largest potential impact. Ventura County would potentially lose about $5.37 million in annual income and about 163 full and part-time jobs. Again, these amounts are tiny fractions of one percent of the Ventura County economy (0.0199% of income and 0.0388% of employment).

Table 2.9 Commercial Fishing: Alternative 3 Study Area Totals - Ex Vessel Value by Species Groups

	Alt. 3									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Species/Species Group	Value	%	Value	%	Value	%	Value	%	Value	%
Squid	105,904	0.98%	70,602	0.65%	176,506	1.64%	1,355,606	12.57%	1,532,113	14.20%
Kelp	0	0.00%	0	0.00%	0	0.00%	328,568	5.48%	328,568	5.48%
Urchins	29,511	0.68%	2,205	0.05%	31,716	0.73%	656,403	15.19%	688,119	15.93%
Spiny Lobster	7,840	0.77%	0	0.00%	7,840	0.77%	167,242	16.32%	175,082	17.09%
Prawn	19,694	9.33%	52,202	24.74%	71,896	34.08%	6,431	3.05%	78,327	37.13%
Rockfish	6,651	4.35%	9,652	6.31%	16,304	10.66%	20,278	13.26%	36,582	23.93%
Crab	5,740	1.38%	0	0.00%	5,740	1.38%	58,924	14.21%	64,665	15.59%
Tuna	44	1.41%	355	11.51%	399	12.92%	50	1.62%	449	14.54%
Wetfish	11,180	2.36%	45,901	9.68%	57,081	12.04%	35,564	7.50%	92,645	19.53%
CA Sheephead	195	0.13%	0	0.00%	195	0.13%	26,645	17.16%	26,840	17.28%
Flatfishes	4,260	1.95%	6,140	2.81%	10,400	4.76%	23,760	10.88%	34,160	15.65%
Sea Cucumbers	1,614	0.73%	0	0.00%	1,614	0.73%	37,030	16.68%	38,644	17.41%
Sculpin & Bass	2,797	3.00%	8,441	9.06%	11,237	12.06%	8,360	8.97%	19,598	21.03%
Shark	421	1.22%	1,235	3.59%	1,656	4.81%	4,431	12.88%	6,087	17.70%
Total	195,851	0.81%	196,732	0.82%	392,584	1.63%	2,729,295	11.32%	3,121,878	12.95%

Table 2.10 Commercial Fishing: Alternative 3 Study Area Totals - Ex Vessel Value by Port

	Alt. 3									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Port	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]	Value	%[1]
1. Moss Landing	$20	0.00	$29	0.00	$49	0.00	$98	0.00	$146	0.00
2. Morro Bay	$1,803	0.09	$4,638	0.22	$6,441	0.31	$1,460	0.07	$7,901	0.38
3. Avila/Port San Luis	$91	0.01	$99	0.01	$189	0.02	$1,561	0.12	$1,750	0.14
4. Santa Barbara	$40,272	0.54	$17,308	0.23	$57,580	0.77	$684,042	9.20	$741,623	9.97
5. Ventura Harbor	$34,341	0.71	$34,976	0.72	$69,317	1.43	$364,564	7.50	$433,882	8.93
6. Channel Islands	$26,674	0.67	$37,475	0.94	$64,149	1.61	$271,390	6.81	$335,540	8.41
7. Port Hueneme	$75,613	0.74	$84,239	0.82	$159,852	1.56	$873,265	8.50	$1,033,117	10.05
8. San Pedro	$8,750	0.08	$8,719	0.08	$17,469	0.15	$106,625	0.93	$124,094	1.08
9. Terminal Island	$7,403	0.06	$7,594	0.06	$14,997	0.11	$91,824	0.68	$106,822	0.80
10. Avalon & Other LA	$305	0.02	$414	0.03	$719	0.05	$1,845	0.14	$2,564	0.19
11. Newport Beach	$445	0.05	$1,156	0.12	$1,601	0.17	$374	0.04	$1,975	0.21
12. San Diego	$81	0.00	$91	0.00	$172	0.01	$2,677	0.11	$2,848	0.11

1. Percents are the amount of ex vessel value as a percent of the total ex vessel value of landings at the Port (1996-2003 Average Annual Value), for all species groups, except Prawn, Rockfish and Tuna, which were valued using 2003 value of landings and CA Sheephead that was valued using the 2000-2003 average value of landings.

Table 2.11 Commercial Fishing: Alternative 3 Study Area Totals - Total Income By County

County		Alt. 3 Total Income: Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey		$66,061	$44,047	$110,108	$845,526	$955,634
	%	0.0005	0.0003	0.0008	0.0065	0.0073
2. San Luis Obispo		$4,283	$10,769	$15,053	$6,412	$21,465
	%	0.0001	0.0001	0.0002	0.0001	0.0003
3. Santa Barbara		$79,751	$24,932	$104,683	$1,387,502	$1,492,185
	%	0.0006	0.0002	0.0008	0.0101	0.0109
4. Ventura		$403,168	$479,773	$882,940	$4,483,234	$5,366,175
	%	0.0015	0.0018	0.0033	0.0166	0.0199
5. Los Angeles		$104,142	$87,609	$191,751	$1,298,161	$1,489,912
	%	0.0000	0.0000	0.0001	0.0004	0.0005
6. Orange		$893	$2,325	$3,219	$811	$4,030
	%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego		$144	$164	$307	$522,749	$523,056
	%	0.0000	0.0000	0.0000	0.0005	0.0005
All 7 Counties		$658,443	$649,618	$1,308,061	$8,544,396	$9,852,457
	%	0.0001	0.0001	0.0002	0.0015	0.0017

Percents are percent of county economy totals for 2002.

Table 2.12 Commercial Fishing Impacts of Alternative 3 on Total Employment By County

County		Alt. 3 Total Employment: Additional St	Federal	Total: New	Existing St	Total: Cumulative
1. Monterey		2	1	3	25	28
	%	0.0008	0.0006	0.0014	0.0106	0.0120
2. San Luis Obispo		0	0	1	0	1
	%	0.0001	0.0003	0.0004	0.0002	0.0005
3. Santa Barbara		3	1	3	45	48
	%	0.0010	0.0003	0.0013	0.0177	0.0190
4. Ventura		12	15	27	136	163
	%	0.0029	0.0035	0.0064	0.0324	0.0388
5. Los Angeles		3	2	5	34	39
	%	0.0000	0.0000	0.0001	0.0006	0.0007
6. Orange		0	0	0	0	0
	%	0.0000	0.0000	0.0000	0.0000	0.0000
7. San Diego		0	0	0	5	5
	%	0.0000	0.0000	0.0000	0.0003	0.0003
All Counties		20	19	39	246	285
	%	0.0002	0.0002	0.0004	0.0024	0.0028

Percents are percent of county economy totals for 2002.

Impacts on Individual Fishermen. In Leeworthy and Wiley (2002) and Leeworthy and Wiley (2003), we were able to provide some information on the impacts to individual fishermen in the Barilotti and Pomeroy samples. Because we updated the baseline information for analyzing impacts, per the request of the Science and Statistical Committee (SSC) of the Pacific Fisheries Management Council (PFMC), we no longer have the capability to assess individual impacts in terms of percent of all fishing revenue and household income. To do this would require that the Barilotti and Pomeroy surveys be replicated. Sufficient time and resources were not available to do this. Instead, what we are able to do is provide socioeconomic profiles of those in the Barilotti and Pomeroy samples that would be potentially impacted by each marine reserve alternative. Again, we cannot estimate the extent of the potential impact (i.e. the percent of their total revenue or percent of their total household income potentially impacted), all we are able to do is present socioeconomic profiles of the fishermen potentially impacted to possibly assess dependence on CINMS and fishermen's abilities to adjust to the potential impacts.

As our analysis above shows, for Alternative 1, there are no potential impacts from the proposed marine reserves in additional state or federal waters. There are only the potential impacts from the existing state marine reserves.

Additional State Waters-Barilotti Sample. The Barilotti Sample included 59 fishing operations. Again, the Barilotti Sample covers all fisheries except squid, wetfish and tuna. For the Additional State waters portion of Alternative 2, 37 of the 59 members of the Barilotti Sample would be potentially impacted. In 1999, on average, this group depended on fishing for 86 percent of their household income, with a range of 30 to 100 percent (Table 2.13). Also, in 1999, this group depended on catch from the CINMS for about 71 percent of their fishing revenue, with a range of as little as 3 percent to a maximum of 100 percent. The heads of these fishing operations have an average number of years of schooling of 13.1 years, with a range of as little as 5 years to a maximum of 17 years, and the average age was 44.5 years, with a range of 30 to 59 years of age. This group also has a significant investment in fishing boat and equipment. There are several members of this group with low levels of education and who are relatively older with significant investments in fishing that may have a difficult time adjusting if a large portion of their catch and revenues from fishing were impacted.

For the Additional State waters portion of Alternative 3, 28 of the 59 members of the Barilotti Sample would be potentially impacted. In 1999, on average, this group depended on fishing for 87 percent of their household income, with a range of 40 to 100 percent (Table 2.13). Also, in 1999, this group depended on catch from the CINMS for about 72 percent of their fishing revenue, with a range of as little as 3 percent to a maximum of 100 percent. The heads of these fishing operations have an average number of years of schooling of 13.3 years, and an average age of 44.8 years, with a range of 30 to 59 years of age. This group also has a significant investment in fishing boat and equipment, with 88 percent boat ownership. There are several members of this group with low levels of education and who are relatively older with significant investments in fishing that may have a difficult time adjusting if a large portion of their catch and revenues from fishing were impacted.

As shown above, the additional state waters portion of the proposed marine reserve alternatives have very small potential impacts (0.66% of fishing revenues for Alternative 2 and 0.81% of fishing revenues for Alternative 3). Given these relatively small potential impacts, we don't expect that any individual operations will have a large portion of their fishing revenues impacted by any of the proposed alternatives for the additional state waters portions of the reserves.

Table 2.13. Socioeconomic Profiles of Fishermen Impacted by Alternative for Additional State Reserves: Barilotti Sample-All Species/Species Groups, Except Squid, Wetfish and Tuna

	Alternative 2			Alternative 3		
	N	Mean	Range	N	Mean	Range
EXPERIENCE						
Years of Commercial Fishing	37	21.3	11-36	28	21.0	11-36
Years Fishing in CINMS	36	19.7	4-32	27	19.3	4-32
AGE	37	44.5	30-59	28	44.8	30-59
EDUCATION						
Years of Schooling	36	13.1	5-17	27	13.3	9-17
DEPENDENCE ON FISHING						
% of 1999 Income from fishing	36	93.0	40-100	27	96.0	40-100
% of 1999 Household Income from Fishing	36	86.0	30-100	27	87.4	40-100
% of Fishing Outside CINMS	36	18.0	0-95	27	15.9	0-95
% of 1999 Fishing Revenue from CINMS						
Urchin	25	78.0	0.5-100	17	78.5	0.5-100
Spiny Lobster	6	64.0	0-100	5	56.8	0-100
Sea Cucumbers	7	57.2	0-100	5	60.0	0-100
Rockfish	10	24.7	0-100	8	29.1	0-100
Crab	11	37.4	0-99.8	8	44.4	0-99.8
Flatfish	9	12.8	0-52	7	9.0	0-38.6
CA Sheephead	9	55.5	0-100	7	44.7	0-100
Sculpin & Bass	5	12.0	0-37.7	4	9.4	0-37.7
Shark	5	7.6	0-18.9	4	6.6	0-18.9
Other (those not listed above)	11	56.8	0-100	9	68.9	1.5-100
All Species/Species Groups	36	70.8	3.1-100	27	71.6	3.1-100
People Directly Employed and Family Members Supported						
Number of Crew	36	1.11	0-4	27	1.07	0-3
Number of Crew with Skipper's License	36	1.03	0-4	27	1.04	0-3
Number of Family Members Supported by Captains/Owners, not including self	37	2.35	0-5	28	2.21	0-5
OWNERSHIP/INVESTMENT						
Boat Ownership (percent yes)	34	91.2		25	88.0	
Replacement Value						
Boat	36	$96,944	0 - 460,000	27	$91,481	0 - 460,000
Electronic Equipment	34	$11,212	0 - 90,000	25	$12,208	0 - 90,000
Fishing/Diving Gear	35	$17,100	1,000 - 110,000	27	$17,870	1,000 - 110,000
Boat, including Equipmentand Gear	33	$126,052	1,500 - 660,000	25	$120,548	1,500 - 660,000
RESIDENCE/PORT		Percent			Percent	
State						
California	37	100		28	100	
City						
Arroyo Grande	0	0.0		0	0.0	
Atascadero	2	5.4		2	7.1	
Carpenteria	1	2.7		1	3.6	
Goleta	1	2.7		1	3.6	
La Conchita	1	2.7		0	0.0	
Morro Bay	0	0.0		0	0.0	
Newbury Park	0	0.0		0	0.0	
Ojai	0	0.0		0	0.0	
Oxnard	2	5.4		2	7.1	
Oak view	1	2.7		1	3.6	
San Pedro	1	2.7		1	3.6	
Santa Barbara	22	59.5		16	57.1	
Simi Valley	0	0.0		0	0.0	
Tarzana	0	0.0		0	0.0	
Ventura	6	16.2		4	14.3	
Main Landing Port						
Channel Islands Harbor	4	10.8		4	14.3	
Santa Barbara	25	67.6		19	67.9	
San Pedro	1	2.7		1	3.6	
Ventura Harbor	5	13.5		3	10.7	
Multiple	2	5.4		1	3.6	

Federal Waters-Barilotti Sample. For the federal waters portion of Alternatives 2 and 3, only four (4) of the 59 members of the Barilotti Sample would be potentially impacted. The same four Barilotti Sample members would be potentially impacted by both Alternatives 2 and 3. In 1999, on average, this group depended on fishing for 81 percent of their household income (Table 2.14). This group, on average, depended on the CINMS for only 35 percent of their 1999 fishing revenues, with a range of as little as 3 percent to a maximum of 84 percent. The heads of these fishing operations have an average number of years of schooling of 12.7 years, with only one person without at least a high school education. The average age of this group was 45.7, with a range of 30 to 64 years. This group also had a significant investment in fishing boat and equipment, with 100 percent boat ownership.

As shown above, the federal waters portion of the proposed marine reserve alternatives have very small potential impacts (0.51% of fishing revenues for Alternative 2 and 0.81% of fishing revenues for Alternative 3). Again, given these relatively small potential impacts, we don't expect that any individual operations will have a large portion of their fishing revenues impacted by any of the proposed alternatives for the federal waters portions of the reserves.

All Waters/Cumulative Impact-Barilotti Sample. Although Alternative 1 is not expected to have any impact from the proposed additional state waters and federal waters, the existing State reserves do have potential impacts on all members of the Barilotti Sample, some of these members, as noted above may have a difficult time adjusting if a large portion of their fishing revenues are impacted. Even though, as noted above, we cannot provide estimates of the extent of the potential impacts on individual fishing operations for all the alternatives proposed, we can look at the work in Leeworthy and Wiley (2003) for Alternative 2, which corresponds to the alternative labeled "Preferred" in Leeworthy and Wiley (2003). The "Existing State Reserves" plus the "Additional State Waters" presented in this report are equivalent to the "State Waters" in Leeworthy and Wiley (2003). In Tables 2.26 and 2.28 of Leeworthy and Wiley (2003), we summarized the percent of income potentially impacted segmented by percentage dependence from fishing in the CINMS (Table 2.26, Leeworthy and Wiley, 2003) and the number of individual operations impacted segmented by the percent of income potentially lost (Table 2.28, Leeworthy and Wiley, 2003). The results in Leeworthy and Wiley (2003) include the potential impacts of the reserves in all waters (state and federal).

The results from Leeworthy and Wiley (2003) showed that for those that were most dependent on the CINMS for their fishing revenues (those that derive 60 to 100 percent of their fishing revenues from the CINMS), the maximum potential impact on income was about 24 percent (i.e., one fishing operation could potentially loose about 24 percent of their total income) from the Alternative 2 here (the Preferred Alternative in Leeworthy and Wiley, 2003). 31 of the 59 members of the Barilotti Sample were estimated to potentially lose less than 10 percent of their total income, while 10 were estimated to potentially lose 10-15 %, 10 were estimated to lose 15-20 %, and 3 were estimated to potentially lose 20-25 %.

During the Marine Reserve Working Group (MRWG) process of designing marine reserve alternatives, the commercial fishermen used heir own standard or threshold level of impact of 10%, i.e., the commercial fishermen thought they could adjust to impacts of 10 percent or less. There are no officially recognized thresholds for judging impacts on small businesses (i.e. whether they will fail if they are impacted to a certain extent). We checked with the Small Business Administration and with several University business schools that specialize in assisting small businesses. All responded that failure among small businesses is very high and variable and no general thresholds exist. All three of the Alternatives analyzed here in Step 1 analysis could potentially exceed the fishermen's 10 percent threshold in aggregate and for several fishing operations in the Barilotti Sample. This is probably a major factor explaining why consensus was not reached by the MRWG on a "preferred" alternative. But as we shall discuss in Step 2 analysis, all three of the alternatives analyzed here are probably within the 10 percent fishermen's threshold in aggregate, however, several fishing operations could potentially exceed the 10 percent threshold.

Table 2.14. Socioeconomic Profiles of Fishermen Impacted by Alternative for Federal Reserves:
Barilotti Sample - All Species/Species Groups, Except Squid, Wetfish and Tuna

	Alternative 2			Alternative 3		
	N	Mean	Range	N	Mean	Range
EXPERIENCE						
Years of Commercial Fishing	4	19.7	15-25	4	19.7	15-25
Years Fishing in CINMS	4	16.5	4-25	4	16.5	4-25
AGE	4	45.7	30-64	4	45.7	30-64
EDUCATION						
Years of Schooling	4	12.7	11-16	4	12.7	11-16
DEPENDENCE ON FISHING						
% of 1999 Income from fishing	4	96.7	88-100	4	96.7	88-100
% of 1999 Household Income from Fishing	4	81.0	40-100	4	81.0	40-100
% of Fishing Outside CINMS	4	65.0	50-95	4	65.0	50-95
% of 1999 Fishing Revenue from CINMS						
Urchin	1	84.1	84.1-84.1	1	84.1	84.1-84.1
Spiny Lobster	0	0.0	0	0	0.0	0
Sea Cucumbers	1	84.7	84.7-84.7	1	84.7	84.7-84.7
Rockfish	2	0.0	0-0	2	0.0	0-0
Crab	1	0.0	0-0	1	0.0	0-0
Flatfish	2	0.0	0-0	2	0.0	0-0
CA Sheephead	2	0.0	0-0	2	0.0	0-0
Sculpin & Bass	2	0.0	0-0	2	0.0	0-0
Shark	2	0.0	0-0	2	0.0	0-0
Other (those not listed above)	2	19.6	1.5-37.7	2	19.6	1.5-37.7
All Species/Species Groups	3	35.2	3.1-84.3	3	35.2	3.1-84.3
People Directly Employed and Family Members Supported						
Number of Crew	4	3.5	1-11	4	3.5	1-11
Number of Crew with Skipper's License	4	3.25	0-11	4	3.25	0-11
Number of Family Members Supported by Captains/Owners, not including self	4	2.25	2-3	4	2.25	2-3
OWNERSHIP/INVESTMENT						
Boat Ownership (percent yes)	4	100		4	100.0	
Replacement Value						
Boat	4	$407,500	50,000-1,400,000	4	$407,500	50,000-1,400,000
Electronic Equipment	3	$33,333	25,000-40,000	3	$33,333	25,000-40,000
Fishing/Diving Gear	3	$53,333	10,000-80,000	3	$53,333	10,000-80,000
Boat, Equipment and Gear	2	$165,000	115,000-215,000	2	$165,000	115,000-215,000
RESIDENCE/PORT		Percent			Percent	
State						
California	4	100		4	100	
City						
Arroyo Grande	0	0.0		0	0.0	
Atascadero	0	0.0		0	0.0	
Carpenteria	0	0.0		0	0.0	
Goleta	0	0.0		0	0.0	
La Conchita	0	0.0		0	0.0	
Morro Bay	0	0.0		0	0.0	
Newbury Park	0	0.0		0	0.0	
Ojai	0	0.0		0	0.0	
Oxnard	1	25.0		1	25.0	
Oak view	0	0.0		0	0.0	
San Pedro	1	25.0		1	25.0	
Santa Barbara	0	0.0		0	0.0	
Simi Valley	0	0.0		0	0.0	
Tarzana	1	25.0		1	25.0	
Ventura	1	25.0		1	25.0	
Main Landing Port						
Channel Islands Harbor	1	25.0		1	25.0	
Santa Barbara	0	0.0		0	0.0	
San Pedro	1	25.0		1	25.0	
Ventura Harbor	2	50.0		2	50.0	
Multiple	0	0.0		0	0.0	

Additional State Waters-Pomeroy Sample. The Pomeroy Sample included 37 fishing operations that were involved in fishing for squid, wetfish (anchovies and sardines) and tuna in the CINMS. 29 of the 37 fishing operations were purse seiners and eight (8) were light boat operations (light boat operators get a percentage of the revenues from the purse seine operations for which they light squid). Generally, the Pomeroy Sample was less dependent on the CINMS than the Barilotti Sample for their total fishing revenues and income. Again, for Alternative 1, there was no impact on the commercial fisheries from the additional state waters proposed for marine reserves. For the additional state waters portion of Alternative 2, 11 of the 29 purse seine boating operations and six (6) of the eight (8) light boat operations would be potentially impacted. In 1999, the purse seine operations, on average, depended on the fisheries for 87 percent of their total income, while light boats depended on the fisheries for over 95 percent of their total income. For the 1996-99 period, the purse seiners, on average, depended on the CINMS for about 43 percent of their fishing revenues, while the light boat operators depended on the CINMS for only 13.7 percent of their total fishing revenues. The heads of the purse seine operations had, on average, a little less than 10 years of schooling, with a range of 0 to 16 years. The heads of the light boat operations had a slightly higher average number of years of schooling (about 12), with a range of 10 to 15 years of schooling. There were several then that had education levels below the high school level across the purse seine and light boat operations. Boat ownership for purse seiners was about 82 percent and about 83 percent for light boat operators.

For the additional state water portions of Alternative 3, all 29 purse seiners and all eight (8) light boat operations would be potentially impacted. In 1999, on average, both the purse seiners and light boat operators derived over 97 percent of their income from the fisheries. The purse seiners were more dependent on the CINMS for their total fisheries revenue than the light boat operators. The purse seine operators, on average, derived about 60 percent of their total fishing revenues from the CINMS, while the light boat operators derived 13.7 percent, with a range of 5 to 22 percent.

Given the low potential impact of alternatives 2 and 3 from the proposed additional state waters portion of the reserves and the lower dependence of the Pomeroy Sample on the CINMS for their total fishing revenues, we don't expect any of these operations will lose a large portion of their revenues or incomes from the marine reserve proposed in the additional state waters.

Table 2.15: Socioeconomic Profiles of Fishermen Impacted by Alternative for Additional State Waters:
Pomeroy Sample - Squid, Wetfish and Tuna

	Purse Seine Boats						Light Boats					
	Alternative 2			*Alternative 3*			*Alternative 2*			*Alternative 3*		
EXPERIENCE	N	Mean	Range	N	Mean	Range	N	Mean	Range	N	Mean	Range
Years Commercial Fishing	25	26.24	9 - 56	19	26.58	13 - 56	8	19.13	8 - 28	8	19.13	8 - 28
Years Fishing in CINMS	25	16.96	4 - 45	19	17.21	5 - 45	8	13.63	6 - 27	8	13.63	6 - 27
AGE	24	44.33	29 - 61	18	44.44	31 - 61	8	37.00	26 - 44	8	37.00	26 - 44
EDUCATION												
Years of Schooling	25	11.54	0 - 16	19	11.79	5 - 16	8	12.56	10 -15.5	8	12.56	10 - 15.5
DEPENDENCY ON FISHING												
Percent of 1999 Income												
From CINMS Squid	25	70.20	32 - 100	19	68.42	32 - 100	8	83.16	65 - 100	8	83.16	65 - 100
From Other CINMS Fisheries	25	4.50	0 - 25	19	5.39	0 - 25	8	6.63	0 - 25	8	6.63	0 - 25
From Fisheries Outside CINMS	25	22.46	0 - 60	19	22.55	0 - 60	8	5.84	0 - 27	8	5.84	0 - 27
From Non Fishing Work	25	0.44	0 - 10	19	0.53	0 - 10	8	0.00	0	8	0.00	0
From Investments	25	2.40	0 - 17	19	3.11	0 - 17	8	0.63	0 - 5	8	0.63	0 - 5
Percent of Average Annual 1996-99 Fishing Revenue												
Squid fishing in CINMS/All Squid Fishing	25	70.38	25.38 - 98.47	19	68.72	25.38 - 98.47	4	14.63	0.96 - 44.44	4	14.63	0.96 - 44.44
Wetfish in CINMS/All Wetfish Fishing	25	21.64	0 - 100	19	24.60	0 - 100	4	3.77	0 - 15.08	4	3.77	0 - 15.08
Tuna in CINMS/All Tuna Fishing	25	4.40	0 - 100	19	5.79	0 - 100	4	14.59	0 - 25.74	4	14.59	0 - 25.74
Other Finfish in CINMS/All Other Finfishing	25	8.00	0 - 100	19	10.53	0 - 100	4	38.67	0 - 70.72	4	38.67	0 - 70.72
Shellfish in CINMS/All Shellfishing	25	4.00	0 - 100	19	5.26	0 - 100	4	41.97	0 - 100	4	41.97	0 - 100
All CINMS Fishing/All Fishing	25	59.13	11.95 - 94.6	19	58.03	11.95 - 94.6	4	13.71	5.2 - 22.29	4	13.71	5.2 - 22.29
People Directly Employed and Family Members Supported												
Number of Crew on Main Vessel	25	5.20	3 - 9	19	5.36	3 - 9	8	0.88	0 - 2	8	0.88	0 - 2
Number of Relief Skippers	25	0.28	0 - 1	19	0.26	0 - 1	8	0.38	0 - 1	8	0.38	0 - 1
Number of Captain/Owners Family Members, including self	25	2.80	0 - 5	19	2.84	0 - 5	8	2.50	0 - 6	8	2.50	0 - 6
Number of Family Members Supported by Crew, including crew	25	19.84	3 - 57	19	20.32	4 - 57	8	2.50	0 - 8	8	2.50	0 - 8
Total Supported, except Relief Skipper Family	25	22.88	4 - 61	19	23.42	7 - 61	8	5.38	1 - 11	8	5.38	1 - 11
OWNERSHIP/INVESTMENT												
Boat Ownership	N	Percent		N	Percent		N	Percent				
Sole Owner	7	28.00		5	26.32		2	25.00		2	25.00	
Owns with Other Family Member	12	48.00		9	47.37		1	12.50		1	12.50	
Owns with Partner	2	8.00		1	5.26		4	50.00		4	50.00	
Market owns	1	4.00		1	5.26		0	0.00		0	0.00	
Other owns	3	12.00		3	15.79		1	12.50		1	12.50	
	N	Mean	Range	N	Mean	Range	N	Mean	Range	N	Mean	Range
Length of Ownership	20	20.80	4 - 37	15	19.47	4 - 37	8	11.19	0 - 23	8	11.19	
Number of Boats Owned	25	0.64	0 - 3	19	0.53	0 - 3	8	0.88	0 - 3	8	0.88	
Replacement Value of Main Boat, including all equipment	25	$807,400	75,000 - 2,000,000	19	$876,842	350,000 - 2,000,000	8	$210,000	70,000 - 485,000	8	$210,000	70,000 - 485,000
Replacement Value of All boats, including all equipment	25	$910,200	275,000 - 2,800,000	19	$989,211	350,000 - 2,800,000	8	$272,500	120,000 - 600,000	8	$272,500	120,000 - 600,000
RESIDENCE/HOME PORT/MAIN LANDING PORT												
Residence	N	Percent		N	Percent		N	Percent		N	Percent	
State												
California	23	92.00		18	94.74		8	100.00		8	100.00	
Washington	2	8.00		1	5.26		0	0.00		0	0.00	

Federal Waters-Pomeroy Sample. For the federal water portions of Alternative 2, 25 of the 29 purse seine boat operators and all eight (8) of the light boat operators would be potentially impacted. In 1999, on average, this group of both the purse seiners and the light boat operators derived about 97 percent of their income from fishing. During 1996-99, this group of purse seiners, on average, derived about 59 percent of their total fishing revenues from the CINMS. As noted above, the eight (8) light boat operators were much less dependent on the CINMS for their total fishing revenues deriving, on average, only 13.7 percent of their total fishing revenues from the CINMS. The heads of this group of purse seiners had an average of 11.5 years of schooling, while the light boat operators had an average of 12.5 years of schooling or more than a high school education. The average age of purse seiners was 44.3, with a range of 29 to 61 years of age. Light boat operators had an average age of 37, with a range of 26 to 44 years of age.

For the federal water portions of Alternative 3, 19 of the 29 purse seine boat operators and all eight (8) of the light boat operators would be potentially impacted. In 1999, on average, this group of purse seiners derived about 96 percent of their incomes from fishing. During 1996-99, this group of purse seiners, on average, derived about 58 percent of their total fishing revenues from the CINMS. The heads of this group of purse seiners had an average of 11.8 years of schooling, with a range of 5 to 16 years.

Given the low potential impact of alternatives 2 and 3 from the proposed federal waters portion of the reserves and the lower dependence of the Pomeroy Sample on the CINMS for their total fishing revenues, we don't expect any of these operations will lose a large portion of their revenues or incomes from the marine reserve proposed in the federal waters.

All Waters/Cumulative Impact-Pomeroy Sample. Although Alternative 1 is not expected to have any impact from the proposed additional state waters and federal waters, the existing State reserves do have potential impacts on all members of the Pomeroy Sample, some of these members, as noted above may have a difficult time adjusting if a large portion of their fishing revenues are impacted. Even though, as noted above, we cannot provide estimates of the extent of the potential impacts on individual fishing operations for all the alternatives proposed, again, as we did above for the Barilotti Sample, we can look at the work in Leeworthy and Wiley (2003) for Alternative 2. In Tables 2.27 and 2.29 of Leeworthy and Wiley (2003), we summarized the percent of income potentially impacted segmented by percentage dependence from fishing in the CINMS (Table 2.27, Leeworthy and Wiley, 2003) and the number of individual operations impacted segmented by the percent of income potentially lost (Table 2.29, Leeworthy and Wiley, 2003). The results in Leeworthy and Wiley (2003) include the potential impacts of the reserves in all waters (state and federal).

The results from Leeworthy and Wiley (2003) showed that for those that were most dependent on the CINMS for their fishing revenues (those that derive 60 to 100 percent of their fishing revenues from the CINMS), the maximum potential impact on income was about 15.8 percent (i.e., one fishing operation could potentially loose about 15.8 percent of their total income) from the Alternative 2 here (the Preferred Alternative in Leeworthy and Wiley, 2003). 22 of the 37 members of the Pomeroy Sample were estimated to potentially lose less than 10 percent of their total income, while 10 were estimated to potentially lose 10-15 % and One (1) was estimated to potentially lose 15-17 %.

Although the cumulative impact for all waters for all three alternatives exceed the fishermen's 10 percent threshold in Step 1 Analysis, in Step 2 Analysis, we will show that it is unlikely the 10 percent threshold will be exceeded for any of the alternatives in aggregate. However, there still could be a couple of individual operations that could potentially lose more than 10 percent of their total fishing revenues or incomes. The final outcomes will depend on many factors as will be discussed in the Step 2 part of our analysis.

Table 2.16: Socioeconomic Profiles of Fishermen Impacted by Alternative for Federal Waters:
Pomeroy Sample - Squid, Wetfish and Tuna

	Purse Seine Boats						Light Boats					
	Alternative 2			*Alternative 3*			*Alternative 2*			*Alternative 3*		
EXPERIENCE	N	Mean	Range	N	Mean	Range	N	Mean	Range	N	Mean	Range
Years Commercial Fishing	11	33.82	18 - 56	29	26.28	9 - 56	6	22.17	10 - 28	8	19.13	8 - 28
Years Fishing in CINMS	11	24.91	7 - 45	29	17.00	4 - 45	6	12.33	6 - 26	8	13.63	6 - 27
AGE	10	51.5	37 - 61	28	44.18	29 - 61	6	36.50	26 - 44	8	37.00	26 - 44
EDUCATION												
Years of Schooling	11	9.91	0 - 16	29	11.78	0 - 16	6	12.08	10 - 15.5	8	12.56	10 - 15.5
DEPENDENCY ON FISHING												
Percent of 1999 Income												
From CINMS Squid	11	57.36	32 - 100	29	70.34	32 - 100	6	83.38	65 - 100	8	83.16	65 - 100
From Other CINMS Fisheries	11	9.77	0 - 25	29	3.88	0 - 25	6	3.83	0 - 20	8	6.63	0 - 25
From Fisheries Outside CINMS	11	29.5	0 - 60	29	23.33	0 - 60	6	6.96	0 - 27	8	5.84	0 - 27
From Non Fishing Work	11	0.91	0 - 10	29	0.38	0 - 10	6	0.00	0	8	0.00	0
From Investments	11	2.45	0 - 17	29	2.07	0 - 17	6	0.83	0 - 5	8	0.63	0 - 5
Percent of Average Annual 1996-99 Fishing Revenue1												
Squid fishing in CINMS/All Squid Fishing	11	59.69	25.38 - 98.47	29	71.07	25.38 - 98.47	4	14.63	0.96 - 44.44	4	14.63	0.96 - 44.44
Wetfish in CINMS/All Wetfish Fishing	11	16.12	0 - 100	29	22.10	0 - 100	4	3.77	0 - 15.08	4	3.77	0 - 15.08
Tuna in CINMS/All Tuna Fishing	11	0.91	0 - 6.63	29	3.79	0 - 100	4	14.59	0 - 25.74	4	14.59	0 - 25.74
Other Finfish in CINMS/All Other Finfishing	11	18.18	0 - 100	29	6.90	0 - 100	4	38.67	0 - 70.72	4	38.67	0 - 70.72
Shellfish in CINMS/All Shellfishing	11	0	0	29	3.44	0 - 100	4	41.97	0 - 100	4	41.97	0 - 100
All CINMS Fishing/All Fishing	11	43.31	11.95 - 88.36	29	60.93	11.95 - 94.6	4	13.71	5.2 - 22.29	4	13.71	5.2 - 22.29
People Directly Employed and Family Members Supported												
Number of Crew on Main Vessel	11	6.36	3 - 9	29	5.00	3 - 9	6	0.83	0 - 1	8	0.88	0 - 2
Number of Relief Skippers	11	0.18	0 - 1	29	0.31	0 - 1	6	0.50	0 - 1	8	0.38	0 - 1
Number of Captain/Owners Family Members, including self	11	2.55	1 - 4	29	2.55	0 - 5	6	2.50	0 - 6	8	2.50	0 - 6
Number of Family Members Supported by Crew, including crew	11	26.64	3 - 57	29	18.66	3 - 57	6	2.00	0 - 5	8	2.50	0 - 8
Total Supported, except Relief Skipper Family	11	29.36	4 - 61	29	21.48	4 - 61	6	5.00	1 - 8	8	5.38	11-Jan
OWNERSHIP/INVESTMENT												
Boat Ownership	N	Percent		N	Percent		N	Percent		N	Percent	
Sole Owner	2	18.18		8	27.59		1	16.67		2	25.00	
Owns with Other Family Member	6	54.55		13	44.83		0			1	12.50	
Owns with Partner	1	9.09		4	13.79		4	66.67		4	50.00	
Market owns	1	9.09		1	3.45		0			0	0.00	
Other owns	1	9.09		3	10.34		1	16.67		1	12.50	
	N	Mean	Range	N	Mean	Range	N	Mean	Range	N	Mean	Range
Length of Ownership	9	25.78		8	11.19	0 - 23	6	11.42		8	11.19	0 - 23
Number of Boats Owned	11	0.55		8	0.88	0 - 3	6	1.00		8	0.88	0 - 3
Replacement Value of Main Boat, including all equipment	11	$968,182	500,000 - 2,000,000	8	$210,000	70,000 - 485,000	6	$243,333	125,000 - 485,000	8	$210,000	70,000 - 485,000
Replacement Value of All boats, including all equipment	11	$1,154,545	500,000 - 2,800,000	8	$272,500	120,000 - 600,000	6	$293,333	125,000 - 600,000	8	$272,500	120,000 - 600,000
RESIDENCE/HOME PORT/MAIN LANDING PORT	N	Percent		N	Percent		N	Percent		N	Percent	
Residence												
State												
California	11	100.00		27	93.10		6	100.00		8	100.00	
Washington	0	0.00		2	6.90		0	0.00		0	0.00	

Recreation Industry

The interpretation of the estimates provided in this analysis is critical to understanding the "true" impact of the various alternatives proposed for the Channel Islands Marine Reserve system. As was mentioned above, the estimates from our GIS analysis for the different boundary alternatives (step one) are simply the sum of each measurement within the boundaries for a given alternative. The estimates therefore represent the **maximum total potential loss from displacement of the consumptive recreational activities**. This analysis ignores possible mitigating factors and the possibility of net benefits that might be derived if the proposed marine reserve system has replenishment effects. Although we don't have the ability to quantify either the extent of the mitigating factors or the potential benefits from replenishment, we will discuss these as well as other potential benefits of the proposed marine reserve system after we have presented and discussed the maximum potential losses from displacement of the current consumptive recreational uses.

The analysis is separated into two steps, step 1) costs, and step 2) benefits/mitigating factors. In the step one analysis, maximum potential loss of income for consumptive activities is presented for existing state waters, for additional state waters, for federal waters, and in total for each alternative.

Recreation: Consumptive Activities – Step 1 Analysis

No-Action Alternative. The no action alternative simply means that the proposed Channel Islands Marine reserve system and corresponding no take regulations would not take place. The no action alternative has a simple interpretation in that any costs of imposing the no take regulations, for any given alternative with no take regulations, would be the benefits of the no action alternative. That is, by not adopting the no-take regulations, the costs are avoided. Similarly, any benefits from imposing the no take regulations, for any given alternative with no take regulations, would be the costs of the no-action alternative. That is, the costs of maintaining the status quo are the benefits lost by not adopting the no take regulations. Said another way, these are opportunities lost. The impacts of the no action alternative can only be understood by comparing it to one of the proposed alternatives. Thus the impacts of the no action alternative can be obtained by reading the impacts from any of the proposed alternatives in reverse.

Alternative 1. This regulatory alternative displaces about one-half of one percent (0.5%) of the annual person-days of consumptive recreation in the CINMS. The estimated maximum potential loss associated with this displacement is about 135 thousand dollars in annual income and 5 full and part-time jobs in the local county economies. Annual consumer's surplus loss to displaced consumptive recreators is estimated to be about $73 thousand. Charter/party boat operations could potentially lose about $2,315 in annual profits (see Table 2.17). The magnitude of impact varies by activity, however no activity is impacted by as much as one percent by the new MPAs in alternative one, either in terms of person-days of activity or in terms of income and employment generated by the activity; consumer's surplus; or profits to charter/party boat operations. The activity that is most impacted is private boat fishing, with a maximum potential loss of 1,217 person-days (0.57 %), followed by charter/party boat fishing with 764 person-days, private boat diving with 48 person-days and charter boat diving with 23 person-days (see Table 2.18). In terms of income generated by the activity, private boat fishing has a maximum potential loss of about 78 thousand dollars, followed by charter/party boat fishing with 54 thousand dollars, private boat diving with about 1.6 thousand dollars and charter/party boat diving with about a thousand dollars.

Reserve Types. The new MPAs in Alternative One are marine conservation areas, which only limit the take of rockfish and flatfish. In addition to this alternative being the smallest in terms of size, this is another reason why the impact from these new alternatives is relatively small. Although data describing recreational fishing and consumptive diving were not collected by species, the California Department of Fish and Game (CDFG) Commercial Passenger Fishing Vessel (CPFV) Log Book Data was used to estimate the proportion of rockfish based on target species. For the 2003 data, flat fish were not among the target species categories, thus these impacts may be a slight underestimation based on this factor. Using this proportion the analysis was conducted on only rockfish for this alternative.

Impact by Jurisdiction. There is a disproportional impact by jurisdiction (Additional State versus Federal waters) since density of recreational activity increases as one moves towards the islands. Additional State waters accounted for 26.56% of the Alternative One MPA area, while the remaining 73.44% is in Federal waters. However, 32 % of the maximum potential loss for new MPAs in Alternative one occurs in State waters, compared with 68 % in Federal waters.

Cumulative Impact. While the current regulatory action only impacts about 0.5% of the annual activity and other associated socioeconomic impact measurements estimated here, the existing State MPAs impact 13.8% of the annual person-days of consumptive recreation in the CINMS. Displacement from the existing State MPAs has an estimated maximum potential annual loss of about $3.275 million in income and 138 full and part-time jobs in the local county economies. This is an additional percentage impact of about 12.4% of income and 12.1% of employment generated. Consumer's surplus losses from displacement from the existing State MPAs are estimated to be about $2.2 million and annual lost profits to charter/party boat operations are estimated to be about $58 thousand (11% of all charter/party boat operation profits from activities in the CINMS). The estimated cumulative impact of the current regulatory action for this alternative is estimated to have an annual maximum potential loss of about 63.7 thousand person-days of consumptive recreation, which is about 14.2% of all consumptive recreation in the CINMS. This displacement has an associated income impact of about $3.4 million and 143 full and part-time jobs in the local county economies (12.9% and 12.6% of all the income and employment generated by consumptive recreation in the CINMS, respectively). Cumulative annual maximum potential loss in consumer's surplus is estimated to be about $2.27 million, while annual lost profits to charter/party boat operations is estimated to be about $60 thousand annually or 11.5% of the total annual profits of the charter/party boat operations from activity in the CINMS.

Table 2.17 Summary: Recreation Consumptive Activities - Alternative 1 - Step 1 Analysis

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	647	0.1%	1,405	0.3%	2,052	0.5%	61,651	13.8%	63,703	14.2%
Market Impact										
Direct Sales	$ 68,896	0.1%	$ 151,829	0.3%	$ 220,725	0.5%	$ 6,037,997	12.4%	$ 6,258,722	12.9%
Direct Wages and Salaries	$ 26,772	0.1%	$ 58,855	0.3%	$ 85,627	0.5%	$ 2,322,681	12.4%	$ 2,408,308	12.9%
Direct Employment	1.3	0.1%	2.9	0.3%	4.2	0.4%	117.6	12.1%	121.8	12.5%
Total Income	$ 37,713	0.1%	$ 97,360	0.4%	$ 135,072	0.5%	$ 3,275,128	12.4%	$ 3,410,200	12.9%
Total Employment	1.6	0.1%	3.4	0.3%	5.0	0.4%	138.1	12.1%	143.1	12.6%
Non-Market Impact										
Consumer's Surplus	$ 22,776	0.1%	$ 49,590	0.3%	$ 72,367	0.5%	$ 2,170,769	13.6%	$ 2,243,136	14.1%
Profit[1]	$ 667	0.1%	$ 1,649	0.3%	$ 2,315	0.4%	$ 57,876	11.0%	$ 60,192	11.5%

1. Profit is used as a proxy for producer's surplus.

Table 2.18 Consumptive Recreation - Maximum Potential Loss - Alternative 1

	Charter Boat Fishing		Charter Boat Diving		Private Boat Fishing		Private Boat Diving	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	220	0.15%	7	0.02%	407	0.19%	13	0.03%
Market Impact								
Direct Sales	$ 28,522	0.15%	$ 1,171	0.02%	$ 38,386	0.19%	$ 817	0.03%
Direct Wages and Salaries	$ 10,816	0.15%	$ 427	0.02%	$ 15,223	0.19%	$ 306	0.03%
Direct Employment	0.7	0.15%	-	0.00%	0.6	0.18%	-	0.00%
Total Income	$ 15,445	0.15%	$ 619	0.02%	$ 21,224	0.19%	$ 426	0.03%
Total Employment	0.8	0.15%	-	0.00%	0.8	0.19%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 7,926	0.15%	$ 260	0.02%	$ 14,147	0.18%	$ 443	0.03%
Profit[1]	$ 651	0.15%	$ 15	0.02%	n/a	n/a	n/a	n/a
Federal								
Person-days	544	0.36%	16	0.04%	810	0.38%	36	0.08%
Market Impact								
Direct Sales	$ 70,550	0.36%	$ 2,668	0.05%	$ 76,329	0.38%	$ 2,282	0.08%
Direct Wages and Salaries	$ 26,757	0.36%	$ 973	0.05%	$ 30,271	0.38%	$ 854	0.08%
Direct Employment	1.6	0.35%	-	0.00%	1	0.39%	-	0.00%
Total Income	$ 38,208	0.36%	$ 1,409	0.05%	$ 56,555	0.51%	$ 1,189	0.08%
Total Employment	1.9	0.35%	-	0.00%	1.6	0.38%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 19,650	0.37%	$ 571	0.05%	$ 28,131	0.36%	$ 1,239	0.07%
Profit[1]	$ 1,615	0.36%	$ 34	0.04%	n/a	n/a	n/a	n/a
Total New								
Person-days	764	0.51%	23	0.06%	1,217	0.57%	48	0.10%
Market Impact								
Direct Sales	$ 99,072	0.50%	$ 3,839	0.07%	$ 114,715	0.57%	$ 3,099	0.10%
Direct Wages and Salaries	$ 37,573	0.50%	$ 1,400	0.07%	$ 45,494	0.57%	$ 1,160	0.10%
Direct Employment	2	0.50%	-	0.00%	2	0.57%	-	0.00%
Total Income	$ 53,653	0.50%	$ 2,027	0.07%	$ 77,779	0.70%	$ 1,614	0.10%
Total Employment	3	0.50%	-	0.00%	2	0.57%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 27,575	0.53%	$ 831	0.07%	$ 42,279	0.55%	$ 1,682	0.10%
Profit[1]	$ 2,266	0.51%	$ 49	0.06%	n/a	n/a	n/a	n/a
Existing State								
Person-days	15,167	10.05%	6,051	16.82%	28,320	13.23%	12,113	25.67%
Market Impact								
Direct Sales	$ 1,982,725	10.10%	$ 610,031	10.54%	$ 2,670,013	13.23%	$ 775,228	25.67%
Direct Wages and Salaries	$ 751,541	10.10%	$ 222,151	10.51%	$ 1,058,873	13.23%	$ 290,116	25.67%
Direct Employment	46	10.13%	14	11.03%	44	13.24%	13	25.60%
Total Income	$ 1,073,389	10.10%	$ 321,779	10.52%	$ 1,476,236	13.23%	$ 403,725	25.67%
Total Employment	53.2	10.12%	17	10.95%	53.3	13.24%	15	25.61%
Non-Market Impact								
Consumer's Surplus	$ 547,449	10.44%	$ 218,392	17.47%	$ 984,039	12.74%	$ 420,889	24.71%
Profit[1]	$ 44,996	10.05%	$ 12,880	16.82%	n/a	n/a	n/a	n/a
Cumulative Total								
Person-days	15,931	10.56%	6,074	16.88%	29,537	13.80%	12,161	25.77%
Market Impact								
Direct Sales	$ 2,081,797	10.60%	$ 613,870	10.61%	$ 2,784,728	13.80%	$ 778,327	25.77%
Direct Wages and Salaries	$ 789,114	10.60%	$ 223,551	10.58%	$ 1,104,367	13.80%	$ 291,276	25.77%
Direct Employment	49	10.63%	14	11.03%	46	13.81%	13	25.60%
Total Income	$ 1,127,042	10.60%	$ 323,806	10.59%	$ 1,554,014	13.93%	$ 405,339	25.77%
Total Employment	56	10.62%	17	10.95%	56	13.81%	15	25.61%
Non-Market Impact								
Consumer's Surplus	$ 575,024	10.97%	$ 219,223	17.54%	$ 1,026,317	13.29%	$ 422,571	24.81%
Profit[1]	$ 47,263	10.56%	$ 12,929	16.88%	n/a	n/a	n/a	n/a

1. Profit is used as a proxy for producer's surplus.

Alternative 2. This regulatory alternative displaces about five percent (5.0%) of the annual person-days of consumptive recreation in the CINMS. The estimated maximum potential loss associated with this displacement is about $1.4 million in annual income and about 61 full and part-time jobs in the local county economies. Annual consumer's surplus loss to displaced consumptive recreators is estimated to be about $791 thousand. Charter/party boat operations could potentially lose about $34 thousand in annual profits (see Table 2.19). The magnitude of impact varies by activity; however fishing incurs a higher maximum potential loss than consumptive diving in the new MPAs. The activity that is most impacted is charter/party boat fishing, with a maximum potential loss of 10,490 person-days (6.95 % of this activity in the CINMS), followed by private boat fishing with 9,625 person-days, charter/party boat diving with 1,423 person-days and private boat diving with 827 person-days (see Table 2.20). In terms of income generated by the activity, charter/party boat fishing has a maximum potential loss of about 736 thousand dollars, followed by private boat fishing with 501 thousand dollars, charter/party boat diving with 122 thousand dollars and private boat diving with 28 thousand dollars.

Reserve Types. One of the new MPAs in Alternative Two, Anacapa Island, is a marine conservation area. This type of reserve allows for the taking of spiny lobster and pelagic finfish. Although recreational fishing or consumptive diving data by species was not collected, the RecFIN fishing location add-on to the MRFSS was used to estimate the proportion of recreational pelagic finfish by CDFG fish block. Using this proportion to eliminate pelagic finfish from the analysis, the model only takes into account prohibited species of finfish for these reserves. Unfortunately, the sample did not include data for recreational taking of spiny lobsters. As a result, this analysis may be an overestimate of actual maximum potential impact.

Impact by Jurisdiction. There is a disproportional impact by jurisdiction (Additional State versus Federal waters) since density of recreational activity increases as one moves towards the islands. Additional State waters accounted for 20.39% of the Alternative Two MPA area, while the remaining 79.61% is in Federal waters. However, 33 % of the maximum potential loss for new MPAs in Alternative Two occurs in State waters, compared with 67 % in Federal waters.

Cumulative Impact. While the current regulatory action only impacts about 5% of the annual activity and other associated socioeconomic impact measurements estimated here, the existing State MPAs impact 13.8% of the annual person-days of consumptive recreation in the CINMS. Displacement from the existing State MPAs has an estimated maximum potential annual loss of about $3.275 million in income and 138 full and part-time jobs in the local county economies. This is an additional percentage impact of about 12.4% of income and 12.1% of employment generated. Consumer's surplus losses from displacement from the existing State MPAs are estimated to be about $2.2 million and annual lost profits to charter/party boat operations are estimated to be about $58 thousand (11% of all charter/party boat operation profits from activities in the CINMS). The estimated cumulative impact of the current regulatory action for this alternative is estimated to have an annual maximum potential loss of about 84 thousand person-days of consumptive recreation, which is about 18.8% of all consumptive recreation in the CINMS. This displacement has an associated income impact of about $4.66 million and 200 full and part-time jobs in the local county economies (17.7% and 17.5% of all the income and employment generated by consumptive recreation in the CINMS, respectively). Cumulative annual maximum potential loss in consumer's surplus is estimated to be about $3 million, while annual lost profits to charter/party boat operations is estimated to be about $92 thousand annually or 17.6% of the total annual profits of the charter/party boat operations from activity in the CINMS.

Table 2.19 Summary: Recreation Consumptive Activities - Alternative 2 - Step 1 Analysis

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	7,361	1.6%	15,005	3.3%	22,365	5.0%	61,651	13.8%	84,016	18.8%
Market Impact										
Direct Sales	$ 832,585	1.7%	$ 1,718,897	3.5%	$ 2,551,482	5.2%	$ 6,037,997	12.4%	$ 8,589,479	17.7%
Direct Wages and Salaries	$ 319,563	1.7%	$ 660,289	3.5%	$ 979,852	5.2%	$ 2,322,681	12.4%	$ 3,302,533	17.7%
Direct Employment	17.0	1.8%	35.7	3.7%	52.7	5.4%	117.6	12.1%	170.3	17.5%
Total Income	$ 452,604	1.7%	$ 935,292	3.5%	$ 1,387,895	5.3%	$ 3,275,128	12.4%	$ 4,663,023	17.7%
Total Employment	19.9	1.7%	41.6	3.7%	61.5	5.4%	138.1	12.1%	199.6	17.5%
Non-Market Impact										
Consumer's Surplus	$ 260,869	1.6%	$ 532,300	3.4%	$ 793,168	5.0%	$ 2,170,769	13.7%	$ 2,963,937	18.7%
Profit[1]	$ 10,693	2.0%	$ 23,457	4.5%	$ 34,151	6.5%	$ 57,876	11.0%	$ 92,027	17.6%

1. Profit is used as a proxy for producer's surplus.

Table 2.20 Consumptive Recreation - Maximum Potential Loss - Alternative 2

	Charter Boat Fishing		Charter Boat Diving		Private Boat Fishing		Private Boat Diving	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	3,121	2.07%	673	1.87%	3,226	1.51%	340	0.72%
Market Impact								
Direct Sales	$ 405,231	2.06%	$ 101,462	1.75%	$ 304,140	1.51%	$ 21,752	0.72%
Direct Wages and Salaries	$ 153,671	2.06%	$ 37,136	1.76%	$ 120,616	1.51%	$ 8,140	0.72%
Direct Employment	9.4	2.06%	2	1.68%	5.0	1.50%	0.4	0.81%
Total Income	$ 219,443	2.06%	$ 53,675	1.76%	$ 168,158	1.51%	$ 11,328	0.72%
Total Employment	10.8	2.06%	3	1.69%	6.1	1.50%	0.5	0.76%
Non-Market Impact								
Consumer's Surplus	$ 112,659	2.07%	$ 24,309	1.87%	$ 112,091	1.51%	$ 11,810	0.72%
Profit[1]	$ 9,260	2.07%	$ 1,434	1.87%	n/a	n/a	n/a	n/a
Federal								
Person-days	7,369	4.88%	750	2.08%	6,399	2.99%	487	1.03%
Market Impact								
Direct Sales	$ 954,719	4.86%	$ 129,720	2.24%	$ 603,298	2.99%	$ 31,160	1.03%
Direct Wages and Salaries	$ 362,097	4.86%	$ 47,275	2.24%	$ 239,256	2.99%	$ 11,661	1.03%
Direct Employment	22.2	4.86%	3	2.30%	10	2.99%	0.5	1.01%
Total Income	$ 517,050	4.86%	$ 68,455	2.24%	$ 333,560	2.99%	$ 16,228	1.03%
Total Employment	25.5	4.85%	3	2.28%	12.1	2.99%	0.6	1.02%
Non-Market Impact								
Consumer's Surplus	$ 265,979	4.88%	$ 27,057	2.08%	$ 222,346	2.99%	$ 16,917	1.03%
Profit[1]	$ 21,862	4.88%	$ 1,596	2.08%	n/a	n/a	n/a	n/a
Total New								
Person-days	10,490	6.95%	1,423	3.96%	9,625	4.50%	827	1.75%
Market Impact								
Direct Sales	$ 1,359,950	6.93%	$ 231,182	4.00%	$ 907,438	4.50%	$ 52,912	1.75%
Direct Wages and Salaries	$ 515,768	6.93%	$ 84,411	3.99%	$ 359,872	4.50%	$ 19,801	1.75%
Direct Employment	32	6.91%	5	3.98%	15	4.49%	1	1.81%
Total Income	$ 736,493	6.93%	$ 122,130	3.99%	$ 501,718	4.50%	$ 27,556	1.75%
Total Employment	36	6.91%	6	3.97%	18	4.50%	1	1.78%
Non-Market Impact								
Consumer's Surplus	$ 378,638	6.95%	$ 51,366	3.96%	$ 334,438	4.50%	$ 28,727	1.75%
Profit[1]	$ 31,121	6.95%	$ 3,029	3.96%	n/a	n/a	n/a	n/a
Existing State								
Person-days	15,167	10.05%	6,051	16.82%	28,320	13.23%	12,113	25.67%
Market Impact								
Direct Sales	$ 1,982,725	10.10%	$ 610,031	10.54%	$ 2,670,013	13.23%	$ 775,228	25.67%
Direct Wages and Salaries	$ 751,541	10.10%	$ 222,151	10.51%	$ 1,058,873	13.23%	$ 290,116	25.67%
Direct Employment	46	10.13%	14	11.03%	44	13.24%	13	25.60%
Total Income	$ 1,073,389	10.10%	$ 321,779	10.52%	$ 1,476,236	13.23%	$ 403,725	25.67%
Total Employment	53.2	10.12%	17	10.95%	53.3	13.24%	15	25.61%
Non-Market Impact								
Consumer's Surplus	$ 547,449	10.05%	$ 218,392	16.82%	$ 984,039	13.23%	$ 420,889	25.67%
Profit[1]	$ 44,996	10.05%	$ 12,880	16.82%	n/a	n/a	n/a	n/a
Cumulative Total								
Person-days	25,658	17.01%	7,474	20.77%	37,945	17.73%	12,940	27.42%
Market Impact								
Direct Sales	$ 3,342,675	17.03%	$ 841,213	14.54%	$ 3,577,451	17.73%	$ 828,140	27.42%
Direct Wages and Salaries	$ 1,267,309	17.03%	$ 306,562	14.51%	$ 1,418,745	17.73%	$ 309,917	27.42%
Direct Employment	78	17.04%	20	15.01%	59	17.73%	14	27.42%
Total Income	$ 1,809,882	17.03%	$ 443,908	14.52%	$ 1,977,953	17.73%	$ 431,281	27.42%
Total Employment	89	17.03%	23	14.91%	71	17.73%	16	27.40%
Non-Market Impact								
Consumer's Surplus	$ 926,087	17.01%	$ 269,758	20.77%	$ 1,318,477	17.73%	$ 449,616	27.42%
Profit[1]	$ 76,117	17.01%	$ 15,909	20.77%	n/a	n/a	n/a	n/a

1. Profit is used as a proxy for producer's surplus.

Alternative 3. This regulatory alternative displaces about 6.4 percent (6.4%) of the annual person-days of consumptive recreation in the CINMS. The estimated maximum potential loss associated with this displacement is about $1.8 million in annual income and about 79 full and part-time jobs in the local county economies. Annual consumer's surplus loss to displaced consumptive recreators is estimated to be about $1 million. Charter/party boat operations could potentially lose about $45 thousand in annual profits (see Table 2.21). The magnitude of impact varies by activity, however the maximum potential loss for fishing activities is more than twice as high than for diving activities. The activity that is most impacted is charter/party boat fishing, with a maximum potential loss of 14,007 person-days (9.28 % of this activity in the CINMS), followed by private boat fishing with 12,149 person-days, charter/party boat diving with 1,613 person-days and private boat diving with 869 person days (see Table 2.22). In terms of income generated by the activity, charter/party boat fishing has a maximum potential loss of about 983 thousand dollars, followed by private boat fishing with 633 thousand dollars, charter/party boat diving with 138 thousand dollars and private boat diving with 29 thousand dollars.

Reserve Types. One of the new MPAs in Alternative Three, Anacapa Island, is a marine conservation area. This type of reserve allows for the taking of spiny lobster and pelagic finfish. Although recreational fishing or consumptive diving data by species was not collected, the RecFIN fishing location add-on to the MRFSS was used to estimate the proportion of recreational pelagic finfish by CDFG fish block. Using this proportion to eliminate pelagic finfish from the analysis, the model only takes into account prohibited species of finfish for these reserves. Unfortunately, the sample did not include data for recreational taking of spiny lobsters. As a result, this analysis may be an overestimate of actual maximum potential impact.

Impact by Jurisdiction. There is a disproportional impact by jurisdiction (Additional State versus Federal waters) since density of recreational activity increases as one moves towards the islands. Additional State waters accounted for 17.58% of the Alternative Three MPA area, while the remaining 82.42% is in Federal waters. However, 26 % of the maximum potential loss for new MPAs in Alternative Three occurs in State waters, compared with 74 % in Federal waters.

Cumulative Impact. While the current regulatory action only impacts about 6.4% of the annual activity and other associated socioeconomic impact measurements estimated here, the existing State MPAs impact 13.8% of the annual person-days of consumptive recreation in the CINMS. Displacement from the existing State MPAs has an estimated maximum potential annual loss of about $3.275 million in income and 138 full and part-time jobs in the local county economies. This is an additional percentage impact of about 12.4% of income and 12.1% of employment generated. Consumer's surplus losses from displacement from the existing State MPAs are estimated to be about $2.2 million and annual lost profits to charter/party boat operations are estimated to be about $58 thousand (11% of all charter/party boat operation profits from activities in the CINMS). The estimated cumulative impact of the current regulatory action for this alternative is estimated to have an annual maximum potential loss of about 90.3 thousand person-days of consumptive recreation, which is about 20.2% of all consumptive recreation in the CINMS. This displacement has an associated income impact of about $5 million and 217 full and part-time jobs in the local county economies (19.2% and 19.1% of all the income and employment generated by consumptive recreation in the CINMS, respectively). Cumulative annual maximum potential loss in consumer's surplus is estimated to be about $3.2 million, while annual lost profits to charter/party boat operations is estimated to be about $103 thousand annually or 19.6% of the total annual profits of the charter/party boat operations from activity in the CINMS.

More detailed results for all three alternatives from the IMPLAN model can be found in Appendix E.

Table 2.21 Summary: Recreation Consumptive Activities - Alternative 3 - Step 1 Analysis

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	7,562	1.7%	21,075	4.7%	28,637	6.4%	61,651	13.8%	90,288	20.2%
Market Impact										
Direct Sales	$ 855,662	1.8%	$ 2,422,169	5.0%	$ 3,277,831	6.7%	$ 6,037,997	12.4%	$ 9,315,828	19.2%
Direct Wages and Salaries	$ 328,466	1.8%	$ 930,955	5.0%	$ 1,259,421	6.7%	$ 2,322,681	12.4%	$ 3,582,102	19.2%
Direct Employment	17.5	1.8%	50.5	5.2%	68.0	7.0%	117.6	12.1%	185.6	19.1%
Total Income	$ 465,200	1.8%	$ 1,318,509	5.0%	$ 1,783,709	6.8%	$ 3,275,128	12.4%	$ 5,058,837	19.2%
Total Employment	20.5	1.8%	58.9	5.2%	79.3	7.0%	138.1	12.1%	217.4	19.1%
Non-Market Impact										
Consumer's Surplus	$ 267,987	1.7%	$ 748,105	4.7%	$ 1,016,093	6.4%	$ 2,170,769	13.7%	$ 3,186,861	20.1%
Profit[1]	$ 10,973	2.1%	$ 34,012	6.5%	$ 44,986	8.6%	$ 57,876	11.0%	$ 102,862	19.6%

1. Profit is used as a proxy for producer's surplus.

Table 2.22 Consumptive Recreation - Maximum Potential Loss - Alternative 3

	Charter Boat Fishing		Charter Boat Diving		Private Boat Fishing		Private Boat Diving	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	3,204	2.12%	690	1.92%	3,337	1.56%	331	0.70%
Market Impact								
Direct Sales	$ 416,159	2.12%	$ 103,725	1.79%	$ 314,605	1.56%	$ 21,173	0.70%
Direct Wages and Salaries	$ 157,809	2.12%	$ 37,967	1.80%	$ 124,766	1.56%	$ 7,924	0.70%
Direct Employment	9.7	2.12%	2	1.76%	5.2	1.56%	0.3	0.60%
Total Income	$ 225,356	2.12%	$ 54,875	1.79%	$ 173,944	1.56%	$ 11,027	0.70%
Total Employment	11.2	2.12%	3	1.75%	6.3	1.55%	0.4	0.68%
Non-Market Impact								
Consumer's Surplus	$ 115,636	2.12%	$ 24,908	1.92%	$ 115,948	1.56%	$ 11,495	0.70%
Profit[1]	$ 9,504	2.12%	$ 1,469	1.92%	n/a	n/a	n/a	n/a
Federal								
Person-days	10,803	7.16%	923	2.56%	8,812	4.12%	538	1.14%
Market Impact								
Direct Sales	$ 1,398,939	7.13%	$ 157,999	2.73%	$ 830,792	4.12%	$ 34,439	1.14%
Direct Wages and Salaries	$ 530,594	7.13%	$ 57,998	2.74%	$ 329,475	4.12%	$ 12,888	1.14%
Direct Employment	32.5	7.11%	4	2.83%	14	4.10%	0.6	1.21%
Total Income	$ 757,642	7.13%	$ 83,592	2.73%	$ 459,341	4.12%	$ 17,935	1.14%
Total Employment	37.4	7.11%	4	2.81%	16.6	4.11%	0.7	1.19%
Non-Market Impact								
Consumer's Surplus	$ 389,917	7.16%	$ 33,301	2.56%	$ 306,190	4.12%	$ 18,698	1.14%
Profit[1]	$ 32,048	7.16%	$ 1,964	2.56%	n/a	n/a	n/a	n/a
Total New								
Person-days	14,007	9.28%	1,613	4.48%	12,149	5.68%	869	1.84%
Market Impact								
Direct Sales	$ 1,815,098	9.25%	$ 261,724	4.52%	$ 1,145,397	5.68%	$ 55,612	1.84%
Direct Wages and Salaries	$ 688,403	9.25%	$ 95,965	4.54%	$ 454,241	5.68%	$ 20,812	1.84%
Direct Employment	42	9.23%	6	4.59%	19	5.66%	1	1.81%
Total Income	$ 982,998	9.25%	$ 138,466	4.53%	$ 633,284	5.68%	$ 28,962	1.84%
Total Employment	49	9.23%	7	4.56%	23	5.66%	1	1.87%
Non-Market Impact								
Consumer's Surplus	$ 505,553	9.28%	$ 58,209	4.48%	$ 422,138	5.68%	$ 30,193	1.84%
Profit[1]	$ 41,553	9.28%	$ 3,433	4.48%	n/a	n/a	n/a	n/a
Existing State								
Person-days	15,167	10.05%	6,051	16.82%	28,320	13.23%	12,113	25.67%
Market Impact								
Direct Sales	$ 1,982,725	10.10%	$ 610,031	10.54%	$ 2,670,013	13.23%	$ 775,228	25.67%
Direct Wages and Salaries	$ 751,541	10.10%	$ 222,151	10.51%	$ 1,058,873	13.23%	$ 290,116	25.67%
Direct Employment	46	10.13%	14	11.03%	44	13.24%	13	25.60%
Total Income	$ 1,073,389	10.10%	$ 321,779	10.52%	$ 1,476,236	13.23%	$ 403,725	25.67%
Total Employment	53.2	10.12%	17	10.95%	53.3	13.24%	15	25.61%
Non-Market Impact								
Consumer's Surplus	$ 547,449	10.05%	$ 218,392	16.82%	$ 984,039	13.23%	$ 420,889	25.67%
Profit[1]	$ 44,996	10.05%	$ 12,880	16.82%	n/a	n/a	n/a	n/a
Cumulative Total								
Person-days	29,174	19.34%	7,663	21.30%	40,469	18.91%	12,982	27.51%
Market Impact								
Direct Sales	$ 3,797,823	19.34%	$ 871,755	15.07%	$ 3,815,410	18.91%	$ 830,840	27.51%
Direct Wages and Salaries	$ 1,439,944	19.34%	$ 318,116	15.05%	$ 1,513,114	18.91%	$ 310,928	27.51%
Direct Employment	89	19.36%	20	15.62%	63	18.90%	14	27.42%
Total Income	$ 2,056,387	19.34%	$ 460,245	15.05%	$ 2,109,520	18.91%	$ 432,687	27.51%
Total Employment	102	19.35%	23	15.51%	76	18.90%	16	27.48%
Non-Market Impact								
Consumer's Surplus	$ 1,053,001	19.34%	$ 276,601	21.30%	$ 1,406,177	18.91%	$ 451,082	27.51%
Profit[1]	$ 86,549	19.34%	$ 16,313	21.30%	n/a	n/a	n/a	n/a

1. Profit is used as a proxy for producer's surplus.

Comparison of Alternatives – Step 1 Analysis

Commercial Fishing & Kelp. Alternative One has the lowest potential impact on the commercial fisheries since the two MPA areas added are marine conservation areas, which allow legally sanctioned fishing for pelagics, spot prawn, white seabass and squid. In addition, for the species/species groups prohibited (rockfish and bottom fish, primarily flatfish) our database indicated that there was zero catch for these species/species groups in the two areas. The only impact is from the existing State MPAs.

The potential impacts of Alternative Two lie between those of Alternative One and Alternative Three. There is very little difference between Alternatives Two and Three. The new proposed areas of Alternative Two potentially impact an additional 1.18% of ex vessel value of catch in the CINMS, while Alternative Three potentially impacts 1.63% of ex vessel value in the CINMS. Estimated potential impacts, measured in terms of income and employment in the local county economies, also show slightly higher impacts for Alternative Three (Table 2.23).

Table 2.23 Commercial Fishing & Kelp: Summary of Impacts by Alternative - Step 1 Analysis

Alternative	Additional State	%[1]	Federal	%	Total New Proposal	%	Existing State	%	Cumulative Total	%
					Ex Vessel Revenue [2]					
1	$0	0	$0	0	$0	0	$2,729,295.00	11.32	$2,729,295	11.32
2	$159,955	0.66	$123,725	0.51	$283,680	1.18	$2,729,295.00	11.32	$3,012,975	12.50
3	$195,851	0.81	$196,732	0.82	$392,584	1.63	$2,729,295.00	11.32	$3,121,879	12.95
					Income[3]					
1	$0	0	$0	0	$0	0	$8,544,396.00	11.93	$8,544,396	11.93
2	$499,787	0.70	$439,661	0.61	$939,448	1.31	$8,544,396.00	11.93	$9,483,844	13.24
3	$658,443	0.92	$649,618	0.91	$1,308,061	1.83	$8,544,396.00	11.93	$9,852,457	13.75
					Employment [4]					
1	0	0	0	0	0	0	246	12.58	246	12.58
2	15	0.77	13	0.66	28	1.43	246	12.58	274	14.01
3	20	1.02	19	0.97	39	1.99	246	12.58	285	14.57

1. Percents are the percent of total baseline.
2. Ex vessel revenue received by fishermen and processed value of kelp, baseline for entire CINMS is equal to $24,103,965.
3. Income is total income, including multiplier impacts. Baseline is equal to $71,649,948.
4. Employment is total employment, including multiplier impacts. Baseline is 1,956 full and part-time jobs.

Recreational Consumptive Activities. As with the commercial fisheries, Alternative One has the lowest impact on consumptive recreational activities because of the exemptions to fishing in the marine conservation areas. Unlike the case for the commercial fisheries, there was some potential impact of Alternative One on the recreational consumptive activities, but the impacts are still the lowest potential impact across all alternatives. This is true despite the fact that there was no information on consumptive diving for lobsters (we were not able to adjust the potential impacts downward for this exemption, so our estimates overstate the impact).

As with the commercial fisheries, the potential impacts of Alternative Two on consumptive recreation activities lie between those of Alternative One and Alternative Three. There is more of difference between Alternatives Two and Three for consumptive recreational activities than for commercial fisheries. Alternative Three potentially impacts an additional 1.4% of all consumptive recreation activity in the CINMS than Alternative Two (Table 2.24).

Table 2.24 Consumptive Recreation Summary of Impacts by Alternative - Step 1 Analysis

Alternative	Additional State	%[1]	Federal	%	Total New Proposal	%	Existing State	%	Cumulative Total	%
					Person-Days [2]					
1	647	0.1	1,405	0.3	2,052	0.5	61,651	13.8	63,703	14.2
2	7,361	1.6	15,005	3.3	22,365	5.0	61,651	13.8	84,016	18.8
3	7,562	1.7	21,075	4.7	28,637	6.4	61,651	13.8	90,288	20.2
					Income[3]					
1	$37,713	0.1	$97,360	0.4	$135,072	0.5	$3,275,128	12.4	$3,410,200	**12.9**
2	$452,604	1.7	$935,292	3.5	$1,387,895	5.3	$3,275,128	12.4	$4,663,023	**17.7**
3	$465,200	1.8	$1,318,509	5.0	$1,783,709	6.8	$3,275,128	12.4	$5,058,837	**19.2**
					Employment [4]					
1	2	0.2	3	0.3	5	0.4	138	12.1	143	**12.6**
2	20	1.8	42	3.7	62	5.4	138	12.1	200	**17.6**
3	21	1.8	59	5.2	79	6.9	138	12.1	217	**19.1**

1. Percents are the percent of total baseline.
2. Person-days of consumptive recreation activity is equal to 448,054..
3. Income is total income, including multiplier impacts. Baseline is equal to $26,416,557.
4. Employment is total employment, including multiplier impacts. Baseline is 1,138 full and part-time jobs.

Total of All Consumptive Activities. Alternative One has the lowest potential impact on all consumptive activities since the marine conservation areas exempt most consumptive uses. Alternative One has an estimated additional potential impact of about $135 thousand in lost income and a reduction of 5 full and part-time jobs in the local county economies. This represents only 0.13% of the total income and 0.2% of the employment generated by consumptive activities in the CINMS. Alternative Two has an estimated additional potential impact of about $2.3 million in lost income compared to almost $3.1 million in additional lost income by Alternative Three. Alternative Two potentially impacts an additional 2.37% of all the income generated by consumptive activities in the CINMS compared to 3.15% for Alternative Three. Results are similar for employment (Table 2.25).

Table 2.25 All Consumptive Activities: Summary of Impacts by Alternative - Step 1 Analysis

Alternative	Additional State	%[1]	Federal	%	Total New Proposal	%	Existing State	%	Cumulative Total	%
					Income[2]					
1	$37,713	0.04	$97,360	0.10	$135,072	0.14	$11,819,524	12.1	$11,954,596	12.2
2	$952,391	0.97	$1,374,953	1.40	$2,327,343	2.37	$11,819,524	12.1	$14,146,867	14.4
3	$1,123,643	1.15	$1,968,127	2.01	$3,091,770	3.15	$11,819,524	12.1	$14,911,294	15.2
					Employment [3]					
1	2	0.1	3	0.1	5	0.2	384	12.4	389	12.6
2	35	1.1	55	1.8	90	2.9	384	12.4	474	15.3
3	41	1.3	78	2.5	119	3.8	384	12.4	503	16.3

1. Percents are the percent of total baseline.
2. Income is total income, including multiplier impacts. Baseline is equal to $98,066,505
3. Employment is total employment, including multiplier impacts. Baseline is 3,094 full and part-time jobs.

Chapter 3 – Step 2 Analysis

Chapter 2 provided our Step 1 analysis of alternatives. Many tables, which contained many numbers, were presented. Here our approach is more comprehensive, but also much less quantitative since all the benefits and costs of marine reserves cannot be quantified. Even though we are not able to exactly quantify the benefits to nonconsumptive users we use 'benefit transfer" methods and policy simulation to derive a range of possible values. We are not able to do this for all nonconsumptive recreation, since as noted in previous sections, there is no available information on the extent of nonconsumptive recreation in the CINMS by access from private household boats. A two-year study is now underway to try and quantify the use and value of use of the activity by this user group.

For nonuse/passive economic use value of marine reserves, we are not able to apply "benefit transfer" methods, since there are no studies in the literature that estimate the passive economic use values for no-take areas anywhere in the world. Instead, we conduct a policy analysis simulation using conservative assumptions about the percent of U.S. households that would be willing to pay for marine reserves and a lower bound range of annual values they might be willing to pay. This policy analysis simulation then allows us to conduct an assessment of the potential net benefits of marine reserves in the CINMS.

We don't always have a common metric across different uses or user groups. This prevents us from conducting a formal benefit-cost analysis BCA. In addition, formal BCA only addresses economic efficiency criteria, whereas our Step 1 analyses include a broader socioeconomic impact analysis. What we do try to do here is address the question of 1) how likely is it that the Step 1 Analysis results are real? (Under what conditions and time frames might they be underestimates or overestimates of the impact of costs or might short-term costs turn into long-term benefits) and 2) Once we look at the benefits side of the ledger, using 'benefits transfer methods and "policy analysis simulation", can we say anything about net benefits or costs?

As mentioned in the introduction to this report, there is a lot of uncertainty about forecasting the future biophysical responses and socioeconomic behavioral responses that will determine outcomes. The Science Panel has not provided quantitative forecasts of biophysical conditions, for which we could then quantify the socioeconomic dimensions. There is simply a limitation in data and models and as the Science Panel has recognized, it would be an overwhelming task to address species-by-species the biophysical responses to protection strategies. But as we also mentioned in the introduction, adaptive management is the institutional response to uncertainty and what we provide here is information and what is known from our theoretical literature on what are the important factors to understand. We hope all this will better inform the adaptive management process.

Before launching into our analyses, we first discuss the many issues, mitigating and offsetting factors and some theoretical literature that may provide some guidance in interpreting or understanding how the many factors interact and the qualitative direction of outcomes under various conditions.

Current Status of Exploited Fishing Stocks. One of the basis assumptions of our Step 1 analysis for the consumptive activities is that our baseline estimates of impact can be used as an approximation of the average impact in the future. This assumes that the current levels of exploitation are sustainable in the future. The Science Panel did not rely on single species stock assessments to develop their design criteria. Formal stock assessments have been done on a few species or are underway (e.g., sardine, squid, cowcod, blackgill rockfish, bocaccio, and red sea urchins). Some data are available for sea cucumber. No data (or limited data) is available for, spiny lobster, prawn, abalone, crab, and California Sheephead.

As mentioned in previous sections, in developing our baseline estimates we looked at the trends in catch of the 14 species/species groups in our commercial fishing analysis (see Appendix C). Table 3.1 summarizes the trends, along with the trends and status of some species/species groups as summarized by the Science Panel. As noted above, few stock assessments have been completed. The only widely recognized species/species groups that are considered to be in overfished status are rockfish; the large species group, Groundfish, which rockfish are a component; abalone; and now spot prawn. In our assessment to establish baselines for Step 1 analyses, we found that 10 of the 14 species/species groups had no general trends and

that the 1996-2003 average catches and ex vessel value of catch would serve as the best estimate of what could be sustained in the future. Three of the species/species groups; rockfish, tunas and prawn, showed steep downward trends. For rockfish and prawn, special regulatory actions are in effect. For rockfish, the cowcod closure areas, the Rockfish Conservation Areas and the Groundfish Closures are currently in effect. Rockfish made up less than one percent (0.63%) of our estimate of baseline ex vessel value (abalone was not in our baseline since harvest was halted in 1997). Prawn also made up less than one percent of the baseline (0.87%), while tuna only made up 0.01% of the baseline. Flatfish and most sharks caught in the CINMS are also classified as Groundfish under the Federal Groundfish Management Plan. In the CINMS, flatfish and shark catches have been fairly stable for the 1996-2003 period.

Tables 3.2, 3.3 and 3.4 show the catch and ex vessel value of catch, by gear type for the period 2000 through 2003. Most of the emphasis in the Federal Groundfish Management Plan is on trawling for Groundfish (limited entry and vessel buy-back program). Tables 3.2 and 3.3 show that trawling have not been an important gear type used for either rockfish or flatfish in the CINMS. For prawn, trawling was an important gear type, especially for ridgeback prawn. The trawling prohibition for spot prawn did not take effect until 2003, yet catch of prawn from trawling in the CINMS was in steep decline prior to the prohibition for both species of prawn. The share of spot prawn caught by trap gear has been increasing since 2000 and by 2003 94% of spot prawn was being caught by trap gear (Table 3.4).

Table 3.1 Commercial Fishing and Kelp: Trends and Status of Stocks

Species	Trends in CINMS	Trends in CA	Trends/Status Science Panel Status Report
Squid	downward	downward	none/assessment underway
Wetfish	upward	upward	unknown/not assessed
Rockfish	downward	downward	downward/overfished
Urchins	none	none	downward/lack of food (sea weed and kelp)
Crabs	upward	upward	none/not assessed
Spiny Lobsters	none	none	none/stable
Flatfish	upward	upward	unknown/not assessed
Sea Cucumber	none	none	downward/underway
Sculpin/Bass	upward	upward	downward/underway
Tuna	downward	downward	unknown/not assessed
Shark	none	none	unknown/not assessed
CA Sheephead	none	none	unknown/not assessed
Prawn	downward	downward	ridgeback downwad/spot not well studied
Kelp	downward	downward	downward/higly influenced by El Nino events

Source: Science Panel Report

Table 3.2 Rockfish Catch in the CINMS by Gear Type: 2000 - 2003

	2000			2001		
Species/Gear	Pounds	Value ($)	% of Value	Pounds	Value ($)	% of Value
Rockfish						
Hook& Line	59,129	281,659	53.75	29,651	142,870	35.10
Longline	55,764	144,937	27.66	86,327	222,591	54.69
Trap	18,683	90,159	17.20	8548	41,534	10.21
Trawl	3,629	5,859	1.12	162	159	0.04
Nets	830	1,324	0.25	1966	1,798	0.44
Other	17	111	0.02	0	0	0.00
Total	138,052	524,049	100.00	126,654	406,995	100.00

	2002			2003		
Rockfish						
Hook& Line	28,901	142,848	65.45	17,592	60,801	39.77
Longline	28,121	60,489	27.72	35,860	70,467	46.09
Trap	3,274	12,645	5.79	4708	19,654	12.85
Trawl	1,625	1,183	0.54	2,714	812	0.53
Nets	526	846	0.39	546	1,158	0.76
Other	40	240	0.11	0	0	0.00
Total	62,487	218,251	100.00	61,420	152,892	100.00

Table 3.3 Flatfish Catch in the CINMS by Gear Type: 2000 - 2003

	2000			2001		
Species/Gear	Pounds	Value ($)	% of Value	Pounds	Value ($)	% of Value
Flatfish						
Hook& Line	9,215	25,090	11.36	9,892	30,342	13.06
Longline	559	1,615	0.73	1,629	4,123	1.78
Trap	152	269	0.12	190	154	0.07
Trawl	6,134	10,445	4.73	4,520	5,925	2.55
Nets	60,715	183,035	82.91	65,270	191,719	82.54
Other	66	318	0.14	0	0	0.00
Total	76,841	220,772	100.00	81,501	232,263	100.00

	2002			2003		
Flatfish						
Hook& Line	10,966	41,825	16.11	5,755	22,931	7.68
Longline	1,812	3,716	1.43	395	669	0.22
Trap	203	305	0.12	17	17	0.01
Trawl	11,274	20,981	8.08	17,711	19,774	6.63
Nets	63,188	191,479	73.75	77,306	255,082	85.46
Other	230	1,322	0.51	0	0	0.00
Total	87,673	259,628	100.00	101,184	298,473	100.00

Table 3.4 Prawn Catch in the CINMS by Gear Type: 2000 - 2003

	2000			2001		
Species/Gear	Pounds	Value ($)	% of Value	Pounds	Value ($)	% of Value
Spot						
Trap	42,108	386,269	51.01	42,470	387,962	63.43
Trawl	44,121	365,091	48.22	27,227	223,663	36.57
Other	712	5,853	0.77	4	6	0.00
Total	86,941	757,213	100.00	69,701	611,631	100.00
Ridgeback						
Trap	304	2,399	1.29	132	1,189	13.34
Trawl	145,458	179,061	96.27	5,193	7,726	86.66
Other	3,885	4,546	2.44	0	0	0.00
Total	149,647	186,006	100.00	5,325	8,915	100.00
All Prawn						
Trap	42,412	388,668	41.21	42,602	389,151	62.71
Trawl	189,579	544,152	57.69	32,420	231,389	37.29
Other	4,597	10,399	1.10	4	6	0.00
Total	236,588	943,219	100.00	75,026	620,546	100.00
	2002			2003		
Spot						
Trap	29,025	271,107	72.11	20,153	197,972	94.00
Trawl	13,207	104,880	27.89	1,109	9,960	4.73
Other	0	0	0.00	271	2,680	1.27
Total	42,232	375,987	100.00	21,533	210,612	100.00
Ridgeback						
Trap	0	0	0.00	26	61	16.62
Trawl	6,504	13,896	100.00	177	306	83.38
Other	0	0	0.00	0	0	0.00
Total	6,504	13,896	100.00	203	367	100.00
All Prawn						
Trap	29,025	271,107	69.54	20,179	198,033	93.86
Trawl	19,711	118,776	30.46	1,286	10,266	4.87
Other	0	0	0.00	271	2,680	1.27
Total	48,736	389,883	100.00	21,736	210,979	100.00

In the face of steep declining trends for rockfish and prawn catch in the CINMS, and the regulations in effect, we have assumed that 2003 levels of catch are sustainable in the future and therefore served as our baseline in Step 1 analysis. If the regulatory actions are not successful in stemming these declines, then our baselines result in overestimation of the negative impact of the MPAs.

Kelp, and the interaction of many species and kelp, has been noted and kelp and seaweed have been heavily impacted by warm water El Nino events. Kelp is assigned a general downward trend, but with expectations of recovery as warm water events subside. We have not been able to find any information saying there is an over harvesting of kelp.

Recent stock assessments for red urchins indicate there is no problem with the number of urchins, but in the number that are reaching harvestable size due to a lack of seaweed and kelp (Barilloti, 2003). Urchin catch was down from its 1996-1999 average in the 2000 and 2001 and has rebounded in 2002 and 2003. Red urchins seem to be sensitive to warm water events that reduce available feed. The warm water events are temporary and we saw no general trend for red urchins, so we used the 1996-2003 average for our estimate of the baseline in Step 1 analysis.

We have not discovered any information to explain the downward trend in tuna catch in the CINMS. Tuna catch in the CINMS is now of little value. Total ex vessel value of catch from the CINMS in 2003 was only $3,085. Any impacts on tuna catches will not be significant.

Given that the three species/species groups with declining trends combined make up only about 1.5% of the baseline ex vessel value of catch and the harvest value of kelp from the CINMS, if the trends continue downwards for these species/species groups, it will have little effect on estimates of impact from our Step 1 analyses.

Replenishment Effect/Stock Effects. This refers to the notion that stocks of currently exploited species will increase in biomass if the stocks are protected by marine reserves. The issues can be complex, but for our purposes it only matters if there is a net increase in biomass and aggregate harvest in the remaining open areas due to the marine reserve protection. Some species of rockfish have long and slow growing life cycles and therefore replenishment effects will take place over much longer time frames. Replenishment effects will generally take place over longer periods of time and this factor should yield increasing mitigation of costs over time and, under certain conditions, could be expected to yield net benefits sometime in the future. For consumptive users, there may be mitigation of costs even in the short-term. Many consumptive users have been observed lining up along the edges of marine reserves in the Florida Keys National Marine Sanctuary (FKNMS Research and Monitoring Report, 2001). In a recent issue of *Science*, Roberts et al (2001) show the edge effects of the Merritt Island National Wildlife Refuge at Cape Canaveral, Florida on recreational fishing records maintained by the International Game and Fish Association (IGFA). There were more recreational fishing records set on the edge of this reserve than in all of the rest of Florida and the number of records is increasing faster on the edge of the reserve than in all the rest of Florida. Also, net increase in biomass and aggregate harvests were two criteria Sanchirico and Wilen (2001) addressed for commercial fisheries, which will be discussed in more detail below.

Substitution/Relocation. For commercial fishing and kelp harvesting, a mitigating or offsetting factor would be the ability to relocate effort to others areas and be just as successful (no loss) or be able to at least mitigate losses to some degree. For the recreation consumptive users (recreational fishing and consumptive diving), the issue is similar, except the recreation consumptive users are the final consumers of the services from the natural environment. Can this group of users find perfect substitutes by relocating to other sites (no loss) or will they find less than perfect substitutes involving either increased costs (travel to more distant sites) or reduced quality (catch per unit of effort, different species mix, rougher or less protected waters)? This will be discussed further in the section on Recreation Consumptive use.

For consumptive users displaced from current sites, a fundamental issue is the current status of the stocks of species, for which they pursue in the areas outside the protected areas. Also, as discussed in the benefits and costs section of the introduction to this report, the impact will be contingent on how the areas outside the marine reserves respond ecologically/biologically. And following Sanchirico and Wilen (2001) one can see that the net effects depend on both the ecological/biological responses and the human responses. Generally, the larger the area included in marine reserves, the lower the probability that substitution and relocation will be successful in mitigating or offsetting Step 1 impacts.

Crowding/Congestion Effects. Displacement of consumptive users means we have to address what happens to this displaced effort. The net result of crowding or congestion effects is to increase estimates of negative impact beyond those estimated in Step 1. This is the most important exception to our references to baseline estimates as representing maximum potential losses.

The Science Panel concluded that the effort displaced from the marine reserves must not be allowed to relocate to the remaining open areas or the catch in the remaining open areas must remain constant. Under this scenario, estimates in our Step 1 analyses would remain our best estimates. In the Nearshore Fishery Management Plan, there is also recognition that the fisheries management plan will have to be integrated with the Marine Life Protection Act (MLPA) closed areas and this will mean holding catch and/or effort in the remaining open areas at current levels when implementing closed areas. This is to avoid the damaging effect of relocating effort and resulting reduced catches in the remaining open areas. Again, our Step 1

analysis estimates would be applicable in this situation. But if catch is not held constant in the remaining open areas or effort not reduced to match the displaced effort from the closed areas, and the stocks are at MSY or below, then the released effort would simply be crowded into a smaller remaining space and will drive the fisheries in the remaining open areas to sub-optimal conditions, perhaps resulting in the collapse of these fisheries. If crowding and congestion lead to reductions in harvest from the remaining open areas, then our Step 1 estimates are underestimates. It is important to note that there is not one study of marine reserves that demonstrates that crowding or congestion effects have occurred. It does, however, remain a theoretical possibility.

In Sanchirico (2004) and Sanchirico (2005), bioeconomic metapopulation analyses are used to simulate the net effect of marine reserves on commercial fishing. As in Sanchirico and Wilen (2001), it is the net effect of the interaction of biophysical system and the human system that determines outcomes. The bioeconomic metapopulation analyses show that the conclusions reached by biologists about the net effect of marine reserves on fish stocks do not generally hold once the human system is included in the analyses. Sanchirico (2004 and 2005) finds there are conditions where commercial fisheries can benefit from marine reserves, but also conditions where there would be long-term losses to commercial fisheries. Generally, if fisheries were rationally managed (managed to maximize economic rents), marine reserves result in net long-term losses to commercial fisheries. However, if fisheries are not managed rationally (current management) then marine reserves can have net long-term gains to commercial fisheries. In most simulation scenarios with non-rational fisheries management, marine reserves covering 30% of fishing areas resulted in net gains to the commercial fisheries. Rational fishery management actions had greater impacts than marine reserves. However, the kinds of rational management actions discussed by Sanchirico are not even being considered in fisheries of the CINMS. The fisheries in the CINMS are currently managed under situations described by Sanchirico as non-rational management (primarily open access) and so the most likely outcome for the CINMS is that commercial fisheries will benefit from marine reserves and our Step 1 impacts overstate impacts, especially over the long-term.

Quality Increases in Marine Reserves. The Science Panel's review of the literature points to the tremendous amount of research showing the increases in many dimensions of the quality of sites that have been protected by no take regulations. Often the changes that occur on the sites protected are noticeable in a year or less (Florida Keys National Marine Sanctuary Monitoring Report, 1999). Increases in the numbers and average size of animals are a common finding. Changes in biodiversity, community structure, and general habitat conditions have been known to take place even in the short-term and would be expected to improve further over time. For nonconsumptive users, nonusers or those with passive economic use values there would be growing benefits over time. There are also the scientific and education benefits of studying and observing changes and having control sites, which help in interpreting the relative causes of the changes observed.

Other Regulations. Other regulations can work towards mitigating, offsetting, avoiding costs, or increasing the costs. Some regulations are known to have short-term costs with long-term benefits to the fishermen. But because many fisheries are open access, fishermen that suffer the short-term costs (make an investment) are not guaranteed that they will receive the benefits (the return on investment).

Most regulations are a response to a problem, which if not addressed, would presumably get worse. The status quo would result in increasing losses. So the assumption that any changes in current activities are always losses doesn't take into account that the future path may be lower levels of current activity without the regulatory intervention. In this case, our baseline estimates of loss are overestimates because the levels of activity are not sustainable. We addressed this issue above in the status of the stocks.

Many fishery regulations are what economists describe as regulated inefficiency. Sometimes inefficiencies are imposed to more equitably spread out the benefits of a fishery by forcing all involved to adopt more economically inefficient methods of harvest. But in the commercial fisheries, fish is mostly a food product that competes with many food products. Over the long run, pressure builds and market forces work to the detriment of those that produce inefficiently. These are forces beyond the control of fishermen or fishery managers. Most economists recommend against using inefficiency, except as a temporary transition strategy. Regulations that make the fisheries inefficient will lead towards a status quo (without marine

reserves) downward path in the regulated activity. This would mean that our baseline estimates in Step 1 are overestimates of potential costs. The weekend closure of the squid fishery is a good example of regulated inefficiency and will be discussed further below.

Regulations may be designed to benefit one group at the expense of another group. Allocation between user groups of total allowable catch is an example. California Proposition 132 restricted the use of gill nets within one mile from shore. This has reduced catch to gill net fishermen and some are claiming that this has been a benefit to recreational fishermen (Kronman, 2001). The only trend data we had on the recreational fisheries was that for Southern California and the CDFG log book data for charter/party boats that operate in the CINMS. As we noted in previous sections, the trends in Southern California are up, while the trends for charter/party boats in the CINMS is down.

Some measures are taken only when the fisheries have collapsed or are at near collapse. The cowcod closures and the Nearshore Fishery Management Plan for rockfish are good examples. The efforts here are on rebuilding stocks. Many have joked that the development of a fishery management plan is the beginning of the end of a fishery. An obvious overstatement, but there have been many more failures than successes in fishery management in the marine environment. In the MRWG process, some viewed the cowcod closure as a substitute for marine reserves in the CINMS. We think the cowcod closure falls into that category of a regulation that requires investment to get a future return. But with many rockfish (because of their noted slow growth rates and longer life cycles) this may require a long-term investment to get an even longer-term return on investment. Given the open access nature of the fishery, we would predict that fishermen would heavily discount future benefits, since they don't expect to see the returns. They would not want to make further investments in more closed areas. The impacts that we have estimated in Step 1 are in addition to the impacts already felt from the cowcod closure. There is no additional impact beyond what we have estimated. We don't see the cowcod closure as a factor making the impact of the marine reserves greater than we have estimated in Step 1. If the cowcod closure works, it should be a long-term mitigating and offsetting factor making our estimates of impact overestimates in the long-term. The striped bass closures on the East Coast of the U.S. were a great success after five years. Both the commercial and recreational fisheries have benefited greatly. The CDFG did open some of the previously closed areas to compensate for the existing State closed areas in the CINMS. Some of the areas were just the nearshore areas closed to invertebrates, so the offsets will be limited to those consumptive user groups pursuing invertebrates. Opening up the cowcod closure areas will offset the losses to those pursuing species restricted by the cowcod closure. So even in the short-term our Step 1 analyses will overstate the costs when the cowcod closure and the Nearshore Fishery Management Plan are considered.

MLPA Process. The Marine Life Protection Act (MLPA) is a California law directing the establishment of a network of marine protected areas (including no take areas) throughout the State. The CINMS areas in State waters were the first to be implemented. The existing State MPAs in the CINMS went into effect on April 9, 2003. Other efforts that were simultaneously underway have been delayed. Establishment of these areas would additionally impact consumptive users. In establishing additional areas outside the CINMS, it will be important to recognize the cumulative impact that these areas will have. In our Step 1 analysis, we evaluated the additional impacts from extending the existing State MPAs in the CINMS to additional State waters and Federal waters (this regulatory action) and then evaluate the cumulative impact, including the impact of the existing State MPAs. For additional MPAs outside the CINMS, there is not a specific set of proposed areas right now, so there is no way we can add impact now. We can only recognize that these areas may present additional impact in the future. If data and analyses are done, as was done here for the CINMS sites, one should be able to estimate the impacts of future closed areas. The MLPA process may also be used to implement the concept of phasing marine reserves. This will be discussed further under the phasing section. As discussed above, given the state of current fishery management, we might expect there would be gains to commercial fisheries in the long-term.

MLMA Process. The Marine Life Management Act (MLMA) is a California law directing the establishment of fishery management plans. Above we mentioned the Nearshore Fishery Management Plan. Another plan currently under development that will be highly relevant is the squid plan. The squid plan is not final, but some of the options include a limited entry program and a reduction in current capacity. As mentioned above with respect to the crowding issue and the Science Panel's recommendation

of catch and/or effort reductions in the remaining open areas, matching displaced catch and effort from the marine reserves would be a requirement that would need to be incorporated in all the management plans if stocks are at or below MSY or else the crowding effects could make losses greater than our Step 1 analyses. However, there are conditions for which the crowding effects won't occur. Until other fisheries management plans are finalized, we can't assess their impacts. However, none of the plans are currently considering the kinds of rational fishery management addressed in Sanchirico (2004 and 2005) in analyzing the potential impacts of marine reserves. This suggests that these fishery management plans will not accomplish the kinds of improvements in the fisheries that will be accomplished by marine reserves.

One example of rational fishery management is the use of individual transferable quotas (ITQs). There have been limited discussions of the use of ITQs in developing fishery management plans. ITQs are preferred by a large majority of economists because they can be designed to take advantage of market efficiencies. ITQs address the fundamental problems of open access, common property resources. They allow users to benefit from investments in the fisheries. Issues of equity and efficiency can be addressed in initial assignments of quotas. ITQs would no doubt result in much greater initial reductions in capacity, income and employment in the commercial fisheries. But over the long-term this approach would most likely yield sustainable commercial fisheries that would have the best chance of competing with other food products. This kind of rationalization of the fisheries would lead to very high offsets in losses estimated in our baseline Step 1 analysis. However, so far there appears to be no serious efforts in this direction.

How ITQs would affect the recreational fishing community is unknown without addressing the details of one of the key first steps, allocation of a given allowable catch between the commercial and recreational fisheries. The usual approach is historical proportions. There is usually a dearth of data and analysis to support an economic approach i.e., one that maximizes the value of the use of the resources.

One approach to ITQs that has been overlooked by most attempting to implement ITQs is the possible double payoff of letting nonusers buy ITQs and then not harvest their allotment. This allows the stocks to grow to a larger size. User group allocations and ITQs are stated in terms of a share of the allowable catch. Allowable catch grows over time and each user group is a beneficiary. Nonusers get to put their money where their mouth is, so to speak, and everyone benefits.

If ITQs were implemented in the commercial fisheries, our estimates of impact from marine reserves would be overestimates since implementation of the ITQs would result in much lower capacity in the fisheries[5]. For the recreational fisheries, the impacts would be dependent on the allocations of allowable take. If nonusers were allowed to purchase ITQs and not harvest their share, our estimates for all consumptive user groups would be overestimates.

ITQ don't solve all the problems in the fisheries. Holland (2004) discusses other externalities, such as "high grading" (culling out and disposing of smaller less valued fish to maximize value of the quota). Holland also discusses the need for additional tools required to address these other externalities. He analyses the use of spatially specific ITQs.

The recent Ocean Commission Report mentions an alternative to ITQs by avoiding the issue of property rights and instead granting privileges to total allowable catch (TAC) by permit. The issue then changes from property rights to dedicated access privileges (DAPs). TACs would be biologically determined and permits would include a specification on the share of TAC. Bromley (2005) has recently provided an analysis using auctions to have fishermen bid on time-limited permits that extend the privilege to harvest a certain share of the TAC. If one violates the conditions of the permits, the fishery manager can revoke the permit (a privilege not a right to the resources).

Existing Area and Temporal Closures. Above we addressed the cowcod closure and to some extent the closure of nearshore areas to gill nets and to taking of invertebrates. The U.S. Department of Interior's Fish and Wildlife Service and Channel Islands National Park have seasonal area closures to protect nesting birds. These regulations may have some additional impacts from what we have estimated. Those regulations that were already in effect in areas that will now be marine reserves will mean no additional impact than we already estimated in Step 1, i.e., they were already accounted for in our Step 1 analysis.

For those areas outside the marine reserves, the impacts would be in addition just as in other area closures discussed above.

Pendleton, Cai and Lutz (2001) analyzed temporal closures (weekend closures) in the Southern California squid fishery. They found that temporal closures resulted in fishermen taking more risks by fishing in bad weather conditions. This raises the cost of harvest (accidents go up with possible injury to crew and loss of life and/or property and insurance rates go up) as crew and equipment are put at greater risk. This is an unintended cost of the effort-reduction regulation. Pendleton, Cai and Lutz (2001) cite an abundance of the economic literature documenting and commenting on the unintended economic costs of effort-limiting regulations.

The interaction of temporal closures and geographic closures could have a compounding effect which would make our estimates of impact underestimates as the squid fishermen take more risks by fishing in bad weather conditions, while crowded into smaller remaining open areas.

Economic Conditions and Other Outside Forces and Internal Forces. Many fishermen, especially commercial fishermen, have expressed concerns about the many outside forces and internal forces that they believe are affecting their ability to maintain sustainable fisheries. Many issues were gleaned from the ethnographic data survey conducted for the CINMS. See Kronman et al (2001). We summarize the issues below.

Outside Forces

- Poor Asian economy
- Strong dollar
- International competition
- Increased cost-of-living in coastal areas
- El Nino events
- Pollution and habitat destruction from coastal development
- Conflicts over environmental allocations (sea otters, seals and sea lions, birds)
- Conflicts among user groups

Internal forces

- Aging workforce
- Industrial organization (buyers and processors with monopoly power over fishermen)
- Open access and overcapitalization and biological and/or economic overfishing

Outside Forces. Before the recessions in the Asian economies, California fisheries were benefiting from Asian demands for Live Fish and Spiny Lobster, for which fishermen were receiving significantly higher prices. The Chinese demand for squid raised prices to fishermen. Urchins primary market is Japan. The combination of the recent strong dollar and economic slow down in Asia has put strong downward pressures on demand and prices for some of the most valuable fisheries in California. As we showed in Chapter 2, CINMS catch of squid and urchins were only a small percent of world supply and fishermen face strong international competition. The strong dollar puts California fishermen at a competitive disadvantage. Recently, favorable conditions have returned in Asian markets for CINMS catch and the dollar has weakened.

Coastal development increases the general cost-of-living. Commercial fishermen must compete for limited dock space at local ports and harbors with costs of berthing their boats on the rise. Many feel that coastal development is also destroying important habitat and increases pollution that affects the fish stocks on which their livelihoods depend.

Fishermen find themselves in conflict with environmental groups that represent the interests of Americans that value the protection of various wildlife species (e.g., sea otters, seals and sea lions and birds) that compete for the seafood they are harvesting.

There are also conflicts between commercial fishermen and recreational fishermen over allocations of limited stocks of fish.

El Nino events have had enormous impacts on the fisheries.

InternalForces. Even though most of the factors we label as internal are factors not under the control of fishermen, they are more directly involved with these factors from an industry perspective, so we label them as internal. They are additional factors, for which fishermen perceive they cannot control and thus raise uncertainty about the future. Some fishermen in the MRWG process mentioned the aging workforce in their industry and were concerned about the loss of a way of life and community. Some fishermen have complained of the buyer/processors and their monopoly power. This allows buyers/processors to hold prices to fishermen artificially low and capture more of the benefits for themselves. And as we have already discussed above, some fishermen recognize the problem with open access common property and the incentives leading to overcapitalization and overfishing (both biological and economic).

Fishermen seem to view all of these factors coming together as an overwhelming set of forces. Marine Reserves are regarded as simply "the straw that broke the camel's back". Whether these perceptions are accurate is not that important for understanding one dimension of social costs. People's behavior is often driven by perceptions. Education and outreach efforts can be utilized to educate people about the facts and lessen some of the costs of actions taken based on incorrect information. However, there can be significant social transaction costs of people challenging regulations, which they perceive as having undue impact. Molotch and Freudenburg (1996) and Paulsen, Molotch and Freudenburg (1996) conducted two studies on Santa Barbara and Ventura Counties for the U.S. Department of Interior's Minerals Management Service. Their reports provided profiles of the county populations and discussed the socioeconomics and political economic aspects of how the communities might respond to issues of oil and gas development. An important aspect of these studies was the identification of "social multipliers". The authors argued that the economic multipliers could not explain the relative power of oil and gas interests in the area. Instead, one had to understand the social multipliers (how groups work together in coalitions) to understand the public policy outcomes and the costs in arriving at those outcomes.

The point of this discussion is that no matter how accurate or how large or small our estimates of impact, the perceptions of impact from cumulative sources may result in social multipliers that stimulate actions which have large transactions costs. 85% of squid fishermen oppose closed areas (Pomeroy and Fitzsimmons 2001) and 95% of the Barilotti sample opposed closed areas. These social costs are not included in our Step 1 analysis.

Phasing of Marine Reserves. The phasing in of marine reserves is similar to the issue of substitution in that the more time people have to learn and adjust to changes, the greater their ability to mitigate or offset the costs. This was an issue discussed by the MRWG, but never implemented in any formal alternatives. It is not included in any of the alternatives that we were asked to analyze here. In "The Proactive Fishermen's Plan" (Miller and Liquornik, 2001), the idea of phasing is recommended to lower the costs to the fishermen. The MLPA process has been delayed. There is an opportunity to use the concept of phasing by delaying any additional closed areas in state waters currently fished by CINMS fishermen. This strategy would lower additional costs imposed by closed areas beyond those being considered in the CINMS. Of course this assumes that marine reserves result in only costs to fishermen. As Sanchirico (2004 and 2005) has shown, under the kind of fishery management currently in place and currently being considered for California fisheries, marine reserves would likely generate benefits to commercial fisheries. Phasing could lead to losing these future gains, but like all regulations that ask fishermen to make an investment for some future gain, under open access conditions, fishermen will discount highly any future gains.

Pelagic or Highly Migratory Species. Some species such as swordfish, tuna and possibly wetfish may not be impacted by closed areas, since fishermen are likely able to capture them when they move through the

adjacent open areas. This has proven to be the case in the Florida Keys National Marine Sanctuary. Even though squid and shark are pelagic species, from what we have read, we are less certain whether the same conclusion applies. We would expect no impacts to swordfish, tuna and wetfish and therefore our estimates for Step 1 are overestimates. Swordfish was not included in our Step 1 analysis and tuna catch in the CINMS is no longer significant. Wetfish made up a significant portion of the ex vessel value of catch impacted by the newly proposed MPAs (Additional State and Federal). For Alternative One, there was no impact in the Step 1 analysis for wetfish. For Alternative Two, wetfish accounted for 11.5% of the total ex vessel value of catch impacted by the additional MPAs, while for Alternative Three wetfish accounted for 12% of the total ex vessel value of catch impacted by the additional MPAs. So if wetfish can be caught outside the additional MPAs, then estimated impacts from the additional MPAs would be reduced by these amounts. The net effect of the additional MPAs would be reduced to less than one percent of all ex vessel value of catch from the CINMS.

Commercial Fishing and Kelp – Step 2 Analysis

Sanchirico and Wilen (2001) provide a theoretical bioeconomic model that incorporates new ecological developments with respect to patchy environments. The authors use the model to address the issue of marine reserves. These authors addressed closed systems, sink-source systems and density dependent systems. They generally assume a Smith (1968) rent dissipation type bioeconomic model and assume spatial arbitrage i.e., fishermen relocate and equilibrium is reached when economic rents are equalized across space. They do not address outcomes in terms of net economic benefits (consumer's surplus plus economic rents). Instead, they limit their conclusions as to what would happen to aggregate biomass and aggregate harvest under varying conditions. We limit the discussion here to their discussion of sink-source systems and density dependent systems because the CINMS and surrounding areas are more likely to be some combination of sink-source and density dependent systems.

Sanchirico and Wilen (2001) provide the following propositions (renumbered here because we don't include their discussion of closed systems):

A. Sink – Source Systems

Proposition 1. "In a sink-source system with unidirectional density dependent flow, closing the sink will increase aggregate biomass and decrease aggregate harvest. A loss in harvest from the sink without any gain from harvest to the source", thus a net loss to the commercial and recreational fisheries.

Proposition 2. "In a sink-source system with unidirectional density dependent flow, closing the source will unequivocally increase aggregate biomass. Aggregate harvest will also increase if the increase from dispersal due to large biomass is greater than the loss in pre-reserve harvest from the closed area."

This double-payoff in increased biomass and harvest is more likely under the following conditions:

1. Source patch cost/price ratios are very low
2. Dispersal rates cannot be too low or too high
3. Growth rate of the stock in the source is greater than the dispersal rate

B. Density Dependent Systems

"Reserve creation in a density dependent system will always increase aggregate biomass".

Proposition 3. "In a density-dependent system, creating a reserve by closing a patch will increase aggregate biomass". Aggregate harvest will also increase if:

1. Patch closed is at a low level before closing (low opportunity costs – not much harvest lost)
2. If cost/price ratios between open and closed areas are not too dissimilar (close)

The Sanchirico and Wilen (2001) model then predicts that there are conditions under which there can be benefits of marine reserves to the commercial fisheries, but these benefits are conditioned on both ecological/biological and human behavioral conditions and responses.

There have been a number of theoretical and a couple of empirical applications of bioeconomic models that incorporate spatial decision-making by commercial fishermen in analyzing marine reserves. Nine papers were published in a special edition of Marine Resource Economics (Marine Resource Economics, Volume 19, Number 1, 2004). The paper by Sanchirico (2004) was one of the papers. In addition, the 2003 Association of Environmental and Resource Economics (AERE) Workshop was devoted to models of spatial decision-making. Two of the papers presented there were related to marine reserves and commercial fisheries. The basic conclusion from all work to date is that the current state-of-the-art in

spatial decision-making is still in its infancy for empirical applications; however, great progress is being made.

The bioeconomic metapopulation models of Sanchirico (2004 and 2005) build on the work of Sanchirico and Wilen (2001) by modeling alternative fishery management regimes into the analyses, where rent maximization can be evaluated. This allows for simulation of policies with and without rational fishery management regimes. Again, the general findings are that with rational fishery management rent maximization is achieved without closing any areas. There are losses to commercial fisheries, but they are less than our maximum potential losses in Step 1 analyses. In addition, when fisheries are not rationally managed (open access as in the current management regime), there are gains to commercial fisheries from marine reserves, and closing around 30 percent of fishable areas generate the most benefits. There might be some short-run losses to commercial fisheries, but they would be less than our Step 1 maximum potential losses. In the long-term, there are expected gains to the commercial fisheries. So in the long-run, there may not be any losses to commercial fisheries. Instead, there may be gains to commercial fisheries from the marine reserves in the CINMS.

Above we discussed the various factors that could mitigate or offset costs or that would result in benefits to commercial fishermen. Impacts were judged relative to our estimates from Step 1 analyses. So a neutral score means no change to our Step 1 estimates of impact. A score of increased costs means we would expect the factor to increase our estimates of impact beyond what was estimated in Step 1 or our impacts in Step 1 were underestimates. A score of decreased costs mean this factor would be expected to decrease the expected impact from what we estimated in our Step 1 analyses or that we overestimated the impacts in Step 1. Finally, a score indicating benefits means this factor would contribute to net benefits (no losses) and thus the impacts estimated in Step 1 are not real or would not be expected to occur. There is a time dimension to the evaluation. We limit this to a short-term (1 to 5 years) and a long-term (5 to 20 years). The results are summarized in Table 3.5.

For the short-term, our net assessment for commercial fishing and kelp ranges between neutral impacts to an increase in costs beyond Step 1. The most important factors influencing this assessment are the current status of stocks (neutral except for rockfish and spot prawn), regulated inefficiency (decrease costs) and the Science Panel's recommendation that catch and/or effort be held constant in the remaining open areas is not implemented (increases cost). The Science Panel's recommendation requires that the effort displaced must exit the fisheries i.e., the assumption of our Step 1 analysis. There is uncertainty about whether such catch and effort recommendations will be included in current and future fishery management plans. If not, the problem of crowding and congestion would probably result in increased costs (beyond Step 1 costs) in the short-term. In addition, the social costs of not accepting regulations, which might result in increased enforcement costs, which could increase costs beyond those estimated in Step 1.

For the long-term, assuming replenishment effects (benefits), substitution/relocation (decrease costs), cowcod closure (benefits) and regulated inefficiency (decrease costs) lead to a conclusion that impacts in Step 1 were overestimated and there are possibilities of net benefits, per the discussion of the Sanchirico and Wilen (2001) analysis and Sanchirico (2004 and 2005). Over the long-term, people have a chance to learn and adjust to changes and there is more time for the biophysical responses to protection to come to fruition. Management plans can be adjusted to respond to any negative outcomes (adaptive management).

The issues of phasing, ITQs, MLPA closed areas and MLMA fishery management plans are actions, which are not fully specified at this time or are not seriously being considered (ITQs). As Sanchirico (2005) concluded, there are potentially greater gains from rational fishery management than from marine reserves for the commercial fisheries, but these kinds of actions are not currently being considered. We are forced to simply give them a neutral score at this time.

Below we give our net assessments by alternative for commercial fishing and kelp, since size of an alternative matters for many of the mitigating and offsetting factors.

Table 3.5 Commercial Fishing & Kelp: Impacts Relative to Step 1 Analysis

Factors	Short-term	Long-term
1. Status of Fishing Stocks	O to ● (rockfish)	O to ● (rockfish)
2. Replenishment Effects	□	■
3. Substitution/Relcoation	□	□
4. Crowding/Congestion Effects	●	●
5. Quality Increases in Marine Reserves	O	O
6. Other Regulations		
a) Regulated Inefficiency	□	□
b) Proposition 132 (Gillnet Restriction)	O	O
c) Allocations to Other User Groups	●	●
d) Cowcod Closure	●	■
e) Opening up some Cowcod Closure Areas	□	□
f) MLPA - Closed Areas	O	O
g) MLMA Fishery Management Plans	O	O
h) ITQs currently not being considered	O to □	O to □
I) Existing Area Closures	O	O
j) Temporal Closures	●	●
k) Economic Conditions and Outside and Internal Forces	●	●
l) Rockfish Conservation Areas	O to □	□ to ●
m) Groundfish Closures	O to □	□ to ●
n) Spot Prawn Trawling Prohibition	O to □	□ to ●
7. Pelagic Species	□	□
8. Phasing	□	□
All Factors	O to ●	□ to ■

O = Neutral Impact
● = Increase in costs from Step 1
□ = Decrease in costs from Step 1
■ = No costs from Step 1 - instead, benefits

Alternative 1. This regulatory alternative has no additional impact in our Step 1 analysis, since the only added areas are marine conservation areas that exempt all fisheries currently with reported catch in those areas. In the short-term, there is no additional impact from the new proposed MPAs.

In the long-term, the replenishment effects are not likely since fishing is not curtailed. Using the results from Sanchirico (2005), there would be lost opportunities to the commercial fisheries under this alternative given the open access, non-rational fishery management regime. Continuation of the current management regime in these areas gives up the benefits that would be expected from marine reserves and so this alternative has higher costs to commercial fisheries than we estimated in Step 1.

Cumulative Impacts. In Step 1 analysis, the only impact of this regulatory alternative was from the existing State MPAs in the CINMS. In the short-term, we expect less impact than estimated in Step 1. The Sanchirico and Wilen (2001) model and the Sanchirico (2005) models suggest there will be short-term costs to the commercial fisheries, but less than our maximum potential costs.

In the long-term, whether replenishment effects are greater than crowding or congestion effects will determine if this alternative's long-term cost can be transformed into long-term benefits. The results of Sanchirico (2005) suggest that marine reserves, under the current fishery management regime, would likely have net benefits to the commercial fisheries. However, if commercial fishermen do not accept these results, there could be increased social costs in terms of additional administrative hearings and lawsuits, and increased costs of enforcement due to low compliance with the regulations. Both ecological and socioeconomic monitoring and education and outreach efforts may be required to mitigate or avoid these social costs.

Alternative 2. In Step 1 analysis, this regulatory alternative impacted an additional 1.18% of the ex vessel value of catch in the CINMS. If wetfish can be caught when they move outside the additional protected areas, the Step 1 impacts would be reduced to below one percent (0.95%) of the total ex value of commercial catch in the CINMS. Squid is also a coastal pelagic species. We are unsure of whether squid could simply be caught when they move out of the protected areas and thus no loss. If squid could be caught when they move out of the closed areas without loss of catch, this would further reduce the Step 1 losses from this alternative to less than one half of one percent (0.48%) of the total ex vessel value of catch from the CINMS. If we assume that 50% of squid could be caught when they move outside the closed areas, the impact of Step 1 would be reduced to about 0.7% of the total value of catch from the CINMS. The Sanchirico and Wilen (2001) model and the Sanchirico (2005) model suggest that there would be some losses to the commercial fisheries in the short-term, but less than the maximum potential losses we estimated in Step 1. This conclusion might be muted to some extent for rockfish due to the Rockfish Conservation Areas and the Groundfish depth contour closures. These areas cover a large proportion of area both inside and outside the CINMS. This limits the possibility of commercial fishermen offsetting any losses from the marine reserves from remaining open areas, since there are few remaining open areas. However, this fishery is in steep decline in the CINMS and throughout the State of California and without serious action these fisheries are likely to completely disappear.

Prawn make up about 13% of the estimated impact of this alternative on the commercial fisheries in Step 1 analysis. Prawn catch both in the CINMS and the State of California has been in decline since 2000. This fishery was in steep decline prior to the spot prawn trawling prohibition that took effect in 2003. Trap fishing is replacing trawling and so it is not clear if prawn catch will increase as fishermen adjust to the new regulations. If they do and catch increases, the short-term impacts could be greater than what we estimated in Step 1 for this fishery.

On net, we expect that there will be short-term losses to the commercial fisheries from this alternative, but that they will be less than what we estimated in Step 1 analyses.

In the long-term, whether replenishment effects are greater than crowding or congestion effects will determine if this alternative's long-term cost can be transformed into long-term benefits. As noted above, squid and wetfish, which are coastal pelagic species account for a majority of the impact on the commercial fisheries from the added MPAs. It is not clear to what extent the added areas serve as sinks or sources for these species. In general, the results of Sanchirico (2005) suggest that marine reserves, under the current fishery management regime, would likely have net benefits to the commercial fisheries. However, it is not clear that these general results will apply for this alternative. But overall the impacts are small from this alternative and net cost or benefits to commercial fisheries are likely to be small.

Cumulative Impacts. In Step 1 analysis, the impact of this regulatory alternative was estimated to potentially impact 12.5% of the total ex vessel value of catch from the CINMS. If wetfish can be caught when they move outside the additional protected areas, the Step 1 impacts would be reduced to 12.1% of the total ex value of commercial catch in the CINMS. If squid could also be caught when they move out of the closed areas without loss of catch, this would further reduce the Step 1 losses from this alternative to 6% of the total ex vessel value of catch from the CINMS. If we assume that 50% of squid could be caught when they move outside the closed areas, the impact of Step 1 would be reduced to about 9.1% of the total value of catch from the CINMS. In the short-term, we expect less impact than estimated in Step 1. The Sanchirico and Wilen (2001) model and the Sanchirico (2005) models suggest there will be short-term costs to the commercial fisheries, but less than our maximum potential costs.

In the long-term, whether replenishment effects are greater than crowding or congestion effects will determine if this alternative's long-term cost can be transformed into long-term benefits. The results of Sanchirico (2005) suggest that marine reserves, under the current fishery management regime, would likely have net benefits to the commercial fisheries. However, if commercial fishermen do not accept these results, there could be increased social costs in terms of additional administrative hearings and lawsuits, and increased costs of enforcement due to low compliance with the regulations. Both ecological and socioeconomic monitoring and education and outreach efforts may be required to mitigate or avoid these social costs.

Alternative 3. In Step 1 analysis, this regulatory alternative impacted an additional 1.63% of the ex vessel value of catch in the CINMS. If wetfish can be caught when they move outside the additional protected areas, the Step 1 impacts would be reduced to 1.39% of the total ex value of commercial catch in the CINMS. If squid could be caught when they move out of the closed areas without loss of catch, this would further reduce the Step 1 losses from this alternative to less than one percent (0.66%) of the total ex vessel value of catch from the CINMS. If we assume that 50% of squid could be caught when they move outside the closed areas, the impact of Step 1 would be reduced to about 1.0% of the total value of catch from the CINMS. The Sanchirico and Wilen (2001) model and the Sanchirico (2005) model suggest that there would be some losses to the commercial fisheries in the short-term, but less than the maximum potential losses we estimated in Step 1. This conclusion might be muted to some extent for rockfish due to the Rockfish Conservation Areas and the Groundfish depth contour closures. These areas cover a large proportion of area both inside and outside the CINMS. This limits the possibility of commercial fishermen offsetting any losses from the marine reserves from remaining open areas, since there are few remaining open areas. However, this fishery is in steep decline in the CINMS and throughout the State of California and without serious action these fisheries are likely to completely disappear.

Prawn make up about 18.3% of the estimated impact of this alternative on the commercial fisheries in Step 1 analysis. Prawn catch both in the CINMS and the State of California has been in decline since 2000. This fishery was in steep decline prior to the spot prawn trawling prohibition that took effect in 2003. Trap fishing is replacing trawling and so it is not clear if prawn catch will increase as fishermen adjust to the new regulations. If they do and catch increases, the short-term impacts could be greater than what we estimated in Step 1 for this fishery.

On net, we expect that there will be short-term losses to the commercial fisheries from this alternative, but that they will be less than what we estimated in Step 1 analyses.

In the long-term, whether replenishment effects are greater than crowding or congestion effects will determine if this alternative's long-term cost can be transformed into long-term benefits. As noted above, squid and wetfish, which are coastal pelagic species account for a majority of the impact on the commercial fisheries from the added MPAs. It is not clear to what extent the added areas serve as sinks or sources for these species. In general, the results of Sanchirico (2005) suggest that marine reserves, under the current fishery management regime, would likely have net benefits to the commercial fisheries. However, it is not clear that these general results will apply for this alternative. But overall the impacts are small from this alternative and net cost or benefits to commercial fisheries are likely to be small.

Cumulative Impacts. In Step 1 analysis, the impact of this regulatory alternative was estimated to potentially impact 12.95% of the total ex vessel value of catch from the CINMS. If wetfish can be caught when they move outside the additional protected areas, the Step 1 impacts would be reduced to 12.6% of the total ex value of commercial catch in the CINMS. If squid could also be caught when they move out of the closed areas without loss of catch, this would further reduce the Step 1 losses from this alternative to 6.2% of the total ex vessel value of catch from the CINMS. If we assume that 50% of squid could be caught when they move outside the closed areas, the impact of Step 1 would be reduced to about 9.4% of the total value of catch from the CINMS. In the short-term, we expect less impact than estimated in Step 1. The Sanchirico and Wilen (2001) model and the Sanchirico (2005) models suggest there will be short-term costs to the commercial fisheries, but less than our maximum potential costs.

In the long-term, whether replenishment effects are greater than crowding or congestion effects will determine if this alternative's long-term cost can be transformed into long-term benefits. The results of Sanchirico (2005) suggest that marine reserves, under the current fishery management regime, would likely have net benefits to the commercial fisheries. However, if commercial fishermen do not accept these results, there could be increased social costs in terms of additional administrative hearings and lawsuits, and increased costs of enforcement due to low compliance with the regulations. Both ecological and socioeconomic monitoring and education and outreach efforts may be required to mitigate or avoid these social costs.

Recreation: Consumptive Activities – Step 2 Analysis

In this section, we investigate the effect of possible mitigating factors on estimated Step 1 losses to consumptive users. Although these issues are addressed quantitatively where possible, the discussion is largely qualitative because it is generally not possible for us to quantify mitigating factors and benefits. Even though we discussed substitution and the long-term benefits from replenishment effects in a previous section, for this section, we revisit these two important mitigating factors with a more pointed discussion about how they relate to recreation. Unlike the commercial fisheries, there is very little in the literature that addresses recreational fishing or other consumptive recreation and the impact of marine reserves once recreation behavior is modeled. The Sanchirico and Wilen (2001) and Sanchirico (2004 and 2005) studies have not attempted to model a bioeconomic model of recreational fishing in a spatial context. Random Utility Models (RUMs), now commonly used to model recreational behavior, do model spatial decision-making based on the relative cost of accessing sites and site attributes. The main focus of RUMs is to model substitution across sites, so the models are well suited to address the issue of marine reserves ex post. Our review of the literature did not uncover any analyses of marine reserves and recreational behavior, especially any that could be used to speculate on a range of outcomes ex ante, as is required here.

Table 3.6 Recreational Consumptive Activities: Impacts Relative to Step 1 Analysis

Factors	Short-term	Long-term
1. Status of Fishing Stocks	O	O to □
2. Replenishment Effects	□	■
3. Substitution/Relcoation	O to □	O to □
4. Crowding/Congestion Effects	●	●
5. Quality Increases in Marine Reserves	O	O
6. Other Regulations		
a) Regulated Inefficiency	□	□
b) Proposition 132 (Gillnet Restriction)	●	●
c) Allocations to Other User Groups	●	●
d) Cowcod Closure	●	□
e) Opening up some Cowcod Closure Areas	□	□
f) MLPA - Closed Areas	O	O
g) MLMA Fishery Management Plans	O	O
h) ITQs currently not being considered	O	O
I) Existing Area Closures	O to □	O to □
j) Temporal Closures	●	●
k) Economic Conditions and Outside and Internal Forces	●	●
l) Rockfish Conservation Areas	O to □	□ to ●
m) Groundfish Closures	O to □	□ to ●
n) Spot Prawn Trawling Prohibition	O to □	□ to ●
7. Pelagic Species	□	□
8. Phasing	□	□
All Factors	O to ●	□ to ■

O = Neutral Impact
● = Increase in costs from Step 1
□ = Decrease in costs from Step 1
■ = No costs from Step 1 - instead, benefits

Substitution. If displaced users are simply able to relocate their activities, they may be able to fully or partially mitigate their losses. This of course depends on the availability of substitute sites and the qualities thereof. Several scenarios are possible. Even when total activity remains constant (i.e., person-days remain the same as they simply go to other sites), if the quality of the site is lower there could be some loss in consumer's surplus (no change in activity, so no change in income and employment). If it costs more to get to the substitute sites, there could still be increases in costs and thus lower consumer's surplus to users and profits to charter/party businesses. If there is not an adequate supply of substitute sites, then there could be losses in total activity and in all the non-market and market economic measures referenced in our above analysis of displaced use. The possibilities for substitution vary by alternative.

The presence of other closed areas will also affect the ability of displaced users to substitute. There are currently regions of closure in the study area in addition to the reserve areas proposed in this process. However to mitigate the negative impacts of the proposed areas, these are either being completely or partially re-opened. The effect this will have on the ability of users to find adequate substitutes site will vary by alternative. This issue is addressed below, where appropriate.

Long-term benefits from Replenishment Effects. Marine reserve systems may have beneficial effects beyond the direct ecological protection for the sites themselves. That is, both the size and number of fish, lobster and other invertebrates both inside and outside the reserves may increase. The quote from Davis (1998) summarizes some key aspects as they relate to recreation and marine reserve systems (for updated information, see the science panel's report):

> "…we found 31 studies that tested whether protected areas had an effect on the size, reproductive output, diversity, and recruitment of fish in adjacent areas. Fisheries targeted species were two to 25 times more abundant in no-take areas than in surrounding areas for fish, crustaceans, and mollusks on coral and temperate reefs in Australia, New Zealand, the Philippines, Japan, Kenya, South Africa, the Mediterranean Sea, Venezuela, Chile, and the United States (California, Florida and Rhode Island). Mean sizes of fished species protected in no-take zones were 12 to 200 percent larger than those in surrounding areas for all fishes studied and in 75 to 78 percent of the invertebrates. Eighty-six percent of the studies that tested fishery yields found that catches within three kilometers of the marine protected areas were 46 to 50 percent higher than before no-take zones were created. It is clear that fishers all over the world believe no-take zones increase yields because they fish as close to the boundaries as possible."

In addition, a study by Roberts, et. al. (2001) included the effects of no-take areas on recreational fishing specifically, in the Merritt Island National Wildlife Refuge at Cape Canaveral Florida. The refuge was established for security reasons relating to the Kennedy Space Center and includes two areas that have been closed to fishing since 1962. Among the findings in Roberts, et. al. (2001) is the following.

> "This region encompasses only 13% of the Florida coast, but of world record-size fish caught in Florida between 1939 and 1999, it accounted for 62% of 39 records for black drum, 54% of 67 records for red drum, 50% of 32 records for spotted sea trout, but only 2% of 84 records for common snook."

The explanation of the common snook finding is that the reserve is at the margin of its range and it does not spend the entire year in the refuge. The number of records for black and red drum are not only greater around the reserve than the rest of Florida, they are also increasing at a faster rate. Thus, marine reserves can be a benefit to recreational anglers. The study concluded the size and longevity of a reserve is fundamental to its success and that the effects of reserve extend beyond reserve boundaries.

The long-term benefits from the reserve could offset short-term costs from displacement, There would likely be long-term net benefits where short-term costs would be offset by long-term benefits. Again, this conclusion may still vary by alternative.

Alternative 1. This regulatory alternative is the smallest of those being considered, both in terms of area and impact to recreational consumptive users. In Step 1, it was estimated that only about one-half of one percent (0.5%) of the person-days of consumptive recreation would potentially be impacted by the newly proposed MPAs. The small impact was due to the many exemptions of the marine conservation areas proposed under this alternative. The success of relocation effort and substituting to alternative sites has a high probability for this alternative. The potential for crowding/congestion effects would be minimal,

again because of the relatively small size and the location of the alternative. In the short-term, impacts should be less than estimated in the Step 1 Analysis.

In the long-term, the proposed marine conservation areas in this alternative do not provide much in the way of additional protection and so there may be additional costs associated with this alternative. The potential added cost is the opportunity cost or lost benefits by not extending protection, i.e. the failure to take advantage of the possible benefits of marine reserves.

Cumulative Impact. In Step 1 analysis, this regulatory alternative was estimated to potentially impact 14.2% of the total person-days of consumptive recreation taking place in the CINMS. It is the existing State MPAs in the CINMS that account for most of the potential impact. One might expect additional costs of substituting to other sites, but much less than estimated in Step 1 analysis. Much of the cost may involve additional search costs of locating good substitute sites. Economists usually assume that there would be some loss in consumer's surplus, since those engaged in consumptive recreation are forced to make choices to go to new sites. The fact that they chose these sites to begin with is evidence that they valued these sites more highly. We expect some losses in the short-term, but much less than estimated in Step 1.

In the long-term, there is more time to learn about substitute sites and increase success in fishing and other consumptive activities. In addition, if there are "edge effects" or spillover/replenishment effects that have been noted elsewhere from the existing State MPAs, there is a possibility of net economic benefits to consumptive recreation. But like in the case of the commercial fisheries this conclusion will depend on the net interaction between the biophysical system and the human system. The human system includes fishery management. As was noted by Sanchirico (2005), in analysis of how the commercial fisheries might be impacted by marine reserves, some of the same conclusions are relevant. If rational fishery management is not applied there are likely benefits from marine reserves. Rational fishery management here might be focused on allocation issues between commercial and recreational fisheries. Currently, there is little discussion of management that would maximize the economic value of the fisheries and allocating fisheries based on their highest economic use. Given the lack of rational fishery management, marine reserves may provide long-term benefits to recreational fisheries and other consumptive recreation.

Alternative 2. This regulatory alternative was estimated to potentially impact an additional five percent (5%) of the consumptive recreation activity in the CINMS. This alternative is more heavily weighted towards adding to the existing State marine reserves than to marine conservation areas, and therefore displaces significantly more consumptive recreation than alternative 1. Still five percent of all consumptive recreation is a relatively low amount of activity and there would be a fairly high probability that adequate substitute areas could be found and significantly mitigate the short-term impacts. There may be little loss in total activity and the associated impacts on the local county economies, however there will be some loss in consumer's surplus, but much less than estimated in Step 1 analysis. The main costs in the short-term will most likely come from added search costs in locating substitute sites.

In the long-term, losses will be further mitigated once adequate substitute sites are located. The size of the displacements is not large enough to result in crowding or congestion effects. This conclusion must be tempered with respect to rockfish, since the Rockfish Conservation Areas and Groundfish Closure areas cover so much of the CINMS that there are few places to find adequate substitutes. Recent regulations have relaxed some of the restrictions on the recreational fisheries and allow more recreational fishing. These actions will allow greater opportunities for recreational fishermen to find adequate substitute sites and mitigate any losses. There is a higher probability under this alternative than alternative 1 for there to be benefits from "edge effects" and/or spillover/replenishment effects from marine reserves. Of course, whether there are net benefits to consumptive recreation users depends on the complex mix of ecological and socioeconomic responses. If there are losses, we expect they will be much smaller than estimated in Step 1 analysis and there is a possibility of net long-term gains to consumptive recreation.

Cumulative Impact. In step 1 analysis, this regulatory alternative potentially impacts 18.8% of all person-days of consumptive recreation activity in the CINMS. Most of the impact is attributed to the existing State MPAs. One might expect additional costs of substituting to other sites, but much less than estimated in Step 1 analysis. Much of the cost may involve additional search costs of locating good substitute sites.

Economists usually assume that there would be some loss in consumer's surplus, since those engaged in consumptive recreation are forced to make choices to go to new sites. The fact that they chose these sites to begin with is evidence that they valued these sites more highly. We expect some losses in the short-term, but much less than estimated in Step 1.

In the long-term, there is more time to learn about substitute sites and increase success in fishing and other consumptive activities. In addition, if there are "edge effects" or spillover/replenishment effects that have been noted elsewhere from the more complete network of existing and newly proposed MPA extensions, there is a possibility of net economic benefits to consumptive recreation. But like in the case of the commercial fisheries this conclusion will depend on the net interaction between the biophysical system and the human system. The human system includes fishery management. As was noted by Sanchirico (2005), in analysis of how the commercial fisheries might be impacted by marine reserves, some of the same conclusions are relevant. If rational fishery management is not applied there are likely benefits from marine reserves. Rational fishery management here might be focused on allocation issues between commercial and recreational fisheries. Currently, there is little discussion of management that would maximize the economic value of the fisheries and allocating fisheries based on their highest economic use. Given the lack of rational fishery management, marine reserves may provide long-term benefits to recreational fisheries and other consumptive recreation.

As with the commercial fisheries, if recreational consumptive users do not accept the proposed regulations they may increase social costs through administrative hearing and lawsuits against the regulation or low compliance resulting in higher enforcement costs. These social costs could be mitigated or avoided through agreements with users to address uncertainties of the effects of marine reserves through both ecological and socioeconomic monitoring and education and outreach efforts.

Alternative 3. This regulatory alternative was estimated to potentially impact an additional 6.4% of the consumptive recreation activity in the CINMS. This alternative is the alternative with the greatest potential impact because of it's increased size over the other alternatives and the fact that it is more heavily weighted towards adding to the existing State marine reserves than to marine conservation areas, and therefore displaces significantly more consumptive recreation than either alternatives 1 or 2. Still 6.4% percent of all consumptive recreation is a relatively low amount of activity and there would be a fairly high probability that adequate substitute areas could be found and significantly mitigate the short-term impacts. There may be little loss in total activity and the associated impacts on the local county economies, however there will be some loss in consumer's surplus, but much less than estimated in Step 1 analysis. The main costs in the short-term will most likely come from added search costs in locating substitute sites.

In the long-term, losses will be further mitigated once adequate substitute sites are located. The size of the displacements is not large enough to result in crowding or congestion effects. This conclusion must be tempered with respect to rockfish, since the Rockfish Conservation Areas and Groundfish Closure areas cover so much of the CINMS that there are few places to find adequate substitutes. Recent regulations have relaxed some of the restrictions on the recreational fisheries and allow more recreational fishing. These actions will allow greater opportunities for recreational fishermen to find adequate substitute sites and mitigate any losses. There is a higher probability under this alternative than alternative 1 or alternative 2 for there to be benefits from "edge effects" and/or spillover/replenishment effects from marine reserves. Of course, whether there are net benefits to consumptive recreation users still depends on the complex mix of ecological and socioeconomic responses. If there are losses, we expect they will be much smaller than estimated in Step 1 analysis and there is a possibility of net long-term gains to consumptive recreation.

Cumulative Impact. In step 1 analysis, this regulatory alternative potentially impacts 20.2% of all person-days of consumptive recreation activity in the CINMS. Most of the impact is attributed to the existing State MPAs. One might expect additional costs of substituting to other sites, but much less than estimated in Step 1 analysis. Much of the cost may involve additional search costs of locating good substitute sites. Economists usually assume that there would be some loss in consumer's surplus, since those engaged in consumptive recreation are forced to make choices to go to new sites. The fact that they chose these sites to begin with is evidence that they valued these sites more highly. We expect some losses in the short-term, but much less than estimated in Step 1.

In the long-term, there is more time to learn about substitute sites and increase success in fishing and other consumptive activities. In addition, if there are "edge effects" or spillover/replenishment effects that have been noted elsewhere from the more complete network of existing and newly proposed MPA extensions, there is a possibility of net economic benefits to consumptive recreation. But like in the case of the commercial fisheries this conclusion will depend on the net interaction between the biophysical system and the human system. The human system includes fishery management. As was noted by Sanchirico (2005), in analysis of how the commercial fisheries might be impacted by marine reserves, some of the same conclusions are relevant. If rational fishery management is not applied there are likely benefits from marine reserves. Rational fishery management here might be focused on allocation issues between commercial and recreational fisheries. Currently, there is little discussion of management that would maximize the economic value of the fisheries and allocating fisheries based on their highest economic use. Given the lack of rational fishery management, marine reserves may provide long-term benefits to recreational fisheries and other consumptive recreation.

As with the commercial fisheries, if recreational consumptive users do not accept the proposed regulations they may increase social costs through administrative hearing and lawsuits against the regulation or low compliance resulting in higher enforcement costs. These social costs could be mitigated or avoided through agreements with users to address uncertainties of the effects of marine reserves through both ecological and socioeconomic monitoring and education and outreach efforts.

Recreation Non-consumptive Activities – Step 2 Analysis

In addition to benefits derived from replenishment effects, the establishment of marine reserve systems is expected to result in benefits to non-consumptive recreational users. These increased benefits take the form of increases in diversity of wildlife, viewing opportunities from increased abundance of fish and invertebrates, water quality, etc. Benefits may also be derived from the decrease in the density of users or in the reduction in conflicts with consumptive users. There is no data currently available to directly estimate the magnitude of these benefits. In light of this fact a simulation is conducted for each alternative using a range of increases in quality and of elasticities. Quality elasticities show the percentage change in consumer's surplus for a percentage change in quality. In a paper by Freeman (1995), 13 studies were summarized on marine recreation, which contained enough information to calculate quality elasticities. Catch rate was the quality variable in all the studies in Freeman (1995). In a paper by Bockstael, et al (1989) there was enough information to calculate quality elasticities for swimming, boating and fishing in Chesapeake Bay. See Appendix G for the derivation of these elasticities. Using the range of quality elasticities and the assumption of a 10%, 50% and 100% increase in quality, benefit estimates were calculated for each alternative. To avoid skewed results from outliers, the highest and lowest elasticities were dropped from this range.

For each alternative, four tables are provided. The first three tables report baseline 1999 activity within each alternative and their corresponding economic impact. More detailed tables are included in Appendix C for the baseline. The fourth table presents a range of potential impacts using our range of quality increases and quality elasticities. Quality increases are expected to grow over time. Elasticities also have a time dimension and in the short-term are smaller (less behavioral response to quality) and larger over the long-term (greater behavioral response). The number in the upper left corner of the tables reflects the smallest changes and the lower right corner of the tables yield the largest potential changes.

One other important point to bear in mind is that data was only available for charter/party boat non-consumptive recreation. This section does not take into account private boat non-consumptive usage, for which there was no data available. Therefore estimates of aggregate benefits presented here will tend to underestimate true benefits due to the exclusion of private boat non-consumptive usage in the calculations. A two-year study is now underway to quantify the amount of use, the economic value of use (both market and nonmarket economic value) and how these values change using a random utility model. The study also will attempt to relate uses to quality attributes so quality elasticities can be estimated.

It is also important to point out that in our 'benefits transfer/policy analysis simulation" we address four different measurements: 1) Consumer's surplus, 2) Income generated in the local county economies, 3) Employment generated in the local county economies and 4) Person-days of activity. The quality elasticities are directly applicable to consumer's surplus. In a paper by Smith and Kaoru (1990) about 200 recreation value studies were summarized in a Meta analysis. One of the measures reported was the own price elasticity of demand. We found that the range of own price elasticities were about the same as the range of quality elasticities, so we use this range of elasticities on all four concepts.

In the years 1999-2000, it is estimated that 6.3 million people age 16 or older from U.S. households participated in either bird watching, viewing other wildlife, viewing scenery or doing photography in the marine environment of California. They spent over 120.2 million days in these activities (Leeworthy 2001b and Leeworthy and Wiley 2001c)[6]. As a comparison, the same study estimated 2.7 million participants that participated in 20.3 million days of saltwater recreational fishing. Given the above estimates, the private boat non-consumptive usage of the CINMS may be quite large.

Alternative 1. This is the smallest of the three alternatives and provides fewer opportunities for nonconsumptive recreation because the added MPAs under this alternative exempt most consumptive activities. The baseline activity occurring in the newly protected areas amounts to only 207 person-days or 0.5% of all nonconsumptive recreation from charter/party/guide operations in the CINMS. The aggregate

economic impact on income associated with this activity is estimated to be about $17.8 thousand, which supports about 1 full or part-time job (Table 3.7). In terms of person-days of activity, Whale Watching was the lead activity with 63 person-days followed by Sailing with 20 person-days and Nonconsumptive Diving with 19 person-days (Table 3.8). There were no kayaking/sightseeing activities conducted in the new MPAs of this alternative.

Using the range of quality increases and elasticities discussed earlier, we conducted a "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional MPAs. The results are summarized in Table 3.9. In terms of person-days of activity, the added activity could range from a low of just one person-day for a 10% increase in quality and a quality elasticity of 0.04 to a high of 931 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $71 and about $80 thousand. Consumer's surplus to nonconsumptive recreators is estimated to range from $30 to $33.6 thousand.

Cumulative Impact. The existing State MPAs account for most of the potential improvement for nonconsumptive recreators. Across all MPAs, 6,805 person-days of nonconsumptive recreation took place in the 1999 baseline year. This was 16.2% of all the nonconsumptive recreation by access to the CINMS by charter/party boat and guide services. We estimate this activity generated over $612 thousand in income and about 33 full and part-time jobs in the local county economies. This activity also generated almost $79 thousand in profits to charter/party boat and guide service operations and an estimated consumer's surplus to the nonconsumptive recreators of $245.6 thousand (Table 3.7).

The results of the "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional and existing MPAs are summarized in Table 3.10. In terms of person-days of activity, the added activity could range from a low of just 27 person-days for a 10% increase in quality and a quality elasticity of 0.04 to a high of 30,624 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $2,449 and about $2.75 million. Consumer's surplus to nonconsumptive recreators is estimated to range from $983 to $1.1 million.

Table 3.7 Summary: Recreation Non-consumptive Activities - Alternative 1 - Economic Impact

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	101	0.2%	106	0.3%	207	0.5%	6,598	15.7%	6,805	16.2%
Market Impact										
Direct Sales	$ 17,349	0.2%	$ 19,044	0.3%	$ 36,393	0.5%	$ 1,130,945	15.9%	$ 1,167,338	16.4%
Direct Wages and Salaries	$ 6,309	0.2%	$ 6,917	0.3%	$ 13,226	0.5%	$ 411,290	15.9%	$ 424,516	16.4%
Direct Employment	0.3	0.2%	0.5	0.3%	0.8	0.5%	27.9	16.0%	28.7	16.5%
Total Income	$ 7,762	0.2%	$ 10,006	0.3%	$ 17,768	0.5%	$ 594,579	15.9%	$ 612,346	16.4%
Total Employment	0.3	0.2%	0.6	0.3%	0.9	0.4%	31.9	16.0%	32.7	16.4%
Non-Market Impact										
Consumer's Surplus	$ 3,656	0.3%	$ 3,811	0.3%	$ 7,467	0.5%	$ 238,166	16.3%	$ 245,633	16.8%
Profit[1]	$ 1,006	0.2%	$ 1,127	0.2%	$ 2,133	0.3%	$ 76,791	14.7%	$ 78,924	12.9%

1. Profit is used as a proxy for producer's surplus.

Table 3.8 Non-consumptive Recreation - Economic Impact - Alternative 1

	Whale Watching		NC Diving		Sailing		Kayaking/Sightseeing	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	63	0.24%	19	0.17%	20	0.49%	-	0.00%
Market Impact								
Direct Sales	$ 10,523	0.25%	$ 3,479	0.19%	$ 3,347	0.47%	$ -	0.00%
Direct Wages and Salaries	$ 3,829	0.25%	$ 1,262	0.19%	$ 1,218	0.47%	$ -	0.00%
Direct Employment	0.3	0.29%	-	0.00%	-	0.00%	-	0.00%
Total Income	$ 4,175	0.19%	$ 1,827	0.19%	$ 1,760	0.47%	$ -	0.00%
Total Employment	0.3	0.25%	-	0.00%	-	0.00%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 2,272	0.25%	$ 670	0.18%	$ 715	0.51%	$ -	0.00%
Profit[1]	$ 668	0.24%	$ 337	0.17%	$ 676	0.49%	$ -	0.00%
Federal								
Person-days	-	0.00%	62	0.58%	44	1.09%	-	0.00%
Market Impact								
Direct Sales	$ -	0.00%	$ 11,681	0.63%	$ 7,363	1.04%	$ -	0.00%
Direct Wages and Salaries	$ -	0.00%	$ 4,238	0.63%	$ 2,679	1.04%	$ -	0.00%
Direct Employment	-	0.00%	0.3	0.66%	0	1.13%	-	0.00%
Total Income	$ -	0.00%	$ 6,134	0.63%	$ 3,872	1.04%	$ -	0.00%
Total Employment	-	0.00%	0.4	0.68%	0.2	0.99%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ -	0.00%	$ 2,238	0.60%	$ 1,573	1.13%	$ -	0.00%
Profit[1]	$ -	0.00%	$ 1,127	0.58%	$ 1,488	1.09%	$ -	0.00%
Total New								
Person-days	63	0.24%	81	0.75%	63	1.58%	-	0.00%
Market Impact								
Direct Sales	$ 10,523	0.25%	$ 15,160	0.82%	$ 10,710	1.51%	$ -	0.00%
Direct Wages and Salaries	$ 3,829	0.25%	$ 5,500	0.82%	$ 3,897	1.51%	$ -	0.00%
Direct Employment	0	0.29%	0	0.66%	0	1.13%	-	0.00%
Total Income	$ 4,175	0.19%	$ 7,961	0.82%	$ 5,632	1.51%	$ -	0.00%
Total Employment	0	0.25%	0	0.68%	0	0.99%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 2,272	0.25%	$ 2,908	0.78%	$ 2,287	1.64%	$ -	0.00%
Profit[1]	$ 668	0.24%	$ 1,465	0.75%	$ 2,165	1.58%	$ -	0.00%
Existing State								
Person-days	3,878	14.92%	1,959	18.18%	403	10.04%	358	29.07%
Market Impact								
Direct Sales	$ 644,785	15.04%	$ 342,379	18.60%	$ 68,922	9.69%	$ 74,859	29.07%
Direct Wages and Salaries	$ 234,683	15.03%	$ 124,448	18.59%	$ 25,066	9.70%	$ 27,093	29.07%
Direct Employment	16	15.07%	9	18.76%	1.7	9.60%	2.0	29.85%
Total Income	$ 339,123	15.03%	$ 179,956	18.60%	$ 36,236	9.69%	$ 39,265	29.07%
Total Employment	18.0	15.05%	10	18.74%	2.0	9.65%	2.3	29.61%
Non-Market Impact								
Consumer's Surplus	$ 139,971	15.50%	$ 70,708	18.88%	$ 14,549	10.43%	$ 12,938	30.20%
Profit[1]	$ 41,173	14.92%	$ 35,618	18.18%	$ 13,767	10.04%	$ 777	29.07%
Cumulative Total								
Person-days	3,941	15.17%	2,040	18.93%	466	11.62%	358	29.07%
Market Impact								
Direct Sales	$ 655,308	15.28%	$ 357,539	19.43%	$ 79,632	11.20%	$ 74,859	29.07%
Direct Wages and Salaries	$ 238,512	15.28%	$ 129,948	19.41%	$ 28,963	11.21%	$ 27,093	29.07%
Direct Employment	16	15.36%	9	19.43%	2	10.73%	2	29.85%
Total Income	$ 343,297	15.22%	$ 187,917	19.42%	$ 41,868	11.20%	$ 39,265	29.07%
Total Employment	18	15.30%	10	19.42%	2	10.64%	2	29.61%
Non-Market Impact								
Consumer's Surplus	$ 142,243	15.75%	$ 73,616	19.66%	$ 16,836	12.07%	$ 12,938	30.20%
Profit[1]	$ 41,841	15.17%	$ 37,083	18.93%	$ 15,932	11.62%	$ 777	29.07%

1. Profit is used as a proxy for producer's surplus.

Table 3.9 Potential Benefits to Non-consumptive Users from Alternative 1- Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 30	$ 747	$ 3,360
	Income	$ 71	$ 1,777	$ 7,995
	Employment	0.003	0.09	0.38
	Person-days	1	21	93
50%				
	Consumer's Surplus	$ 149	$ 3,733	$ 16,800
	Income	$ 355	$ 8,884	$ 39,977
	Employment	0.017	0.43	1.91
	Person-days	4	103	465
100%				
	Consumer's Surplus	$ 299	$ 7,467	$ 33,601
	Income	$ 711	$ 17,768	$ 79,954
	Employment	0.034	0.85	3.83
	Person-days	8	207	931

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 1

Table 3.10 Potential Benefits to Non-consumptive Users from Alternative 1, Cummulative - Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 983	$ 24,563	$ 110,535
	Income	$ 2,449	$ 61,235	$ 275,556
	Employment	0.131	3.27	14.72
	Person-days	27	681	3,062
50%				
	Consumer's Surplus	$ 4,913	$ 122,816	$ 552,674
	Income	$ 12,247	$ 306,173	$ 1,377,779
	Employment	0.654	16.35	73.58
	Person-days	136	3,403	15,312
100%				
	Consumer's Surplus	$ 9,825	$ 245,633	$ 1,105,348
	Income	$ 24,494	$ 612,346	$ 2,755,557
	Employment	1.308	32.70	147.15
	Person-days	272	6,805	30,624

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 1

Alternative 2. This regulatory alternative adds significantly more protected area that could potentially benefit nonconsumptive recreators than alternative 1. The baseline activity occurring in the newly protected areas amounts to 956 person-days or 2.3% of all nonconsumptive recreation from charter/party/guide operations in the CINMS. This is still a relatively small addition because most nonconsumptive recreation in the CINMS takes place in State waters closer to the islands. The aggregate economic impact on income associated with this activity is estimated to be about $84.3 thousand, which supports about 4 full or part-time jobs (Table 3.11). In terms of person-days of activity, Nonconsumptive diving was the lead activity with 439 person-days followed by Whale Watching with 433 person-days and Sailing with 84 person-days (Table 3.12). There were no kayaking/sightseeing activities conducted in the new MPAs of this alternative. Whale Watching is the most significant activity in Federal water portions of the proposed protected areas accounting for about 37% of the person-days of nonconsumptive recreation in the proposed new MPA areas.

The results of the "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional MPA are summarized in Table 3.13. In terms of person-days of activity, the added activity could range from a low of just four person-days for a 10% increase in quality and a quality elasticity of 0.04 to a high of 4,301 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $337 and about $380 thousand. Consumer's surplus to nonconsumptive recreators is estimated to range from $138 to $155 thousand.

Cumulative Impact. The existing State MPAs account for most of the potential improvement for nonconsumptive recreators. Across all MPAs, 7,554 person-days of nonconsumptive recreation took place in the 1999 baseline year. This was 18% of all the nonconsumptive recreation by access to the CINMS by charter/party boat and guide services. We estimate this activity generated about $679 thousand in income and about 36 full and part-time jobs in the local county economies. This activity also generated about $89 thousand in profits to charter/party boat and guide service operations and an estimated consumer's surplus to the nonconsumptive recreators of $272.7 thousand (Table 3.11).

The results of the "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional and existing MPAs are summarized in Table 3.14. In terms of person-days of activity, the added activity could range from a low of just 30 person-days for a 10% increase in quality and a quality elasticity of 0.04 to a high of 33,994 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $2,717 and about $3 million. Consumer's surplus to nonconsumptive recreators is estimated to range from $1,091 to $1.2 million.

Table 3.11 Summary: Recreation Non-consumptive Activities - Alternative 2 - Economic Impact

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	313	0.7%	643	1.5%	956	2.3%	6,598	15.7%	7,554	18.0%
Market Impact										
Direct Sales	$ 50,288	0.7%	$ 110,055	1.6%	$ 160,343	2.3%	$ 1,130,945	15.9%	$ 1,291,288	18.2%
Direct Wages and Salaries	$ 18,313	0.7%	$ 40,025	1.6%	$ 58,338	2.3%	$ 411,290	15.9%	$ 469,628	18.2%
Direct Employment	1.1	0.6%	2.6	1.5%	3.7	2.1%	27.9	16.0%	31.6	18.2%
Total Income	$ 26,455	0.7%	$ 57,861	1.6%	$ 84,316	2.3%	$ 594,579	15.9%	$ 678,895	18.2%
Total Employment	1.3	0.6%	3.0	1.5%	4.2	2.1%	31.9	16.0%	36.1	18.1%
Non-Market Impact										
Consumer's Surplus	$ 11,291	0.7%	$ 23,205	1.5%	$ 34,496	2.3%	$ 238,166	15.7%	$ 272,662	18.0%
Profit[1]	$ 4,626	0.8%	$ 7,956	1.3%	$ 12,582	2.1%	$ 76,791	12.6%	$ 89,373	14.6%

1. Profit is used as a proxy for producer's surplus.

Table 3.12 Non-consumptive Recreation - Economic Impact - Alternative 2

	Whale Watching		NC Diving		Sailing		Kayaking/Sightseeing	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	82	0.32%	207	1.92%	24	0.61%	-	0.00%
Market Impact								
Direct Sales	$ 13,572	0.32%	$ 33,369	1.81%	$ 3,347	0.47%	$ -	0.00%
Direct Wages and Salaries	$ 4,940	0.32%	$ 12,155	1.82%	$ 1,218	0.47%	$ -	0.00%
Direct Employment	0.3	0.29%	0.8	1.77%	-	0.00%	-	0.00%
Total Income	$ 7,138	0.32%	$ 17,557	1.81%	$ 1,760	0.47%	$ -	0.00%
Total Employment	0.4	0.29%	0.9	1.74%	-	0.00%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 2,958	0.32%	$ 7,456	1.92%	$ 877	0.61%	$ -	0.00%
Profit[1]	$ 870	0.32%	$ 3,756	1.92%	$ 830	0.61%	$ -	0.00%
Federal								
Person-days	351	1.35%	233	2.16%	59	1.48%	-	0.00%
Market Impact								
Direct Sales	$ 58,484	1.36%	$ 41,530	2.26%	$ 10,041	1.41%	$ -	0.00%
Direct Wages and Salaries	$ 21,285	1.36%	$ 15,087	2.25%	$ 3,653	1.41%	$ -	0.00%
Direct Employment	1.4	1.34%	1.0	2.21%	0	1.13%	-	0.00%
Total Income	$ 30,759	1.36%	$ 21,823	2.26%	$ 5,280	1.41%	$ -	0.00%
Total Employment	1.6	1.34%	1.2	2.22%	0.2	0.99%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 12,659	1.35%	$ 8,402	2.16%	$ 2,145	1.48%	$ -	0.00%
Profit[1]	$ 3,724	1.35%	$ 4,232	2.16%	$ 2,029	1.48%	$ -	0.00%
Total New								
Person-days	433	1.67%	439	4.08%	84	2.09%	-	0.00%
Market Impact								
Direct Sales	$ 72,056	1.68%	$ 74,899	4.07%	$ 13,388	1.88%	$ -	0.00%
Direct Wages and Salaries	$ 26,225	1.68%	$ 27,242	4.07%	$ 4,871	1.88%	$ -	0.00%
Direct Employment	2	1.63%	2	3.97%	0	1.13%	-	0.00%
Total Income	$ 37,897	1.68%	$ 39,380	4.07%	$ 7,040	1.88%	$ -	0.00%
Total Employment	2	1.64%	2	3.96%	0	0.99%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 15,617	1.67%	$ 15,858	4.08%	$ 3,022	2.09%	$ -	0.00%
Profit[1]	$ 4,594	1.67%	$ 7,988	4.08%	$ 2,859	2.09%	$ -	0.00%
Existing State								
Person-days	3,878	14.92%	1,959	18.18%	403	10.04%	358	29.07%
Market Impact								
Direct Sales	$ 644,785	15.04%	$ 342,379	18.60%	$ 68,922	9.69%	$ 74,859	29.07%
Direct Wages and Salaries	$ 234,683	15.03%	$ 124,448	18.59%	$ 25,066	9.70%	$ 27,093	29.07%
Direct Employment	16	15.07%	9	18.76%	1.7	9.60%	2.0	29.85%
Total Income	$ 339,123	15.03%	$ 179,956	18.60%	$ 36,236	9.69%	$ 39,265	29.07%
Total Employment	18.0	15.05%	10	18.74%	2.0	9.65%	2.3	29.61%
Non-Market Impact								
Consumer's Surplus	$ 139,971	14.92%	$ 70,708	18.18%	$ 14,549	10.04%	$ 12,938	29.07%
Profit[1]	$ 41,173	14.92%	$ 35,618	18.18%	$ 13,767	10.04%	$ 777	29.07%
Cumulative Total								
Person-days	4,311	16.59%	2,398	22.26%	487	12.13%	358	29.07%
Market Impact								
Direct Sales	$ 716,841	16.72%	$ 417,278	22.67%	$ 82,310	11.57%	$ 74,859	29.07%
Direct Wages and Salaries	$ 260,908	16.71%	$ 151,690	22.66%	$ 29,937	11.58%	$ 27,093	29.07%
Direct Employment	17	16.70%	10	22.74%	2	10.73%	2	29.85%
Total Income	$ 377,019	16.71%	$ 219,336	22.67%	$ 43,275	11.58%	$ 39,265	29.07%
Total Employment	20	16.69%	12	22.71%	2	10.64%	2	29.61%
Non-Market Impact								
Consumer's Surplus	$ 155,588	16.59%	$ 86,566	22.26%	$ 17,571	12.13%	$ 12,938	29.07%
Profit[1]	$ 45,767	16.59%	$ 43,606	22.26%	$ 16,627	12.13%	$ 777	29.07%

1. Profit is used as a proxy for producer's surplus.

Table 3.13 Potential Benefits to Non-consumptive Users from Alternative 2 - Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 138	$ 3,450	$ 15,523
	Income	$ 337	$ 8,432	$ 37,942
	Employment	0.017	0.42	1.89
	Person-days	4	96	430
50%				
	Consumer's Surplus	$ 690	$ 17,248	$ 77,616
	Income	$ 1,686	$ 42,158	$ 189,711
	Employment	0.084	2.10	9.45
	Person-days	19	478	2,150
100%				
	Consumer's Surplus	$ 1,380	$ 34,496	$ 155,233
	Income	$ 3,373	$ 84,316	$ 379,422
	Employment	0.168	4.20	18.90
	Person-days	38	956	4,301

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 2

Table 3.14 Potential Benefits to Non-consumptive Users from Alternative 2, Cummulative - Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 1,091	$ 27,266	$ 122,698
	Income	$ 2,716	$ 67,889	$ 305,503
	Employment	0.144	3.61	16.22
	Person-days	30	755	3,399
50%				
	Consumer's Surplus	$ 5,453	$ 136,331	$ 613,490
	Income	$ 13,578	$ 339,447	$ 1,527,513
	Employment	0.721	18.03	81.11
	Person-days	151	3,777	16,997
100%				
	Consumer's Surplus	$ 10,906	$ 272,662	$ 1,226,980
	Income	$ 27,156	$ 678,895	$ 3,055,025
	Employment	1.442	36.05	162.23
	Person-days	302	7,554	33,994

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 2.

Alternative 3. This regulatory alternative adds the most protected area that could potentially benefit nonconsumptive recreators among all alternatives. The baseline activity occurring in the newly protected areas amounts to 2,136 person-days or 5.1% of all nonconsumptive recreation from charter/party/guide operations in the CINMS. This is still a relatively small addition because most nonconsumptive recreation in the CINMS takes place in State waters closer to the islands. The aggregate economic impact on income associated with this activity is estimated to be about $187 thousand, which supports about 10 full or part-time jobs (Table 3.15). In terms of person-days of activity, Whale Watching was by far the lead activity with 1,514 person-days followed by Nonconsumptive Diving with 534 person-days and Sailing with 88 person-days (Table 3.16). There were no kayaking/sightseeing activities conducted in the new MPAs of this alternative. Whale Watching is the most significant activity in Federal water portions of the proposed protected areas accounting for about 59% of the person-days of nonconsumptive recreation in the proposed new MPA areas.

The results of "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional MPAs are summarized in Table 3.17. In terms of person-days of activity, the added activity could range from a low of just nine person-days for a 10% increase in quality and a quality elasticity of 0.04 to a high of 9,614 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $748 and about $841 thousand dollars. Consumer's surplus to nonconsumptive recreators is estimated to range from $308 to $347 thousand.

Cumulative Impact. The existing State MPAs account for most of the potential improvement for nonconsumptive recreators. Across all MPAs, 8,735 person-days of nonconsumptive recreation took place in the 1999 baseline year. This was 20.8% of all the nonconsumptive recreation by access to the CINMS by charter/party boat and guide services. We estimate this activity generated about $781 thousand in income and about 42 full and part-time jobs in the local county economies. This activity also generated about $102.6 thousand in profits to charter/party boat and guide service operations and an estimated consumer's surplus to the nonconsumptive recreators of $315.3 thousand (Table 3.15).

The results of the "benefits transfer/policy analysis simulation" to estimate a range on the possible benefits of the additional and existing MPAs are summarized in Table 3.18. In terms of person-days of activity, the added activity could range from a low of just 35 person-days for a 10% increase in quality and a quality elasticity of 0.04 to a high of 39,307 additional person-days for a quality increase of 100% and a quality elasticity of 4.5. The estimated range of potential increases in income generated in the local county economies is between $3,126 and about $3.5 million. Consumer's surplus to nonconsumptive recreators is estimated to range from $1,261 to $1.4 million.

Table 3.15 Summary: Recreation Non-consumptive Activities - Alternative 3 - Economic Impact

	Additional State		Federal		Total: New Proposed		Existing State		Cumulative Total	
Person-days	493	1.2%	1,643	3.9%	2,136	5.1%	6,598	15.7%	8,735	20.8%
Market Impact										
Direct Sales	$ 80,237	1.1%	$ 275,149	3.9%	$ 355,386	5.0%	$ 1,130,945	15.9%	$ 1,486,331	20.9%
Direct Wages and Salaries	$ 29,222	1.1%	$ 100,127	3.9%	$ 129,349	5.0%	$ 411,290	15.9%	$ 540,639	20.9%
Direct Employment	1.9	1.1%	6.7	3.9%	8.6	4.9%	27.9	16.0%	36.5	21.0%
Total Income	$ 42,213	1.1%	$ 144,700	3.9%	$ 186,913	5.0%	$ 594,579	15.9%	$ 781,492	20.9%
Total Employment	2.2	1.1%	7.7	3.8%	9.9	5.0%	31.9	16.0%	41.7	21.0%
Non-Market Impact										
Consumer's Surplus	$ 17,799	1.2%	$ 59,312	3.9%	$ 77,111	5.1%	$ 238,166	15.7%	$ 315,277	20.8%
Profit[1]	$ 6,638	1.1%	$ 19,155	3.1%	$ 25,793	4.2%	$ 76,791	12.6%	$ 102,584	16.8%

1. Profit is used as a proxy for producer's surplus.

More detailed estimates for all three alternatives are available in Appendix F.

Table 3.16 Non-consumptive Recreation - Economic Impact - Alternative 3

	Whale Watching		NC Diving		Sailing		Kayaking/Sightseeing	
	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area	Boundary Alternative	% of Study Area
Additional State								
Person-days	260	1.00%	213	1.98%	20	0.49%	-	0.00%
Market Impact								
Direct Sales	$ 42,529	0.99%	$ 34,361	1.87%	$ 3,347	0.47%	$ -	0.00%
Direct Wages and Salaries	$ 15,487	0.99%	$ 12,517	1.87%	$ 1,218	0.47%	$ -	0.00%
Direct Employment	1.0	0.96%	0.8	1.77%	0.1	0.56%	-	0.00%
Total Income	$ 22,374	0.99%	$ 18,080	1.87%	$ 1,760	0.47%	$ -	0.00%
Total Employment	1.2	0.96%	1.0	1.84%	0.1	0.50%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 9,388	1.00%	$ 7,696	1.98%	$ 715	0.49%	$ -	0.00%
Profit[1]	$ 2,762	1.00%	$ 3,877	1.98%	$ 676	0.49%	$ -	0.00%
Federal								
Person-days	1,254	4.83%	321	2.98%	68	1.69%	-	0.00%
Market Impact								
Direct Sales	$ 205,505	4.79%	$ 57,653	3.13%	$ 11,991	1.69%	$ -	0.00%
Direct Wages and Salaries	$ 74,829	4.79%	$ 20,941	3.13%	$ 4,357	1.69%	$ -	0.00%
Direct Employment	5.0	4.80%	1.4	3.09%	0	1.69%	-	0.00%
Total Income	$ 108,106	4.79%	$ 30,293	3.13%	$ 6,302	1.69%	$ -	0.00%
Total Employment	5.7	4.78%	1.6	3.09%	0.4	1.73%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 45,274	4.83%	$ 11,588	2.98%	$ 2,450	1.69%	$ -	0.00%
Profit[1]	$ 13,318	4.83%	$ 5,837	2.98%	$ 2,318	1.69%	$ -	0.00%
Total New								
Person-days	1,514	5.83%	534	4.96%	88	2.18%	-	0.00%
Market Impact								
Direct Sales	$ 248,034	5.78%	$ 92,014	5.00%	$ 15,338	2.16%	$ -	0.00%
Direct Wages and Salaries	$ 90,316	5.79%	$ 33,458	5.00%	$ 5,575	2.16%	$ -	0.00%
Direct Employment	6	5.76%	2	4.86%	0	2.26%	-	0.00%
Total Income	$ 130,480	5.78%	$ 48,372	5.00%	$ 8,062	2.16%	$ -	0.00%
Total Employment	7	5.74%	3	4.93%	0	2.23%	-	0.00%
Non-Market Impact								
Consumer's Surplus	$ 54,662	5.83%	$ 19,283	4.96%	$ 3,165	2.18%	$ -	0.00%
Profit[1]	$ 16,079	5.83%	$ 9,714	4.96%	$ 2,995	2.18%	$ -	0.00%
Existing State								
Person-days	3,878	14.92%	1,959	18.18%	403	10.04%	358	29.07%
Market Impact								
Direct Sales	$ 644,785	15.04%	$ 342,379	18.60%	$ 68,922	9.69%	$ 74,859	29.07%
Direct Wages and Salaries	$ 234,683	15.03%	$ 124,448	18.59%	$ 25,066	9.70%	$ 27,093	29.07%
Direct Employment	16	15.07%	9	18.76%	1.7	9.60%	2.0	29.85%
Total Income	$ 339,123	15.03%	$ 179,956	18.60%	$ 36,236	9.69%	$ 39,265	29.07%
Total Employment	18.0	15.05%	10	18.74%	2.0	9.65%	2.3	29.61%
Non-Market Impact								
Consumer's Surplus	$ 139,971	14.92%	$ 70,708	18.18%	$ 14,549	10.04%	$ 12,938	29.07%
Profit[1]	$ 41,173	14.92%	$ 35,618	18.18%	$ 13,767	10.04%	$ 777	29.07%
Cumulative Total								
Person-days	5,392	20.75%	2,493	23.14%	491	12.22%	358	29.07%
Market Impact								
Direct Sales	$ 892,819	20.82%	$ 434,393	23.60%	$ 84,260	11.85%	$ 74,859	29.07%
Direct Wages and Salaries	$ 324,999	20.82%	$ 157,906	23.59%	$ 30,641	11.86%	$ 27,093	29.07%
Direct Employment	22	20.83%	11	23.62%	2	11.86%	2	29.85%
Total Income	$ 469,602	20.82%	$ 228,328	23.59%	$ 44,297	11.85%	$ 39,265	29.07%
Total Employment	25	20.80%	12	23.67%	2	11.88%	2	29.61%
Non-Market Impact								
Consumer's Surplus	$ 194,633	20.75%	$ 89,991	23.14%	$ 17,714	12.22%	$ 12,938	29.07%
Profit[1]	$ 57,252	20.75%	$ 45,332	23.14%	$ 16,762	12.22%	$ 777	29.07%

1. Profit is used as a proxy for producer's surplus.

Table 3.17 Potential Benefits to Non-consumptive Users from Alternative 3 - Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 308	$ 7,711	$ 34,700
	Income	$ 748	$ 18,691	$ 84,111
	Employment	0.039	0.99	4.43
	Person-days	9	214	961
50%				
	Consumer's Surplus	$ 1,542	$ 38,555	$ 173,499
	Income	$ 3,738	$ 93,457	$ 420,554
	Employment	0.197	4.93	22.16
	Person-days	43	1,068	4,807
100%				
	Consumer's Surplus	$ 3,084	$ 77,111	$ 346,997
	Income	$ 7,477	$ 186,913	$ 841,109
	Employment	0.394	9.85	44.33
	Person-days	85	2,136	9,614

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 3

Table 3.18 Potential Benefits to Non-consumptive Users from Alternative 3, Cummulative - Step 2 Analysis

Increase in Quality	Economic Measure	Elasticity of 0.04	Elasticity of 1.0	Elasticity of 4.5
10%				
	Consumer's Surplus	$ 1,261	$ 31,528	$ 141,874
	Income	$ 3,126	$ 78,149	$ 351,671
	Employment	0.167	4.17	18.77
	Person-days	35	873	3,931
50%				
	Consumer's Surplus	$ 6,306	$ 157,638	$ 709,372
	Income	$ 15,630	$ 390,746	$ 1,758,356
	Employment	0.834	20.85	93.83
	Person-days	175	4,367	19,653
100%				
	Consumer's Surplus	$ 12,611	$ 315,277	$ 1,418,745
	Income	$ 31,260	$ 781,492	$ 3,516,712
	Employment	1.668	41.70	187.65
	Person-days	349	8,735	39,307

1. Benefits are the aggregate amounts across all non-consumptive activities for Alternative 3.

Other Potential Benefits and Net Assessment

In previous sections we addressed the potential costs to all consumptive users (both the recreational industry and for the commercial fishery and kelp), we discussed the potential benefits to recreational consumptive users and commercial fisheries from the replenishment effect of the marine reserves. We also discussed the potential benefits to nonconsumptive recreational users and simulated the potential benefits using a range of assumptions about future quality increases in the marine reserves and the behavioral responses (quality elasticities). In the introduction of the report, we introduced the concepts of nonuse or passive economic use values. Here we conduct a policy analysis simulation. This is not a benefits transfer because there are no available studies in the literature on the passive economic use values of marine reserves anywhere in the world. Our policy analysis simulation uses conservative assumptions about how many American households might be willing to pay for marine reserves in the CINMS. We inform the policy analysis simulation by using a conservative range of values from the economics literature on passive economic use value estimated for a variety of natural resources. We describe our ranges of values as conservative meaning they will generate lower bound estimates of this potential value of marine reserves in the CINMS. We summarize some key National and California Statewide surveys to provide underlying support for the notion that people are willing to pay for marine reserves. Lastly, we provide a rough assessment of the Net National Benefits of marine reserves in the CINMS. We do this by using maximum potential loss estimates for consumptive uses, which we showed in Step 2 analysis generally overstates losses to consumptive uses and compare with the estimates for passive economic use value generated with lower bound conservative estimates of the number of households willing to pay and the annual amounts they might be willing to pay. Although we show a range of values for nonconsumptive recreation, we did not add these in the Net Benefit Assessment.

We are not able to provide an analysis by alternative; however, for passive economic use values to be considered valid, researchers usually apply a "scope test". The scope test checks to make sure that people's total willingness to pay for a good or service increases with the quantity and/or quality of the good or service being evaluated. So we would presume that a larger marine reserve or a network of marine reserves that provides more resource protection will have higher passive economic use values than smaller marine reserves of a network of marine reserves that provides less resource protection.

An important conclusion of our policy analysis simulation and net benefits assessment is that, although we don't have estimates of the "actual value" of marine reserves (lack of information uncertainty), decision-makers can be highly confident that any of the marine reserve alternatives considered here would yield net economic benefits. The gains to the Nation will be greater than the costs. The costs being the lost values from all current and future consumptive activities displaced from the marine reserves.

Nonuse or Passive Use Economic Value. As noted above, to date there are no known studies that have estimated nonuse or passive use economic values specifically for the marine reserves in the CINMS or for marine reserves anywhere else. However, Spurgeon (1992) has offered two sets of identifiable factors, which will dictate the magnitude of nonuse or passive use economic values. First, nonuse economic values will be positively related to the quality, condition, and uniqueness of the ecosystem on a national or global scale. Second, the size of population, standard of education, and environmental perception of people in the country owning or having jurisdiction over the ecosystem will be positively related to nonuse or passive use economic values. Thus, nonuse or passive use economic values are determined by both supply and demand conditions. The existence of many similar sites would reduce the value. Although Spurgeon limits his scope to the people in the country owning or having jurisdiction over the ecosystem, people from all over the world may have nonuse or passive use economic values for ecosystem protection in other countries. Debt for nature protection swaps being conducted by The Nature Conservancy in South America is just one example. Legitimacy of including the values of people from other countries is more a judicial concern than an economic one. In some judicial proceedings people from other countries might not have legal standing over issues of resource protection and their economic values may be eliminated from inclusion in the proceedings.

What we know about nonuse economic values. We searched the literature and found 19 studies in which nonuse economic values were estimated. Desvouges et al (1992) contained summaries of 18 of the 19

studies. The remaining study was by Carson et al (1992) on the Exxon Valdez Oil Spill. Sixteen (16) of the 18 studies found in Desvouges et al (1992) reported values (not adjusted for inflation) of $10 or more per household per year for a broad variety of natural resource protection efforts. Of the two studies that reported values less than $10/household/year, one reported $3.80/household/year for adding one park in Australia and $5.20/household per year for a second park (these estimates were from a National sample of Australians). The other study that estimated nonuse economic values less than $10/household/year was a study of Wisconsin resident's willingness to pay for protecting bald eagles and striped shiners in the State of Wisconsin. For the bald eagle, nonuse economic values had an estimated range of $4.92 to $28.38/household/year, while for striped shiners the values ranged from $1.00 to $5.66/household/year. Total value ranged from $6.50 to $75.31/household/year.

Only two of the 18 studies summarized in Desvouges et al (1992) used National samples of U.S. households, the others were limited to state or region populations. The Exxon Valdez Oil Spill Study (Carson et al, 1992) used a National sample of U.S. households. An important caveat is that the sample included only English speaking households and eliminated Alaskan residents. Alaskan residents were eliminated to limit the sample to primarily nonusers of Prince William Sound (site of the oil spill) and non-English speaking households were eliminated because the researchers were not able to convert their questionnaires to other languages. The impact was that the sample represented only 90 percent of U.S. households.

Carson et al (1992) reported a median willingness to pay of $31 per household. The payment was a lump sum payment through income taxes and covered a ten-year period. The funds would go into a trust fund to pay for equipment and other costs necessary to prevent a future accident like the Exxon Valdez in Prince William Sound. After 10 years, double hull tankers would be fully implemented and the need for the protection program would expire. Mean willingness to pay was higher and more variable to model specification than the median willingness to pay, so the authors argued that the median value was a conservative estimate. Applying the $31/household to only 90 percent of the U.S. population of households was also considered conservative since non English speaking people probably have positive nonuse economic values as do Alaskans.

Estimation of Nonuse Economic Values. Given what we know about nonuse economic values, we can develop a range of "conservative" (i.e., lower bound) estimates of nonuse or passive use economic values for the marine reserves in the CINMS. To do this requires the following assumptions and facts:

Assumptions:

1. One (1 to 2) percent of U.S. households would have some positive nonuse or passive economic use values for a network of marine reserves in the CINMS.
2. The one (1 to 2) percent of U.S. households would be, on average, willing to pay either $3/household/year, $5/household/year, or $10/houshold/year for marine reserves in the CINMS.

Fact:

1. As of July 1, 1999, there were 103.9 million households in the U.S.

Using the above assumptions and the number of U.S. households in 1999, we can estimate a probable lower bound set of estimates for the nonuse or passive use economic values for the network of marine reserves in the CINMS.

	$3/household/year	$5/household/year	$10/household/year
Annual Amount (1%)	$3.12 million	$5.19 million	$10.39 million
Annual Amount (2%)	$6.23 million	$10.39 million	$20.78 million

Under the assumption that 1% of U.S. households would be willing to pay some amount, the annual willingness to pay for marine reserves in the CINMS would range between $3.12 million and $10.39 million, depending on the assumed willingness to pay per household. Under the assumption that 2% of U.S. households would be willing to pay some amount, the annual willingness to pay for marine reserves in the CINMS would range between $6.23 million and $20.78 million. We would expect that nonuse economic values would be greater the larger the area protected. But as described earlier, we would also expect willingness to pay to be positively related to both the characteristics of those valuing the reserve and the characteristics of what they are asked to value. Since our estimates of nonuse economic values are based on an assumed range of values (at the lowest end of the distribution of values estimated in other studies), we are not able to compare the values of the different alternatives in dollar terms. However, following the suggestions of Spurgeon, we demonstrate the characteristics of the U.S. population that would support our statement that the above estimates would likely be lower bound estimates.

Factors Supporting Positive Nonuse Economic Value. We reviewed four studies based on National surveys of U.S. households that evaluated adult's perceptions and concerns about the environment. In addition, one of the studies focused specifically on ocean related issues (SeaWeb, 1996) and found strong support for marine protected areas. One more recent study (SeaWeb, 2001) directly addressed the issue of marine protected areas and fully protected marine reserves. Each of the surveys demonstrated that U.S. citizens have a high level of concern about the environment and believe the environment is threatened and requires action and overwhelmingly support the creation of marine reserves. One recent study based on a survey of Californians (SeaWeb, 2002) found support for the California MLPA and for marine reserves in the CINMS. Also, our assumption that only one (1) percent of U.S. households would be willing to pay for marine reserves in the CINMS would appear to be a conservative lower bound estimate since the Roper survey (Roper, 1990) indicated that in 1990 eight (8) percent of U.S. households made financial contributions to environmental organizations. Selected results from the five studies are summarized below.

Environmental Opinion Study, Inc. National sample of 804 households conducted May 18-26, 1991.

Identification with Environmental Label

	%
Strong Environmentalist	31
Weak Environmentalist	29
Lean Towards Environmentalism	30
Neutral	6
Anti-Environmentalist	4

Roper 1989 and 1990 National Surveys

1. Things the Nation Should Make a Major Effort on Now

	1989 (%)	1990 (%)
a. Trying to solve the problem of crime and drugs	78	88
b. Taking steps to contain the cost of health care	70	80
c. **Trying to improve the quality of the environment**	**56**	**78**
d. Trying to improve the quality of public school education	N//A	77
2. Contribute money to environmental groups	7	8

SeaWeb 1996. National Sample of 900 U.S. Households (May 1-15, 1996)

1. Condition of the ocean	49% very important	38% somewhat important
2. Destruction of the ocean on Quality of Life		
a. Today	52% very serious	35% somewhat serious
b. 10 years from now	63% very serious	23% somewhat serious
3. Oceans threatened by human activity		82% agree
4. The federal government needs to do more to help protect the oceans		85% agree to strongly agree
5. Destruction of ocean plants/ animals		56% very serious problem
6. Overfishing by commercial fishermen		45% very serious problem
7. Deterioration of coral reefs		43% very serious problem
8. Protect sanctuaries where fishing, boating, etc, prohibited		62% strongly agree
9. Support efforts to set up Marine Sanctuaries		24% say they are almost certain to take this action
10. Marine sanctuaries where no human activity is permitted		19% say they are almost certain to take this action

SeaWeb 2001, A combination of two studies.

1. **Attitudes Toward Marine Reserves, National Sample of 1,000 Adult Americans Nationwide, February 9-11, 2001**

2. **Public Attitudes Toward Protected Areas in the Ocean, National Sample of 802 Adult Americans Nationwide, September 25, 1999 to October 3, 1999**

Summary of Key findings:

- **Most Americans have a fairly Negative View of the Overall Health of the Oceans** (44% - Only Fair, and 15% - Poor for a total of 59% with Negative ratings)
- **Nearly Two-thirds believe that regulations protecting the ocean are too lax** (63% - regulations are not strict enough)
- **Pollution, Contaminated Seafood, and Dirty Beaches Top the list of ocean concerns. Recreation-related concerns are seen as less serious.**
- **Large majorities find the condition of both "Coastal" and "Deep Sea" Waters Important**
  "How important is the condition of _____ to you personally?"
  Coastal Waters (69% very important and 23% somewhat important)
  Deep Sea (53% very important, 30% somewhat important)
- **Americans believe a far greater percentage of our ocean waters are fully protected than actually are.**
  "As you may know, there are different kinds of protected areas in American oceans – some are fully protected and allow no human activities that could harm the ocean environment at all. Other kinds of protected areas have lower levels of protected areas and ban only certain activities. What percentage of U.S. waters do you think are fully protected – that is, allow no human activities that could harm the ocean environment at all?"
  On average, Americans believe 22% of the oceans are fully protected.
- **Only one-third of Americans are even dimly aware of the existence of Marine Sanctuaries.**
  "Do you happen to know whether or not the federal government has established certain areas of the ocean as marine sanctuaries – or don't you happen to know?"
  (Yes-do know, 33%, No-don't know, 17% and Don't Know, 50%)

- **Most Americans think there are too few Marine Sanctuaries.**
  "Currently there are 12 areas of the ocean in US territorial waters that are designated as marine sanctuaries. Do you think that is too many, about the right number, or too few?"
  (Too Few-60%, About Right-19%, Too Many-3%, Don't Know-18%)
- **Support for Strengthening Protections in the 12 Marine Sanctuaries is Overwhelming.**
  "There are currently 12 marine sanctuaries in United States territorial waters which total about 1% of US waters and there are few restrictions on recreational or commercial activities within the sanctuaries. Do you think that we should increase protections that restrict human activities within the sanctuaries or do you think we should not increase protections that restrict human activities within marine sanctuaries in U.S. waters or don't you have an opinion on this?"
  (Increase Protections-75%, Do not Increase Protections-10%, Don't Know-15%)
- **A plurality think of the ocean as a habitat for marine creatures. Only a minority thinks of the ocean in purely instrumental terms.**
  "Which of the following best describes how you mainly think of the ocean?"
  - *As a habitat for the fish, marine creatures and plants that live in the ocean (41%)*
  - *As a spiritual place important to human life on earth (13%)*
  - *As a place for recreation such as swimming, boating, fishing, and vacationing (17%)*
  - *As an important source of food (15%)*
  - *As an important resource for oil and transportation (6%)*
  - *Other or don't know (8%)*
- **At the same time, People are not sure exactly how ocean systems work. Most, but far from all, think fish breeding grounds and coral reefs are found only in particular places.**
  "As far as you know, do most species of fish breed all throughout the ocean or do various species of fish breed in particular places within the ocean or don't you have an opinion on this?"
  (All Over-14%, Particular Places-63%, Don't Know-24%)
  "As far as you know, are coral reefs only found in certain areas of the ocean or are they found all throughout the ocean or don't you have an opinion on this?"
  (Throughout-26%, Certain areas-56%, Don't Know-18%)
- **On the other hand, most feel that pollution in one area affects the whole ocean…..**
  "As far as you know, does pollution entering on area of the ocean affect the entire ocean, or does it mostly affect the area of the ocean near the source, or don't you have an opinion on this?"
  (Entire Ocean-58%, Area Near Source-34%, Don't Know-8%)
- **…Which results in division on whether the ocean has unique areas that can be protected.**
  "Which of the following statements comes closest to your own view: the ocean, like the land, has certain areas that are unique and can be protected from pollution or overfishing <u>OR</u> The ocean is one giant body of water and protecting one particular area of it from pollution or overfishing is useless since anything that is done in one part of the ocean will affect every other part or don't you have an opinion on this?"
  (Unique Areas-47%, One Giant Body-43%, Don't Know-10%)
- **Yet, when these areas are described, support for protected areas is broad and strong.**
  "Do you favor or oppose the United States having certain areas of the ocean within U.S. territorial waters as ocean protected areas in which activities that can result in pollution, seriously deplete fish or marine life, or damage important underwater habitat such as coral reefs and other special places are limited, or don't you have an opinion on this?"
  (Favor-75%, Oppose-10%, Don't Know-15%)
- **Overwhelming public support for the Clinton Executive Order on marine reserves (from Feb., 2001 Survey)**
  "Last May, former President Clinton signed an executive order calling on states, local governments and non-governmental organizations to create a system of protected areas in the oceans off the U.S. coasts. Do you favor or oppose this executive order to establish a system of marine protected areas in U.S. waters?"
  (Favor-83%, Oppose-16%, Don't Know-2%)
- **Top goals for ocean protected areas focus on dumping and pollution, followed by protection of sea life and habitats. Middle tier goals focus on management of commercial enterprise.**

- **Americans see a value in fully protected marine reserves with no exceptions for even recreational activities.**
  "We need some areas that are fully protected, even from recreational activities" (63%)
  "It is not right to prohibit individual recreational use of the ocean" (16%)
  "Don't Know" (21%)
- **The public finds scientific consensus to be a compelling reason to support fully protected marine areas.**
  "Leading marine scientists issued a statement recently saying that we need fully protected ocean areas that prohibit all invasive and extractive human activities, both recreational and commercial. These scientists say that the research shows that full protection in these areas leads to more robust and diverse marine life within the area, and also provides greater benefits to ocean habitat and marine life outside the protected area. How convincing is this as a reason to support fully protected ocean areas?"
  (Convincing-77%, Not Convincing-21%, Not Sure-2%)
- **A simple statement that we protect less than 1% of our ocean waters is very compelling to the public.**
  "Currently, we only protect less than 1% of US waters. To preserve this beautiful resource, we need to protect more. How convincing is this as a reason to support fully protected ocean areas?"
  (Convincing-88%, Not Convincing-9%, Not sure-3%)

SeaWeb 2002. Survey of 1,000 likely voters in California (January 8-16, 2002)

Summary of key findings:

- **64% say overall health of California's ocean is fair-to-poor**
- **62% say health of marine life, fish and mammals that live in California's ocean waters is only fair-to-poor**
- **56% say the abundance of marine life in state ocean waters is fair-to-poor**
- **22% believe their state's ocean waters are fully protected from all human activities that can harm the ocean environment.**
- **There is strong support for establishing fully-protected areas in the ocean in which all extractive activities are prohibited, including oil drilling, mining and all commercial and recreational fishing. 71% support establishing such areas in California's ocean waters, and 55% strongly support their establishment, while 15% are opposed.**
- **Even when respondents are told they might loose personal access to parts of the ocean, 69% continue to support full protected areas, while 16% are opposed.**
- **When told that the Marine Life Protection Act "provides for the establishment of a range of protected areas from fully protected with no commercial or recreational activities to those that allow all recreational and most commercial activities," 85% say it is important that the MLPA result in at least some percentage of California's ocean being fully protected from all commercial and recreational activities.**
- **65% say that the long-term benefits of a healthier and more abundant resources, including fish populations and increased tourism to restored ocean places is more important than the short-term costs in jobs, higher prices for goods and services and impacts on people whose incomes depend on ocean resources. Only 14% feel that short-term costs should take precedence.**
- **83% agree with the statement, "I am willing to give up personal access to certain places in the ocean just so there can be some places that are fully protected from all human use (59% strongly agree)**
- **89% agree that, "Individuals and businesses that use ocean resources have a responsibility to leave critically important habitat and nursery grounds for fish and marine mammals untouched" (66% strongly agree)**
- **80% agree that, "Protecting less than 1% of California's ocean from all commercial and extractive activities is not enough *55% strongly agree)**

An important criterion for evaluating the legitimacy of estimated nonuse or passive economic use values is referred to the scale or scope test. The scale or scope test is based on the premise that more of a good or service should have higher value than less of a good or service. When consumers are presented with a valuation scenario, a larger marine reserve that provides more habitat protection should have more value than a smaller marine reserve that provides less habitat protection.

The U.S. population is certainly a high income and highly educated population and, as the results above predictably show, the U.S. and California population has high environmental concern and overwhelmingly supports the creation of marine reserves. Cleary on the demand side, our assumption that only one (1) or two (2) percent of the U.S. households would be willing to pay some amount for marine reserves in the Channel Islands National Marine Sanctuary (CINMS) seems extremely conservative.

On the supply side, the CINMS is one of only 13 National Marine Sanctuaries, two of which only protect cultural resources (Monitor and Thunder Bay). The other 11 represent special marine resources. National Marine Sanctuaries have special recognition. Each goes through a public process to be established. Congress must approve the designation and the President must sign the legislation before a proposed area becomes a National Marine Sanctuary. To date only 11 marine areas protecting natural resources in the U.S. have been established as National Marine Sanctuaries.

Contrast Prince William Sound (site of the Exxon Valdez Oil Spill) with the CINMS. Prince William Sound doesn't have the special recognition as a National Marine Sanctuary and is not recognized, as a Marine Protected Area (MPA) i.e., there is no law specifically recognizing Prince William Sound as a special marine area. However, Carson et al (1992) were able to show that 90 percent of U.S. households were willing to pay $31 per household for a ten-year protection program for Prince William Sound.

Given the demand and supply information above, it would seem that our assumption of only one (1) or two (2) percent of U.S. households being willing to pay some amount is extremely conservative.

Scientific and Education Values. Marine reserves provide a multitude of benefits. Sobel (1996) provides a long list of these benefits. Most of those benefits have been covered in Chapter 1 and 2 and in our discussion of nonuse economic benefits above. Scientific and education values were categorized by Sobel into those things a reserve provides that increase knowledge and understanding of marine systems. Sobel provides the following lists of benefits:

Scientific

- Provides long-term monitoring sites
- Provides focus for study
- Provides continuity of knowledge in undisturbed site
- Provides opportunity to restore or maintain natural behaviors
- Reduces risks to long-term experiments
- Provides controlled natural areas for assessing anthropogenic impacts, including fishing and other impacts

Education

- Provides sites for enhanced primary and adult education
- Provides sites for high-level graduate education

We cannot quantify these benefits, but they are extremely important.

Net Assessment

Here we provide a net assessment using the National Net Benefits Approach. Under this approach, only consumer's surplus and economic rent values are appropriate for consideration, as in a formal benefit-cost analysis. We are not able to quantify all the costs and benefits, especially not across all alternatives, as with the nonuse or passive economic use values. But with certain assumptions designed to bias the result in favor of the consumptive activities, we show that, except under the most conservative assumptions for the larger reserve alternatives, the nonuse or passive economic use values would likely exceed all consumptive use values. ***Thus, there would be net national benefits to adopting any of the alternatives for the proposed marine reserves in the CINMS.***

Commercial Fishing and Kelp. We concluded in Chapter 1 that the supplies of CINMS caught commercial fish were not a high enough proportion of total supply to affect prices. Squid and urchins are primarily sold in international markets and CINMS total catch is only 2.15% of world supply for squid and 2.24% of world supply for urchins. The proportions of supply impacted by each marine reserve alternative would be far too small to impact prices and consumer's surplus impacts from each alternative would be zero. For squid and urchins the percent of world supply impacted varies from about one-tenth of one percent to one-half of one percent. Also, we have found no evidence that economic rents exist in the CINMS fisheries. For the largest commercial fishery, squid, there appears to be economic overfishing and possibly negative economic rents. Thus, the most likely net value from commercial fishing is negative economic rents. We bias the assessment in favor of the commercial fisheries by simply assuming no net economic value, instead of negative economic value.

Consumptive Recreation Activities. We use our Step 1 analysis estimates and ignore the offsetting factors discussed at the beginning of this chapter that indicate much of the losses in Step 1 would not likely occur. Again, the effect here will be to bias the analysis towards the consumptive users.

Nonconsumptive Recreation Activities. We simulated a range of potential benefits for a portion of the group that we were able to include in our analyses, i.e., those doing nonconsumptive activities using the for hire or charter/party/guide boat businesses. We were not able to find any information to estimate the amount of nonconsumptive use from private household/rental boats in the CINMS. We include a mid-range and upper range of values estimated for the charter/party/guide boat nonconsumptive users. Because the nonconsumptive private household boat use is not included, again our estimates are biased towards the consumptive users.

Table 3.19 summarizes the results of our National Net Benefits Assessment. The "+" at the bottom of the table means that, when comparing only the nonuse or passive economic use values with the sum of the consumptive use values, the nonuse or passive economic use values are higher. A "-" means that nonuse/passive economic use values are lower. We conduct the assessment using the two policy simulation assumptions, 1) one percent of U.S. households are willing to pay the three different dollar amounts, and 2) two percent of U.S. households are willing to pay the three different dollar amounts.

Results of our policy analysis simulation indicate that passive economic values of marine reserves will most likely exceed the value of all consumptive uses in all cases, except in the case where passive economic use values are at the lowest amount per household ($3/household/year) and only one percent of U.S. households would be willing to pay the amount and reserves displaced recreation consumptive use at the magnitude of alternative 3. If we were to consider the values to nonconsumptive recreation, in addition to the passive economic uses values, then the marine reserves would have net benefits for all three alternatives for all scenarios. Even in the face of information uncertainty, decision-makers can be highly confident that marine reserves in the CINMS will yield positive net benefits to the Nation.

Table 3.19 Net Assessment: National Net Benefits of Marine Reserves in the CINMS

Use	Alternatives 1	2	3
Costs			
Recreation Consumptive	$2.24 million	$2.96 million	$3.19 million
Commercial fisheries	$0	$0	$0
Total Consumptive	$2.24 million	$2.96 million	$3.19 million
Benefits			
Recreation Nonconsumptive			
Mid-range (50% Quality increase, elasticity 1.0)	$122.8 thousand	$136.3 thousand	$157.6 thousand
Highest (100% Quality increase, elasticity 4.5)	$1.1 million	$1.2 million	$1.4 million
Nonuse/Passive Economic Use Value			
1% of Households Willing to Pay			
Lowest ($3.12 million)	+	+	-
Mid-range ($5.19 million)	+	+	+
Highest ($10.39 million)	+	+	+
2% of Households Willing to Pay			
Lowest ($6.24 million)	+	+	+
Mid-range ($10.38 million)	+	+	+
Highest ($20.78 million)	+	+	+

Net National Benefits Approach versus Local Income and Employment

Economists for years have been trying to explain cost-benefit analysis or the net national benefits approach. Even though cost-benefit analysis has been widely accepted in public policy and management many still don't understand the concepts of consumer's surplus, producer's surplus or economic rent used by economists in cost-benefit analysis. Many understand sales, income and employment numbers and how this relates to their local economies. But, generally these measures are not appropriate inputs into the cost-benefit calculation. They enter the analysis indirectly when one of the major assumptions of cost-benefit analysis is violated i.e., that the economy is at full employment and any displaced capital or labor can easily find employment. When the economy is not at full employment or capital and labor cannot simply find alternative employment, this leads to real economic costs that must be included. There are also issues of equity or fairness that are not addressed in cost-benefit analysis. To address this issue some public agencies have asked that the distribution of costs and benefits be included in analyses.

The net national benefits approach versus the local income and employment approach partially addresses this question of the distribution of benefits and costs. As we showed above in the net national benefits exercise, the main benefits of marine reserves came from national sources that are highly dispersed across the country. Nonuse or passive economic use values will be dispersed widely across people throughout the country. There are no income and employment impacts associated with nonuse or passive use values, except the media sources, which are the basis for people finding out about the resources they value. Consumer's surplus values from changes in supply of commercial fishing products are also widely dispersed and, for many CINMS species, consumers would include foreign consumers. The potential income and employment impacts are largely concentrated in the local communities adjacent to the CINMS. If there are trade-offs, they might entail distributions of national benefits with most of the costs born locally. This is true for many goods and services where there might be high net national benefits, but the costs are concentrated (e.g. pollution and undesirable industrial development) in local areas. Oil and gas development is certainly one of these types of issues. Benefits are often small per individual dispersed

across the whole country, while costs are high per a small number of individuals concentrated in local areas.

Why don't economists want to include income and employment impacts in cost-benefit analysis? The general answer is that if people don't spend their money on one thing they will spend it on something else. So, one person's loss is another person's gain. This is the issue of substitution we discussed in our Step 2 analysis, but on a broader scale. If someone is displaced from their favorite recreational fishing spot and decide to not go fishing, but instead go to out to a restaurant and see a movie, this too has sales, income and employment impacts that would partially or even fully off set the sales, income and employment impacts in the local economy of the lost fishing day. If people don't go fishing or diving, they will do something else and that something else will generally involve some activity which requires some spending. That spending will partially or fully off set the impacts on sales, income and employment. There may be different patterns of spending. And, it may be an issue of one person's loss is another person's gain. The net effect could be zero, in terms of total local sales, income and employment, or it could be lower sales, income and employment locally, but no difference from a State, Region or National perspective. The same is not true for the net national benefits approach. The concepts of consumer's surplus, producer's surplus and economic rents are net benefits and costs. They may have different distributions, but they are by definition net benefits and costs and do not cancel each other out. This is why economists don't include income and employment in cost-benefit analyses.

End Notes

1. Some confusion exists about open access fisheries. For economic analysis, it is critical to understand the structure of who can enter the fishery, if there are constraints on the amount and timing of total take allowed, and what is the current capacity to catch the fish stock.

   Case 1. A permit system where all you have to do is buy a permit and you are allowed to fish. And, the fishery has some total allowable take, but not specified by fishermen (first come first serve). The economic analysis of open access fisheries applies.

   Case 2. A permit system where all you have to do is buy a permit and you are allowed to fish, except the number of permits is limited. However, the capacity of the fleet is such that they could catch the entire stock of fish. One might describe this as limited entry, but it has no real effect economically or biologically because of the capacity of the fleet. This would still be analyzed as an open access fishery.

   Case 3. A permit system where all you have to do is buy a permit and you are allowed to fish, except the number of permits is limited. In this case, the number of permits and the capacity of the fleet is controlled to where it cannot exceed total allowable catch. Still do not have Individual Transferable Quotas, but there is the possibility of the participants in the fishery earning economic rents. This would not be analyzed as an open access fishery. This is likely to be a derby fishery, still not the economically efficient solution, but not the open access fishery.

   Case 4. Individual transferable Quotas (ITQs). A limited number of fishermen are given ITQs, which specify a certain share of the total allowable catch. This avoids the derby fishery problem and since one can buy and sell the ITQs, it solves the capacity problem and fosters economic efficiency. Not open access.

   It would appear that all the CINMS fisheries fir either Case 1 or 2 and can be analyzed as open access fisheries.

2. Because the Pomeroy Sample surveys were undertaken during the off season for squid, the squid/wetfish sample under-represents squid fishery participants from Washington and, to a lesser extent, those from California who were fishing in Alaska at the time of the study. The representativeness of the Barilotti Sample is also limited, due in large part to the greater participation of Santa Barbara fishermen, and the more limited participation of Ventura and Channel Islands Harbor fishermen.

3. On monopoly in the squid fishery, Hackett (in press) writes, “California receiver/processors can be characterized as oligopsonists (few buyers, relative high concentration, and costly entry) in the market for fish. It is important to note, however, that a more concentrated market structure (such as oligopsony) does not necessarily imply that firms can exercise market power, and the question of market power is beyond the scope of this report.”

4. Economic overfishing does not necessarily lead to exit from the fishery, especially if social, economic and/or regulatory conditions limit participants’ alternatives. The squid fishery is only one component of the larger wetfish fishery (in geographic and species terms), such that economic overfishing of squid may be offset by emerging opportunities with other species (e.g., sardine). Moreover, recent and pending regulatory changes have led to and will likely lead to further changes in this situation.

5. This outcome may or may not be realized, depending on the extent of overcapitalization prior to implementing ITQs and to the extent to which ITQs actually reduce capacity – which will depend on how the ITQ program is designed.

6. Bird Watching was estimated at 2.6 million participants, Viewing Other Wildlife at about 2.6 million participants, and Viewing or Photographing Scenery at about 4.2 million participants. The total of 6.3 million participants in all viewing activities eliminates double counting due to the fact that people participate in multiple activities. There may be some double counting in days of activity as well.

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Appendix A

A Socioeconomic Overview of the Santa Barbara and Ventura Counties as it Relates to Marine Related Industries and Activities

Originally Published, June 2000

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Appendix A

INTRODUCTION

Background

The CINMS is currently involved in a management plan revision, a process that is mandated to take place approximately every five years. Two major issues have emerged from public scoping meetings on the management plan revision; 1) Boundary Expansion and 2) Ecological or Marine Reserve(s) or "no take areas". Changes with respect to either of these issues was entail management actions and regulations that may have socioeconomic impacts on current and future user groups.

For the management plan revision, the CINMS organized a Sanctuary Advisory Council (SAC) made-up of various stakeholders. For the ecological or marine reserve (s), the CINMS organized a Marine Reserve Working Group (MRWG), also made-up of various stakeholders, that was develop alternatives and make a recommendation to the SAC and the CINMS with regard to establishment of marine reserves. A science panel and socioeconomics team have been established to advise the CINMS, SAC and MRWG for both the boundary expansion and marine reserve (s).

The socioeconomics team has hired three contractors who performed the data collection for the recreation industry and the commercial fishing industry to support the socioeconomic impact analysis of the marine reserves (s). The Socioeconomics Team is led by two NOAA economists, Dr. Vernon R. (Bob) Leeworthy and Peter C. Wiley. For the recreation industry, Dr. Charles Kolstad, Professor of Economics at the University of California-Santa Barbara, was contracted to collect information. For the commercial fisheries, two contractors were hired to collect information; Dr. Craig Barilotti of Sea Foam Enterprises in San Diego, California and Dr. Caroline Pomeroy of the University of California-Santa Cruz. Dr. Barilotti collected information from all commercial fishermen that fish in the CINMS, other than squid fishermen, and Dr. Pomeroy collected information from squid fishermen that fish the CINMS.

The information was collected to support the socioeconomic impact analysis of the marine reserve (s) is being collected and compiled in a manner so as to capture both the temporal and spatial variation in activities for the recreation industry and catch and value for the commercial fisheries. The information was placed in a geographical information system (GIS) using the ArcView software. The information from both the recreation industry and the commercial fishing industry was collected using a one square minute unit of resolution.

The information organized in the GIS are linked with economic parameters from existing studies and were used to develop estimates of economic impacts as measured by changes in both market economic values (e.g., sales/output, income and employment) and non market economic values (e.g., consumer's surplus and economic rents). Socioeconomic profiles of those potentially impacted were compared against all users from a given user group and against the general population of the local area (e.g., Santa Barbara and Ventura Counties).

To accomplish the above required a review of the existing literature and data bases available and compiling this information in a manner that it was used in the socioeconomic impact analyses.

Even though our focus here is on Santa Barbara and Ventura counties as the primary study areas for estimating economic impact, we have learned that some impacts was experienced in Los Angeles, Orange and San Diego counties. Impacts from kelp harvesting take place in San Diego County. A significant portion of the market squid catch is landed in San Pedro in Los Angeles County. And, we have also learned that several recreational fishing and diving operations operate out of Los Angeles County. So in our final analyses these impacts was have to be accounted for, however, they were not significant relative to the entire county economies for this county. They were important for our purposes of estimating the impacts on users, both direct and indirect.

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Appendix A

Purpose

The purpose of this document is to provide the necessary background information on the local social and economic (socioeconomic) environment for which changes in management actions in the Channel Islands National Marine Sanctuary (CINMS) were analyzed in this socioeconomic impact analysis. The information presented here is what we have found to date to be the "best available information".

For the issues of boundary expansion and marine reserves, three direct uses are potentially impacted; 1) tourist/recreational use, 2) commercial fishing (including kelp harvesting) and 3) offshore oil and gas. With respect to the local economies, each of these three uses will have ripple or multiplier effects as measured by market economic values (e.g., output/sales, income, employment and tax revenues). In this report, we attempt to review available information to assess how important these three industries are to the Santa Barbara and Ventura County economies. In addition, we present information on the currently known spatial distribution of recreational uses, and commercial fishing in the marine reserve study area. We also present what is known about social and economic parameters that are used in socioeconomic impact analyses for proposed management changes or regulatory changes in the two study areas.

Demographic and Economic Profile

Population. Historical population estimates presented here are from the U.S. Department of Commerce, Census Bureau (http://www.census.gov), while population projections are from the University of California-Santa Barbara, Economic Forecast Project. Ventura County has almost twice the population of Santa Barbara County and has been growing faster since 1980. Through the 1990s', Ventura County population has been growing faster than both the State of California and Santa Barbara County. Santa Barbara County has been growing slightly slower than the State of California. Santa Barbara County is projected to grow faster between 1998-2002 than Ventura County (7.8% vs. 6.0%), but then slower between 2002-2006 (3.1% vs. 5.8%). See Table 1.

Although, Ventura County's population is larger and has been growing faster than Santa Barbara's, the relative compositions of both populations are quite similar in terms of gender, race/ethnicity and age and, both counties are projected to change in the same general directions. For the 1990s', there appear to be no significant differences with regard to gender or race/ethnicity between Santa Barbara and Ventura Counties. However, there does appear to be a difference in age distributions. Santa Barbara appears to be a little older with a higher percent of population age 65 or older indicating a larger retirement community. For the projection periods, the most significant change expected is the proportion of population that was Latino. The populations of both counties are expected to become more Latino and less White, Not Latino, while the Black, Not Latino and Asian, Not Latino remain at approximately constant proportions. The projected proportions of retirement age populations are expected to remain constant in Santa Barbara County, while increasing slightly in Ventura County. See Table 2.

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Appendix A

Table 1. Population, Population Growth and Projected Growth for California, Santa Barbara and Ventura Counties

	California	Santa Barbara County	Ventura County
Population			
1990	29,950,100	370,900	671,600
1994	31,317,200	386,700	703,700
1998	32,682,800	389,500	732,100
Population Growth (%)			
1980-1990	25.7	23.7	26.4
1990-1994	4.6	4.3	4.8
1994-1998	4.4	0.7	4.0
1990-1999	11.2	5.8	11.4
Population Projections			
2002	n/a	419,800	776,000
2006	n/a	433,000	821,200
Population Projection Growth			
1998-2002	n/a	7.8	6.0
2002-2006	n/a	3.1	5.8

Sources: Population; U.S. Department of Commerce, Census Bureau (http://www.census.gov). Population Projections; University of California-Santa Barbara, Economic Forecast Project, 1999 Economic Outlook Santa Barbara and Ventura Counties.

Appendix A

Table 2. Demographic Profiles of Santa Barbara and Ventura County Populations

	1990	1994	1998	2002	2006
Santa Barbara County					
Gender					
Male	50.2	51.2	50.5	50.6	50.6
Female	49.8	48.8	49.5	49.4	49.4
Ethnicity					
White	66.2	63.7	63.1	62.1	60.7
Black	2.5	2.5	2.7	2.8	2.9
Asian	4.7	4.6	4.7	4.7	4.8
Latino	26.6	27.6	29.5	30.4	31.4
Age					
Less than 5	7.5	7.8	7.5	6.9	6.9
5 to 19	20.2	19.4	20.0	20.6	20.4
20 to 34	28.6	26.8	24.1	21.2	18.9
35 to 44	14.4	15.7	16.3	17.0	17.3
45 to 54	9.2	10.4	12.0	13.4	14.4
55 to 64	7.8	7.5	7.7	8.5	9.7
65 to 74	6.9	6.8	6.4	6.1	6.1
75 and Over	5.4	5.6	6.0	6.2	6.2
Ventura County					
Gender					
Male	50.4	50.5	50.5	50.6	50.6
Female	49.6	49.5	49.5	49.4	49.4
Ethnicity					
White	66.0	64.4	62.7	61.1	59.4
Black	2.2	2.2	2.1	2.3	2.3
Asian	5.4	5.4	5.5	5.6	5.9
Latino	26.4	28.0	29.7	31.0	32.4
Age					
Less than 5	8.3	8.3	7.9	7.4	7.4
5 to 19	22.4	22.1	22.2	22.1	21.4
20 to 34	25.7	23.2	21.2	20.2	19.8
35 to 44	16.3	16.7	16.3	15.3	13.9
45 to 54	10.6	12.3	13.6	14.4	14.6
55 to 64	7.3	7.7	8.6	10.0	11.3
65 to 74	5.5	5.7	5.8	6.2	6.9
75 and Over	3.8	4.1	4.3	4.5	4.7

Source: University of California – Santa Barbara, Economic Forecast Project, 1999 Economic Outlook Santa Barbara and Ventura Counties.

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Appendix A

Labor Force. As with population, the labor force of Ventura County is almost twice that of Santa Barbara County. Unlike population, however, the labor force of both counties have followed different growth patterns than that of the State of California. In the early 1990s', both counties labor forces grew faster than that of the State of California. However, from 1994-1998, labor force growth came to almost a halt in both counties, actually declining in Santa Barbara. As with population, Ventura County's labor force grew faster than Santa Barbara County's from 1990 to 1998 (6.8% vs. 3.7%). Labor forces in both counties are projected to grow relatively fast between 1998-2002, but, as with population, both are expected to slow over the 2002-2006 period, more in line with projected population growths. Labor Force composition was not available on a time series basis, nor were there projections available. However, comparing 1990 labor forces in both counties, there were no significant differences between the counties and the patterns generally matched those of populations for the two counties. Although, as we shall discuss below, there is a difference between those that work in a county and those that live in a county. And, this was have important implications for assessing socioeconomic impacts.

Table 3. Labor Force, Labor Force Growth and Projected Labor Growth for California, Santa Barbara and Ventura Counties

	California	Santa Barbara	Ventura
Labor Force			
1990	15,193,400	193,000	370,400
1994	15,450,000	196,900	385,300
1998	16,323,900	195,700	387,700
Labor Force Growth (%)			
1990-1994	1.7	2.0	4.0
1994-1998	5.7	-0.6	0.6
1990-1999	9.2	3.7	6.8
Labor Force Projections			
2002	n/a	208,900	412,900
2006	n/a	216,100	436,800
Labor Force Projection Growth			
1998-2002	n/a	6.7	6.5
2002-2006	n/a	3.4	5.8
Labor Force 1990			
Gender			
Male	56.0	55.4	56.7
Female	44.0	44.6	43.3
Ethnicity			
White	60.3	67.8	68.2
Black	6.2	2.2	2.1
Hispanic	23.6	25.2	24.3
Native American	0.6	0.8	0.5
Asian/Pacific Islander	9.0	3.9	4.9
Other	0.1	0.1	0.1

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Appendix A

Employment and Income. In conducting economic impact analyses, an important first step is defining the study area. In developing regional economic impact models it is important to understand the interrelationships between surrounding areas. The county political unit and metropolitan statistical areas (MSAs) are used to organize statistical information about employment and income. MSAs attempt to define areas that cross political boundaries but are economically closely linked because of numerous interrelationships. There is no Santa Barbara-Ventura County MSA indicating that these two counties are not highly linked economically. The only MSA in the two-county area exists within Santa Barbara County, e.g., Santa Barbara-Lompoc-Santa Maria MSA. Therefore, we only report Santa Barbara County and Ventura County information here.

Income is reported from two perspectives; 1) income by place of residence and 2) income by place of work. Income and employment by place of work are further reported by industry. Income and employment by place of work is also reported for wage and salary workers versus proprietors (business owners). Differences in these measurements often reveal important differences about the nature of the local economies that are important for socioeconomic impact analyses. For example, a large difference between income by place of residence and income by place of work might reveal that the economy of the area under study is largely driven by income earned from sources unrelated to work in the area and this was dampen the impacts of management changes that impact local work related income and employment. A large number of proprietors indicate the prevalence of small businesses which receive special treatment under Federal Regulatory Impact Reviews.

Income by Place of Residence versus Income by Place of Work. In 1990, Santa Barbara County's income by place of work was only 48.8% of the income by place of residence. This was much higher than the 36.2% for the State of California, but much lower than the 76.0% for Ventura County. From 1990 to 1997, the proportion of income by place of work rose for Santa Barbara County (from 48.8% to 59.6%), but declined for Ventura County (from 76.0% to 72.1%). Santa Barbara County is driven much more by forces unrelated to work in the county than Ventura County.

Table 4. Personal Income by Place of Residence and by Place of Work
For California, Santa Barbara and Ventura Counties

	Income by Place of Residence (000's $)	Income by Place of Work (000's $)	Work as % of Residence
1990			
California	639,297,540	469,355,580	36.2
Santa Barbara	8,282,659	5,567,203	48.8
Ventura	14,744,992	8,378,763	76.0
1994			
California	718,321,442	517,993,813	38.7
Santa Barbara	9,311,405	5,887,111	58.2
Ventura	16,557,595	9,799,145	69.0
1997			
California	846,838,798	607,976,152	39.3
Santa Barbara	10,760,412	6,743,656	59.6
Ventura	19,173,001	11,138,553	72.1

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Appendix A

There are several sources of income unrelated to work in a county that are recorded and they are generally referred to as transfer payments and property income. Social security and pensions are two of the most important transfer payments and dividends, interest and rent are the most important sources of property income. Social Security and Medicare deductions from current workers are recorded as a deduction in income by place of work in deriving income by place of residence. The other difference between income by place of work and residence is called the residence adjustment. The residence adjustment is the net flow of income to a county that results from some residents that work outside the county of residence and bring income into the county (inflow of income) versus residents from other counties that work inside the county but take their incomes home to their counties of residence (outflow of income).

In 1990, Santa Barbara had a net outflow of income or a residence adjustment of about -$131 million. By 1997 this figure had grown to almost -$150 million. Ventura County, however, has a net inflow of income based on the residence adjustment. In 1990, the Ventura County residence adjustment was about $2.95 billion and by 1997 rose to over $3 billion.

The Census of Intercounty Commuters for 1990 reveals the nature of the above net flows (see Appendix Table 1). The 1990 Census of Intercounty Commuters shows that Santa Barbara County had a net inflow of workers into the county of 4,397. There were 10,236 residents of Santa Barbara County that commuted to work outside the county and there were 14,633 non-residents that worked inside the county. This net flow of workers into the county results in a net outflow of income from the county as non-resident workers take their earned incomes home to their counties of residence.

In 1990, Ventura County had a net outflow of workers of –55,392. There were 84,838 residents that commuted to work outside the county and 29,446 non-residents that worked inside the county. The net outflow of workers resulted in a net inflow of income as residents that worked outside the county brought their incomes home to Ventura County. Los Angeles County accounted for the overwhelming majority of residents that commute to work outside the county (92.5%). Los Angeles and Ventura counties are highly connected with 23,635 of the 26,354 (or 89.7%) non residents that work inside Ventura County coming from Los Angeles County.

Ventura County and Santa Barbara County are not highly connected. Relatively small proportions of both counties work forces live in the neighboring county. In 1990, only 2,433 residents of Santa Barbara County commuted to work in Ventura County and only 5,594 Ventura County residents commuted to work to Santa Barbara County. Ventura County residents only made up only about 3% of all Santa Barbara County workers and Santa Barbara County residents made up less than one percent (0.8%) of all Ventura County workers.

Proprietors. Proprietors account for a significant proportion of both income and employment in both Santa Barbara and Ventura counties. In 1990, proprietors accounted for 18.7% of income and 20.2% of employment in Santa Barbara County and 15.65% of income and 19.9% of employment in Ventura County. In the 1990s, the relative importance of proprietors in both counties increased. In 1997, proprietors accounted for 19.1% of the income and 22.3% of the employment in Santa Barbara County and 16.8% of the income and 23.1% of the employment in Ventura County. These proportions were relatively higher than that for the entire State of California. This is a fairly good indicator that small businesses are very important in both counties. See Table 5.

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Appendix A

Table 5. Proprietors Income and Employment for California, Santa Barbara and Ventura Counties

	Proprietors Income (000's $)	%	Proprietors Employment	%
1990				
California	60,048,930	12.8	2,908,845	17.2
Santa Barbara	1,041,631	18.7	43,583	20.2
Ventura	1,307,970	15.6	65,577	19.9
1994				
California	73,643,501	14.2	3,287,440	19.6
Santa Barbara	1,100,644	18.7	47,273	21.7
Ventura	1,668,389	17.0	77,455	22.2
1997				
California	86,155,451	14.2	3,608,489	20.0
Santa Barbara	1,289,111	19.1	51,809	22.3
Ventura	1,870,996	16.8	83,690	23.1

Indicators of Economic Health and Wealth. Unemployment rates and per capita incomes are probably the two most popular measures used as indicators of the health and wealth of communities, states or nations. Through the 1990s both unemployment and real per capita income (per capita income in 1999 $ i.e., adjusted for inflation using the Consumer Price Index) moved in the same directions in both Santa Barbara and Ventura counties. Throughout the 1990s unemployment rates in Santa Barbara and Ventura counties were lower than that for the entire State of California. Santa Barbara's unemployment rate has always been below that of Ventura County and, except for 1994, Santa Barbara's unemployment rate was lower than that for the entire U.S. Ventura County's unemployment rate has remained somewhere between that for the entire State of California and the U.S.

Real per capita incomes in Santa Barbara and Ventura counties were higher than that for the entire State of California and for the U.S throughout the 1990s. Santa Barbara's real per capita income is slightly higher than Ventura County's and has grown faster than Ventura County's. In 1990, real per capita income was 1.6% higher in Santa Barbara County than in Ventura County, by 1998 Santa Barbara County's real per capita income was 3.5% higher than Ventura County's. This is largely explained by a higher proportion of Santa Barbara County's income coming from dividends and interests from investments. The 1990s were are relatively good time for return on investments in stocks.

Other comparisons between the two counties reveal another source of the difference in real per capita incomes between the two counties. Average Earnings Per Job and Average Wage & Salaries reveal that real average earnings per job and real average wages & salaries declined in Santa Barbara County from 1990 to 1997, while in Ventura County there was a more mixed result. From 1990-1997, real average earnings per job decreased, while real average wage & salaries increased. In addition, real average nonfarm proprietor's income increased in Ventura County, while declining in Santa Barbara County (see Appendix Table A.2). Again we see from these patterns that Santa Barbara County incomes are much more dependent on sources not related to work in the county than in Ventura County.

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Table 6. Unemployment Rates and Per Capita Incomes for U.S., California, Santa Barbara And Ventura Counties

	U.S.	California	Santa Barbara County	Ventura County
Unemployment (%)				
1990	5.6	5.8	4.9	5.7
1994	5.6	8.6	7.2	7.8
1998	4.5	5.9	4.4	5.6
1999	4.2	5.2	3.9	4.8
Per Capita Income ($)				
1990	19,156	21,363	22,361	22,002
1994	22,056	22,953	24,406	23,690
1997	25,288	26,314	27,839	26,563
1998	26,482	27,579	28,678	27,699
Per Capita Income (1999 $)				
1990	24,328	27,131	28,398	27,943
1994	24,703	25,707	27,335	26,533
1997	26,300	27,367	28,953	27,626
1998	27,012	28,131	29,252	28,253

For Santa Barbara County, the disparity between the trends in real per capita income and measures of income from work in the county reveal a pattern often cited about the distribution of income and wealth becoming more concentrated amongst higher income groups. Neither workers nor proprietors in Santa Barbara shared the gains in income and wealth indicated by the increase in real per capita income through the 1990s. Workers and proprietors have faired relatively better in Ventura County. On average, workers now earn more in Ventura County than in Santa Barbara County. Although, the trend for the average real earning of proprietors is on the decline in Santa Barbara County and increasing in Ventura County, Ventura County proprietors still earn, on average, significantly less than Santa Barbara County proprietors.

Income and Employment by Industry. For purposes of economic impact analyses, in terms of income and employment impacts, income and employment by industry is critical because it provides the necessary control totals in the economic accounting system. A limitation of this accounting system is that it is still based on the old industrial economy and generally is not designed to yield direct insights into how the use of natural resources and the environment are connected to the economy. Linking the economy and the environment is the very heart of the Socioeconomic Team's task. We need to be able to answer the question, if the use of the natural resources of the CINMS is changed, what was the impact on the income and employment in the local economies? To answer this question requires supplemental information organized so that it maps directly into the current system of accounting. In some cases, the income and employment by industry statistics can give us upper bound estimates of the direct portion of impact (i.e., not counting multiplier impacts) for particular uses. Our approach here is to first look at the most aggregated information, then proceed to evaluate information collected by other institutions and how it maps into the more aggregated statistics. Each step along the way our objective is to see how close we can get to linking the economy with the environment and assessing the relative importance to the economy of natural resource base uses.

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Appendix A

Figures 1 and 2 show the percentages of income and employment by industry to Santa Barbara and Ventura counties (see Appendix Tables A.3 and A.4 for more details and comparisons for different years). At this very aggregated level, the distributions for both income and employment by industry are very similar for the two counties. Commercial fisheries would be included under the category "Agricultural Services, Forestry, Fishing and Other". In 1997, this category accounted for only 2.2% of income by place of work in Santa Barbara County and only 2.3% in Ventura County. This serves as a first step upper bound on the proportion of income by place of work for the direct impacts of the harvesting portion (not including multiplier impacts) of commercial fishing. Other direct impacts of commercial fishing would include some portion of Wholesale Trade (e.g., fish houses and buyers) and some portion of Manufacturing (fish processing).

The category "Mining" includes oil and gas extraction and production activities. In 1997, this category accounted for only 1.2% of income by place of work in both Santa Barbara and Ventura counties. This estimate serves as a first step upper bound on the proportion of income by place of work for the direct impacts of the extraction and production portion of offshore oil and gas activities. Other direct impacts of oil and gas extraction and production activities would include some portion of Construction and some portion of Transportation, Communication and Public Utilities (e.g., pipelines, tankers, port and towing).

The Retail Trade and Services sectors are where the direct impacts of tourism/recreation would be included. However, these categories are too broad to yield any useful bounds for estimation of the direct impacts for tourism/recreation. The accounts, as stated above, were simply not designed for this purpose. In any case, the first step of linking the three natural resource use activities to the economy yielded only limited insights.

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Figure 1. Personal Income Percentage by Industry for California and Santa Barbara & Ventura Counties. 1997

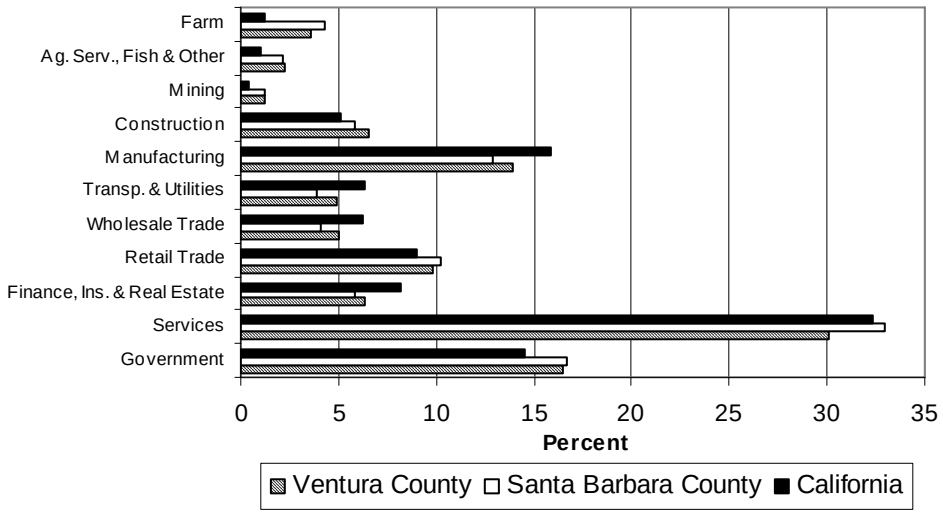
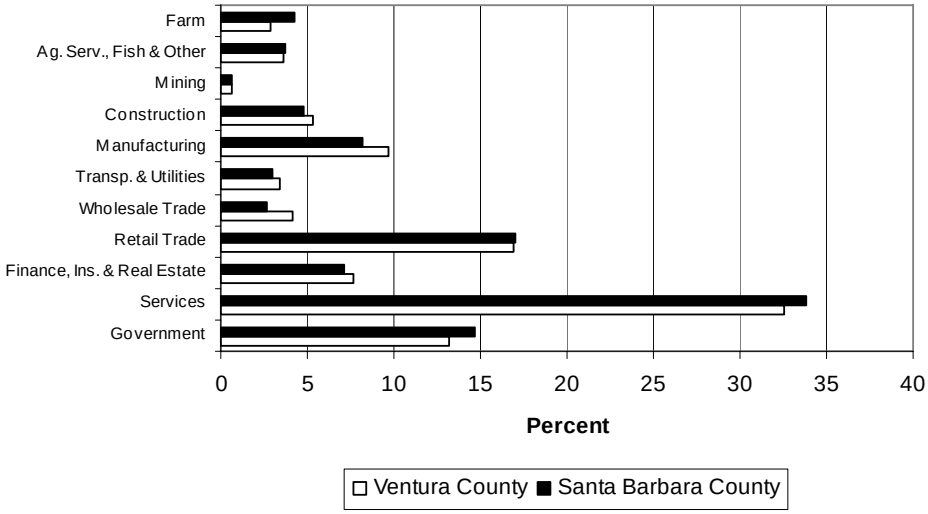


Figure 2. Employment Percent by Industry for Santa Barbara and Ventura Counties, 1997



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Income and Employment: Step 2 Additional Disaggregation. The accounts reviewed above are what are called two-digit SIC (Standard Industrial Classification) level of aggregations. The SIC system of accounting can actually go down to four and six digit levels, which contain more specificity about the activity. However, because of nondisclosure rules to protect the privacy of business information, the four digit level is the best available for large counties and even here there are many categories for which information is not reported due to nondisclosure. In this step, we explore how much detail we can glean about the three sectors that are our primary interest. Only income is reported at the lower levels of disaggregation.

Commercial Fishing Industry. In 1997, fishing income was a little over $4.8 million in Santa Barbara County and over $5.9 million in Ventura County. This represents less than one percent of the incomes by place of work in both counties (0.07% in Santa Barbara and 0.05% in Ventura). Again, this would be the income received by harvesters or commercial fishermen including crews and proprietors of the harvesting operations. It would not include buyers and fish houses or processors of commercial fish products.

Table 7. Direct Income to Commercial Fishing Harvesting Sector: Santa Barbara And Ventura Counties 1991 – 1997

Year	Santa Barbara County (000s $)	Ventura County (000s $)	Santa Barbara County (000s 1999 $)	Ventura County (000s 1999 $)
1991	3,520	3,010	4,306	3,682
1992	2,912	3,105	3,458	3,687
1993	2,618	3,644	3,018	4,201
1994	3,384	3,895	3,804	4,379
1995	5,194	6,618	5,678	7,235
1996	4,708	5,731	4,999	6,085
1997	4,811	5,937	4,994	6,163

Sources: U.S. Department of Commerce, Bureau of Economic Analysis, Regional Economic Information System (http://www.bea.doc.gov) and University of Virginia Library (http://fisher.lib.virginia.edu).

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APPENDIX TABLES AND SOURCES

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APPENDIX TABLES AND SOURCES (Continued)

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Appendix A

Table A.1 1990 Census of Intercounty Commuters for Santa Barbara and Ventura Counties

Santa Barbara County			
Total Workers in County			183,655
Total Working Residents of County			179,258
Net Flow of Workers to County			**4,397**
Residents that Work in the County			169,022
Residents that Commute to Work Outside County			10,236
Surrounding Counties:		7,978	
Ventura	2,433		
San Luis Obispo	3,584		
Kern	186		
Los Angeles	1,775		
Other Counties:		1,729	
Other States:		481	
Other Countries:		48	
Non Residents that Work Inside County			14,633
Surrounding Counties:		12,546	
Ventura	5,594		
San Luis Obispo	5,478		
Kern	207		
Los Angeles	1,267		
Other Counties:		1,390	
Ventura County			
Total Workers in County			299,794
Total Working Residents of County			355,186
Net Flow of Workers to County			**-55,392**
Residents that Work in the County			250,348
Residents that Commute to Work Outside County			84,838
Surrounding Counties:		78,208	
Santa Barbara	5,594		
Los Angeles	72,353		
Kern	261		
Other Counties:		5,513	
Other States:		912	
Other Countries:		205	
Non Residents that Work Inside County			29,446
Surrounding Counties:		26,354	
Santa Barbara	2,433		
Los Angeles	23,635		
Kern	286		
Other Counties:		2,873	

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Table A.2. Average Earnings Per Job, Average Wages & Salaries and Average Nonfarm Proprietors Income for U.S., California, Santa Barbara and Ventura Counties

	U.S.	California	Santa Barbara County	Ventura County
Avg. Earnings Per Job ($)				
1990	24,531	27,683	25,752	25,381
1994	28,171	30,952	27,036	28,032
1997	30,842	33,744	29,024	30,685
Avg. Wage & Salary ($)				
1990	23,430	26,239	23,632	24,099
1994	26,528	29,342	24,973	26,608
1997	29,814	32,971	27,562	30,285
Avg. Nonfarm Proprietor's Income ($)				
1990	17,055	19,815	21,551	16,060
1994	20,098	21,804	21,925	19,002
1997	21,508	23,430	22,993	20,379
Avg. Earnings Per Job (1999 $)				
1990	31,154	35,157	32,705	32,234
1994	31,552	34,666	30,280	31,396
1997	32,076	35,094	30,185	31,912
Avg. Wage & Salary (1999 $)				
1990	29,756	33,324	30,013	30,606
1994	29,711	32,863	27,970	29,801
1997	31,007	34,290	28,664	31,496
Avg. Nonfarm Proprietor's Income (1999 $)				
1990	21,660	25,165	27,370	20,396
1994	22,510	24,420	24,556	21,282
1997	22,368	24,367	23,913	21,194

Table A.3. Personal Income by Industry for California, Santa Barbara and Ventura County: Comparisons 1990, 1994 and 1997

Industry	California			Santa Barbara County			Ventura County		
	1990	1994	1997	1990	1994	1997	1990	1994	1997
Farm	7,005,842	6,812,919	7,507,183	237,461	202,473	291,652	450,821	393,867	402,932
Agricultural Services, Forestry, fish and other	4,683,875	5,465,048	6,314,573	112,051	152,050	146,343	155,989	216,680	259,297
Mining	2,169,653	2,098,118	2,231,096	56,147	71,593	80,209	114,676	136,206	134,263
Construction	30,337,414	25,983,262	30,913,991	363,000	301,431	389,677	694,911	634,118	719,340
Manufacturing	80,850,964	81,727,019	96,393,224	903,182	840,098	871,241	1,186,769	1,261,513	1,542,983
Transportation and Public Utilities	27,172,880	32,625,047	38,288,896	192,556	225,547	261,270	467,074	528,759	547,416
Wholesale trade	29,863,793	31,579,036	37,597,610	217,708	243,225	273,804	419,433	496,587	557,688
Retail trade	44,960,799	48,542,063	54,460,590	538,393	601,777	686,103	862,664	972,086	1,089,610
Finance, Insurance and Real estate	32,857,887	40,950,659	49,628,356	287,244	343,822	390,644	443,763	590,870	697,718
Services	137,928,814	160,540,316	196,643,496	1,792,528	1,938,617	2,227,804	2,102,144	2,871,550	3,352,905
Government	71,523,659	81,670,326	87,997,137	866,933	966,478	1,124,909	1,480,519	1,696,909	1,834,401
Total	469,355,580	517,993,813	607,976,152	5,567,203	5,887,111	6,743,656	8,378,763	9,799,145	11,138,553
Farm	1.5	1.3	1.2	4.3	3.4	4.3	5.4	4	3.6
Agricultural Services, Forestry, fish and other	1	1.1	1	2 0	2.6	2.2	1.9 0	2.2	2.3 0
Mining	0.5	0.4	0.4	1	1.2	1.2	1.4	1.4	1.2
Construction	6.5	5	5.1	6.5	5.1	5.8	8.3	6.5	6.5
Manufacturing	17.2	15.8	15.9	16.2	14.3	12.9	14.2	12.9	13.9
Transportation and Public Utilities	5.8	6.3	6.3	3.5	3.8	3.9	5.6	5.4	4.9
Wholesale trade	6.4	6.1	6.2	3.9	4.1	4.1	5	5.1	5
Retail trade	9.6	9.4	9	9.7	10.2	10.2	10.3	9.9	9.8
Finance, Insurance and Real estate	7	7.9	8.2	5.2	5.8	5.8	5.3	6	6.3
Services	29.4	31	32.3	32.2	32.9	33	25.1	29.3	30.1
Government	15.2	15.8	14.5	15.6	16.4	16.7	17.7	17.3	16.5
Total	100	100	100	100	100	100	100	100	100

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Table A.4. Employment by Industry for California, Santa Barbara and Ventura Counties: Comparisons: 1994 and 1997 (000's $ and Percent)

Industry	Santa Barbara County 1994	Santa Barbara County 1997	Ventura County 1994	Ventura County 1997
Farm	7,814	10,095	10,313	10,499
Agricultural Services, forestry, fish and other	9,959	8,636	13,149	13,051
Mining	1,514	1,421	2,601	2,121
Construction	9,136	11,077	17,736	19,335
Manufacturing	18,898	19,000	32,778	35,246
Transportation, Communication and Public Utilities	6,265	6,971	13,025	12,428
Wholesale trade	6,416	6,369	14,076	15,168
Retail trade	37,375	39,606	57,354	61,308
Finance, Insurance and Real Estate	15,791	16,564	26,463	28,003
Services	71,802	78,550	113,069	117,943
Government	32,380	34,062	49,008	47,895
Federal, Civilian	3,452	3,493	11,053	9,106
Military	4,302	4,348	7,766	7,080
State and Local	24,626	26,221	30,189	31,709
State	7,152	7,449	3,139	2,409
Local	17,474	18,772	27,050	29,219
Total	217,750	232,351	349,572	362,997
Wage and Salary	170,477	180,542	272,117	279,307
Proprietors	47,273	51,809	77,455	83,690
Farm	3.6	4.3	3.0	2.9
Agricultural Services, forestry, fish and other	4.6	3.7	3.8	3.6
Mining	0.7	0.6	0.7	0.6
Construction	4.2	4.8	5.1	5.3
Manufacturing	8.7	8.2	9.4	9.7
Transportation, Communication and Public Utilities	2.9	3.0	3.7	3.4
Wholesale trade	2.9	2.7	4.0	4.2
Retail trade	17.2	17.0	16.4	16.9
Finance, Insurance and Real Estate	7.3	7.1	7.6	7.7
Services	33.0	33.8	32.3	32.5
Government	14.9	14.7	14.0	13.2
Federal, Civilian	1.6	1.5	3.2	2.5
Military	2.0	1.9	2.2	2.0
State and Local	11.3	11.3	8.6	8.7
State	3.3	3.2	0.9	0.7
Local	8.0	8.1	7.7	8.0
Total	100.0	100.0	100.0	100.0
Wage and Salary	78.3	77.7	77.8	76.9
Proprietors	21.7	22.3	22.2	23.1

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Table A.5. Santa Barbara County Ports - Ex Vessel Value and Total Income Generated (000's $)

Year	Urchins	Shrimp & Prawn	Spiny Lobster	Sea Cucumbers	Market Squid	Other Crab	Ground-fish	California Halibut	Total Ex Vessel
1988	2,512	234	305	b/	0	182	398	377	5,691
1989	4,140	240	492	b/	0	335	286	352	8,764
1990	6,126	175	679	15	1	585	197	378	10,119
1991	9,637	167	762	31	b/	531	197	333	13,262
1992	9,142	154	773	35	b/	451	236	184	13,584
1993	9,745	180	652	57	b/	505	239	107	14,274
1994	9,035	379	880	54	13	456	552	151	13,804
1995	5,319	400	1,200	127	2	581	413	154	10,217
1996	4,706	777	933	27	524	618	273	166	9,953
1997	3,976	835	1,529	47	354	729	254	219	8,852
1998	2,797	847	966	53	24	736	320	171	6,726

b/ less than 3 buyers, not reported for confidentiality reasons.

Total Income									
1994	17,739	887	1,696	193	63	1,338	828	313	27,476
1995	10,531	1,059	2,301	417	9	1,615	544	319	20,724
1996	9,407	1,914	1,793	94	2,492	1,741	327	348	21,861
1997	8,112	1,928	2,939	176	1,754	2,043	305	462	19,458
1998	5,702	1,944	1,881	197	74	2,068	385	365	13,306
Total Income to Ex Vessel Value									
1994	2.0	2.3	1.9	3.6	4.8	2.9	1.5	2.1	2.0
1995	2.0	2.6	1.9	3.3	4.5	2.8	1.3	2.1	2.0
1996	2.0	2.5	1.9	3.5	4.8	2.8	1.2	2.1	2.2
1997	2.0	2.3	1.9	3.7	5.0	2.8	1.2	2.1	2.2
1998	2.0	2.3	1.9	3.7	3.1	2.8	1.2	2.1	2.0

Table A.6. Ventura County Ports - Ex Vessel Value and Total Income Generated (000's $)

Year	Urchins	Shrimp & Prawn	Spiny Lobster	Sea Cucumbers	Market Squid	Other Crab	Ground-fish	California Halibut	Total Ex Vessel
1988	3,016	189	390	-	3,531	84	735	262	13,379
1989	5,230	390	491	-	2,696	92	1,266	292	12,560
1990	6,204	432	401	b/	1,933	76	1,203	404	11,797
1991	7,139	485	456	45	2,505	128	1,267	471	13,605
1992	7,091	461	412	61	459	204	1,226	311	11,015
1993	6,310	729	419	b/	4,370	99	1,073	292	15,151
1994	6,297	859	283	71	9,396	62	561	326	22,272
1995	5,723	746	514	149	16,321	57	835	354	27,044
1996	4,150	932	476	328	25,556	58	919	512	34,846
1997	3,219	1,318	777	144	12,680	131	922	376	21,659
1998	1,785	1,441	451	255	1,510	202	570	395	7,801
Total Income									
1994	12,359	1,700	544	235	38,311	184	895	672	64,581
1995	11,344	1,544	986	460	68,099	163	1,385	733	90,168
1996	8,342	1,906	915	1,081	92,309	170	1,460	1,070	n/a
1997	6,576	2,602	1,490	526	57,028	373	1,505	787	77,925
1998	3,693	2,875	880	868	4,854	565	896	840	19,487
Income to Ex Vessel Value									
1994	2.0	2.0	1.9	3.3	4.1	3.0	1.6	2.1	2.9
1995	2.0	2.1	1.9	3.1	4.2	2.9	1.7	2.1	3.3
1996	2.0	2.0	1.9	3.3	3.6	2.9	1.6	2.1	n/a
1997	2.0	2.0	1.9	3.7	4.5	2.8	1.6	2.1	3.6
1998	2.1	2.0	2.0	3.4	3.2	2.8	1.6	2.1	2.5

Appendix B

Appendix B.
Data Collection and Estimation Methods Used for Commercial Fishing and Recreation Industry Use of the Channel Islands National Marine Sanctuary

Appendix B

Forward

The documentation of data collection methods presented here is part of the ongoing work being conducted by the Socioeconomic Panel for the Channel Islands National Marine Sanctuary (CINMS). CINMS is in the process of updating its five-year management plan. The creation of marine reserves is one of the major issues being addressed in the five-year management plan revision. The Socioeconomic Panel was formed to provide information and analyses to the Marine Reserve Working Group (MRWG) of the Sanctuary Advisory Council (SAC) of the CINMS. The MRWG is comprised of a broad group of stakeholders and was charged with the task of designing and forwarding a consensus based alternative for marine reserves in the CINMS.

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Appendix B

Introduction

This report documents the data sources and methods used to estimate the both the total amount of usage and the spatial distribution of usage of the Channel Islands National Marine Sanctuary (CINMS). This information was developed by the Socioeconomic Panel that was created to support the Marine Reserve Working Group (MRWG) of the Sanctuary Advisory Council (SAC). The MRWG was charged with designing and forwarding a consensus recommendation for marines reserves (no take areas) within the CINMS. Usage here meaning the commercial fishing catch and the ex vessel value of the catch (i.e., what the fisherman receives for his catch) and the number of person-days of recreation activity. Maps and tables summarizing the information can be found in "Data Distributions and Exclusion Zones: Commercial Fishing – Recreation" (Leeworthy and Wiley, 2001a). This report has been commonly referred to as the "Binder".

Commercial Fishing

Contractors. Two contractors were selected by NOAA to gather information for the commercial fisheries in the CINMS. Criteria for selection were that commercial fishermen had personal knowledge of the contractor and would trust the contractor with access to proprietary information. In addition, the contractor had to be considered to be neutral and acceptable to NOAA as an objective researcher.

NOAA selected Dr. Craig Barilotti of Sea Foam Enterprises, Inc. located in San Diego, California for the contract to collect information from all commercial fisheries, except squid and wetfish (e.g., anchovies, sardines and mackerel). For squid and wetfish, Dr. Caroline Pomeroy of the University of California-Santa Cruz was selected. Dr. Barilotti had formerly worked for Kelco (now ISP Alginates) the only harvester of kelp in the CINMS. Dr. Barilotti also was involved in developing stock assessment information for red urchins. Dr. Pomeroy had an ongoing Sea Grant-sponsored study of the changing social and economic organization of the squid fishery (R/MA-39, with Co-PI Margaret FitzSimmons). Both contractors had developed significant knowledge and working relationships with the commercial fishermen in the region of study. NOAA ran the contracts through a contract with Tetra Tech, which was hired to support a variety of activities associated with CINMS's five-year management plan revision. Both contractors, by the nature of their work, became part of the Socioeconomic Panel.

Questionnaires. NOAA provided both contractors with Office of Management and Budget (OMB) approved questionnaires to guide the data collection (OMB Approval #: 0648-0408, expiration date: 6/30/2003). The questionnaires were designed to be flexible across applications in different regions and in different fisheries. This afforded some latitude to each contractor in modifying the questionnaire to accomplish the general information requirements. Because of the ongoing work by Dr. Pomeroy in her Sea Grant-sponsored project, the socioeconomic data from the squid/wetfish fishery is more detailed than that obtained by Dr. Barilotti.

Maps and Coding Sheets. NOAA provided maps and coding sheets and formats for how data on catch/ex vessel value would be recorded and entered into databases. Catch/ex vessel value was to be obtained from each fisherman in 1-minute by 1-minute grid cells within the 22 10-minute by 10-minute California Department of Fish and Game (CDFG) blocks that were selected as best approximating the CINMS. CDFG uses 10-minute by 10-minute blocks to organize commercial fish catch/ex vessel value from the fish ticket reporting system. Maps were developed from NOAA nautical charts that provided necessary details for reference points to assist fishermen in identifying the location of their catch. The 1-minute by 1-minute grid cells were overlade on the nautical charts. Each grid cell was numbered for data recording and database construction.

Databases/GIS. Contractors were instructed to deliver catch/ex vessel distribution information in Excel spreadsheets. Excel spreadsheets were then easily read into the Arcview Geographic Information System (GIS) for further processing and analysis.

Appendix B

Squid/Wetfish Fisheries-Pomeroy Sample

In late April 2000, Dr. Pomeroy and three project team members (D. Reese, M. Hunter and M. Los Huertos) began work. The team developed two survey instruments (within the purview of the OMB Approved instruments provided by NOAA), one each for catcher vessels (purse seiners) and light boat skippers. Protocols appropriate for the squid fishery were also developed. The team met (by phone and in person) with key members of the squid fishery to solicit their input and feedback on the instruments and protocols, to secure their participation, and to gain their support for the study and their help in bringing others from the fishery's diverse membership on board. In addition, permission was secured, under a strict confidentiality agreement, to use landings data from the Pacific Fisheries Information Network (PacFIN) database, maintained by the Pacific States Marine Fisheries Commission, to complement the data to be collected through interviews.

Dr. Pomeroy's knowledge of the fishery and its participants (including that acquired through extensive ethnographic fieldwork), the PacFIN database, the CDFG squid permittee list, and squid industry participants' input to develop a list of participants in the CINMS squid fishery. In mid May, the survey instruments were pre-tested and refined. Data was then collected over the ensuing six weeks.

The data collection worked as follows: fishermen were contacted (usually on the dock) and provided with an information package. The information package included: 1) a cover letter explaining the study and its relationship to Dr. Pomeroy's ongoing study of the statewide squid fishery. The cover letter also asked for permission to draw upon the ongoing study information already collected for the current application to the CINMS., 2) a draft schedule of the CINMS process, 3) a sub-set of socioeconomic questions, and 4) a set of maps with a request that fishermen think about where they caught squid and other species around the CINMS between 1996 and 1999. Fishermen were asked to review the information provided and to consider participating in the study. Fishermen were encouraged to contact Dr. Pomeroy with any questions or concerns then contacted the following day (or soon after) to secure their participation and to set up a convenient time to meet and complete the interview. Overall, 37 interviews were completed. These included interviews with 29 purse seine skippers and 8 light boat skippers. One of the light boats was also classified as a scoop or brail boat.

Data collection required extensive fieldwork, involving face-to-face contact with fishermen on the docks in San Pedro, Ventura, Monterey and elsewhere. Although good coverage was achieved in terms of the percent of total catch/ex vessel revenue, the sample is probably not representative of the entire fleet in terms of socioeconomic characteristics. Fishermen involved in the CINMS squid fishery are involved in fisheries from San Diego to Alaska. During the survey period, it was not possible to reach many of these fishermen (especially those from out of state). Data from Pomeroy's Sea Grant-sponsored project afforded a more representative sample of the fleet for socioeconomic characterization. Comparisons were made on several key socioeconomic characteristics. There were not significant differences in investment in boats and equipment, but there were differences in where the fishermen come from and our samples accounted for a higher proportion of catch/ex vessel value.

Distribution of Catch/Ex Vessel Value. Fishermen first marked on the maps the places where they fished. The 1-minute by 1-minute grids were then overlade on the maps. The fishermen were then asked to assign points to each cell where they indicated they caught fish (e.g., squid/wetfish/tunas/other species). Points were assigned as follows: for each fisherman, cells that covered less than or equal to 50% were set equal to 0.5. Cells that covered greater than 50% were coded equal to 1. Cells not covered were coded zero. For each fisherman, a normalized distribution (i.e., one that summed to 100 percent across all cells) was created. To aggregate across sampled fishermen required weighting for catch/ex vessel value using the average reported catch/ex vessel value for 1996-1999 from PacFIN for each fishermen. This provided a normalized percentage distribution across all cells in the study area (again, normalized percentage adding to 100 percent across all fishermen and all cells).

MAP Generation. Two maps were generated. One based on the information provided by the purse seiners and one based on the information provided by the light boat operators. In July 2000, the two maps were presented to the fishermen in San Pedro. The fishermen unanimously approved the map based on the light

boat operators' input as the more accurate of the two and requested that this map be used by the MRWG representative to depict their fishery to the MRWG.

The next task was to assign ex vessel value to the map. Dr. Leeworthy obtained catch and ex vessel value for years 1988 to 1999 from CDFG. The Socioeconomic Panel had decided early in the project that the 1996-1999 annual average of ex vessel value would be used for prospective analysis, since this four year average captured the variability of catch and ex vessel value. Data from CDFG for 1996 however was incorrect. PacFIN sources reported much different ex vessel value for 1996, although the same quantity of catch. Our 1996-1999 annual average for ex vessel value was revised from $11 million to $13 million based on PacFIN revisions to the 1996 ex vessel value (personal communication, Will Daspit, Pacific State Marine Fisheries Commission). The 1996-199 estimated annual average from PacFIN was $13,046,664. This amount was distributed to each 1-minute by 1-minute grid cell according to our sample-normalized distribution. Our sample of squid fishing operations accounted for 21.89% of the squid fishing operations that operated in the CINMS, but accounted for 95.15% of the ex vessel value of squid caught in the CINMS.

The same procedures used for squid were followed for wetfish (anchovies, sardines and mackerel) and for tunas. The original contracts with Dr. Barilotti and Dr. Pomeroy did not include the tuna information from Dr. Pomeroy. However, after reviewing the data, the Socioeconomic Panel decided the "best" information on tunas came from the Pomeroy sample. Maps were also developed for "Other Species" caught by the squid/wetfish sample. These maps were developed for the purpose of analyzing impacts on individual fishing operations rather than for entire fisheries since they would include double counting across fisheries.

Summary. Three maps were developed from the squid/wetfish fisheries that are used in the socioeconomic impact analyses. Ex vessel value was chosen for map generation and placed in the Arcview GIS for analysis. The 1996-2003 annual average of ex vessel value was mapped for each of Squid and Wetfish and the 2003 value was used for Tuna. For squid, the 1996-2003 annual average ex vessel value was $10,788,355. For wetfish (anchovies, sardines and mackerel), the 1996-2003 average annual ex vessel value was $474,251. For tunas, the 2003 ex vessel value was $3,085.

For squid, our samples accounted for 21.89% of the squid vessels operating in the CINMS and over 95% of the ex vessel value of catch from the CINMS. For wetfish, our sample accounted for 54% of the fishing vessels operating in the CINMS and 84.48% of the ex vessel value of catch from the CINMS. For tunas, our samples were somewhat weaker. The sample of tuna vessels accounted for 36.84% of the tuna vessels operating in the CINMS but only 13.62% of the ex vessel revenues from the CINMS. Maps and tables summarizing a comparison of the 1999 population and sample distributions for each fishery, in terms of fishing operations (vessels) and ex vessel value of catch are provided in (Leeworthy and Wiley, 2001a).

All Other Species/Species Groups-Barilotti Sample

In late April 2000, Dr. Barilotti and two project team members began work. Dr. Barilotti first assembled a group of fishermen and pre-tested the NOAA supplied, OMB approved questionnaire with the fishermen. The questionnaire was modified within the purview of the OMB approved questionnaire. The fishermen formed a Fishermen's Data Committee (FDC). The FDC wanted to be able to review all data and maps and provide approval before any maps could be shown to the MRWG. The FDC decided that individual maps of species/species groups could not be shown to the public. The maps could be shown to the MRWG in closed working sessions, but had to be collected at the end of each working session. The map data could be entered into Arcview GIS and be used by the Socioeconomic Panel for analysis, but the electronic database or paper maps could not be accessed by the Science Panel.

At the fishermen's first meeting, they decided not to provide individual catch information. The fishermen wanted to first produce what came to be called the Exclusion Zone maps. Exclusion zones were places in which the fishermen did not want marine reserves (no take areas). The data collection maps with the 1-minute by 1-minute grid cells were colored in for cells in which the fishermen did not want marine

reserves. This was done for crabs, sea cucumbers, kelp, live fish or near shore rockfish, spiny lobster, Nets(swordfish, seabass, halibut and shark, prawn, and urchin. A total map was also created which simply summed the number of species/species groups from the individual species/species group maps for each grid cell. This mapped data was sent to NOAA and entered into the Arcview GIS. Maps were produced and sent back to the FDC for approval to be distributed to the MRWG. The FDC made these maps available to the public.

The fishermen were informed that the Exclusion Zone maps would not be adequate for the socioeconomic impact analyses. Fishermen were organized in group meetings to fill in individual maps for each species/species group they caught in the CINMS. Fishermen were uncomfortable meeting in the groups when providing individual information as each attempted to conceal their information from other fishermen. Fishermen did not want to reveal their individual fishing locations to other fishermen. All future data collections were done one-on-one with project team data collectors.

Data was collected to support the development of 11 species/species group maps. The kelp map was developed from data provided by Dale Glantz of ISP Alginates (the sole harvester of kelp in the CINMS). Other maps included urchin, spiny lobster, rockfish, prawn, crab, CA sheepshead, flatfish, sea cucumber, sculpin & bass and shark. The Barilotti sample included 59 fishermen. Most of the fishermen caught multiple species/species groups. The Barilotti sample was not adequate for rockfish, prawn and crabs. For these species/species groups, CDFG 10-minute by 10-minute data combined with the exclusion zone maps were used to derive distributions at the 1-minute by 1-minute spatial resolution. This will be described below.

Distribution of Catch/Ex Vessel Value. The data collection followed similar procedures used in the squid/wetfish fisheries. One-on-one meetings were set-up with fishermen. Maps and questionnaires were filled out working with the project team. A different scoring system was used in the Barilotti sample. Each fisherman was given a 50-point budget. Each fisherman was asked to assign a number of either 1 or 2 to each map cell for each species/species group. The number 2 indicating they caught more of their catch in that cell. Very few actually assigned a value of 2 to any one cell. Many went over their budget of 50 because they fished in many more cells. The scores were all normalized to 50 for each fisherman, then normalized to 100 percent across cells. As with the Pomeroy sample, the distributions were weighted by individual catch/ex vessel value. Each sampled fisherman was asked to sign an affidavit that gave Dr. Barilotti access to CDFG trip ticket and logbook information on each fisherman. Weighted distributions for each species/species groups were then produced. Percentage distributions that add to 100 percent across all cells were produced.

Map Generation. As with the squid/wetfish fishery, the 1996-1999 annual average ex vessel value for each species/species group was distributed across the 1-minute by 1-minute grid cells in Arcview GIS. The maps were then sent then presented to the FDC for review and approval. As noted above, these maps are not available in (Leeworthy and Wiley, 2001a) because the FDC would not allow access to the public or the Science Panel. The maps and data were only made available to the Socioeconomic Panel for analysis and to the MRWG in closed sessions.

As noted above, for rockfishes, crab and prawn, the sample distributions were not completely adequate. For rockfish, we had good distribution information west of 119 degrees 50' West Longitude. The sample contained no information east of this point. We used the sample distribution for the western portion and the CDFG 10-minute by 10-minute block data along with the Exclusion Zone maps for the eastern portion. For the eastern area, the ex vessel value for each 10-minute by 10-minute block was distributed to the 1-minute by 1-minute cells equally for each cell in the 10-minute by 10-minute block that was included in the Exclusion Zone map. The CDFG 10-minute by 10-minute block data confirm what our sample revealed, i.e., that the eastern area of the CINMS is relatively unimportant for rockfish. The 1996-1999 average annual ex vessel value for rockfish was $507,758 for the western area and $41,561 for the eastern area.

For crab, we followed the same procedure as for rockfish for the western area. For the eastern area, Exclusion Zone information was not available. We distributed the CDFG 10-minute by 10-minute block totals to the 1-minute by 1-minute cells within each 10-minute by 10-minute to those cells within three

miles from shore (the pattern in the western area). As with rockfish, the CDFG data confirm that catch of crabs from the eastern area of the CINMS is relatively small. The 1996-1999 average annual ex vessel value for the western area was $304,029 and $39,565 for the eastern area.

For prawn, there were only three fishermen in our sample. We used the CDFG 10-minute by 10-minute block totals and distributed the these totals within the 10-minute by 10-minute blocks evenly to the 1-minute by 1-minute cells included in the Exclusive Zone maps. Prawn distributions extend out to the edges of the CINMS and into blocks outside our 22-block definition of the CINMS. We accounted for this by taking the data from CDFG block 690 and distributing its total to the 1-minute by 1-minute Exclusion Zone cells in 690, 671 and 672. Also, data from CDFG block 711 was distributed to the 1-minute by 1-minute cells in CDFG blocks 711 and 730.

Summary. The Barilotti sample included 59 fishing operations and accounted for 25 percent of the 1996-1999 average annual ex vessel value of catch from the CINMS. Together with the Pomeroy sample, our two samples included 96 fishing operations which represent 13 percent of the fishing operations that fished in the CINMS, but accounted for 79 percent of the total ex vessel value of catch from the CINMS.

Species/Species Groups Not Mapped at the 1-minute by 1-minute Resolution or Not Mapped

The following table summarizes the other species/species groups either not mapped at the 1-minute by 1-minute cell resolution or not mapped at all and the percent of ex vessel value each species/species group accounted for over the 1996-1999 period. All these species/species groups accounted for less than 1.5 percent of the total ex vessel value from the CINMS, including abalone. Abalone has not been commercially harvested since 1997 in the CINMS. Excluding abalone, these species/species groups accounted for only a little over one half of one percent of the total ex vessel value from the CINMS.

Species/Species Group	1996-1999 Avg. Value	Percent of CINMS	
Abalone	178,027	0.878273	mapped at 10 by 10 mile
Swordfish	39,090	0.192845	mapped at 10 by 10 mile
Roundfish	33,262	0.164094	mapped at 10 by 10 mile
Other	22,990	0.113418	mapped at 10 by 10 mile
Yellowtail	6,891	0.033996	mapped at 10 by 10 mile
Shrimp	5,813	0.028678	mapped at 10 by 10 mile
Mussels, Snails	4,694	0.023157	mapped at 10 by 10 mile
Salmon	1,411	0.006961	mapped at 10 by 10 mile
Rays & Skates	1,164	0.005742	mapped at 10 by 10 mile
Surf Perch	695	0.003429	not mapped
Grenadiers	211	0.001041	not mapped
Octopus	196	0.000967	not mapped
Total	294,444	1.452601	
Total, Excluding Abalone	116,417	0.574328	

Appendix B

Recreation Industry

The Recreation Industry data included information organized into consumptive and nonconsumptive activities and within each of these categories whether the activity was done from a charter/party boat or guide service (for hire operation) of from a private household owned boat. The charter/party boat or guide service activity was obtained through a contract with Dr. Charles Kolstad of the University of California – Santa Barbara. Dr. Kolstad was able to obtain a census i.e., all operators that operated in the CINMS in 1999. Dr. Kolstad's team used a NOAA provided OMB Approved questionnaire (OMB Approval #: 0648-0408, expiration date: 6/30/2003. Information was obtained on person-days of activity, by activity type along with revenues, operating and capital costs and profits associated with each activity. Person-days of activity, by type of activity, were mapped in 1-minute by 1-minute cells for all the cells in the CINMS. For private household boat use data was obtained from multiple sources which will be explained below.

Charter/Party Boat or Guide Service – For Hire Operations

A total of 51 operators of charter/party boat or guide services were identified as having operated in the CINMS in 1999. Operators often engaged in providing multiple activities, sometimes both consumptive and nonconsumptive activities. Therefore, the addition of the number of operators across activities will add to more than 51. Person-days of activities, revenues, costs and profits are not double counted across activities.

Nautical charts with the 1-minute by 1-minute cell grid overlade were provided to the Kolstad team by NOAA. Dr. Kolstad used students at UC-Santa Barbara to collect the information. The students went to the offices of each operation to collect the information. Person-days of activity, by type of activity, were mapped for each operation and entered into Excel spreadsheets. Excel spreadsheets were then entered into the Arcview GIS for each operation. Person-days of activity, by type of activity, were then summed across operations. Since a census of operations was achieved, the sum of the sample represents the population estimate.

Charter/PartyBoat Fishing. In 1999, there were 18 operators that accounted for 158,768 person-days of fishing in the CINMS.

Charter/Party Boat Consumptive Diving. In 1999, there were 10 operators that accounted for 17,935 person-days of consumptive diving in the CINMS.

Charter/Party Boat Whale Watching. In 1999, there were 8 operators that accounted for 25,984 person-days of whale watching in the CINMS.

Charter/Party Boat Non-Consumptive Diving. In 1999, there were 7 operators that accounted for 10,776 person-days of non-consumptive diving in the CINMS.

Charter/Party Boat Sailing. In 1999, there were 8 operators that accounted for 4,015 person-days of activity in the CINMS.

Guide Service for Kayaking/Island Sightseeing. In 1999, there were 4 operators that accounted for 1,233 person-days of kayaking/island sightseeing in the CINMS.

Private Household Boat Use Estimation

The data distribution for private household boat fishing and consumptive diving in the marine reserves study area was estimated in three steps.

The **first step** involved compiling and incorporating all of the existing geo-referenced data sources for private boat usage in the study area. Data was incorporated from the following sources:

- Recreational Fisheries Information Network (RecFIN). These data include a sample of anglers in the Southern California Region. Data elements include mode, gear, annual person days and species as well as the geographic coordinates of activity. The sample was not sufficient to provide a dense enough coverage of the study area to be the sole data source, however it did provide a rough distribution and also much needed parameters such as the breakdown of gear usage (e.g. hook and line, diving (e.g. spearfishing), etc.).
- The Sanctuary Aerial Monitoring Spatial Analysis Program (SAMSAP). This is an Aerial Survey conducted by sanctuary personnel, which, among other things, provides geo-referenced point data broken down by boat type. Boat categories include "recreation," which is defined as private boats. The assumption was used that the breakdown between fishing and consumptive diving is the same as the RecFIN sample. The sample was also not of a sufficient size to be used as a sole distribution data source.
- Channel Islands National Park (anchorage data). This data was from a program of visitor statistics compilation conducted by National Park Rangers. The data collection includes a breakout of data for private vessels in the National Park anchorages. Park staff use a multiplier of 5.5 persons per private vessel (for private boats). Again, the assumption was used that the breakdown between fishing and consumptive diving is the same as the RecFIN sample.
- Yacht Clubs and Marinas. A written request for private boat usage patterns was sent to area yacht clubs and marinas. Unfortunately, the response to this effort was dismal. We received responses from two yacht clubs and one marina. However, this added to our aggregate picture of the distribution of private boat usage.
- The Nature Conservancy (TNC) and the Professional Association of Dive Instructors (PADI). Data was also received from these organizations, however, because this data was in no way geo-referenced, it was not incorporated into the distribution estimation process.

As is mentioned above, none of these data sources could be used as a stand-alone source for the estimation of private boat activity distribution. However for each grid cell for which we had data, the data was entered and in the next two steps, the estimation of activity distribution was completed.

Step two involved extrapolating the existing data to the remainder of the study area. The assumption was made that the private boat activity distribution was approximately the same as charter/party boat consumptive activity. For each grid cell for which no data was available, the cell value was estimated using the following formula.

$$x=ay/b$$

where
- x = The grid cell value estimate for private boat usage grid cells containing no data from the above sources.
- a = The equivalent grid cell value from the charter/party boat distribution for the grid cell missing private boat usage data.
- b = The mean of grid cell values from the charter/party boat distribution for the grid cells containing private boat usage data.
- y = The mean of grid cell values from the private boat distribution for the grid cells containing private boat usage data.

Step three involved fine tuning the distribution estimate based on the rough private boat data distributions. Although we may not have had a sufficient density of data to capture the distribution at the required one-by-one minute grid cells, we did have a rough geographic distribution of the data. In cases where this rough distribution suggested that the method in step two was incorrect, an adjustment was made to reflect the variance between the distribution of private boat and charter/party boat usage. For example, the yacht club and marina data clearly indicated that the private boat activity distribution was concentrated closer to the islands.

For private household boat fishing, 214,015 person-days of activity were estimated for the CINMS in 1999. For private household boat consumptive diving, 47,190 person-days of activity were estimated

for the CINMS in 1999. ***Nonconsumptive activities from private household boats could not be estimated. There were no known sources of information.***

References

Leeworthy, Vernon R. and Wiley, Peter C. 2001a. ***Data Distributions and Exclusion Zones: Commercial Fishing – Recreation.*** Prepared for the Channel Islands National Marine Sanctuary, Marine Reserves Working Group. Socioeconomic Panel Report. National Oceanic and Atmospheric Administration, National Ocean Service, Special Projects Office, Silver Spring, Maryland. Can be found in portable document format (pdf) at http://www.cinms.nos.noaa.gov/MRWGsocioec/panel.html

APPENDIX C

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APPENDIX C

1. Commercial Fisheries

Map Distributions

For urchins, spiny lobsters, flatfish, sea cucumbers, sculpin & bass, and sharks, we used the sample distributions of catch by the 1 by 1 minute blocks obtained from the fishermen through a contract with Sea Foam Enterprises (Dr. Craig Barilotti). These distributions are normalized to equal 100 percent across all blocks. We then calculated the 2003 Ex Vessel Values for each species/species group (see our list of species in each species group) and each of the 22 he California Department of Fish and Game (CDFG) blocks that define the Channel Islands National Marine Sanctuary (CINMS). The totals across all 22 blocks are then distributed to the 1 by 1 minute blocks.

For rockfishes, crab, and prawns, the sample distributions were not completely adequate. For rockfish, we had good distribution information west of 119 Degrees 50' West Longitude (see rockfish map). The sample contained no information east of this point. So we used the sample distribution and the CDFG 10 block totals for the western area to derive the 1 by 1 mile distribution on the western half. For the eastern half, we used the CDFG 10 by 10 mile total for each block and distributed them equally within the block to the 1 by 1 mile blocks included in the Exclusion Zone maps. The CDFG 10 by 10 mile block data confirm that our sample is correct in maintaining that little of the rockfish catch comes from the eastern half. The 2003 Average Annual Rockfish ex vessel value was $137,469 for the western half and $15,422 for the eastern half.

For crab, we followed the same procedure as for rockfish for the western half. For the eastern half, Exclusion Zone information was not available. We distributed the CDFG 10 by 10 mile block totals to the 1 by 1 mile blocks within each 10 by 10 mile block to those 1 by 1 mile blocks within three miles from shore (the pattern on the western half). As with rockfish, the CDFG data confirm that catches from the eastern half is relatively small. The 1996-2003 Average Annual ex vessel value for the western half was $367,019 and $47,713 for the eastern half.

For prawn, there were only three fishermen in our sample. We used the CDFG 10 by 10 mile block totals and distributed the these totals within the 10 by 10 mile blocks evenly to the 1 by 1 mile blocks included in the Exclusion Zone maps. Prawn distributions extend out to the edges of the CINMS and into blocks outside our 22 block definition (see map). We accounted for this by taking the data from CDFG block 690 and distributing its total to the 1 by 1 mile Exclusion Zone blocks in 690, 671 and 672. Also, data from CDFG block 711 was distributed to the 1 by 1 mile blocks in 711 and 730.

For squid, wetfish (Anchovies & Sardines and Mackerel) and tuna, we use the sample distributions obtained from the squid/wetfish fishermen through a contract with Dr. Carrie Pomeroy of UC-Santa Cruz. These distributions were normalized to 100 percent across the 1 by 1 mile blocks. We then calculated the 1996 – 2003 Average Annual Ex Vessel Values for each species/species group (see our list of species in each species group) and each of the 22 he California Department of Fish and Game (CDFG) blocks

that define the Channel Islands National Marine Sanctuary (CINMS). The totals across all 22 blocks are then distributed to the 1 by 1 mile blocks.

Species/Species Groups Not Mapped at the 1 by 1 mile Resolution or Not Mapped

The following table summarizes the other species/species groups either not mapped at the 1 by 1 mile block resolution or not mapped at all and the percent of ex vessel value each species/species group accounted for over the 1996-2003 period. All these species/species groups accounted for less than 1.5 percent of the total ex vessel value from the CINMS, including abalone. Abalone has not been commercially harvested since 1997 in the CINMS. Excluding abalone, these species/species groups accounted for only a little over one half of one percent of the total ex vessel value from the CINMS.

Table C.1.

Species/Species Group	1996-2003 Avg. Value	Percent of CINMS	
Abalone [1]	0	0	mapped at 10 by 10 mile
Swordfish	50,087	0.2066858	mapped at 10 by 10 mile
Roundfish	32,736	0.1350863	mapped at 10 by 10 mile
Others	22,493	0.0928182	mapped at 10 by 10 mile
Yellowtail	8,066	0.0332846	mapped at 10 by 10 mile
Shrimp	3,505	0.0144635	mapped at 10 by 10 mile
Mussels & Snails	5,819	0.0240123	mapped at 10 by 10 mile
Salmon	5,119	0.0211237	mapped at 10 by 10 mile
Rays & Skates	993	0.0040976	mapped at 10 by 10 mile
Surf Perch	412	0.0017001	not mapped
Grenadiers	106	0.0004374	not mapped
Octopus	105	0.0004333	not mapped
Total	129,441	0.5341428	
Total, Excluding Abalone	129,441	0.5341428	

1. Abalone value is the 2000-2003 average since Abalone harvest has been prohibited since 1997.

APPENDIX C

Quality Assessment

We have attempted to provide a quality assessment for each species/species group map. We also have attempted to provide information to assess how representative our sample would be of the population of fishing operations in the CINMS.

There are significant differences in the distributions of catch between the population of fishing operations and our samples for each species/species groups. So without sample weighting, extrapolating sample means (averages) to derive population totals would not be advisable. We are also evaluating the impact this might have on socioeconomic profiles. However, we are more confident in our spatial distributions for the maps. Still some maps are better than others. To help assess the quality of the maps, we provide the sample size in parentheses, the CDFG control totals for the 1996-1999 Annual Averages, and what percent of that total our sample accounted for. As you will see from the population distributions of fishing operations and ex vessel value, in many cases, a small percent of the fishing operations account for a large percentage of the ex vessel value. Overall our two samples (Barilotti and Pomeroy) accounted for about 79 percent of the ex vessel value of catch from the CINMS for the 1996-1999 period (excluding Kelp). So overall, we are highly confident that we are capturing the commercial fishing values.

For each mapped distribution of species/species groups, we provide the population distributions of the number of fishing operations that operated in the Channel Islands National Marine Sanctuary (CINMS) and the ex vessel value (amount received by fishermen) from catch in the CINMS. The data is from the California Department of Fish and Game (CDFG) and is reported by fisherman and CDFG 10 by 10 mile blocks. We use 22 of the CDFG blocks to define the CINMS.

For comparison purposes, we also provide the sample distributions for the number of fishing operations and their ex vessel value from the CINMS.

The population distributions from CDFG were for 1999 and were gathered in the spring of 2000. These numbers were preliminary and the totals don't agree with the control totals you will find in a summary table included in you package. The differences in the totals are not significant.

APPENDIX C

Table C.2. Population

All Species in Channel Islands National Marine Sanctuary - 22 Block Definition, 1999

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	737	100.00	36,718,444	100.00
GE $500,000	19	2.58	12,809,041	34.88
GE $100,000	78	10.58	25,866,209	70.44
GE $50,000	141	19.13	30,110,099	82.00
GE $20,000	268	36.36	34,469,665	93.88
LT $20,000	469	63.64	2,248,779	6.12
LT $10,000	389	52.78	1,127,487	3.07
LT $5,000	286	38.81	367,003	1.00
LT $1,000	170	23.07	75,105	0.20

Note that, in 1999, 78 or 10.58 percent of the fishing operations accounted for 70.44 percent of the ex vessel revenue. The Barilotti sample (all species/species groups except squid, wetfish and tunas) accounted for about 25 percent of the 1996-1999 Average Annual Ex Vessel Value. The Pomeroy sample (squid, wetfish and tunas) accounted for 95 percent of squid, 84.5 percent of wetfish and 13.62 percent of tuna. But across all three species/species groups, the Pomeroy sample accounts for 54.12 percent of the total 1996-1999 value. The Barilotti sample included 59 fishing operations and the Pomeroy sample included 37 fishing operations for a total of 96 fishing operations or 13 percent of all CINMS fishing operations which accounted for about 79 percent of the total ex vessel value in the CINMS.

All Species in Channel Islands National Marine Sanctuary - 22 Block Definition, 2000

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2000 Ex Vessel Value	Percent of 2000 Ex Vessel Value
GT $0	543	100.00	21,631,837	100.00
GE $500,000	4	0.74	2,248,706	10.40
GE $100,000	49	9.02	13,077,418	60.45
GE $50,000	100	18.42	16,792,037	77.63
GE $20,000	193	35.54	19,797,659	91.52
LT $20,000	350	64.46	1,834,178	8.48
LT $10,000	282	51.93	822,097	3.80
LT $5,000	215	39.59	309,506	1.43
LT $1,000	113	20.81	42,797	0.20

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All Species in Channel Islands National Marine Sanctuary - 22 Block Definition, 2001

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2001 Ex Vessel Value	Percent of 2001 Ex Vessel Value
GT $0	448	100.00	13,000,830	100.00
GE $500,000	0	0.00	0	0.00
GE $100,000	31	6.92	6,075,633	46.73
GE $50,000	69	15.40	8,856,051	68.12
GE $20,000	152	33.93	11,625,992	89.42
LT $20,000	296	66.07	1,374,839	10.58
LT $10,000	247	55.13	646,497	4.97
LT $5,000	196	43.75	298,693	2.30
LT $1,000	96	21.43	38,416	0.30

All Species in Channel Islands National Marine Sanctuary - 22 Block Definition, 2002

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2002 Ex Vessel Value	Percent of 2002 Ex Vessel Value
GT $0	458	100.00	12,074,375	100.00
GE $500,000	0	0.00	0	0.00
GE $100,000	25	5.46	4,649,240	38.51
GE $50,000	68	14.85	7,636,250	63.24
GE $20,000	156	34.06	10,467,234	86.69
LT $20,000	302	65.94	1,607,141	13.31
LT $10,000	239	52.18	718,682	5.95
LT $5,000	178	38.86	272,305	2.26
LT $1,000	88	19.21	34,655	0.29

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

Table C.3.

Commercial Fishing Ex Vessel Value for the CDFG 22 Block Definition of the CINMS

Species/Species Group	Sum of 1988 - 1999 Value $	Percent	1999 Value $	Percent	Avg. 1996-1999 Value $	Percent	Rank 1999	Rank 1996-1999
Squid	58,414,283	40.79	26,558,813	72.31	11,249,837	55.42	1	1
Urchins	56,515,080	39.46	5,963,876	16.24	5,265,233	25.94	2	2
Spiny Lobster	6,774,501	4.73	952,991	2.59	922,098	4.54	3	3
Rockfishes	4,659,502	3.25	549,446	1.50	549,319	2.71	5	5
Prawn	3,558,714	2.48	743,159	2.02	703,186	3.46	4	4
sub-total (TOP 5)	**129,922,080**	**90.72**	**34,768,285**	**94.66**	**18,689,673**	**92.07**		
Abalone	2,544,275	1.78	47	0.00	178,027	0.88	n/a	11
Crab	2,378,003	1.66	313,289	0.85	343,664	1.69	8	6
Anchovy & Sardines	1,378,517	0.96	548,944	1.49	234,367	1.15	6	8
CA Sheepshead	1,326,089	0.93	153,147	0.42	235,928	1.16	10	7
Flatfish	1,105,209	0.77	324,685	0.88	183,871	0.91	7	10
sub-total (6-10)	**8,732,093**	**6.10**	**1,340,112**	**3.65**	**1,175,857**	**5.79**		
Total TOP 10	**138,654,173**	**96.82**	**36,108,397**	**98.31**	**19,865,530**	**97.86**		
Total TOP 8, excluding Abalone	**136,109,898**	**95.04**	**36,108,350**	**98.31**	**19,687,503**	**96.98**		
Total All Species	**143,209,999**	**100.00**	**36,730,499**	**100.00**	**20,299,548**	**100.00**		
Sea Cucumbers	737,031	0.51	267,842	0.73	167,700	0.83	9	12
Mackerel	550,216	0.38	59,921	0.16	67,119	0.33	12	13
Sculpin&Bass	568,354	0.40	88,547	0.24	60,327	0.30	11	14
Tuna	958,499	0.67	53,694	0.15	205,884	1.01	13	9
Swordfish	824,731	0.58	21,472	0.06	39,090	0.19	17	15
Shark	373,328	0.26	41,638	0.11	34,751	0.17	14	16

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Species/Species Group	1996-1999 Average Value	1996-1999 Average Percent	2000-2003 Average Value	2000-2003 Average Percent	1996-2003 Average Value	1996-2003 Average Percent
Squid	13,046,664	45.87	8,530,046	38.80	10,788,355	42.79
Kelp	5,991,367	21.07	5,991,367	27.25	5,991,367	23.76
Urchins	5,265,233	18.51	3,375,854	15.35	4,320,544	17.14
Spiny Lobster	922,098	3.24	1,126,974	5.13	1,024,536	4.06
Prawn	703,186	2.47	541,157	2.46	622,172	2.47
Rockfish	549,319	1.93	326,036	1.48	437,678	1.74
Crab	343,594	1.21	485,870	2.21	414,732	1.64
Tuna	305,655	1.07	10,052	0.05	157,854	0.63
Wetfish	301,486	1.06	647,015	2.94	474,251	1.88
CA Sheephead	235,928	0.83	155,290	0.71	195,609	0.78
Flatfishes	183,871	0.65	252,784	1.15	218,328	0.87
Sea Cucumbers	167,700	0.59	276,313	1.26	222,007	0.88
Sculpin & Bass	60,327	0.21	126,078	0.57	93,203	0.37
Shark	34,751	0.12	34,043	0.15	34,397	0.14
sub-total (counted)	28,111,179	98.84	21,878,879	99.52	24,995,029	99.13
Others Not Included						
Abalone	178,027	0.63	0	0.00	89,014	0.35
Swordfish	75,014	0.26	25,161	0.11	50,087	0.20
Roundfish	33,262	0.12	32,209	0.15	32,736	0.13
Others	22,990	0.08	21,996	0.10	22,493	0.09
Yellowtail	6,891	0.02	9,241	0.04	8,066	0.03
Shrimp	5,813	0.02	1,197	0.01	3,505	0.01
Mussels & Snails	4,694	0.02	6,944	0.03	5,819	0.02
Salmon	1,411	0.00	8,827	0.04	5,119	0.02
Rays & Skates	1,164	0.00	822	0.00	993	0.00
Surf Perch	695	0.00	129	0.00	412	0.00
Grenadiers	211	0.00	0	0.00	106	0.00
Octopus	196	0.00	14	0.00	105	0.00
sub-total (not counted)	330,368	1.16	106,540	0.48	218,454	0.87
sub-total, excluding Abalone	152,341	0.54	106,540	0.48	129,440	0.51
Total All Species/Species Groups	28,441,547	100.00	21,985,419	100.00	25,213,483	100.00
Total All Species/Species Groups, excluding Abalone	28,263,520	99.37	21,985,419	100.00	25,124,470	99.65

APPENDIX C

Table C.4. Species Included in Each Species Group for Commercial Fisheries Analyses

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
1	Tuna	1	Tuna, yellowfin	Thunnus albacares
		2	Tuna, skipjack	Katsuwonus pelamis
		3	Bonito, Paciffic	Sarda chilienis
		4	Tuna, bluefin	Thunnus thynnus
		5	Tuna, albacore	Thunnus alalunga
		6	Tuna, unspecified	Scombridae
		8	Tuna, bigeye	Thunnus obesus
		9	Tuna, skipjack, black	Euthynnus lineatus
2	Mackerel	19	Mackerel, bullet	Auxis rochei
		50	Mackerel, unspecified	Scomber / Trachurus
		51	Mackerel, Pacific	Scomber japonicus
		55	Mackerel, jack	Trachurus symmetricus
3	Sharks	96	Shark, white	Carcharodon carcharias
		97	Shark, bigeye thresher	Alopias superciliosus
		98	Shark, pelagic thresher	Alopias pelagicus
		150	Shark, unspecified	Selachii spp.
		151	Shark, shortfin mako	Isurus oxyrinchus
		152	Shark, spiny dogfish	Squalus acanthias
		153	Shark, leopard	Triakis semifasciata
		154	Shark, brown smoothhound	Mustelus henlei
		155	Shark, thresher	Alopias vulpinus
		156	Shark, basking	Cetorhinus maximus
		158	Shark, smooth hammerhead	Sphyrna zygaena
		159	Shark, soupfin	Galeorhinus zyopterus
		161	Shark, sixgill	Hexanchus griseus
		162	Shark, sevengill	Notorynchus cepedianus
		163	Shark, swell	Cephaloscyllium ventriosum
		165	Shark, Pacific angel	Squatina californica
		167	Shark, blue	Prionace glauca
		169	Shark, horn	Heterodontus francisci
		179	Shark, gray smoothhound	Mustelus californicus
4	Rays & Skates	170	Ray, unspecified	Rajiformes
		171	Ray, bat	Myliobatis californica
		172	Ray, Pacific electric	Torpedo californica
		174	Guitarfish, shovelnose	Rhinobatos productus
		175	Skate, unspecified	Rajidae
5	Rockfishes	245	Rockfish, cowcod	Sebastes levis
		246	Rockfish, copper (whitebelly)	Sebastes caurinus
		247	Rockfish, canary	Sebastes pinniger
		249	Rockfish, vermilion	Sebastes miniatus
		250	Rockfish, unspecified	Sebastes spp.

Table C. 4. (continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
5	Rockfishes[1] (continued)	251	Rockfish, black-and-yellow	Sebastes chrysomelas
		252	Rockfish, black	Sebastes melanops
		253	Rockfish, bocaccio	Sebastes paucispinis
		254	Rockfish, chilipepper	Sebastes goodei
		255	Rockfish, greenspotted	Sebastes chlorostictus
		256	Rockfish, starry	Sebastes constellatus
		257	*Rockfish, darkblotched*	*Seabastes crameri*
		258	Rockfish, China	Sebastes nebulosus
		259	Rockfish, yellowtail	Sebastes flavidus
		260	Rockfish, California	Scorpaena guttata
		261	Cabezon	Scorpaenichthys marmoratu
		262	Thornyheads	Sebastolobus spp.
		263	Rockfish, gopher	Sebastes carnatus
		264	Rockfish, pinkrose	Sebastes simulator
		265	Rockfish, yelloweye	Sebastes ruberrimus
		267	Rockfish, brown	Sebastes auriculatus
		268	Rockfish, rosy	Sebastes rosaceus
		269	Rockfish, widow	Sebastes entomelas
		270	Rockfish, splitnose	Sebastes diploproa
		651	Rockfish, olive	Sebastes serranoides
		652	Rockfish, grass	Sebastes rastrelliger
		653	*Rockfish, pink*	*Sebastes eos*
		654	Rockfish, greenstripped	Sebastes elongatus
		655	Rockfish, copper	Sebastes caurinus
		657	Rockfish, flag	Sebastes rubrivinctus
		658	Rockfish, treefish	Sebastes serriceps
		659	Rockfish, kelp	Sebastes atrovirens
		660	*Rockfish, honeycomb*	*Sebastes umbrosus*
		661	Rockfish, greenblotched	Sebastes rosenblatti
		662	Rockfish, bronzespotted	Sebastes gilli
		663	Rockfish, bank	Sebastes rufus
		664	Rockfish, rosethorn	Sebastes helvomaculatus
		665	Rockfish, blue	Sebastes mystinus
		666	*Rockfish, squarespot*	*Sebastes hopkinsi*
		667	Rockfish, blackgill	Sebastes melanostomus
		668	*Rockfish, stripetail*	*Sebastes saxicola*
		669	Rockfish, speckled	Sebastes ovalis
		670	*Rockfish, swordspine*	*Sebastes ensifer*
		671	*Rockfish, calico*	*Sebastes dallii*
		672	*Rockfish, shortbelly*	*Sebastes jordani*
		673	*Rockfish, chameleon*	*Sebastes phillipsi*
		674	Rockfish, aurora	Sebastes aurora
		675	Rockfish, redbanded	Sebastes babcocki
		678	Thorneyhead, longspine	Sebastolobus altivelis
		679	Thorneyhead, shortspine	Sebastolobus alascanus

Table C. 4. (continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
5	Rockfishes (continued)	956	Rockfish, group bocaccio/chili	Sebastes/group
		957	Rockfish, group bolina	Sebastes/group
		958	Rockfish, group deepwater reds	Sebastes/group
		959	Rockfish, group red	Sebastes/group
		960	Rockfish, group small	Sebastes/group
		961	Rockfish, group rosefish	Sebastes/group
		962	Rockfish, group gopher	Sebastes/group
		970	Rockfish, quillback	Sebastes maliger
		971	*Rockfish, group canary/vermili*	*Sebastes/group*
		972	*Rockfish, group black/blue*	*Sebastes/group*
6	Sculpin & Bass	272	Sculpin, staghorn	Leptocottus armatus
		273	*Sculpin, yellowchin*	*Icelinus quadriseriatus*
		275	Bass, rock	Paralabrax spp.
		276	*Bass, spotted sand*	*Paralabrax maculatofasciat*
		277	Bass, kelp	Paralabrax clathratus
		278	*Bass, barred sand*	*Paralabrax nebulifer*
		280	Bass, giant sea	Stereolepis gigas
		400	Seabass, white	Atractoscion noblilis
7	Salmon	300	Salmon	Oncorhynchus spp.
		301	*Salmon, chum*	*Oncorhynchus keta*
		302	Salmon, chinook	Oncorhynchus tshawytscha
		303	*Salmon, pink*	*Oncorhynchus goruscha*
		304	Salmon, coho	Oncorhynchus kisutch
		306	*Salmon, Roe (Chinook and Coho)*	*Onchorhynchus spp.*
8	Crab	341	Crab, red rock	Cancer productus
		342	Crab, yellow rock	Cancer anthonyi
		343	Crab, brown rock	Cancer antennarius
		800	Crab, Dungeness	Cancer magister
		801	Crab, rock unspecified	Cancer spp.
		802	Crab, claws	Cancer spp.
		803	Crab, spider	Loxorhynchus spp.
		804	Crab, king	Paralithodes spp.
		805	Crab, sand	Emerita analoga
		806	Crab, shore	Pachygrapsus crassipes
		807	Crab, pelagic red	Pleuroncodes planipes
		808	Crab, tanner	Chionoecetes tanneri
		809	Crab, box	Lopholithodes foraminatus
9	Shrimp	810	Shrimp, bay	Crangonidae
		811	*Shrimp, ghost*	*Callianassa californiensis*
		812	Shrimp, Pacific Ocean	Pandalus jordani
		814	Shrimp, unspecified	Crustacea

APPENDIX C

Table C. 4. (continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
9	Shrimp (continued)	*817*	*Shrimp, coonstriped*	*Pandalus hypsinotus*
		818	Shrimp, red rock	Lysmata californica
		819	*Shrimp, brine*	*Artemia salina*
10	Spiny Lobster	820	Lobster, California spiny	Panulirus interruptus
11	Urchins	752	Urchin, red	Strongylocentrotus francisc
		753	Urchin, purple sea	Strongylocentrotus purpurat
12	Sea Cucumbers	755	Cucumber, sea	Holothuroidea
13	Roundfish	190	Sablefish	Anoplopoma fimbria
		191	Louvar	Luvarus imperialis
		195	Lingcod	Ophiodon elongatus
		290	Greenling, kelp	Hexagrammos decagramm
		495	Whiting, Pacific	Merluccius productus
14	Grenadiers	198	Grenadiers	Macouridae
15	Yellowtail	40	Yellowtail	Seriola lalandi
16	Swordfish	91	Swordfish	Xiphias gladius
17	Flatfish	200	Sole, unspecified	Pleuronectiformes
		201	Flounder, arrowtooth	Atheresthes stomias
		202	*Sole, bigmouth*	*Hippoglossina stomata*
		203	Sole, rock	Pleuronectes bilineata
		204	Sole, fantail	Xystreurys liolepis
		205	Sole, sand	Psettichthys melanostictus
		206	Sole, English	Pleuronectes vetulus
		207	Sole, rex	Errex zachirus
		208	*Sole, butter*	*Pleuronectes isolepis*
		209	Sole, petrale	Eopsetta jordani
		210	*Sole, slender*	*Eopsetta exilis*
		211	Sole, Dover	Microstomus pacificus
		212	Sole, tongue	Symphurus atricauda
		220	Halibut, unspecified	Pleuronectiformes
		221	*Halibut, Pacific*	*Hippoglossus stenolepis*
		222	Halibut, California	Paralichthys californicus
		225	Sanddab	Citharichthys spp.
		226	*Sanddab, longfin*	*Citharichthys xanthostigma*
		227	Sanddab, Pacific	Citharichthys sordidus
		228	*Sanddab, speckled*	*Citharichthys stigmaeus*

Table C. 4. (continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
17	Flatfish (continued)	230	Flounder, unspecified	Pleuronectidae
		231	Flounder, starry	Platichthys stellatus
		235	*Turbot, curlfin*	*Pleuronichthys decurrens*
		236	*Turbot, diamond*	*Hypsopsetta guttulata*
		237	*Sole, C-O*	*Pleuronichthys coenosus*
		238	*Turbot, hornyhead*	*Pleuronichthys verticalis*
		239	*Turbot, spotted*	*Pleuronichthys ritteri*
		240	Turbot	Pleuronectidae
18	Surf Perch	550	Surfperch, unspecified	Embiotocidae
		551	Surfperch, barred	Amphistichus argenteus
		552	Surfperch, black	Embiotoca jacksoni
		553	Surfperch, redtail	Amphistichus rhodoterus
		554	Surfperch, shiner	Cymatogaster aggregata
		556	*Surfperch, white*	*Phanerodon furcatus*
		557	Surfperch, walleye	Hyperprosopon argenteum
		558	Surfperch, rubberlip	Rhacochilus toxotes
		559	Surfperch, pile	Rhacochilus vacca
		560	*Surfperch, calico*	*Amphistichus koelzi*
		561	*Surfperch, dwarf*	*Micrometrus minimus*
		562	Surfperch, rainbow	Hypsurus caryi
		563	*Surfperch, pink*	*Zalembius rosaceus*
		601	*Kahawai*	*Annipis trutta*
		602	Zebraperch	Hermosilla azurea
19	Abalone	700	Abalone	Haliotis spp.
		701	Abalone, black	Haliotis cracherodii
		702	Abalone, red	Haliotis rufescens
		703	Abalone, green	Haliotis fulgens
		704	Abalone, pink	Haliotis corrugata
		705	Abalone, white	Haliotis sorenseni
		706	Abalone, threaded	Haliotis assimilis
		707	Abalone, pinto	Haliotis kamtschatkana
		708	Abalone, flat	Haliotis walallensis
		709	Limpet, unspecified	Archaeogastropoda
20	Squid	710	Squid, jumbo	Doscidicus gigas
		711	Squid, market	Loligo opalescens
21	Octopus	712	Octopus, unspecified	Octopus spp.
22	Mussels & Snails	730	Mussel	Mytilus spp.
		731	Whelk, Kellet’s	Kelletia Kelleti
		732	Snail, sea	Gastropoda
		736	Snails, moon	Polinices spp.
		746	*Snail, bubble*	*Bulla gouldiana*

Table C.4. (Continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
22	Mussels & Snails (continued)	747	Snail, top	Astraea undosa
		749	Sea hare	Aplysia spp.
		751	Sea stars	Asteroidea
23	Anchovy & Sardines	110	Anchovy, northern	Engraulis mordax
		100	Sardine, Pacific	Sardinops sagax caeruleus
24	Herring & Roe	121	Herring, Pacific	Clupea pallasi
		122	Herring, roe	Clupea pallasi
25	Prawn	813	Prawn, ridgeback	Eusicyonia ingentus
		815	Prawn, spot	Pandalus platyceros
		816	*Prawn, golden*	*Penaeus Californiensis*
26	CA Sheephead	145	Sheephead, California	Semicossyphus pulcher
27	Other[2]	57	Wahoo	Acanthocybium solanderi
		80	Butterfish (Pacific pompano)	Peprilus simillimus
		130	Barracuda, California	Sphyraena argentea
		135	Mullet, striped	Mugil cephalus
		166	Ratfish, spotted	Hydrolagus colliei
		184	Jacksmelt	Atherinopsis californiensis
		189	Silversides	Atherinidae
		291	Triggerfish	Balistidae
		324	Shad, threadfin	Dorosoma petenense
		325	Shad, American	Alosa sapidissima
		346	Hardhead (freshwater)	Mylopharodon conocephalu
		340	Tilapia	Tilapia spp.
		420	Croaker, unspecified	Sciaenidae
		421	Croaker, black	Cheilotrema saturnum
		430	Grouper	Mycteroperca/Epinephelus
		432	Grouper, Broomtail	Mycteroperca xenarcha
		435	Croaker, white	Genyonemus lineatus
		440	Queenfish	Seriphus politus
		450	Eel	Osteichthyes
		452	Eel, California moray	Gymnothorax mordax
		454	Eel, wolf	Anarrhichthys ocellatus
		456	Eel, monkeyface	Cebidichthys violaceus
		457	Hagfishes	Eptatretus spp.
		467	Opah	Lampris guttatus
		473	Lizardfish, California	Synodus lucioceps
		475	Opaleye	Girella nigricans
		476	Needlefish, California	Strongylura exilis
		478	Halfmoon	Medialuna californiensis
		479	Blacksmith	Chromis punctipinnis
		480	Sargo	Anisotremus davidsonii
		481	Dolphin (fish)	Coryphaena hippurus

Table C.4. (Continued)

Species Group Code	Species Group Name	CDFG Species Code	Common Name	Scientific Name
27	Other (continued)			
		485	Midshipman, planifin	Porichthys notatus
		490	Whitefish, ocean	Caulolatilus princeps
		999	Fish, unspecified	Osteichthyes

1. Species in italics were not caught in any of the study areas.
2. All species under Other were caught in the study areas.

APPENDIX C

Table C5. Landings Distribution

Landings Distribution by Port: Squid

Port	Port Name	County	Value	Percent	Percent
605	Port Hueneme	Ventura	50,048,318	0.817330157	81.7330
606	Morro Bay	San Luis Obispo	17,140	0.00027991	0.0280
608	Oxnard/Channel Islands Harbor	Ventura	6,601	0.0001078	0.0108
611	Santa Barbara Harbor	Santa Barbara	559,666	0.009139806	0.9140
613	Ventura Harbor	Ventura	3,949,838	0.0645041	6.4504
745	Terminal Island	Los Angeles	1,317,869	0.021521884	2.1522
748	New Port Beach	Orange	98	1.60042E-06	0.0002
OLA	Other Los Angeles	Los Angeles	7,746	0.000126499	0.0126
770	San Pedro	Los Angeles	5,326,630	0.086988245	8.6988
	Total		61,233,906	1	100.0000

Landings Distribution by Port: Urchins

Port Code	Port Name	County	Value	Percent	Percent
608	Oxnard/Channel Islands Harbor	Ventura	133,556.24	0.082434273	8.2434
611	Santa Barbara Harbor	Santa Barbara	1,467,768.76	0.905943822	90.5944
613	Ventura Harbor	Ventura	2,645.20	0.001632684	0.1633
745	Terminal Island	Los Angeles	1,375.40	0.000848931	0.0849
770	San Pedro	Los Angeles	6,067.80	0.003745199	0.3745
880	San Diego	San Diego	8,740.89	0.005395097	0.5395
	Total		1,620,154.28	1	100.0000

Landings Distribution by Port: Spiny Lobsters

Port	Port Name	County	Value	Percent	Percent
608	Oxnard/Channel Islands Harbor	Ventura	1,415.75	0.003873061	0.3873
611	Santa Barbara Harbor	Santa Barbara	348,188.83	0.952538611	95.2539
613	Ventura Harbor	Ventura	15,151.20	0.041449069	4.1449
741	Avalon	Los Angeles	101.25	0.000276989	0.0277
770	San Pedro	Los Angeles	680.73	0.00186227	0.1862
	Total		365,537.76	1	100.0000

Landings Distribution by Port: Rockfishes

Port	Port Name	County	Value	Percent	Percent
606	Morro Bay	San Luis Obispo	4,023.15	0.11903353	11.9034
608	Oxnard/Channel Islands Harbor	Ventura	1,235.97	0.036568826	3.6569
611	Santa Barbara Harbor	Santa Barbara	28,365.35	0.839249776	83.9250
613	Ventura Harbor	Ventura	174	0.005148164	0.5148
	Total		33,798.46	1	100.0000

Landings Distribution by Port: Prawn

Port	Port Name	County	Value	Percent	Percent
605	Port Hueneme	Ventura	7,760.00	0.04686528	4.6865
608	Oxnard/Channel Islands	Ventura	134,689.00	0.813432701	81.3433
611	Santa Barbara Harbor	Santa Barbara	9,493.00	0.057331457	5.7331
613	Ventura Harbor	Ventura	13,639.00	0.082370562	8.2371
	Total		165,581.00	1	100.0000

APPENDIX C

Table C5. Landings Distribution (Cont.)

Landings Distribution by Port: Crab

Port	Port Name	County	Value	Percent	Percent
608	Oxnard/Channel Islands Harbor	Ventura	5,998.42	0.043971573	4.3972
611	Santa Barbara Harbor	Santa Barbara	129,800.75	0.951507765	95.1508
613	Ventura Harbor	Ventura	616.7	0.004520735	0.4521
	Total		136,415.86	1	100.0000

Landings Distribution by Port: Wetfish

Port	Port Name	County	Value	Percent	Percent
605	Port Hueneme	Ventura	841,713.00	0.84075538	84.0755
608	Oxnard/Channel Islands Harbor	Ventura	3,916.00	0.003911545	0.3912
613	Ventura Harbor	Ventura	330.00	0.000329625	0.0330
592	Moss Landing	Monterey	304.00	0.000303654	0.0304
770	San Pedro	Los Angeles	97,914.00	0.097802603	9.7803
745	Terminal Island	Los Angeles	56,926.00	0.056861235	5.6861
OLA	Other Los Angeles	Los Angeles	36.00	3.5959E-05	0.0036
	Total		1,001,139.00	1	100.0000

Landings Distribution by Port: CA Sheepshead

Port	Port Name	County	Value	Percent	Percent
606	Morro Bay	San Luis Obispo	6.00	0.001630213	0.1630
608	Oxnard/Channel Islands Harbor	Ventura	759.55	0.206371417	20.6371
611	Santa Barbara Harbor	Santa Barbara	901.10	0.244830865	24.4831
613	Ventura Harbor	Ventura	1,518.85	0.412674908	41.2675
770	San Pedro	Los Angeles	495.00	0.134492596	13.4493
	Total		3,680.50	1	100.0000

Landings Distribution by Port: Flatfish

Port	Port Name	County	Value	Percent	Percent
602	Avila/Port San Luis	San Luis Obispo	269.75	0.001598383	0.1598
608	Oxnard/Channel Islands Harbor	Ventura	101,568.10	0.601833859	60.1834
611	Santa Barbara Harbor	Santa Barbara	7,599.45	0.045029949	4.5030
613	Ventura Harbor	Ventura	59,295.05	0.351348196	35.1348
770	San Pedro	Los Angeles	32.00	0.000189614	0.0190
	Total		168,764.35	1	100.0000

Landings Distribution by Port: Sea Cucumbers

Port	Port Name	County	Value	Percent	Percent
608	Oxnard/Channel Islands Harbor	Ventura	48,429.70	0.774335519	77.4336
611	Santa Barbara Harbor	Santa Barbara	13,226.85	0.211482205	21.1482
770	San Pedro	Los Angeles	887.00	0.014182116	1.4182
	Total		62,543.56	1	100.0000

APPENDIX C

Table C5. Landings Distribution (Cont.)

Landings Distribution by Port: Sculpin & Bass

Port	Port Name	County	Value	Percent	Percent
608	Oxnard/Channel Islands Harbor	Ventura	9,952.36	0.522201141	52.2201
613	Ventura Harbor	Ventura	4,127.63	0.216577083	21.6577
770	San Pedro	Los Angeles	4,975.80	0.261080632	26.1081
	Total		19,058.48	1	100.0000

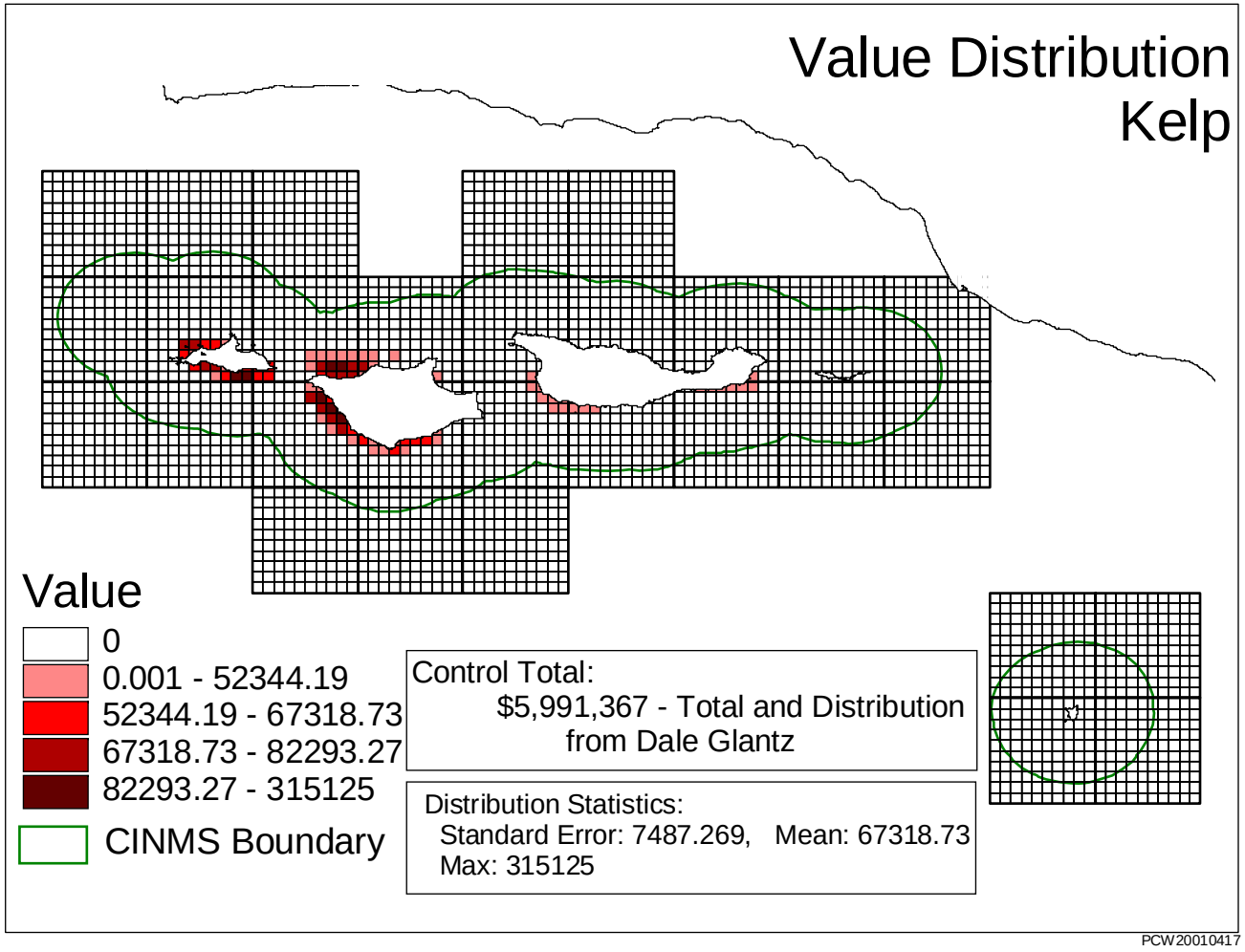
Landings Distribution by Port: Tuna

Port	Port Name	County	Value	Percent	Percent
605	Port Hueneme	Ventura	12,340	0.0314816	3.1482
608	Oxnard/Channel Islands Harbor	Ventura	3,290	0.008393392	0.8393
611	Santa Barbara Harbor	Santa Barbara	1,219	0.003109892	0.3110
613	Ventura Harbor	Ventura	294	0.000750048	0.0750
745	Terminal Island	Los Angeles	337,074	0.859937496	85.9937
748	New Port Beach	Orange	288	0.000734741	0.0735
770	San Pedro	Los Angeles	35,291	0.090033803	9.0034
880	San Diego	San Diego	2,179	0.005559028	0.5559
	Total		391,975	1	100.0000

Landings Distribution by Port: Sharks

Port	Port Name	County	Value	Percent	Percent
602	Avila/Port San Luis	San Luis Obispo	19	0.000714685	0.0715
608	Oxnard/Channel Islands Harbor	Ventura	13,175.60	0.495599987	49.5600
613	Ventura Harbor	Ventura	5,639.15	0.212116539	21.2117
745	Terminal Island	Los Angeles	6,910.00	0.259919542	25.9920
770	San Pedro	Los Angeles	787.4	0.029618039	2.9618
880	San Diego	San Diego	54	0.002031209	0.2031
	Total		26585.15	1	100.0000

APPENDIX C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Kelp
Value
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52344.19 - 67318.73
67318.73 - 82293.27
82293.27 - 315125
CINMS Boundary
Control Total:
$5,991,367 - Total and Distribution
from Dale Glantz
Distribution Statistics:
Standard Error: 7487.269, Mean: 67318.73
Max: 315125
PCW20010417

APPENDIX C

POPULATION

Squid in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	169	100.00	26,545,014	100.00
GE $500,000	18	10.65	12,237,494	46.10
GE $100,000	69	40.83	24,241,115	91.32
GE $50,000	84	49.70	25,371,366	95.58
GE $20,000	108	63.91	26,148,240	98.51
LT $20,000	61	36.09	396,774	1.49
LT $10,000	45	26.63	178,302	0.67
LT $5,000	27	15.98	47,588	0.18
LT $1,000	10	5.92	4,319	0.02

SAMPLE

Squid in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	32	100.00	16,280,048	100.00
GE $500,000	17	53.13	13,100,449	80.47
GE $100,000	28	87.50	16,177,748	99.37
GE $50,000	29	90.63	16,275,110	99.97
GE $20,000	29	90.63	16,275,110	99.97
LT $20,000	4	12.50	4,938	0.03
LT $10,000	4	12.50	4,938	0.03
LT $5,000	4	12.50	4,938	0.03
LT $1,000	1	3.13	632	0.00

Sample is 21.89% of the squid fishing operations in CINMS and accounts for 95.15% of total squid revenue from the CINMS. Does not include revenue from four light boats in sample. Light boats get 20 percent of the revenue of the boats they provide lighting services.

APPENDIX C

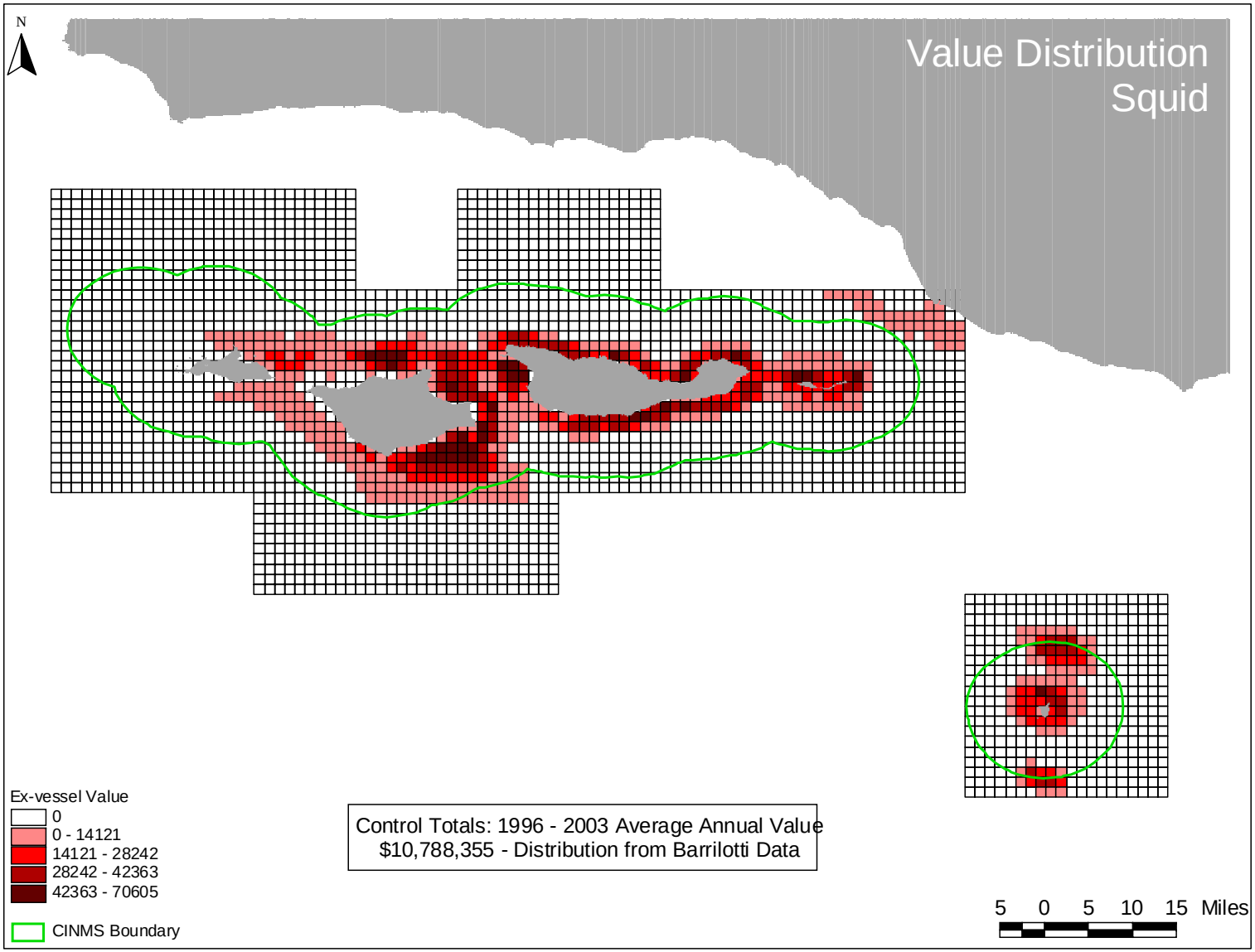
2003 UPDATE

Squid in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	82	100.00	9,712,813	100.00
GE $500,000	1	1.22	521,978	5.37
GE $100,000	33	40.24	7,749,084	79.78
GE $50,000	53	64.63	9,263,625	95.38
GE $20,000	62	75.61	9,602,449	98.86
LT $20,000	20	24.39	110,364	1.14
LT $10,000	15	18.29	40,808	0.42
LT $5,000	12	14.63	19,799	0.20
LT $1,000	5	6.10	1,731	0.02

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C


N
Value Distribution
Squid
Ex-vessel Value
0
0 - 14121
14121 - 28242
28242 - 42363
42363 - 70605
CINMS Boundary
Control Totals: 1996 - 2003 Average Annual Value
$10,788,355 - Distribution from Barrilotti Data
5 0 5 10 15 Miles
PCW20050316

APPENDIX C

POPULATION

Wetfish in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	37	100.00	605,259	100.00
GE $50,000	4	10.81	396,316	65.48
GE $20,000	7	18.92	501,242	82.81
GE $10,000	10	27.03	544,952	90.04
GE $5,000	16	43.24	581,537	96.08
GE $1,000	24	64.86	603,299	99.68
LT $1,000	13	35.14	1,959	0.32
LT $500	12	32.43	1,425	0.24

SAMPLE

Wetfish in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	13	100.00	351,034	100.00
GE $50,000	2	15.38	275,031	78.35
GE $20,000	3	23.08	308,943	88.01
GE $10,000	4	30.77	319,843	91.11
GE $5,000	8	61.54	347,925	99.11
GE $1,000	9	69.23	349,892	99.67
LT $1,000	4	30.77	1,142	0.33
LT $500	3	23.08	587	0.17

Sample is 54.05% of wetfish fishing operations in the CINMS and accounts for 84.48% of the wetfish revenues from the CINMS. Wetfish are caught by the squid fishermen as they are often referred to as the squid/wetfish fleet.

APPENDIX C

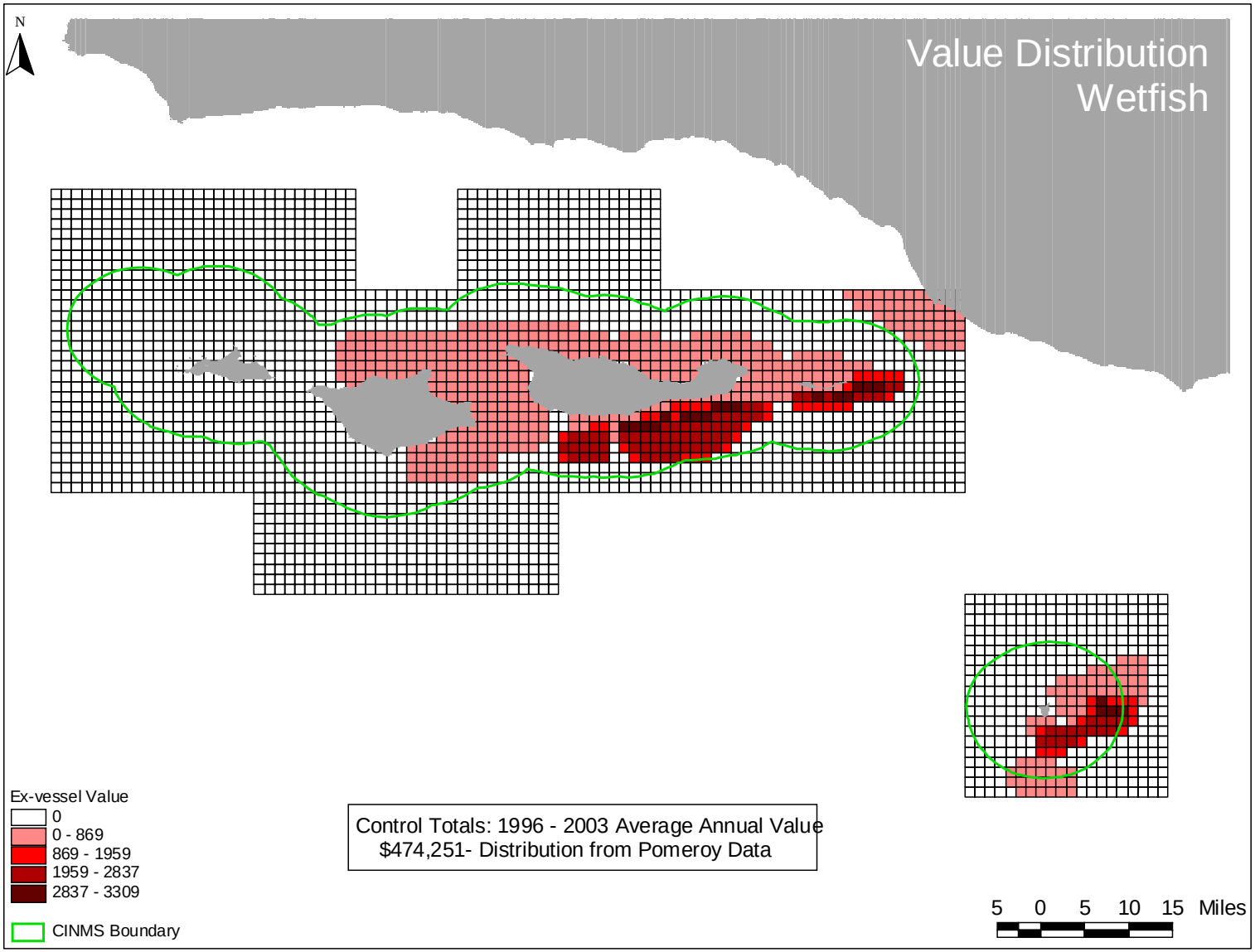
2003 UPDATE

Wetfish in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	20	100.00	300,624	100.00
GE $100,000	1	5.00	105,667	35.15
GE $50,000	3	15.00	219,333	72.96
GE $20,000	4	20.00	241,365	80.29
LT $20,000	16	80.00	59,259	19.71
LT $10,000	13	65.00	18,107	6.02
LT $5,000	12	60.00	12,898	4.29
LT $1,000	6	30.00	938	0.31

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C


N
Value Distribution
Wetfish
Ex-vessel Value
0
0 - 869
869 - 1959
1959 - 2837
2837 - 3309
CINMS Boundary
Control Totals: 1996 - 2003 Average Annual Value
$474,251- Distribution from Pomeroy Data
5 0 5 10 15 Miles
PCW20050316

APPENDIX C

POPULATION

Tuna in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	19	100.00	53,693	100.00
GE $10,000	2	10.53	39,270	73.14
GE $5,000	3	15.79	45,231	84.24
GE $1,000	7	36.84	50,662	94.36
LT $1,000	12	63.16	3,031	5.64
LT $500	9	47.37	1,358	2.53

SAMPLE

Tuna in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	4	100.00	4,181	100.00
GE $10,000	0	0.00	0	0.00
GE $5,000	0	0.00	0	0.00
GE $1,000	2	50.00	3,831	91.63
LT $1,000	2	50.00	350	8.37
LT $500	2	50.00	350	8.37

Sample is 36.84% of tuna fishing operations in the CINMS and accounts for 13.62% of the tuna revenues from the CINMS.

APPENDIX C

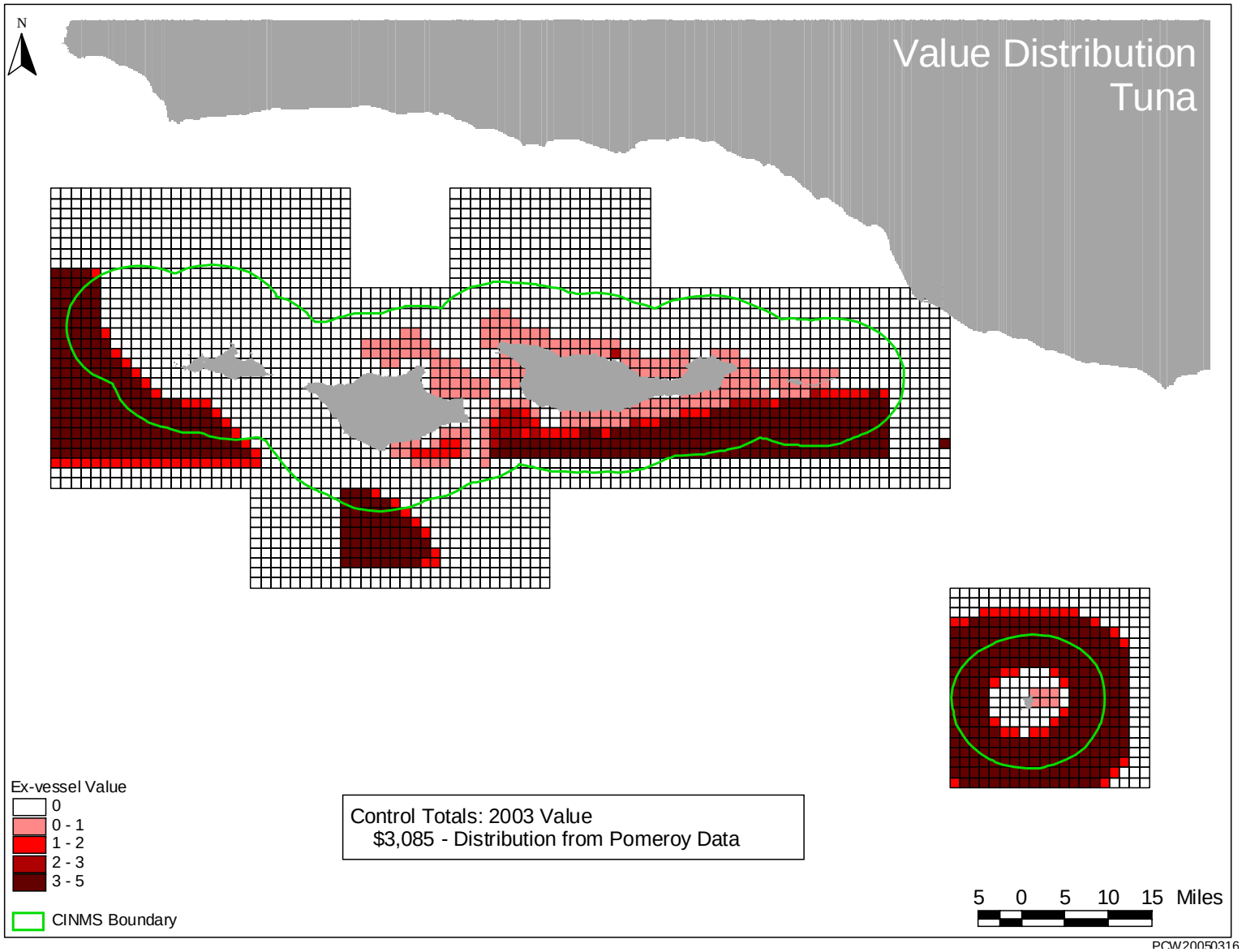
2003 UPDATE

Tuna in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	7	100.00	3,085	100.00
GE $5,000	0	0.00	0	0.00
LT $5,000	7	100.00	3,085	100.00
LT $1,000	6	85.71	1,884	61.07

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C


N
Value Distribution
Tuna
Ex-vessel Value
0
0 - 1
1 - 2
2 - 3
3 - 5
CINMS Boundary
Control Totals: 2003 Value
$3,085 - Distribution from Pomeroy Data
5 0 5 10 15 Miles
PCW20050316

APPENDIX C

POPULATION

Urchins in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	331	100.00	5,969,017	100.00
GE $50,000	27	8.16	1,842,302	30.86
GE $40,000	53	16.01	3,028,599	50.74
GE $30,000	83	25.08	4,070,498	68.19
GE $20,000	111	33.53	4,774,826	79.99
GE $10,000	157	47.43	5,422,317	90.84
LT $10,000	174	52.57	546,699	9.16
LT $5,000	127	38.37	203,041	3.40
LT $1,000	61	18.43	35,721	0.60

SAMPLE

Urchins in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	40	100.00	1,620,154	100.00
GE $50,000	12	30.00	881,097	54.38
GE $40,00	18	45.00	1,149,884	70.97
GE $30,000	25	62.50	1,400,589	86.45
GE $20,000	29	72.50	1,502,880	92.76
GE $10,000	35	87.50	1,592,466	98.29
LT $10,000	5	12.50	27,688	1.71
LT $5,000	2	5.00	1,918	0.12
LT $1,000	1	2.50	543	0.03

Sample is 12.08% of all urchin fishing operations in CINMS and account for 27.17% of all urchin revenue from CINMS.

APPENDIX C

2003 UPDATE

Urchins in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	184	100.00	4,177,999	100.00
GE $100,000	2	1.09	253,705	6.07
GE $50,000	24	13.04	1,729,036	41.38
GE $20,000	79	42.93	3,554,634	85.08
LT $20,000	105	57.07	623,365	14.92
LT $10,000	83	45.11	285,011	6.82
LT $5,000	60	32.61	113,907	2.73
LT $1,000	24	13.04	10,856	0.26

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Spiny Lobster in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	46	100.00	950,748	100.00
GE $50,000	7	15.22	475,993	50.07
GE $40,000	9	19.57	564,677	59.39
GE $30,000	14	30.43	741,798	78.02
GE $20,000	16	34.78	785,227	82.59
GE $10,000	22	47.83	874,524	91.98
LT $10,000	24	52.17	76,223	8.02
LT $5,000	18	39.13	28,607	3.01
LT $1,000	10	21.74	3,708	0.39

SAMPLE

Spiny Lobster in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	8	100.00	365,538	100.00
GE $50,000	3	37.50	247,226	67.63
GE $40,000	5	62.50	335,910	91.89
GE $30,000	5	62.50	335,910	91.89
GE $20,000	5	62.50	335,910	91.89
GE $10,000	7	87.50	361,112	98.79
LT $10,000	1	12.50	4,426	1.21
LT $5,000	1	12.50	4,426	1.21
LT $1,000	0	0.00	0	0.00

Sample is 17.39% of spiny lobster fishing operations in the CINMS and account for 38.36% of spiny lobster revenue from CINMS.

APPENDIX C

2003 UPDATE

Spiny Lobster in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	46	100.00	1,194,462	100.00
GE $100,000	2	4.35	235,409	19.71
GE $50,000	9	19.57	792,396	66.34
GE $20,000	17	36.96	1,080,447	90.45
LT $20,000	29	63.04	114,014	9.55
LT $10,000	24	52.17	44,528	3.73
LT $5,000	20	43.48	15,532	1.30
LT $1,000	15	32.61	4,978	0.42

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Rockfishes in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	128	100.00	553,260	100.00
GE $50,000	1	0.78	154,300	27.89
GE $40,000	2	1.56	197,605	35.72
GE $30,000	3	2.34	231,151	41.78
GE $20,000	9	7.03	376,742	68.09
GE $10,000	10	7.81	393,077	71.05
LT $10,000	118	92.19	160,183	28.95
LT $5,000	106	82.81	72,092	13.03
LT $1,000	82	64.06	17,401	3.15

SAMPLE

Rockfishes in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	10	100.00	33,798	100.00
GE $50,000	0	0.00	0	0.00
GE $40,00	0	0.00	0	0.00
GE $30,000	0	0.00	0	0.00
GE $20,000	1	10.00	27,649	81.81
GE $10,000	1	10.00	27,649	81.81
LT $10,000	9	90.00	6,149	18.19
LT $5,000	9	90.00	6,149	18.19
LT $1,000	5	50.00	470	1.39

Sample is 7.81% of rockfish fishing operations in CINMS and accounts for 6.15% of rockfish revenues from the CINMS.

APPENDIX C

2003 UPDATE

Rockfishes in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	63	100.00	152,892	100.00
GE $20,000	1	1.59	23,428	15.32
LT $20,000	62	98.41	129,464	84.68
LT $10,000	60	95.24	101,223	66.21
LT $5,000	54	85.71	57,289	37.47
LT $1,000	35	55.56	11,177	7.31

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Prawn in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	30	100.00	725,404	100.00
GE $50,000	5	16.67	421,453	58.10
GE $40,000	6	20.00	466,052	64.25
GE $30,000	9	30.00	576,109	79.42
GE $20,000	10	33.33	597,794	82.41
GE $10,000	17	56.67	698,507	96.29
LT $10,000	13	43.33	26,897	3.71
LT $5,000	11	36.67	13,693	1.89
LT $1,000	6	20.00	2,273	0.31

Barilotti Sample only contained three Prawn fishermen. CDFG 10 by 10 mile block data was distributed according to 1 by 1 mile blocks using Exclusion Zone maps provided by the fishermen. Data from block 690 was distributed to 1 by 1 mile blocks contained in blocks 690, 671 and 672 of the Exclusion Zone maps. Data from block 711 was distributed to to 1 by 1 mile blocks contained in blocks 711 and 730. The CDFG blocks around Santa Barbara Island showed low levels of catch, but the fishermen did not include any 1 by 1 mile blocks in the Exclusion Zone maps for this area.

APPENDIX C

2003 UPDATE

Prawn in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	5	100.00	210,978	100.00
GE $100,000	1	20.00	162,906	77.21
GE $50,000	1	20.00	162,906	77.21
GE $20,000	2	40.00	200,713	95.13
LT $20,000	3	60.00	10,265	4.87
LT $10,000	2	40.00	214	0.10
LT $5,000	2	40.00	214	0.10
LT $1,000	2	40.00	214	0.10

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Crab in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	71	100.00	313,320	100.00
GE $20,000	5	7.04	209,805	66.96
GE $10,000	8	11.27	243,501	77.72
GE $5,000	14	19.72	280,081	89.39
GE $1,000	23	32.39	300,912	96.04
LT $1,000	48	67.61	12,408	3.96
LT $500	40	56.34	7,126	2.27

SAMPLE

Crab in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	12	100.00	136,416	100.00
GE $20,000	3	25.00	128,456	94.16
GE $10,000	3	25.00	128,456	94.16
GE $5,000	4	33.33	133,936	98.18
GE $1,000	5	41.67	135,162	99.08
LT $1,000	7	58.33	1,254	0.92
LT $500	6	50.00	750	0.55

Sample is 16.90% of crab fishing operations in CINMS and accounts for 43.54% of the crab fishing revenue from the CINMS. The Barilotti Sample did not include any information from fishermen catching crabs for the eastern half of the study area. CDFG data show a relatively low amount of crabs being caught from the eastern half. CDFG 10 by 10 mile grid totals were apportioned to 1 by 1 mile blocks within three miles from shorelines within the CDFG blocks. Block 706 contained $70.50 but contains no blocks within three miles from shore.

APPENDIX C

2003 UPDATE

Crab in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	64	100.00	490,408	100.00
GE $100,000	1	1.56	119,004	24.27
GE $50,000	2	3.13	174,827	35.65
GE $20,000	8	12.50	372,713	76.00
LT $20,000	56	87.50	117,695	24.00
LT $10,000	53	82.81	78,409	15.99
LT $5,000	49	76.56	50,591	10.32
LT $1,000	34	53.13	10,326	2.11

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

CA Sheephead in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	92	100.00	153,140	100.00
GE $20,000	2	2.17	70,298	45.90
GE $10,000	4	4.35	95,393	62.29
GE $5,000	6	6.52	111,802	73.01
LT $5,000	86	93.48	41,338	26.99
LT $1,000	75	81.52	19,261	12.58
LT $500	63	68.48	10,445	6.82

SAMPLE

CA Sheephead in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	13	100.00	3,680	100.00
GE $20,000	0	0.00	0	0.00
GE $10,000	0	0.00	0	0.00
GE $5,000	0	0.00	0	0.00
LT $5,000	13	100.00	3,680	100.00
LT $1,000	12	92.31	2,666	72.45
LT $500	10	76.92	1,858	50.49

Sample is 14.13% of sheephead fishing operations in the CINMS but only accounts for 2.40% of sheephead revenue from the CINMS.

APPENDIX C

2003 UPDATE

CA Sheephead in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	46	100.00	136,333	100.00
GE $20,000	1	2.17	41,632	30.54
LT $20,000	45	97.83	94,701	69.46
LT $10,000	41	89.13	40,847	29.96
LT $5,000	39	84.78	28,363	20.80
LT $1,000	29	63.04	10,590	7.77

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Flatfishes in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	85	100.00	323,568	100.00
GE $50,000	3	3.53	213,068	65.85
GE $10,000	6	7.06	249,009	76.96
GE $5,000	9	10.59	274,809	84.93
GE $1,000	22	25.88	305,708	94.48
LT $1,000	63	74.12	17,860	5.52
LT $500	50	58.82	8,045	2.49

SAMPLE

Flatfishes in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	8	100.00	168,764	100.00
GE $50,000	2	25.00	158,385	93.85
GE $10,000	2	25.00	158,385	93.85
GE $5,000	3	37.50	167,499	99.25
GE $1,000	3	37.50	167,499	99.25
LT $1,000	5	62.50	1,265	0.75
LT $500	4	50.00	741	0.44

Sample is 9.41% of flatfish fishing operations in CINMS and accounts for 51.98% of the flatfish revenues from the CINMS.

APPENDIX C

2003 UPDATE

Flatfishes in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	56	100.00	298,474	100.00
GE $50,000	2	3.57	124,326	41.65
GE $20,000	5	8.93	235,761	78.99
LT $20,000	51	91.07	62,713	21.01
LT $10,000	50	89.29	47,755	16.00
LT $5,000	48	85.71	34,982	11.72
LT $1,000	37	66.07	8,724	2.92

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Sea Cucumbers in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	61	100.00	269,017	100.00
GE $20,000	3	4.92	99,855	37.12
GE $10,000	8	13.11	169,185	62.89
GE $5,000	16	26.23	226,574	84.22
GE $1,000	30	49.18	259,491	96.46
LT $1,000	31	50.82	9,526	3.54
LT $500	26	42.62	6,235	2.32

SAMPLE

Sea Cucumbers in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	11	100.00	62,544	100.00
GE $20,000	0	0.00	0	0.00
GE $10,000	2	18.18	31,760	50.78
GE $5,000	5	45.45	55,143	88.17
GE $1,000	7	63.64	60,337	96.47
LT $1,000	4	36.36	2,207	3.53
LT $500	2	18.18	779	1.25

Sample is 18.03% of Sea Cucumber fishing operations in the CINMS and accounts for 23.45% of the Sea Cucumber revenue from the CINMS. Urchin divers are the primary harvesters of Sea Cucumbers.

APPENDIX C

2003 UPDATE

Sea Cucumbers in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	47	100.00	290,716	100.00
GE $50,000	1	2.13	72,585	24.97
GE $20,000	3	6.38	131,135	45.11
LT $20,000	44	93.62	159,581	54.89
LT $10,000	39	82.98	98,992	34.05
LT $5,000	34	72.34	63,253	21.76
LT $1,000	14	29.79	5,416	1.86

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Sculpin & Bass in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	43	100.00	103,379	100.00
GE $10,000	3	6.98	59,177	57.24
GE $5,000	5	11.63	73,413	71.01
GE $1,000	15	34.88	96,541	93.39
LT $1,000	28	65.12	6,838	6.61
LT $500	25	58.14	4,758	4.60

SAMPLE

Sculpin & Bass in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	5	100.00	19,058	100.00
GE $10,000	0	0.00	0	0.00
GE $5,000	1	20.00	8,037	42.17
GE $1,000	4	80.00	11,021	57.83
LT $1,000	0	0.00	0	0.00
LT $500	0	0.00	0	0.00

Sample is 11.63% of Sculpin & Bass fishing operations in CINMS and accounts for 21.52% of Sculpin & Bass revenue from the CINMS.

APPENDIX C

2003 UPDATE

Sculpin & Bass in the Channel Islands National Marine Sanctuary - 22 block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	39	100.00	167,344	100.00
GE $20,000	1	2.56	35,098	20.97
LT $20,000	38	97.44	132,246	79.03
LT $10,000	32	82.05	41,565	24.84
LT $5,000	31	79.49	33,118	19.79
LT $1,000	20	51.28	5,206	3.11

GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

POPULATION

Sharks in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	40	100.00	41,948	100.00
GE $10,000	1	2.50	14,080	33.57
GE $2,000	7	17.50	29,074	69.31
GE $1,000	12	30.00	36,007	85.84
LT $1,000	28	70.00	5,940	14.16
LT $500	25	62.50	3,751	8.94

SAMPLE

Sharks in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 1999 Ex Vessel Value	Percent of 1999 Ex Vessel Value
GT $0	6	100.00	18,220	100.00
GE $10,000	1	16.67	14,081	77.28
GE $2,000	1	16.67	14,081	77.28
GE $1,000	3	50.00	17,241	94.63
LT $1,000	3	50.00	979	5.37
LT $500	2	33.33	467	2.56

Sample is 15.0% of shark fishing operations in CINMS and accounts for 43.76% of shark revenues from the CINMS.

APPENDIX C

2003 UPDATE

Sharks in Channel Islands National Marine Sanctuary - 22 Block Definition

Value	Number of Fishing Operations	Percent of Fishing Operations	Sum of 2003 Ex Vessel Value	Percent of 2003 Ex Vessel Value
GT $0	32	100.00	31,824	100.00
GE $10,000	0	0.00	0	0.00
LT $10,000	32	100.00	31,824	100.00
LT $5,000	30	93.75	19,412	61.00
LT $1,000	24	75.00	5,309	16.68

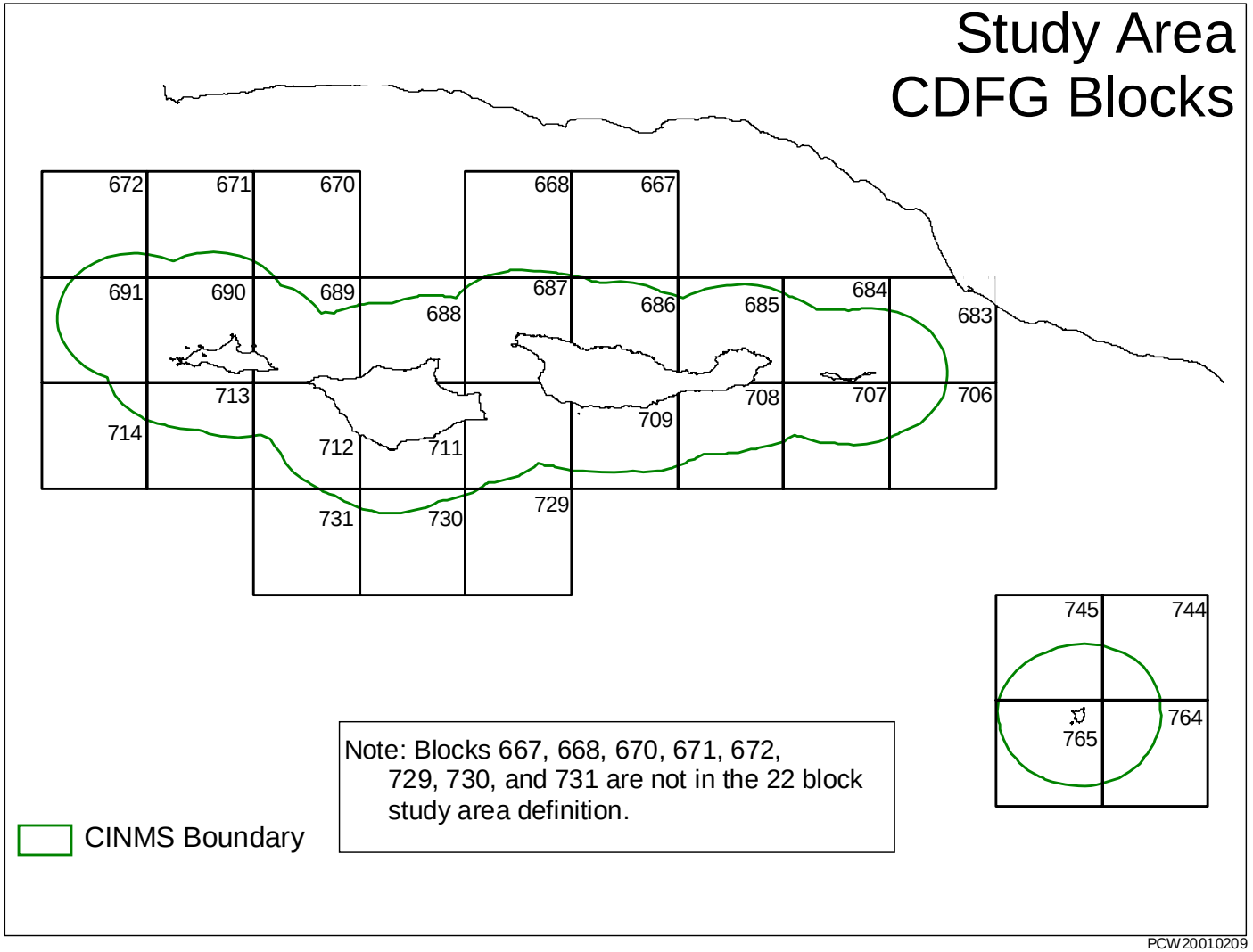
GT stands for Greater Than.
GE stands for Greater than or Equal to.
LT stands for Less Than.
LE stands for Less than or Equal to.

APPENDIX C

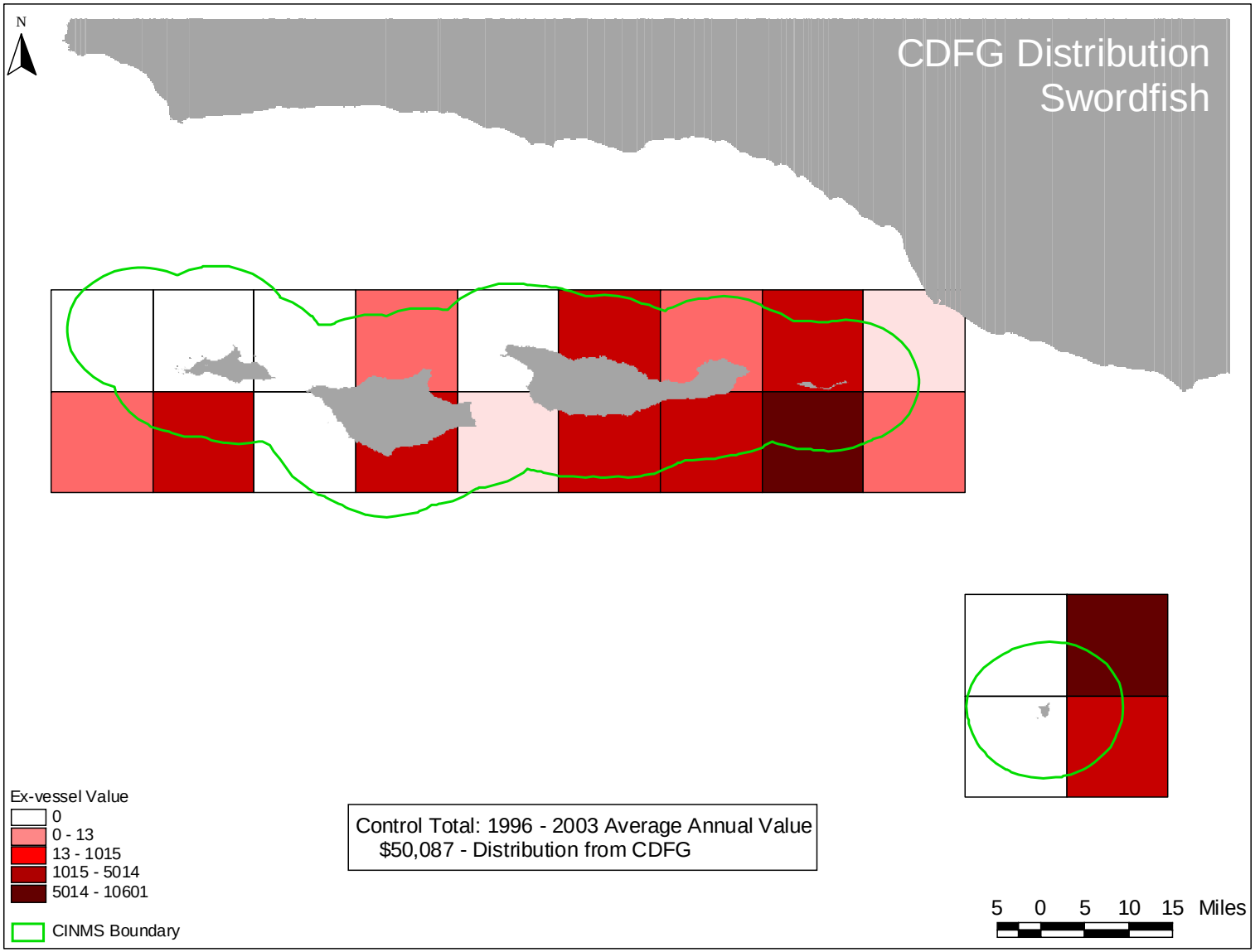
Species/Species Group	1996-2003 Avg. Value	Percent of CINMS
Abalone [1]	0	0
Swordfish	50,087	0.2066858
Roundfish	32,736	0.1350863
Others	22,493	0.0928182
Yellowtail	8,066	0.0332846
Shrimp	3,505	0.0144635
Mussels & Snails	5,819	0.0240123
Salmon	5,119	0.0211237
Rays & Skates	993	0.0040976
Surf Perch	412	0.0017001
Grenadiers	106	0.0004374
Octopus	105	0.0004333
Total	129,441	0.5341428
Total, Excluding Abalone	129,441	0.5341428

1. Abalone value is the 2000-2003 average since Abalone harvest has been prohibited since 1997.

APPENDIX C


Study Area
CDFG Blocks
672
671
670
668
667
691
690
689
688
687
686
685
684
683
713
714
712
711
709
708
707
706
731
730
729
745
744
764
765
Note: Blocks 667, 668, 670, 671, 672, 729, 730, and 731 are not in the 22 block study area definition.
CINMS Boundary
PCW20010209

APPENDIX C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CDFG Distribution
Swordfish
Ex-vessel Value
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0 - 13
13 - 1015
1015 - 5014
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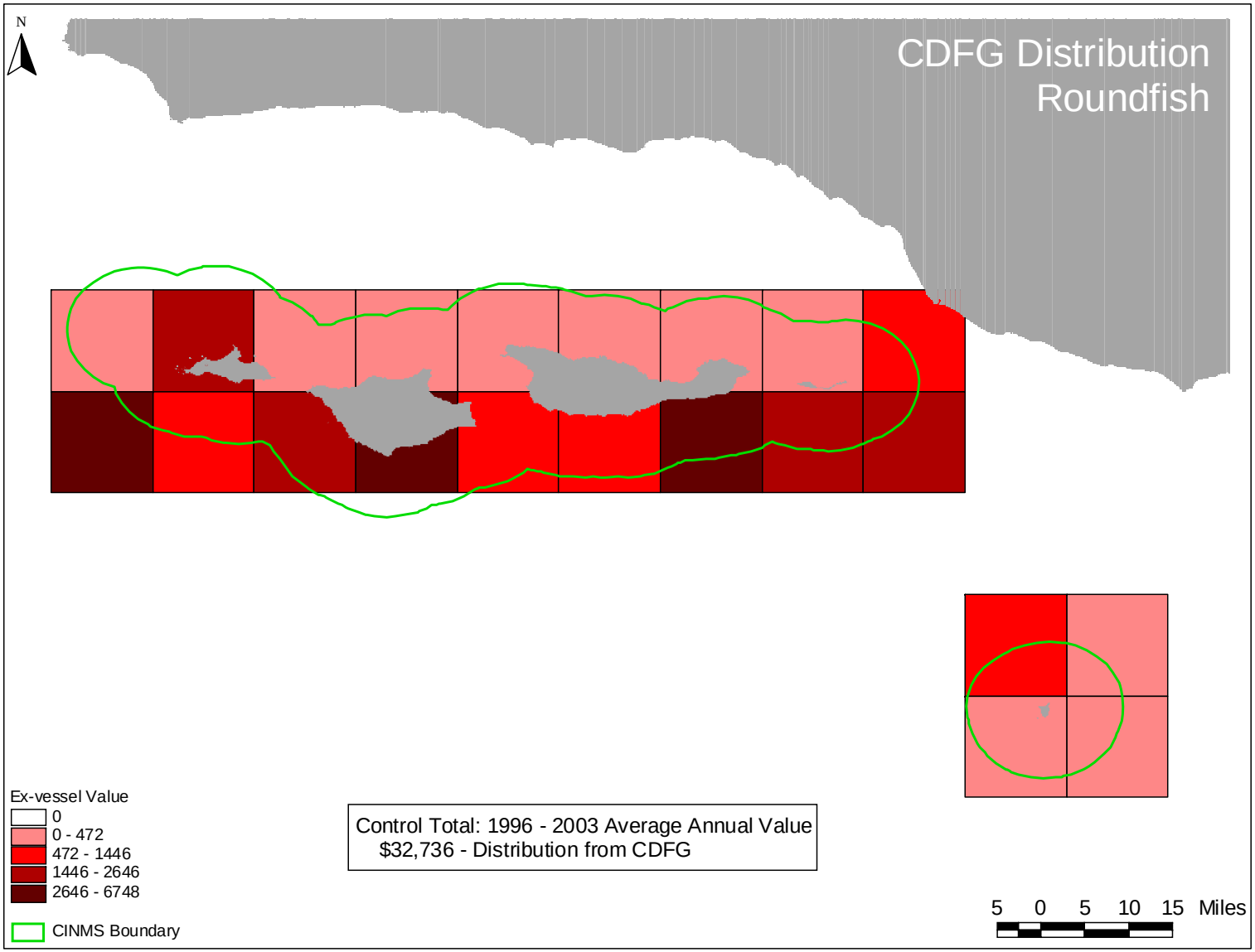
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$50,087 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

APPENDIX C


N
CDFG Distribution
Roundfish
Ex-vessel Value
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472 - 1446
1446 - 2646
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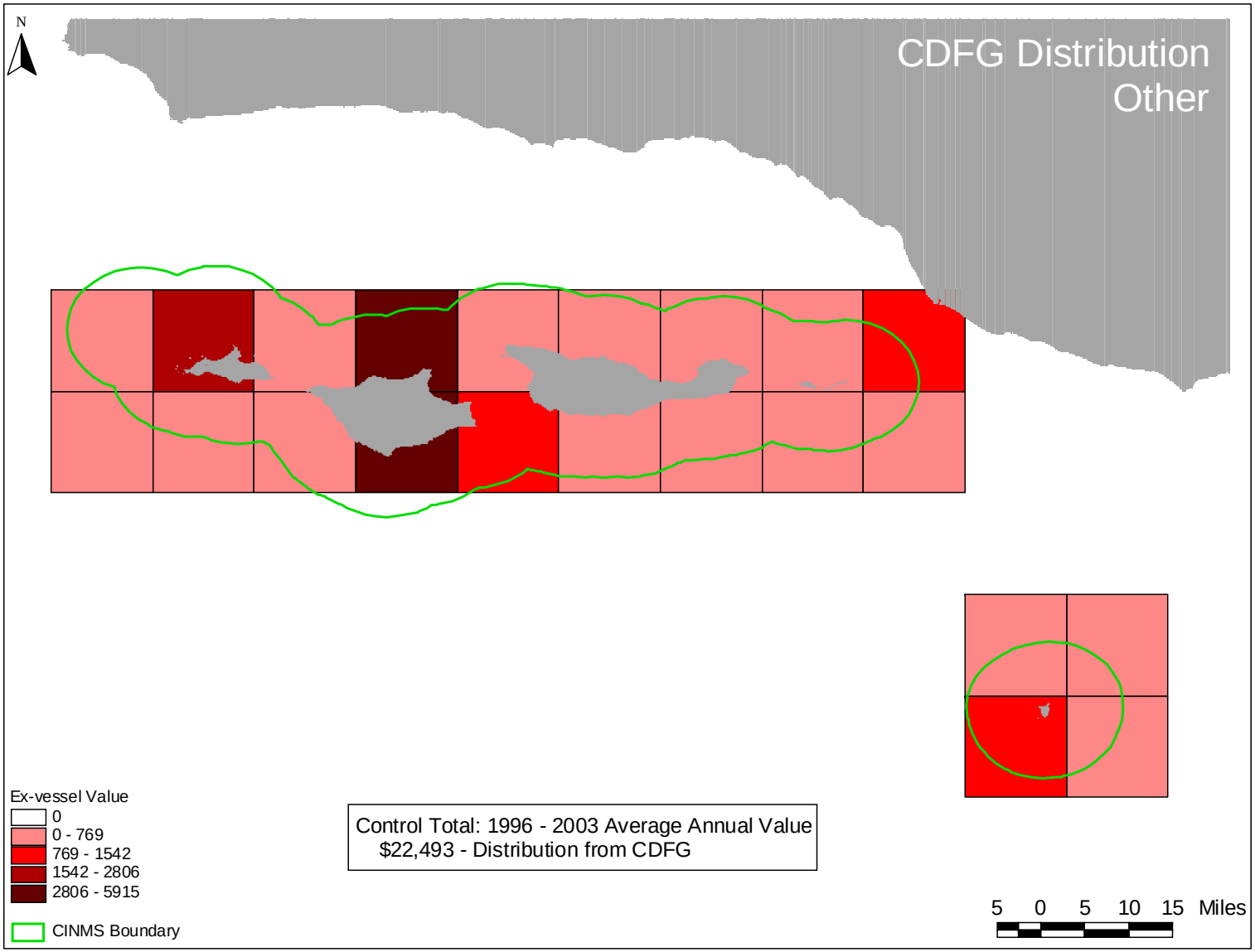
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$32,736 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

APPENDIX C


N
CDFG Distribution
Other
Ex-vessel Value
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0 - 769
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1542 - 2806
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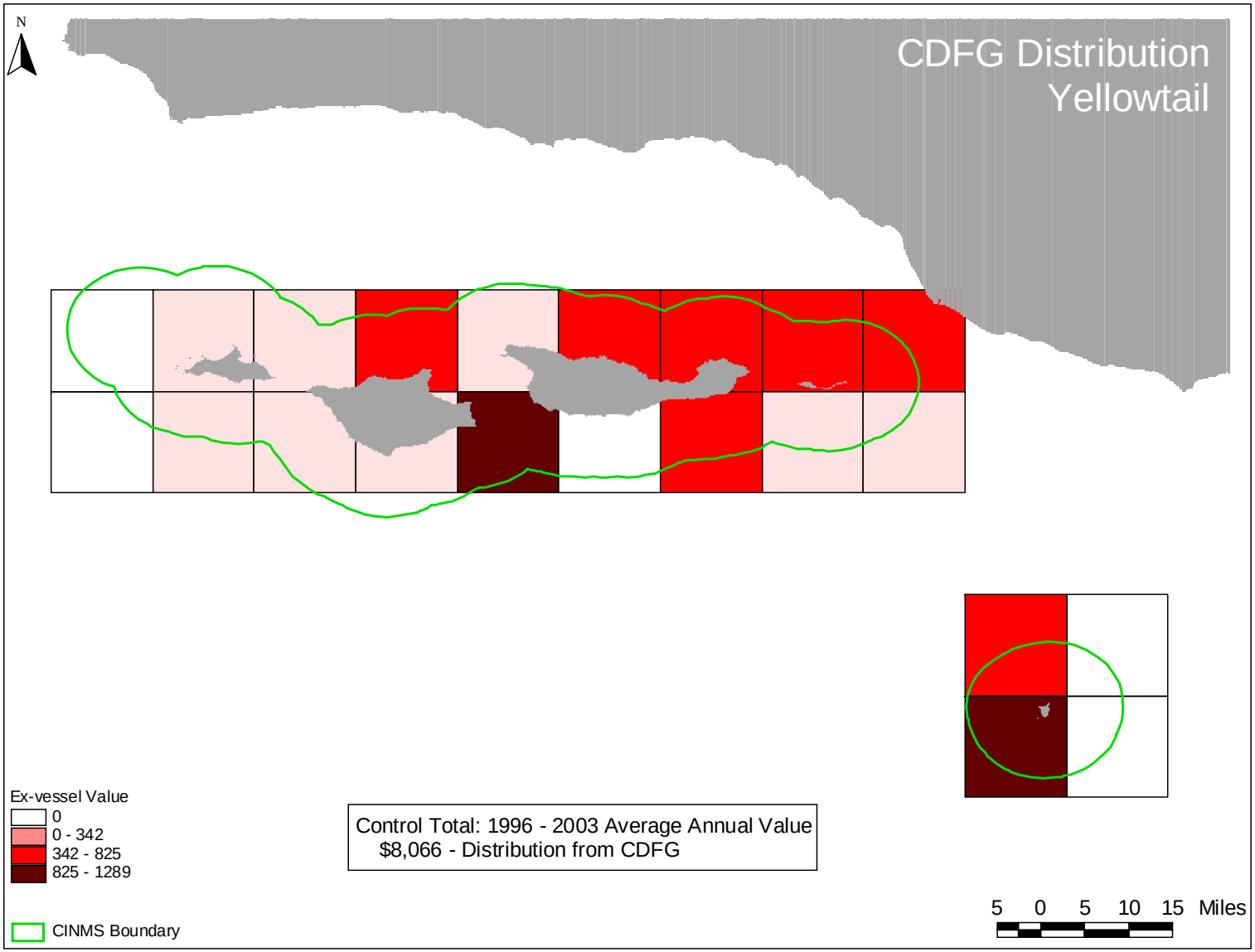
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$22,493 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

APPENDIX C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Yellowtail
Ex-vessel Value
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0 - 342
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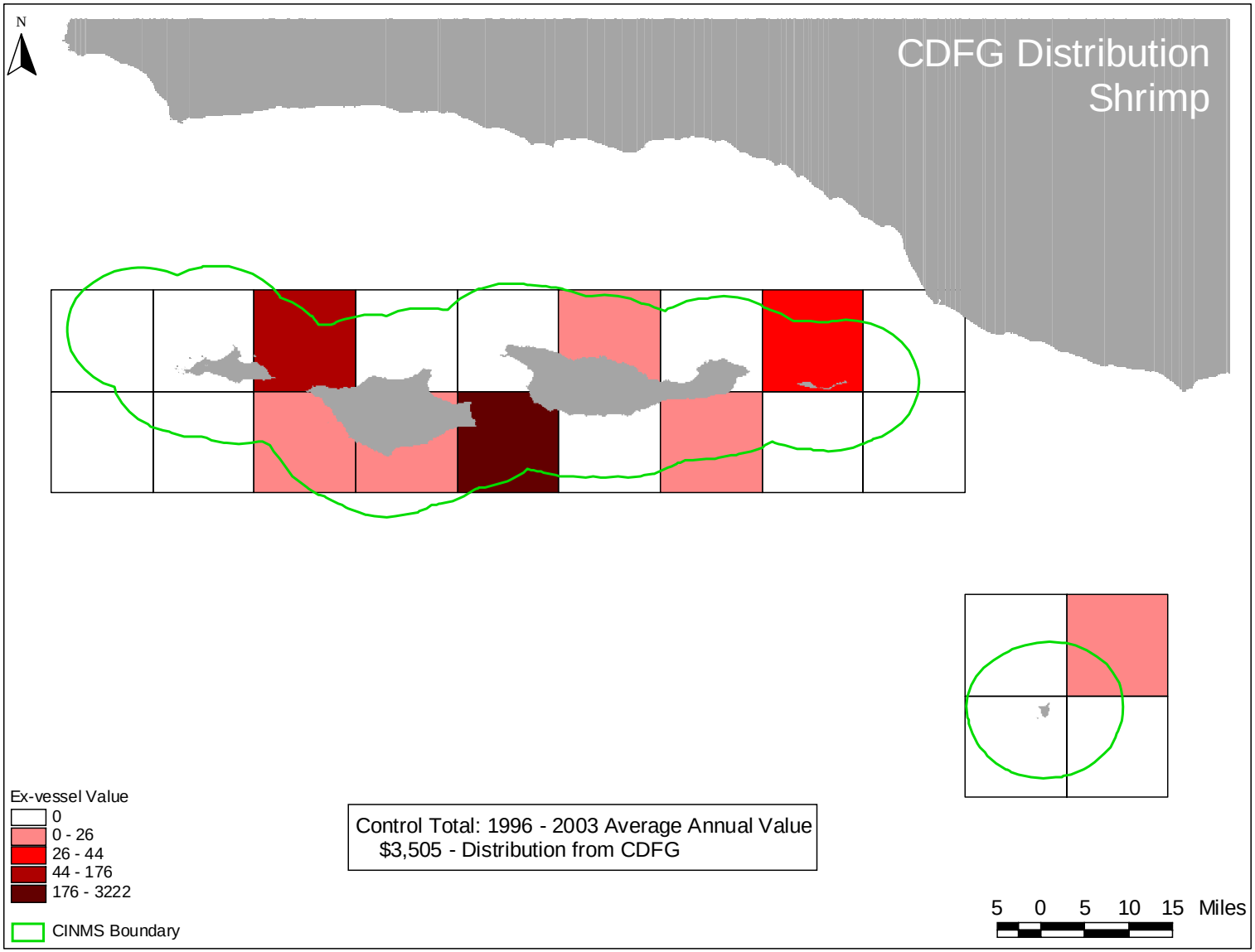
825 - 1289
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$8,066 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

APPENDIX C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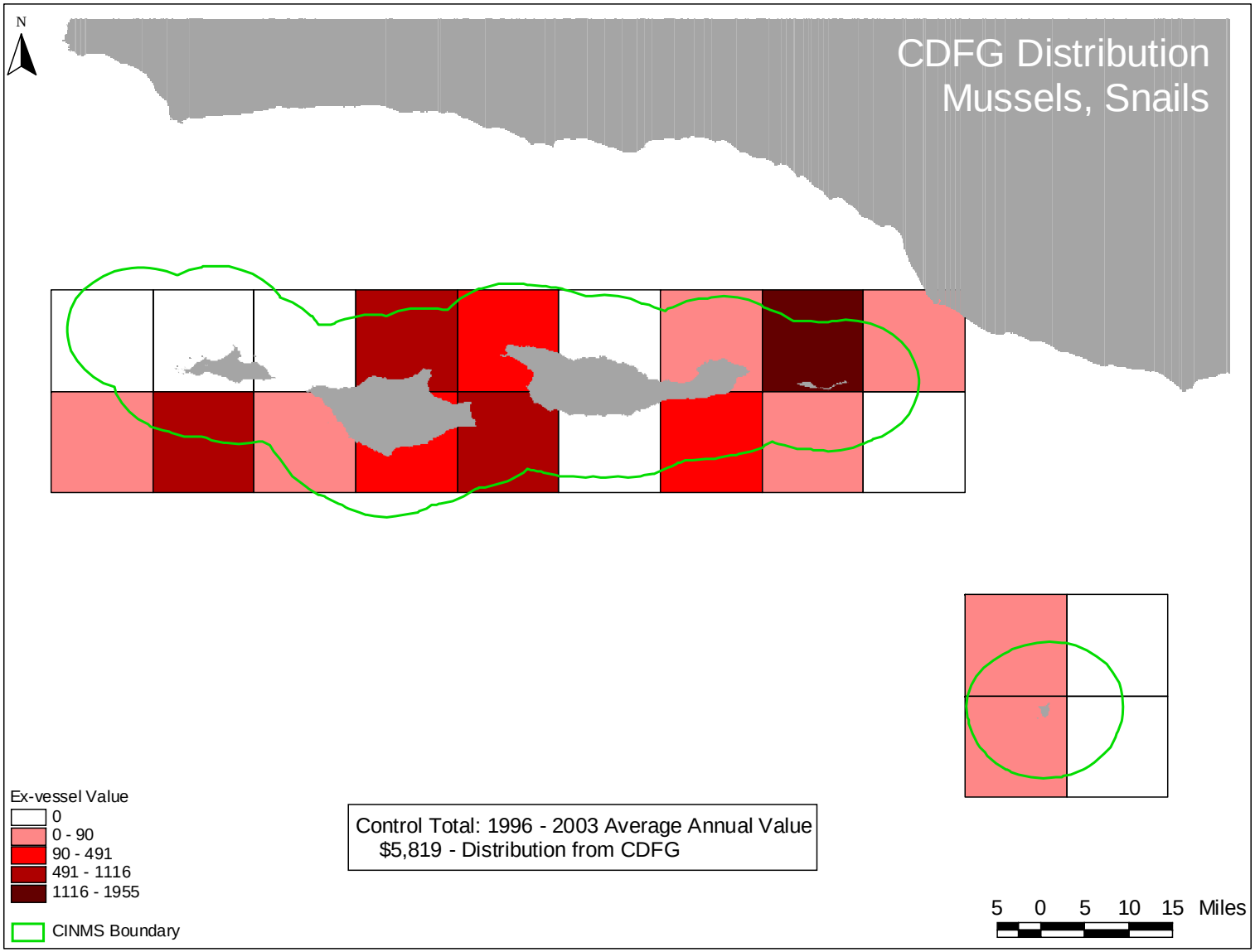
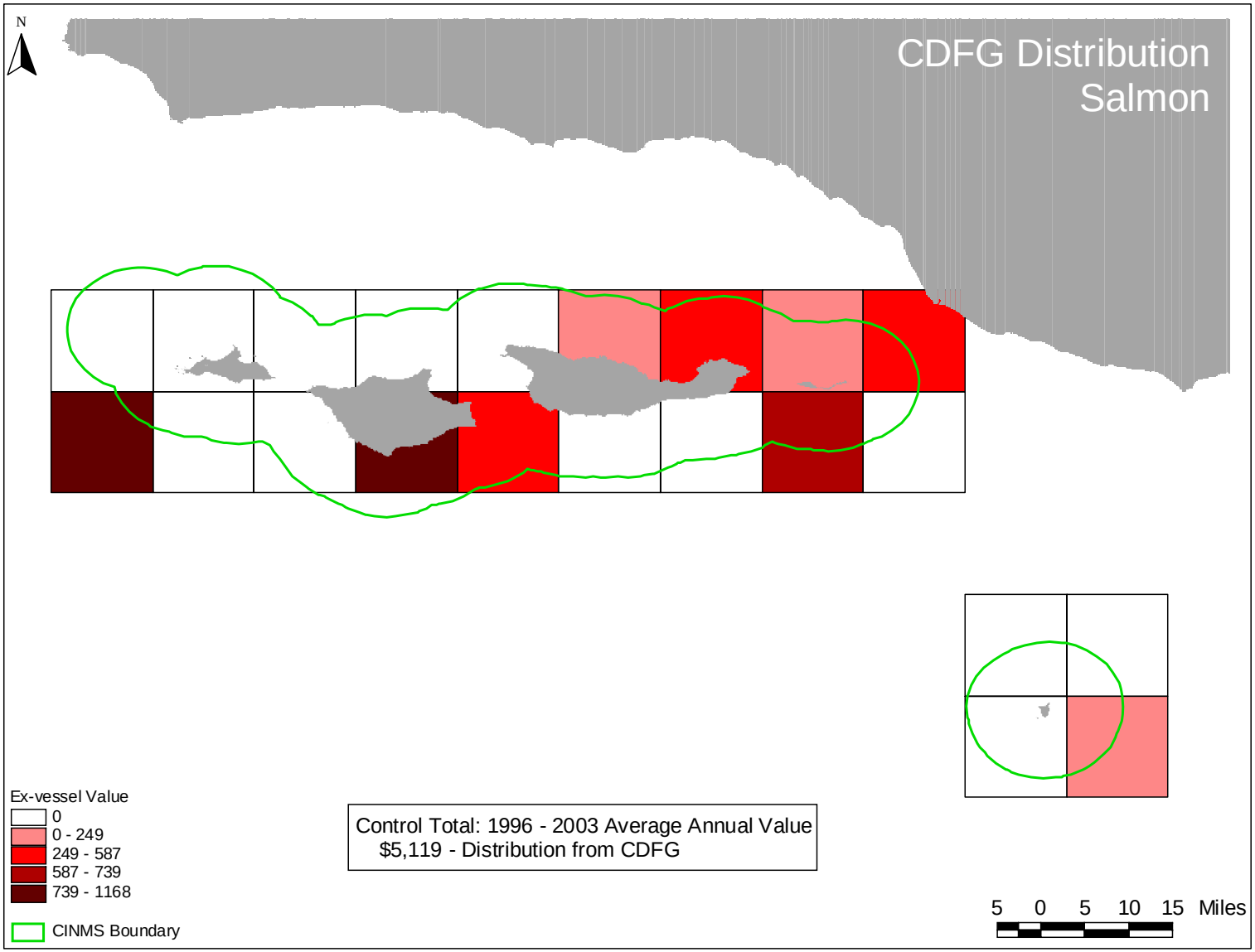
CDFG Distribution
Shrimp
Ex-vessel Value
0
0 - 26
26 - 44
44 - 176
176 - 3222
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$3,505 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

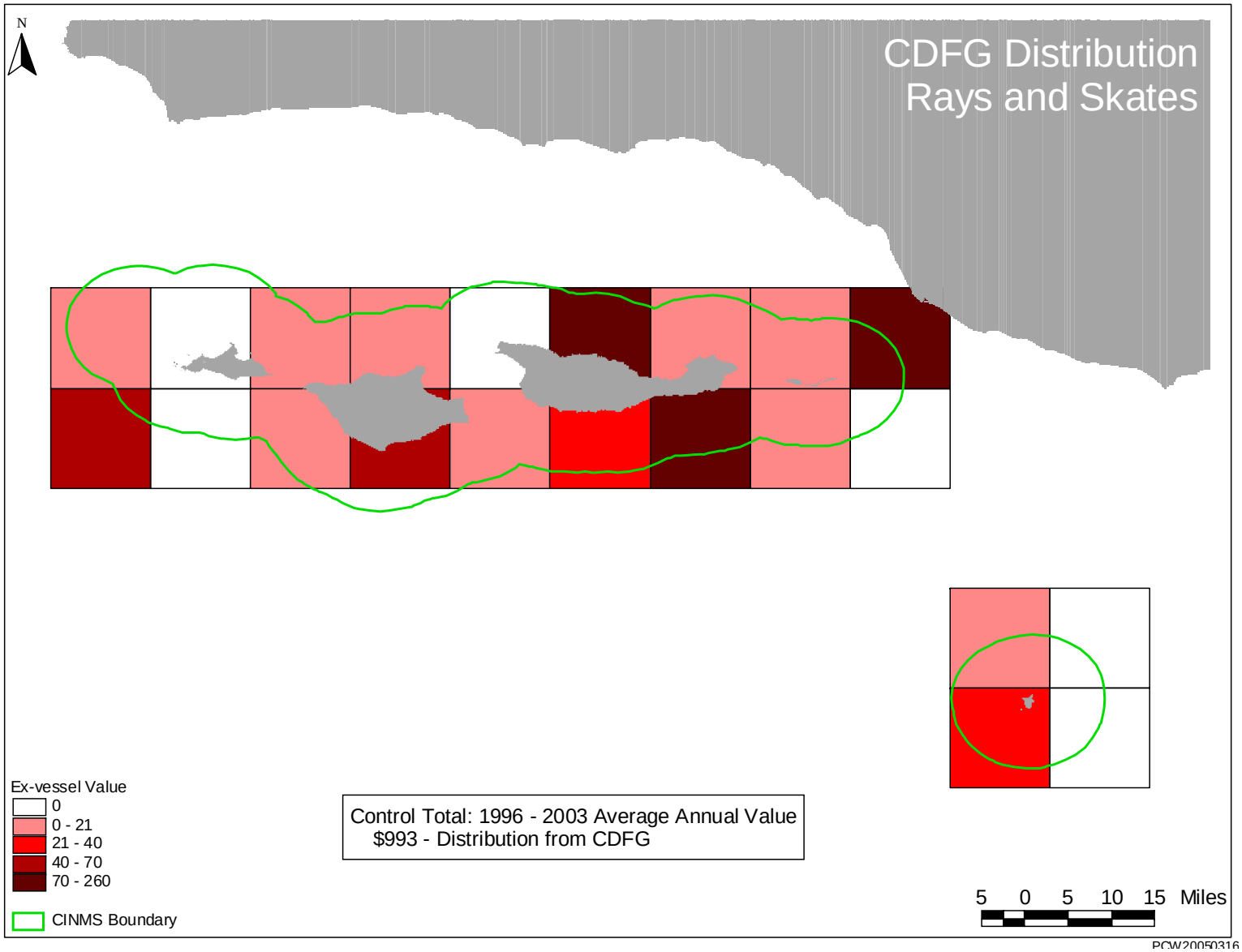
APPENDIX C


N
CDFG Distribution
Mussels, Snails
Ex-vessel Value
0
0 - 90
90 - 491
491 - 1116
1116 - 1955
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$5,819 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

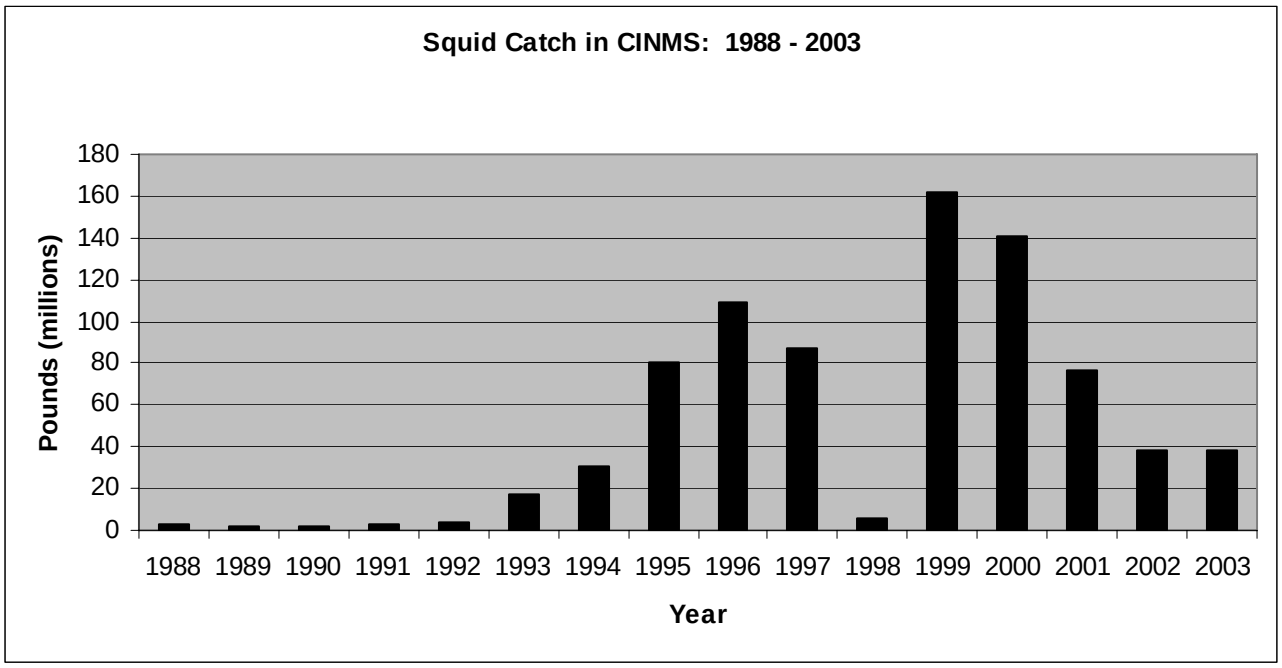
APPENDIX C

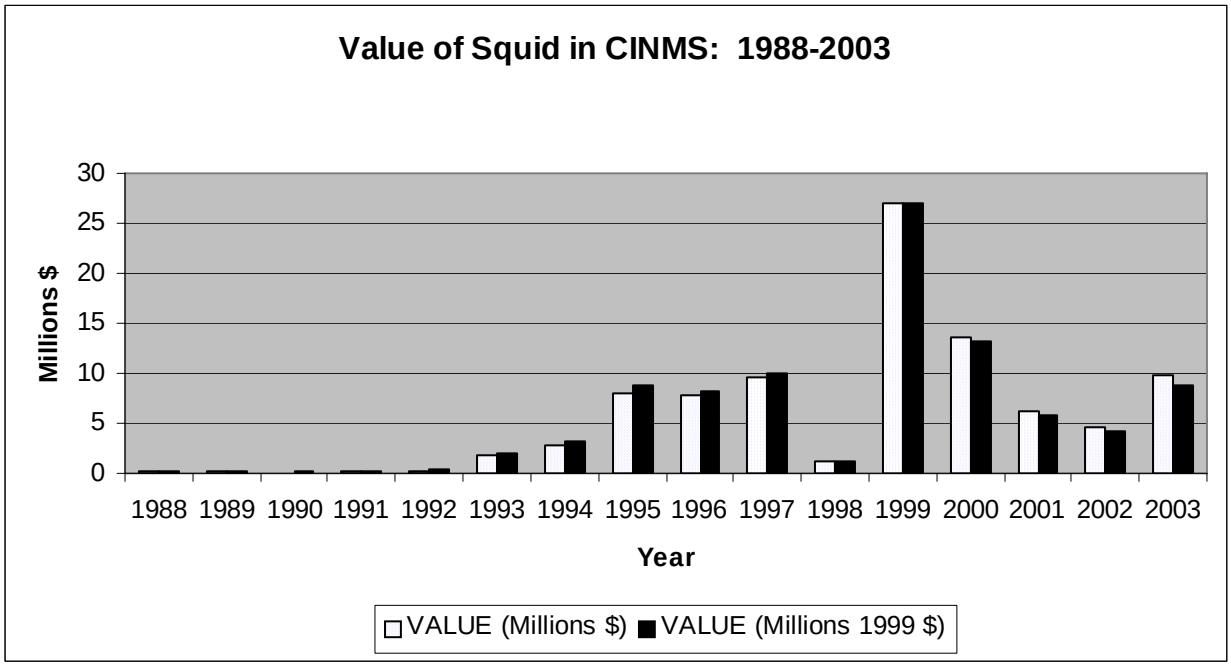

N
CDFG Distribution
Salmon
Ex-vessel Value
0
0 - 249
249 - 587
587 - 739
739 - 1168
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$5,119 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

APPENDIX C

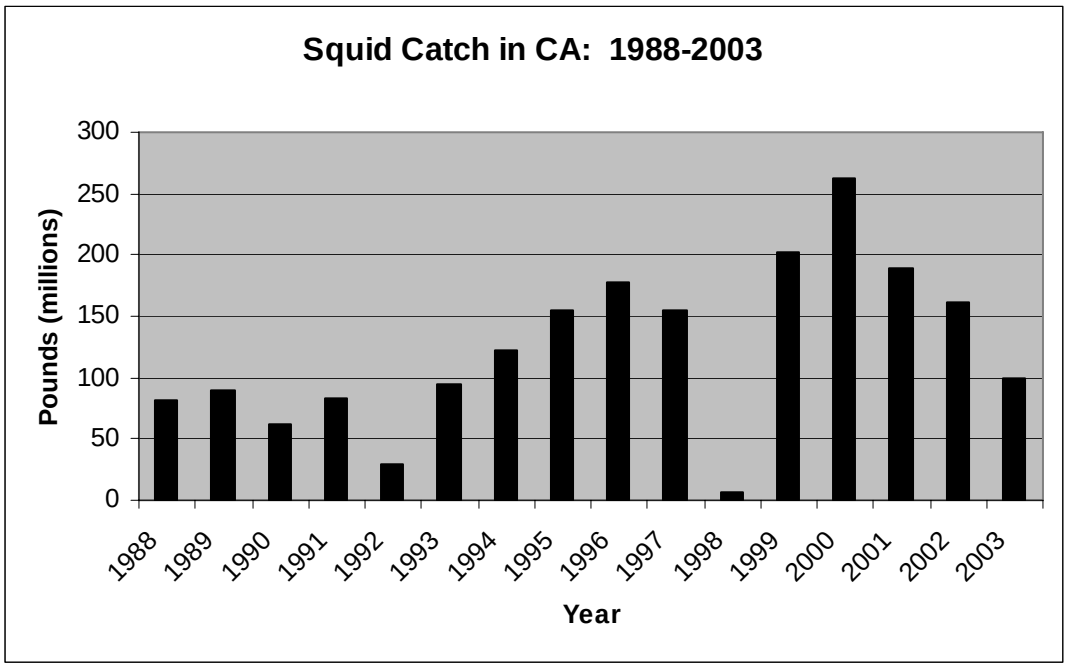

N
CDFG Distribution
Rays and Skates
Ex-vessel Value
0
0 - 21
21 - 40
40 - 70
70 - 260
CINMS Boundary
Control Total: 1996 - 2003 Average Annual Value
$993 - Distribution from CDFG
5 0 5 10 15 Miles
PCW20050316

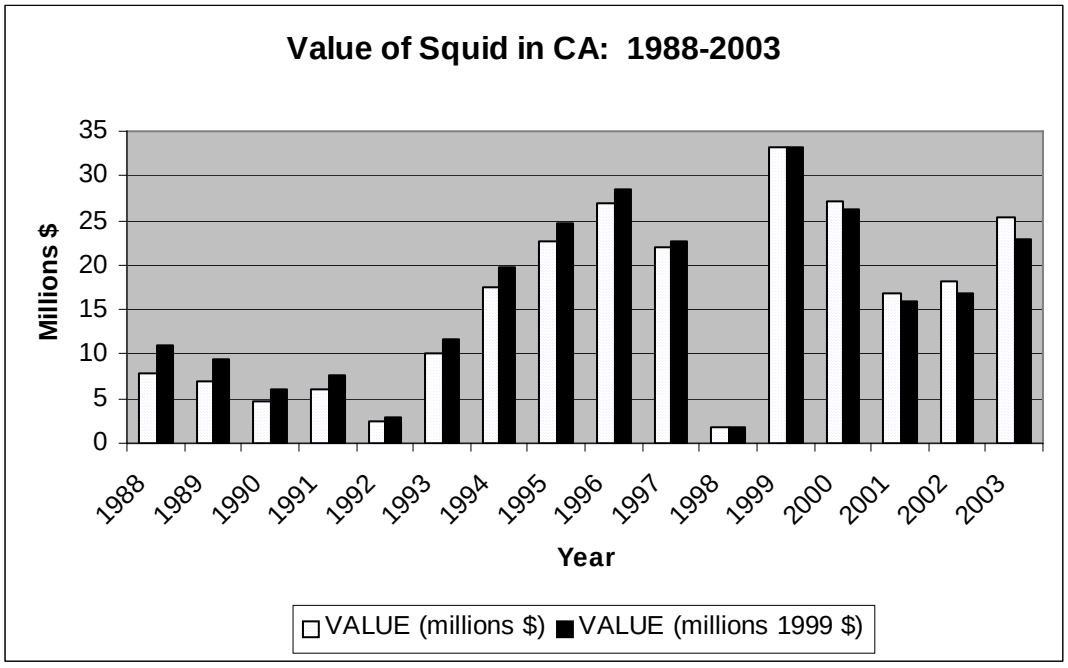
APPENDIX C


Squid Catch in CINMS: 1988 - 2003
Pounds (millions)
180
160
140
120
100
80
60
40
20
0
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Year

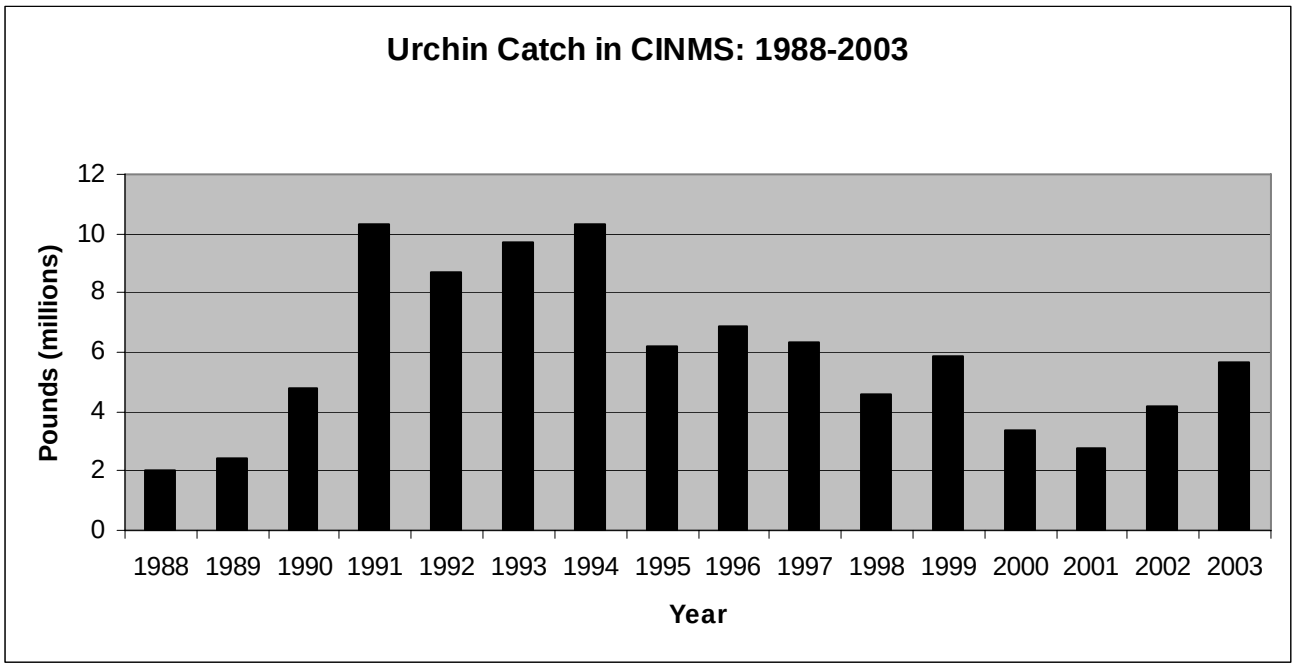

Value of Squid in CINMS: 1988-2003
Millions $
30
25
20
15
10
5
0
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Year
VALUE (Millions $)
VALUE (Millions 1999 $)

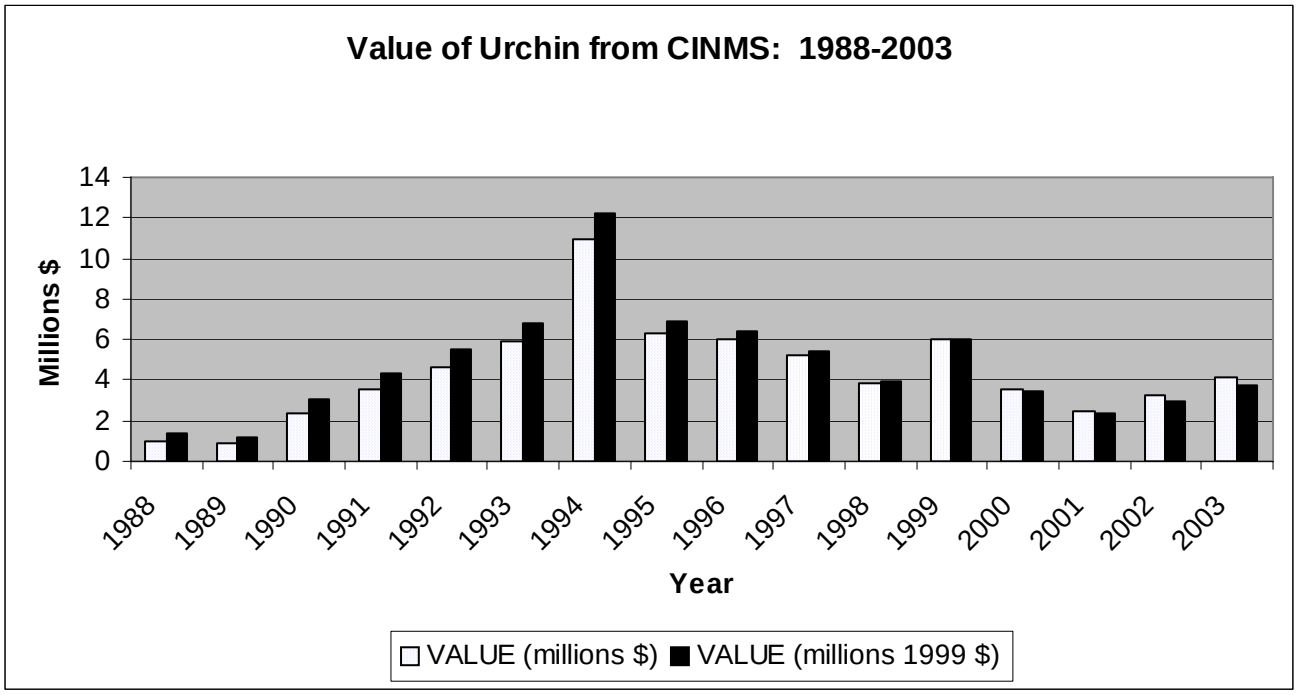
APPENDIX C


Squid Catch in CA: 1988-2003
Pounds (millions)
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

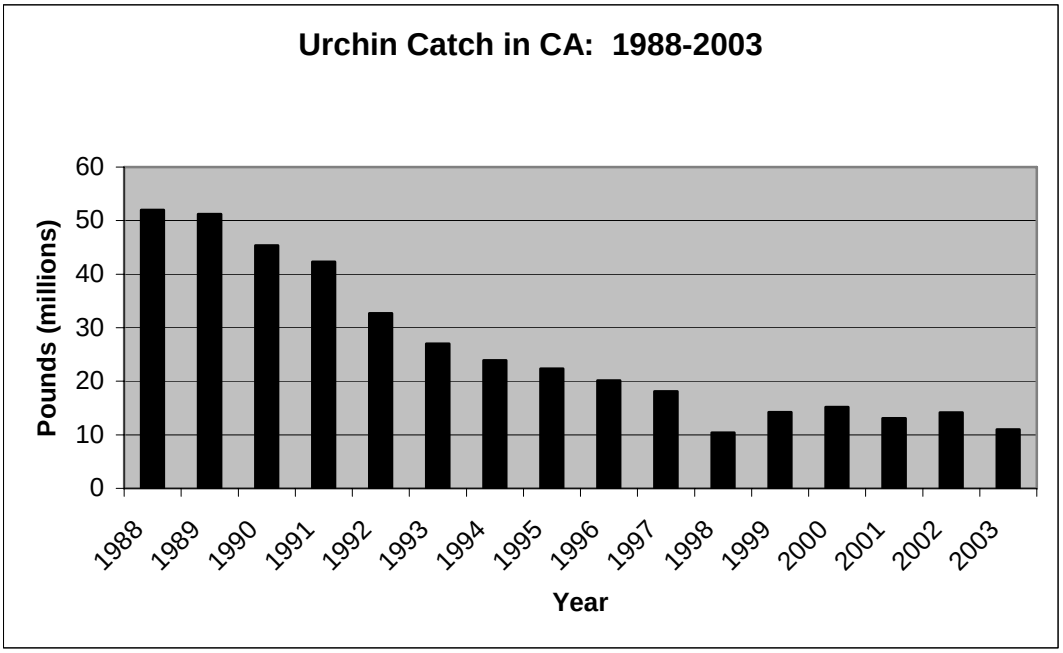

Value of Squid in CA: 1988-2003
Millions $
35
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

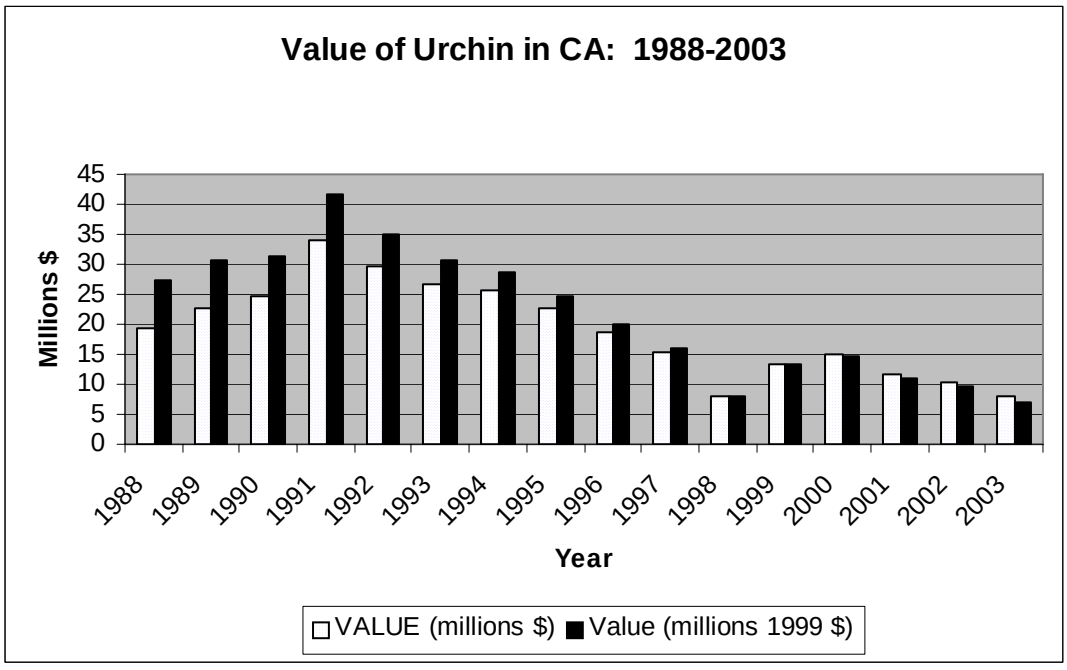
APPENDIX C


Urchin Catch in CINMS: 1988-2003
Pounds (millions)
0
2
4
6
8
10
12
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Year

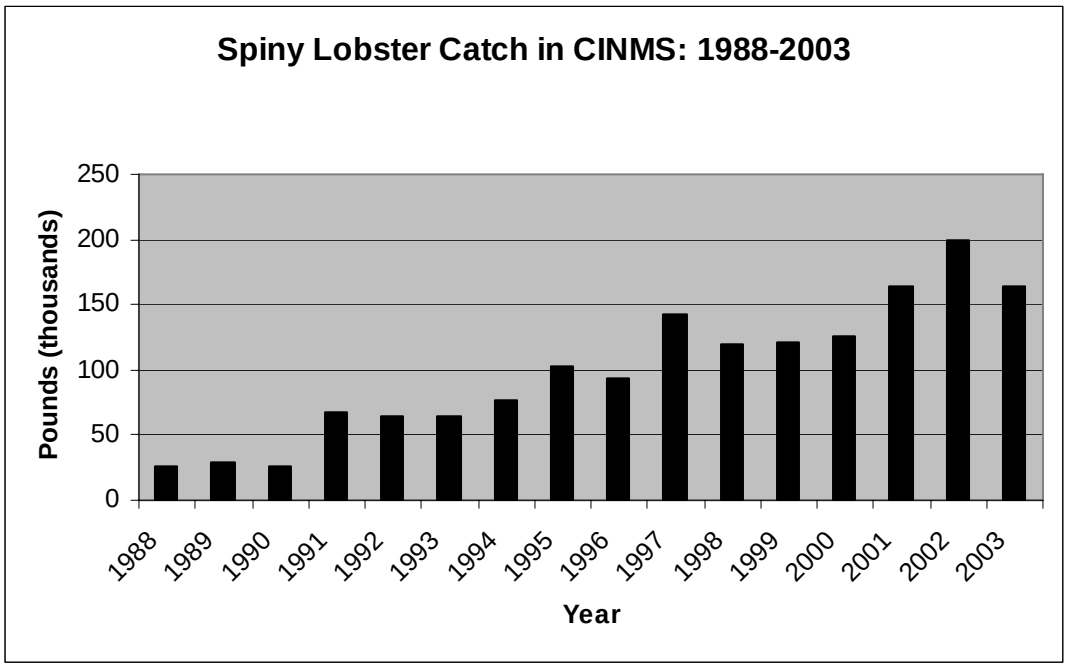

Value of Urchin from CINMS: 1988-2003
Millions $
0
2
4
6
8
10
12
14
1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

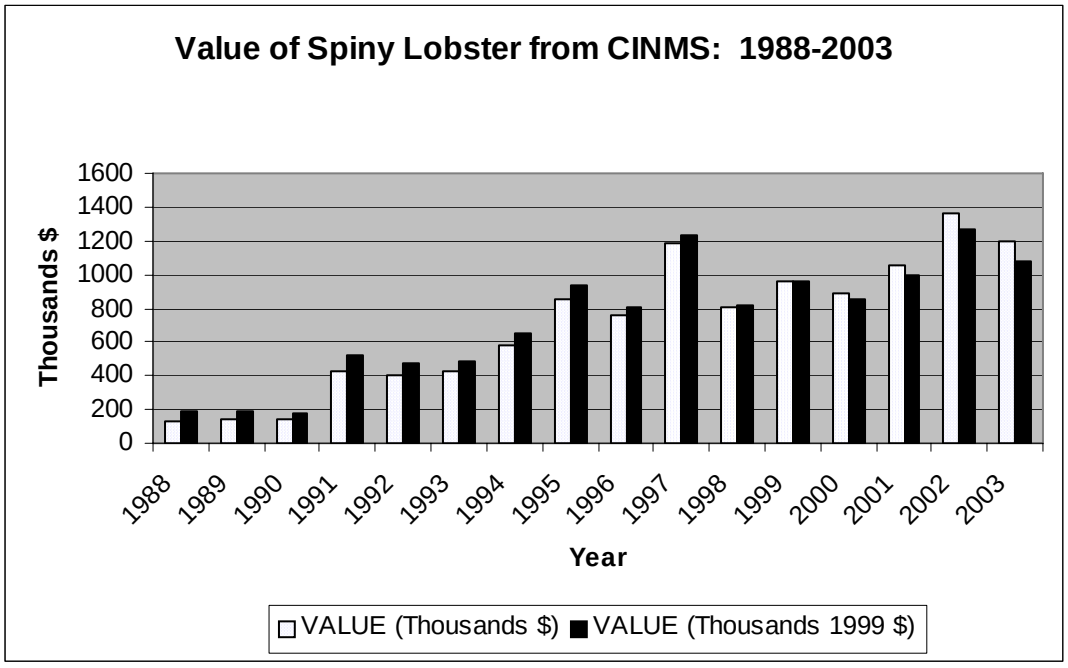
APPENDIX C


Urchin Catch in CA: 1988-2003
Pounds (millions)
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

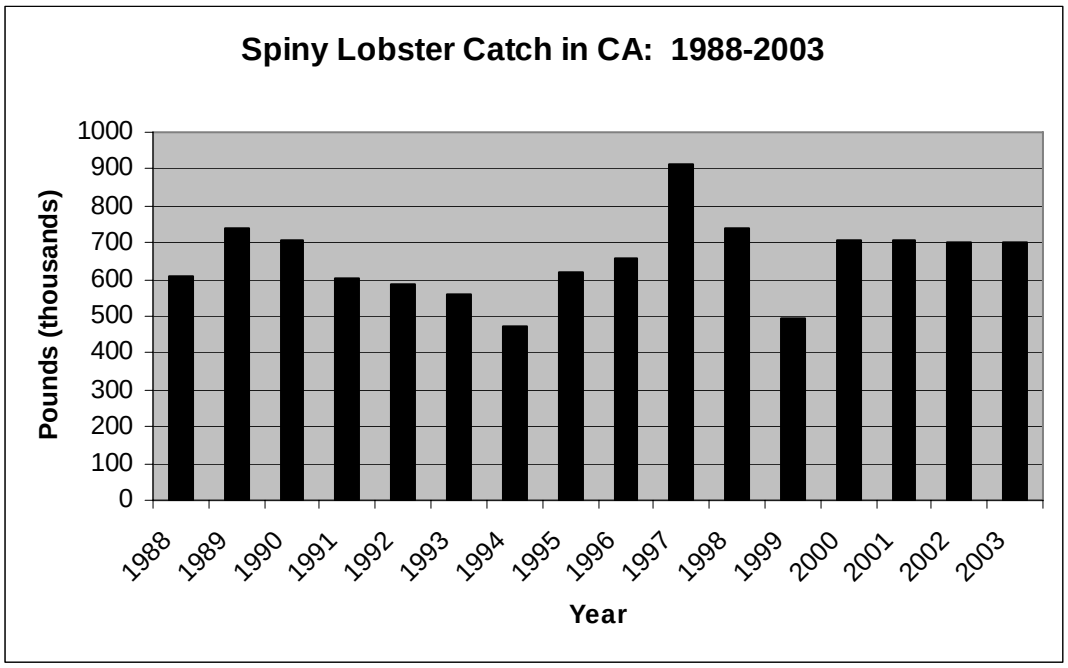

Value of Urchin in CA: 1988-2003
Millions $
45
40
35
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
Value (millions 1999 $)

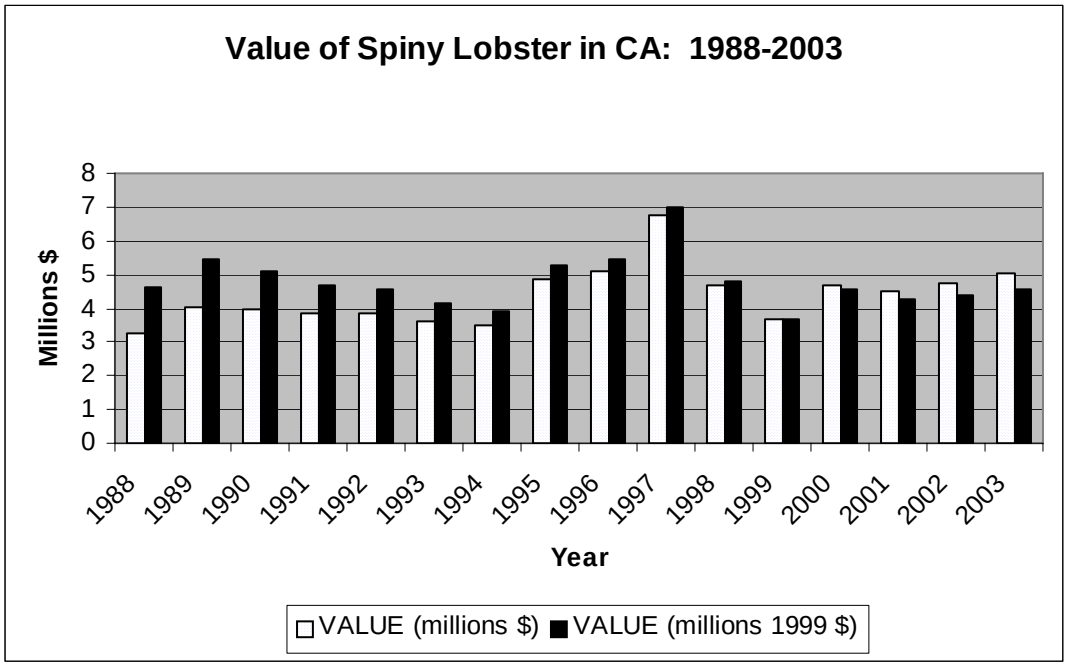
APPENDIX C


Spiny Lobster Catch in CINMS: 1988-2003
Pounds (thousands)
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

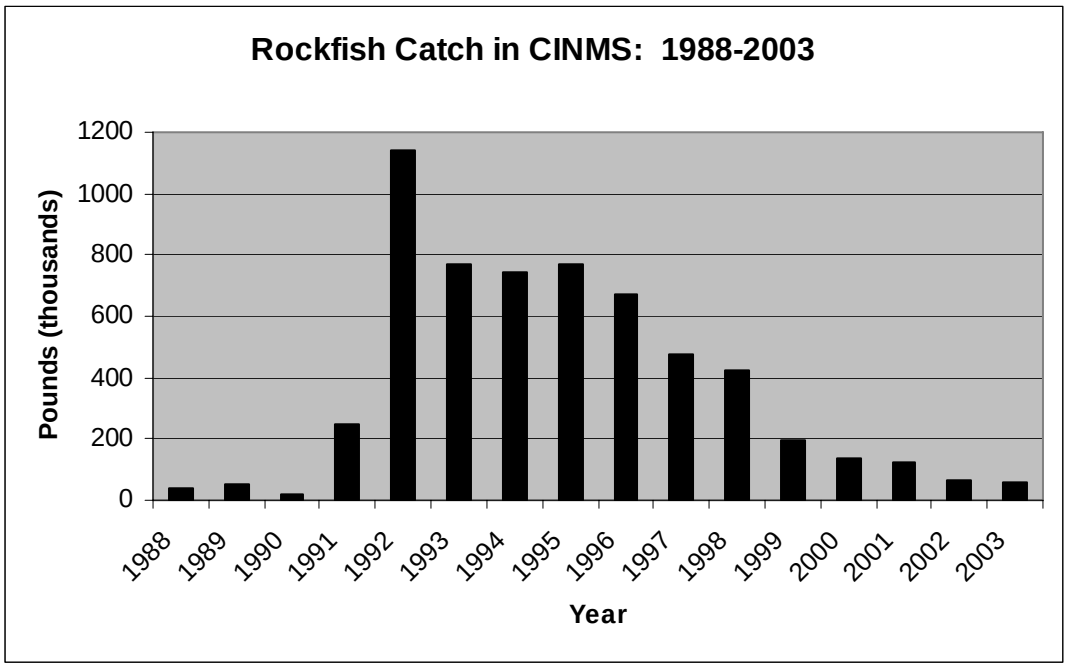

Value of Spiny Lobster from CINMS: 1988-2003
Thousands $
1600
1400
1200
1000
800
600
400
200
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (Thousands $)
VALUE (Thousands 1999 $)

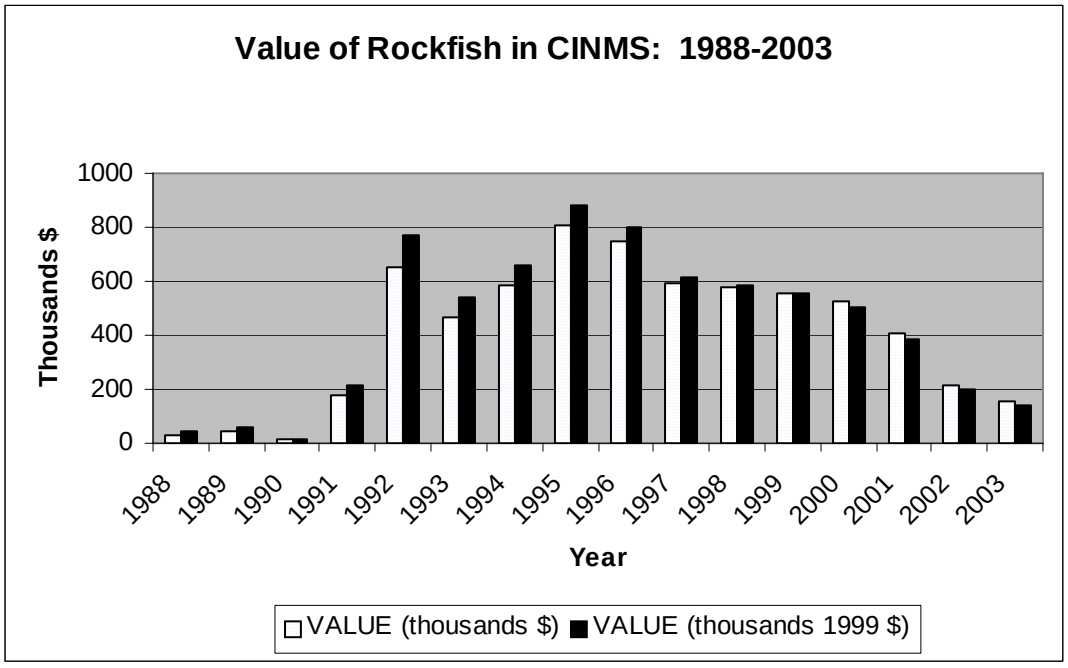
APPENDIX C


Spiny Lobster Catch in CA: 1988-2003
Pounds (thousands)
1000
900
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

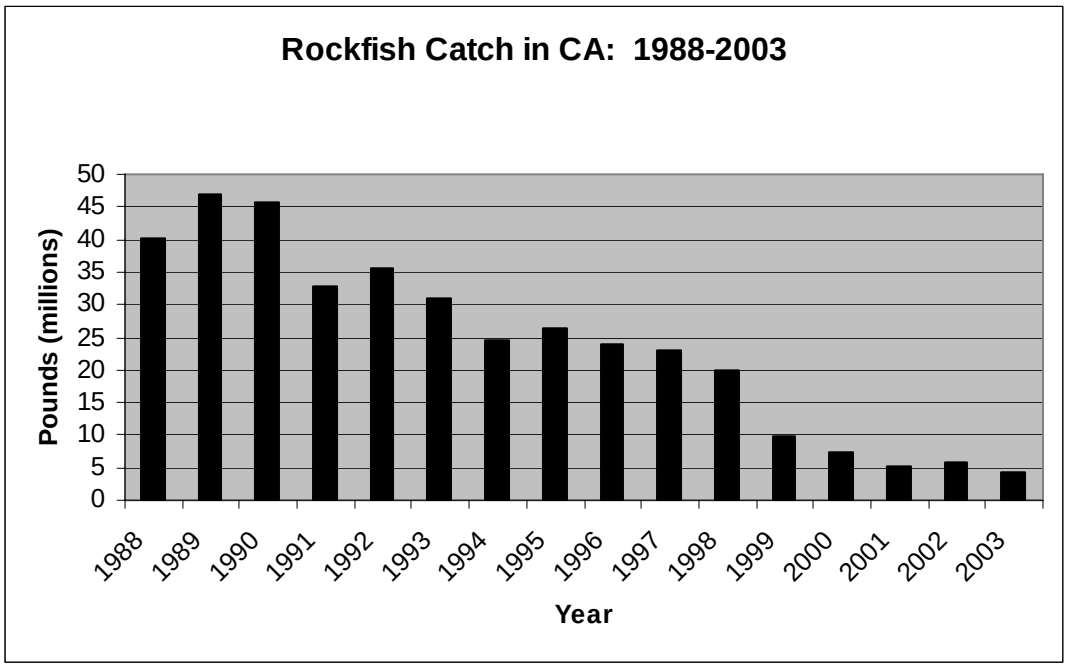

Value of Spiny Lobster in CA: 1988-2003
Millions $
8
7
6
5
4
3
2
1
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

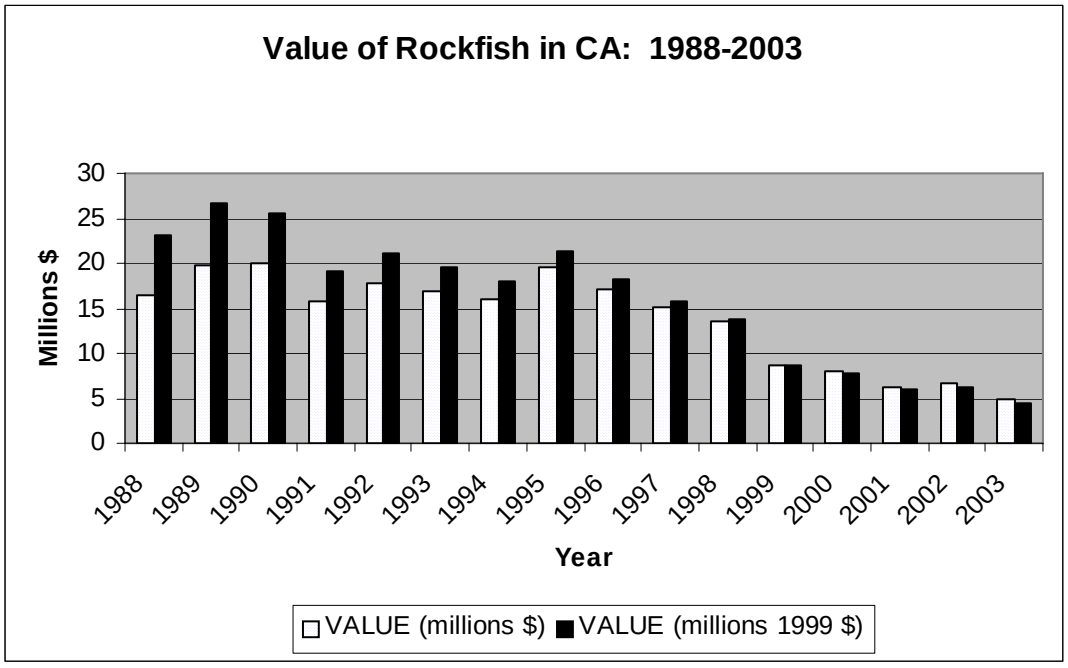
APPENDIX C


Rockfish Catch in CINMS: 1988-2003
Pounds (thousands)
1200
1000
800
600
400
200
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

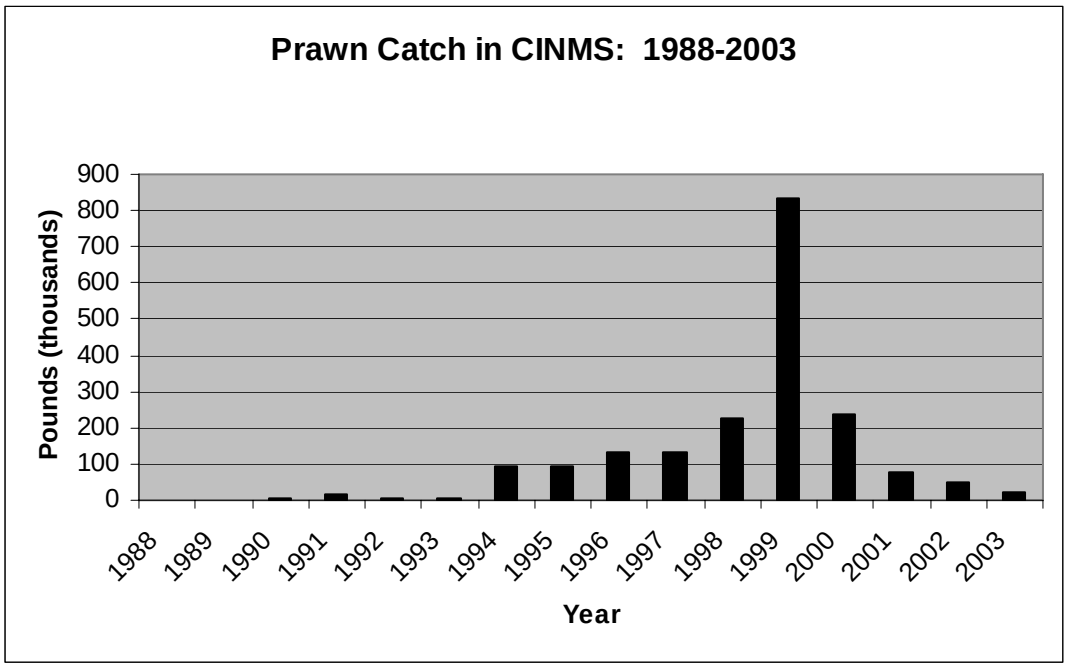

Value of Rockfish in CINMS: 1988-2003
Thousands $
1000
800
600
400
200
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

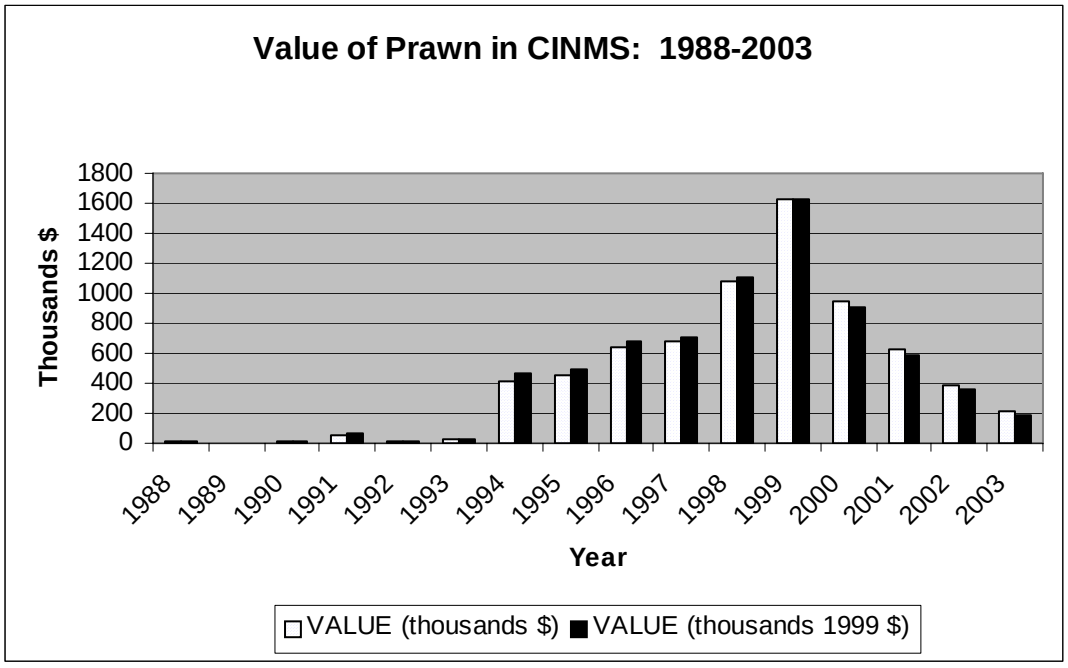
APPENDIX C


Rockfish Catch in CA: 1988-2003
Pounds (millions)
50
45
40
35
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

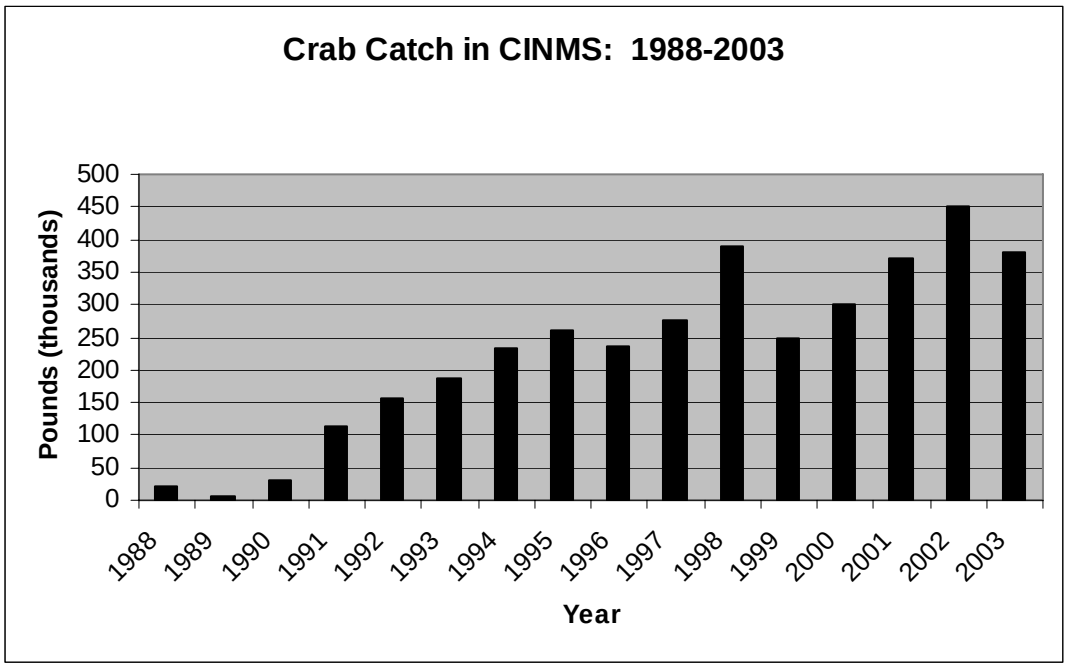

Value of Rockfish in CA: 1988-2003
Millions $
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

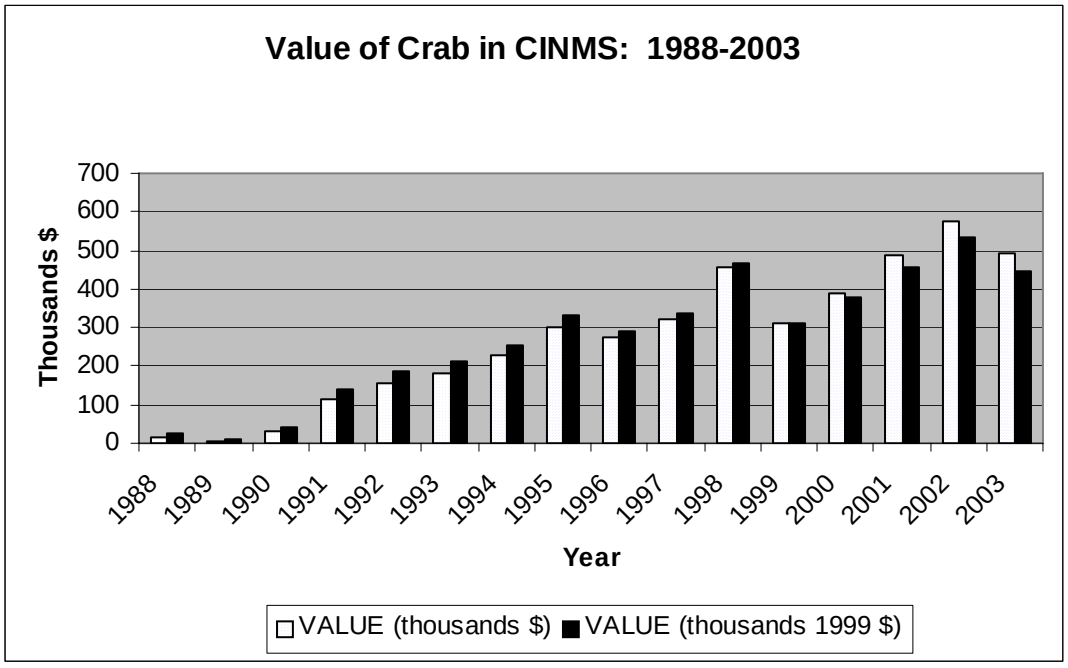
APPENDIX C


Prawn Catch in CINMS: 1988-2003
Pounds (thousands)
900
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

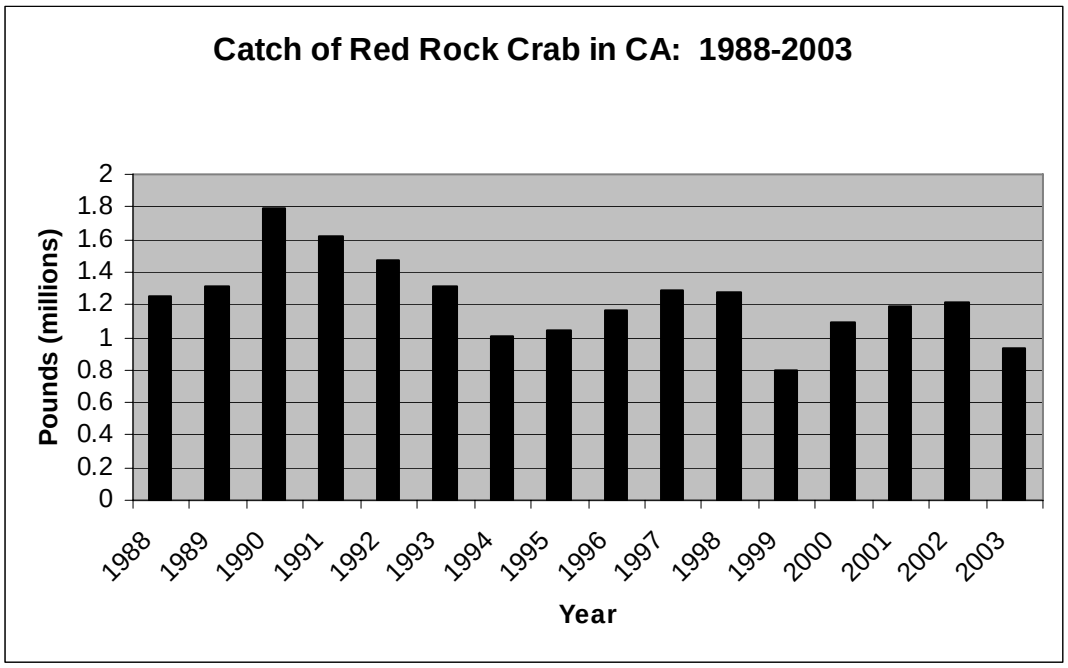

Value of Prawn in CINMS: 1988-2003
Thousands $
1800
1600
1400
1200
1000
800
600
400
200
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

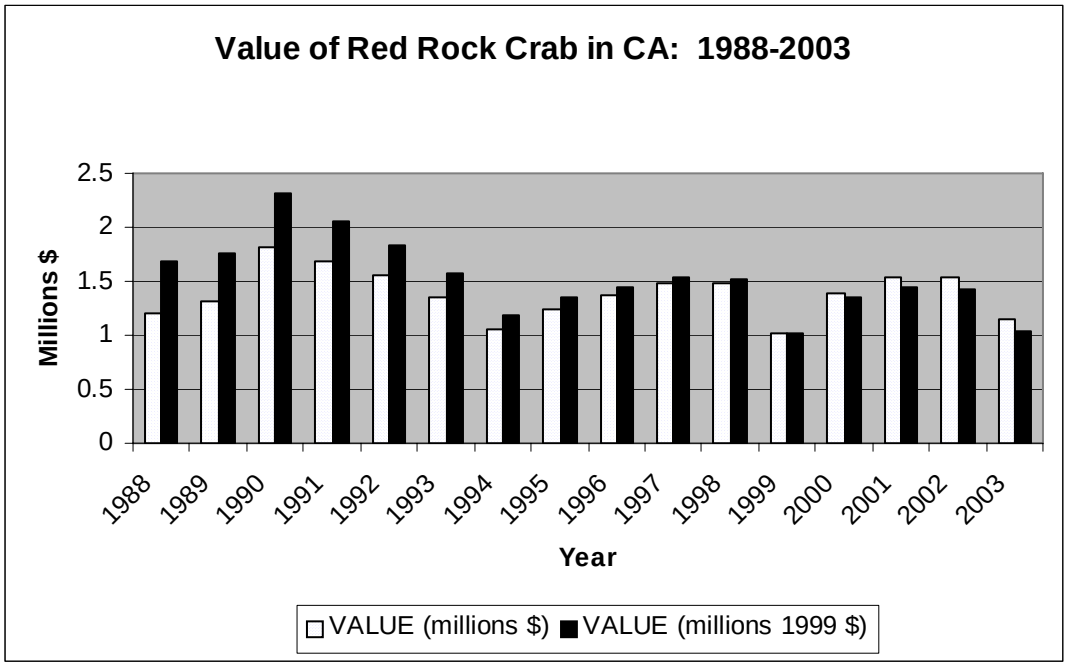
APPENDIX C


Crab Catch in CINMS: 1988-2003
Pounds (thousands)
500
450
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

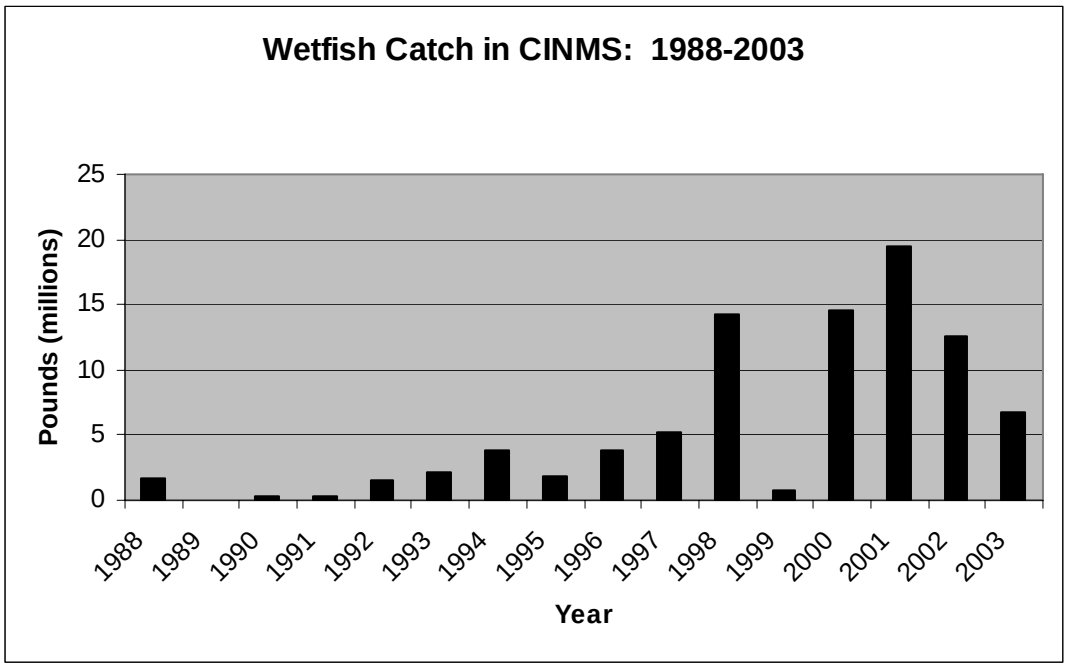

Value of Crab in CINMS: 1988-2003
Thousands $
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

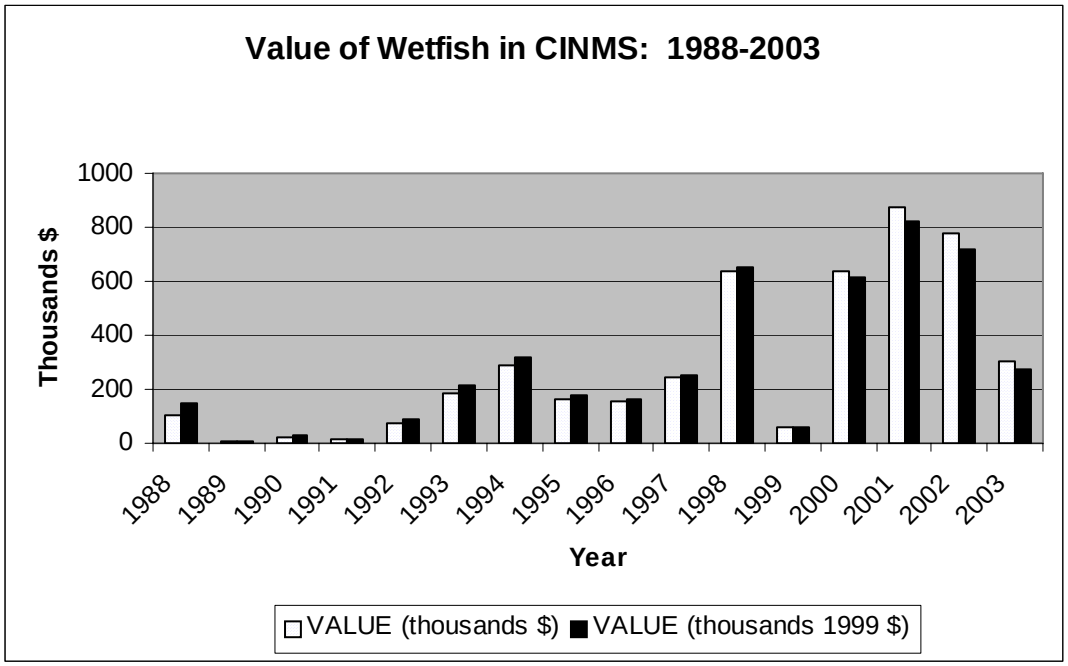
APPENDIX C


Catch of Red Rock Crab in CA: 1988-2003
Pounds (millions)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

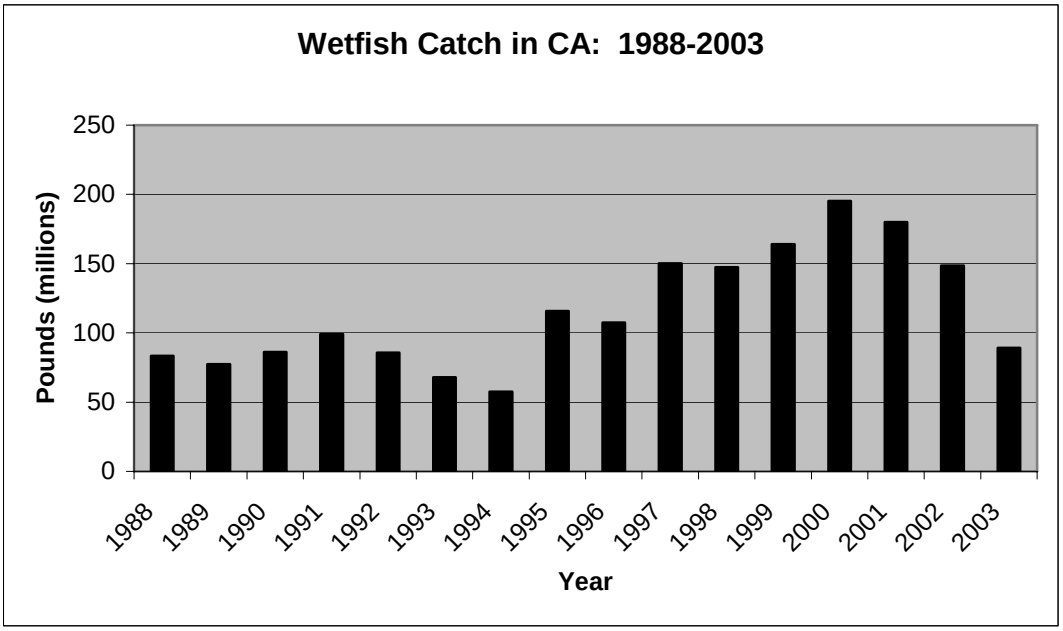

Value of Red Rock Crab in CA: 1988-2003
Millions $
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

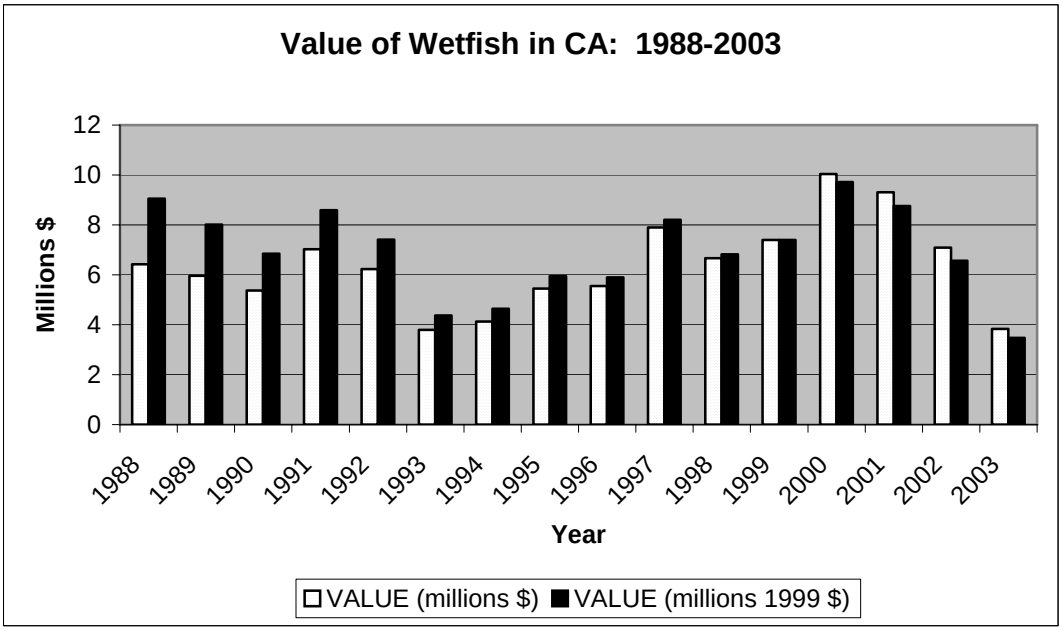
APPENDIX C


Wetfish Catch in CINMS: 1988-2003
Pounds (millions)
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

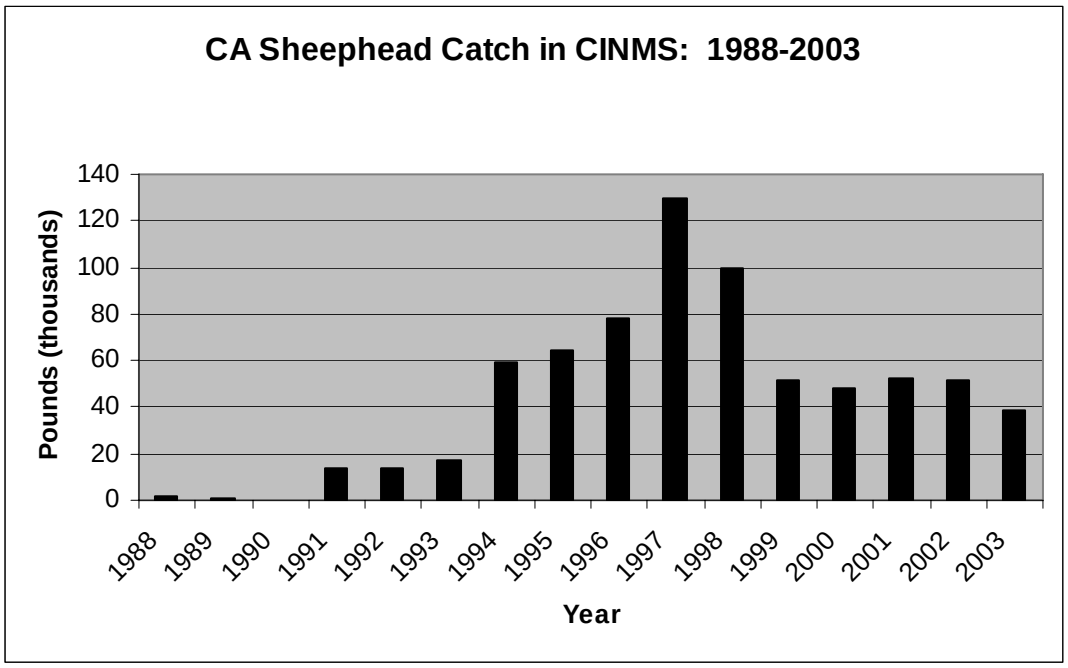

Value of Wetfish in CINMS: 1988-2003
Thousands $
1000
800
600
400
200
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

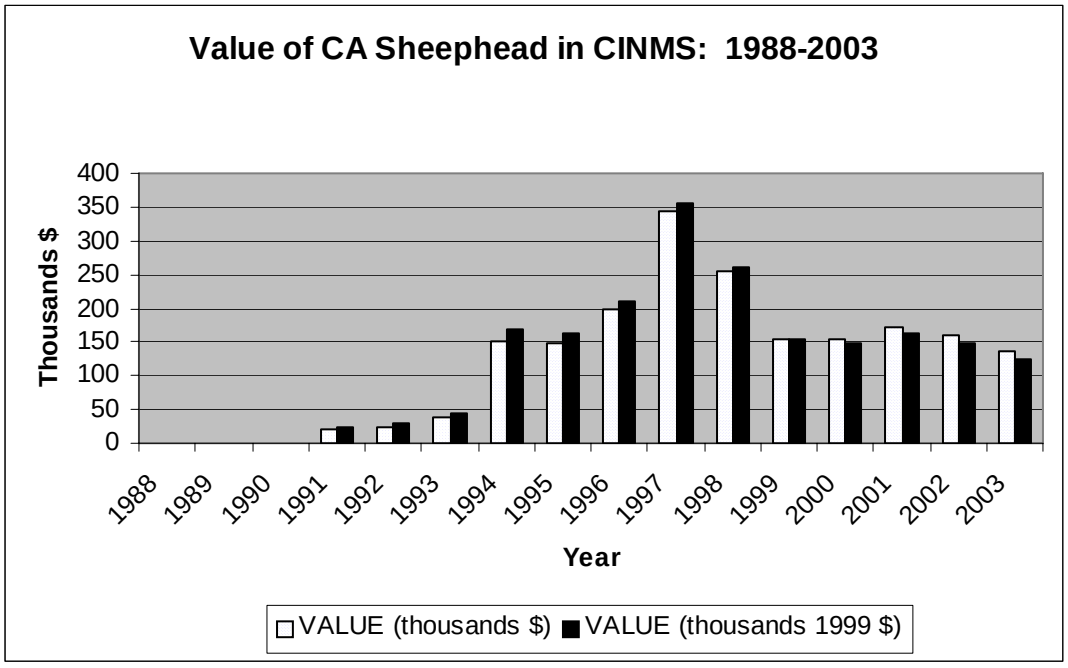
APPENDIX C


Wetfish Catch in CA: 1988-2003
Pounds (millions)
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

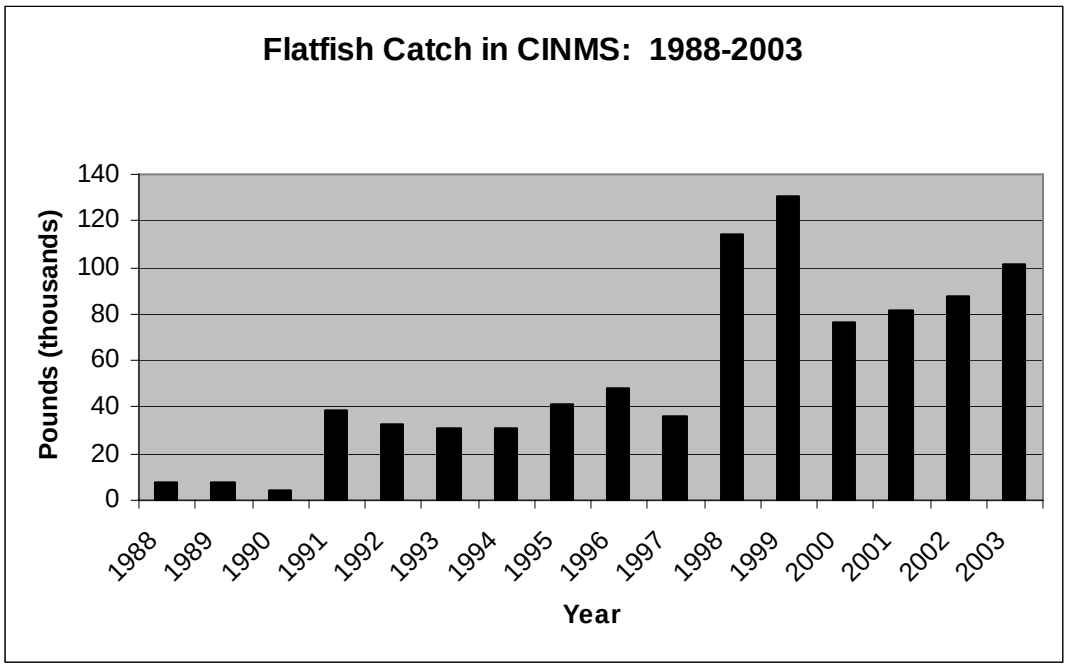

Value of Wetfish in CA: 1988-2003
Millions $
12
10
8
6
4
2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

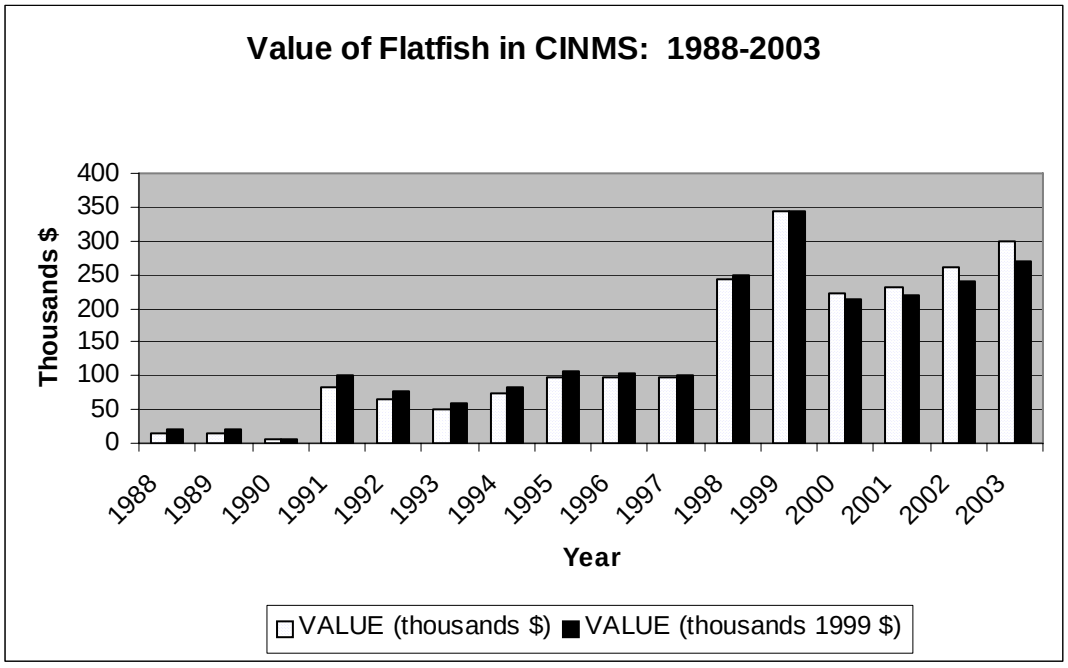
APPENDIX C


CA Sheephead Catch in CINMS: 1988-2003
Pounds (thousands)
140
120
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

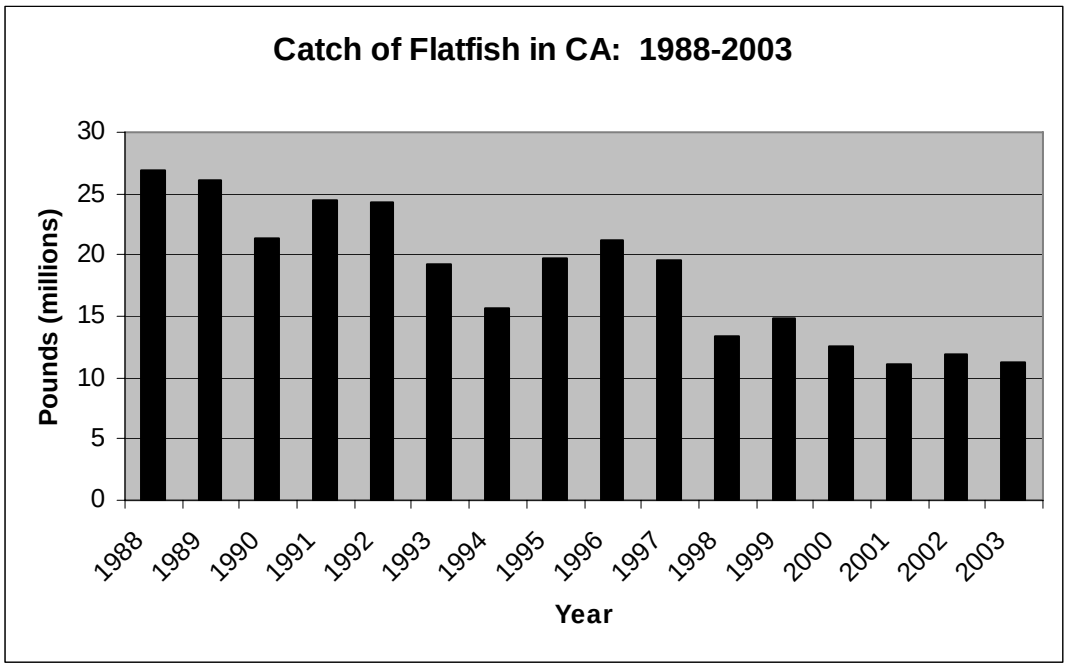

Value of CA Sheephead in CINMS: 1988-2003
Thousands $
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

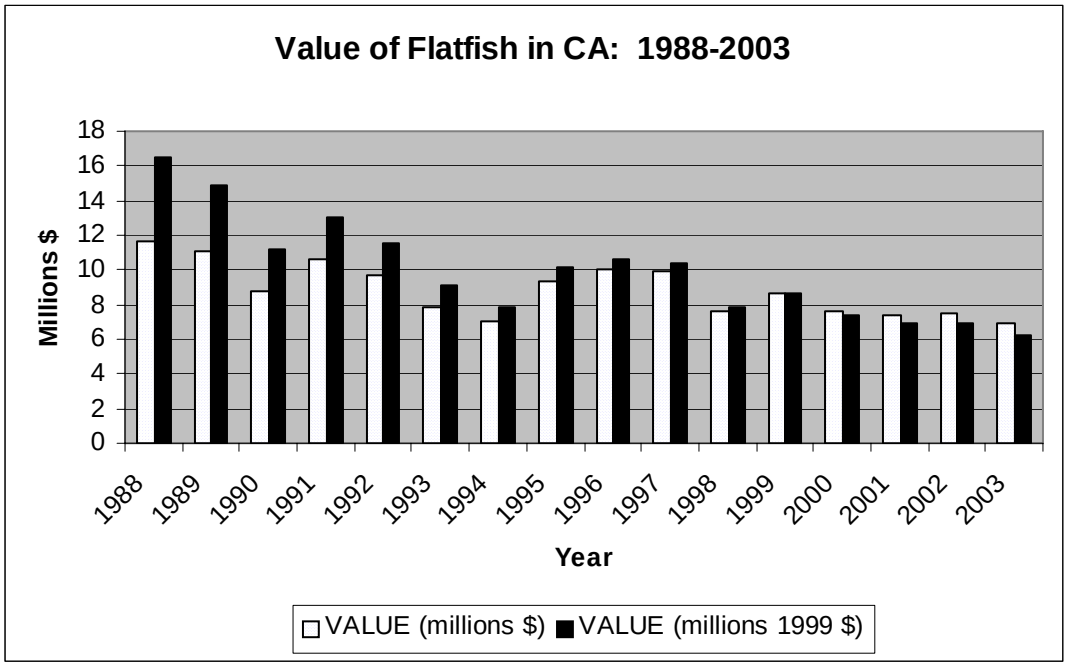
APPENDIX C


Flatfish Catch in CINMS: 1988-2003
Pounds (thousands)
140
120
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

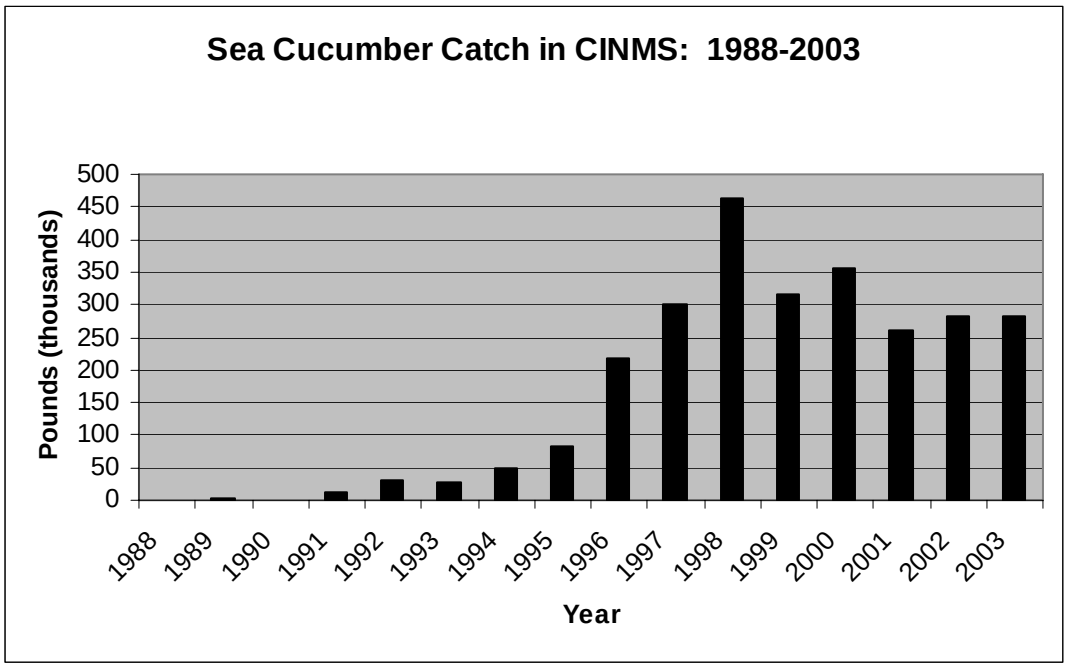

Value of Flatfish in CINMS: 1988-2003
Thousands $
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

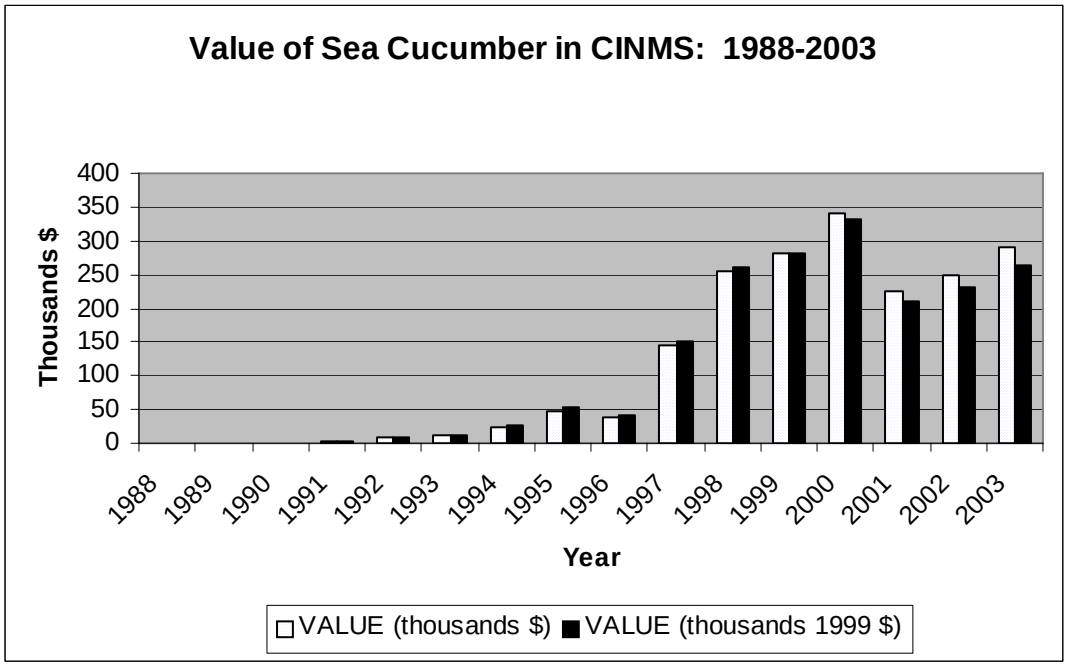
APPENDIX C


Catch of Flatfish in CA: 1988-2003
Pounds (millions)
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

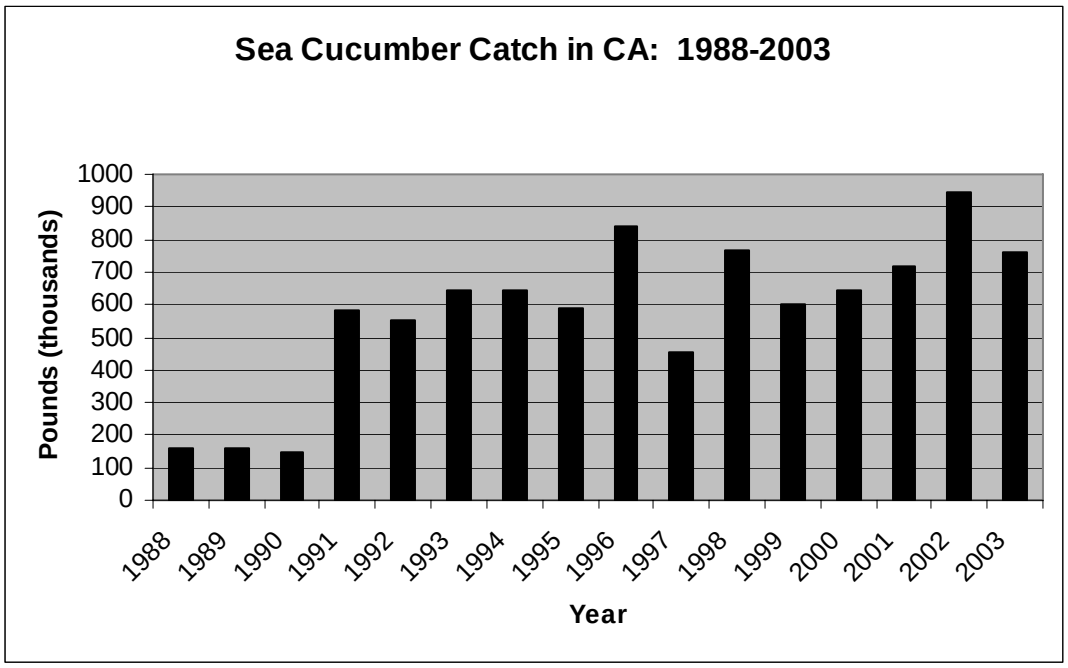

Value of Flatfish in CA: 1988-2003
Millions $
18
16
14
12
10
8
6
4
2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

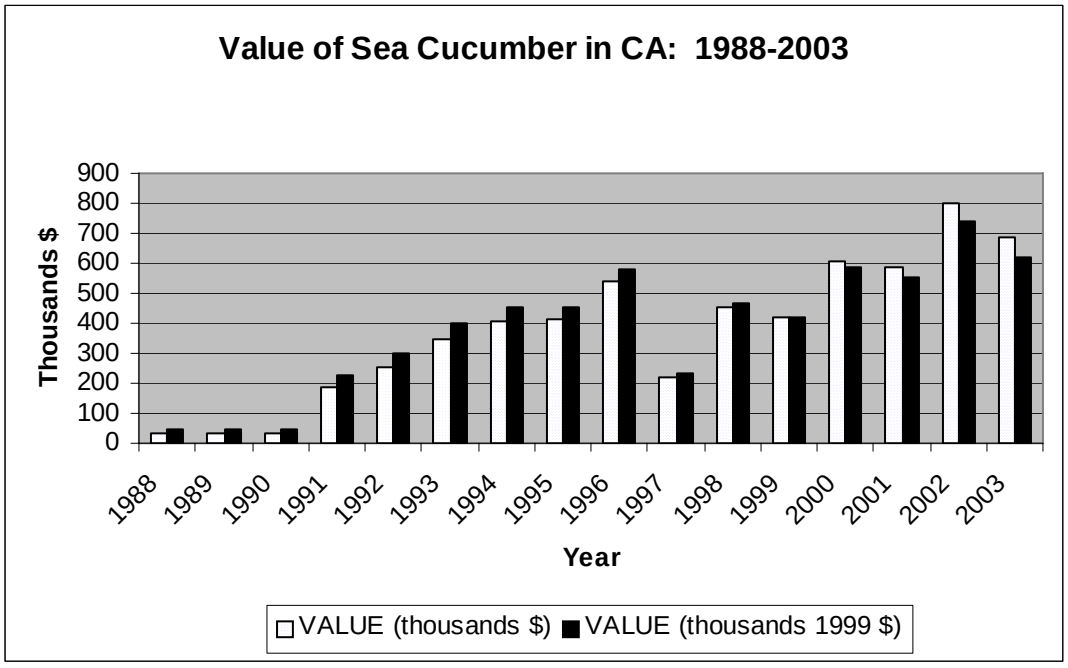
APPENDIX C


Sea Cucumber Catch in CINMS: 1988-2003
Pounds (thousands)
500
450
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

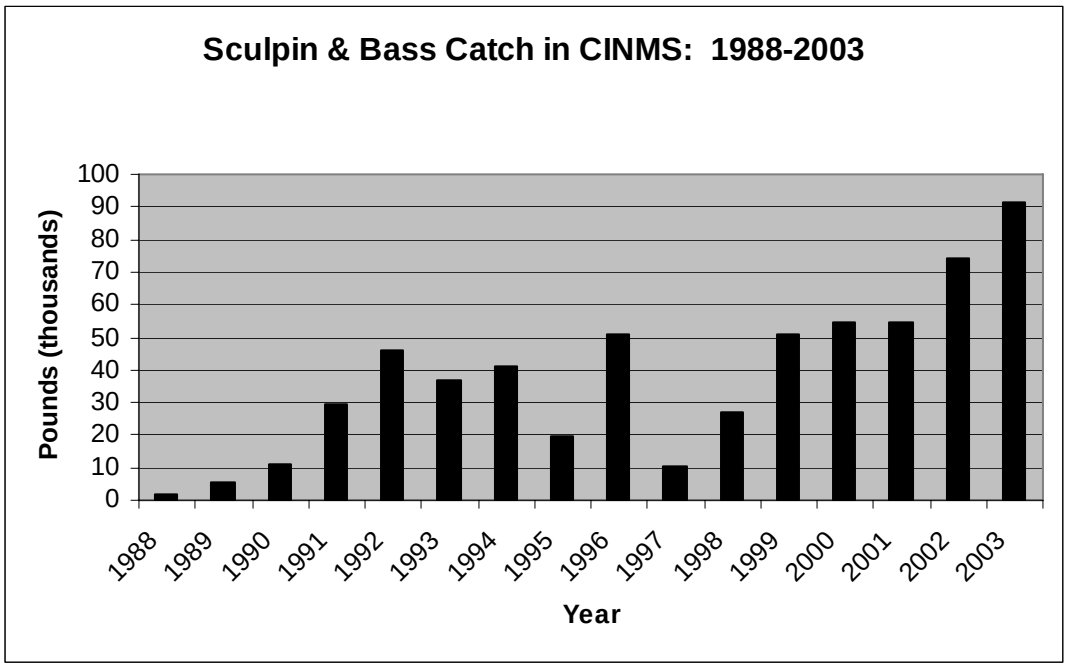

Value of Sea Cucumber in CINMS: 1988-2003
Thousands $
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

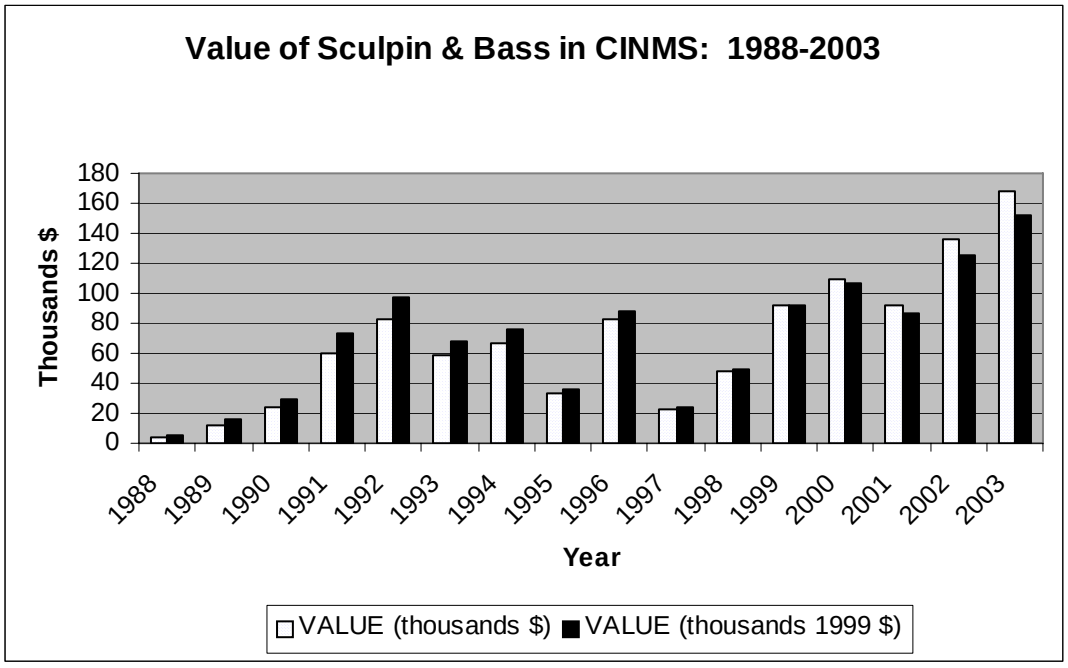
APPENDIX C


Sea Cucumber Catch in CA: 1988-2003
Pounds (thousands)
1000
900
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

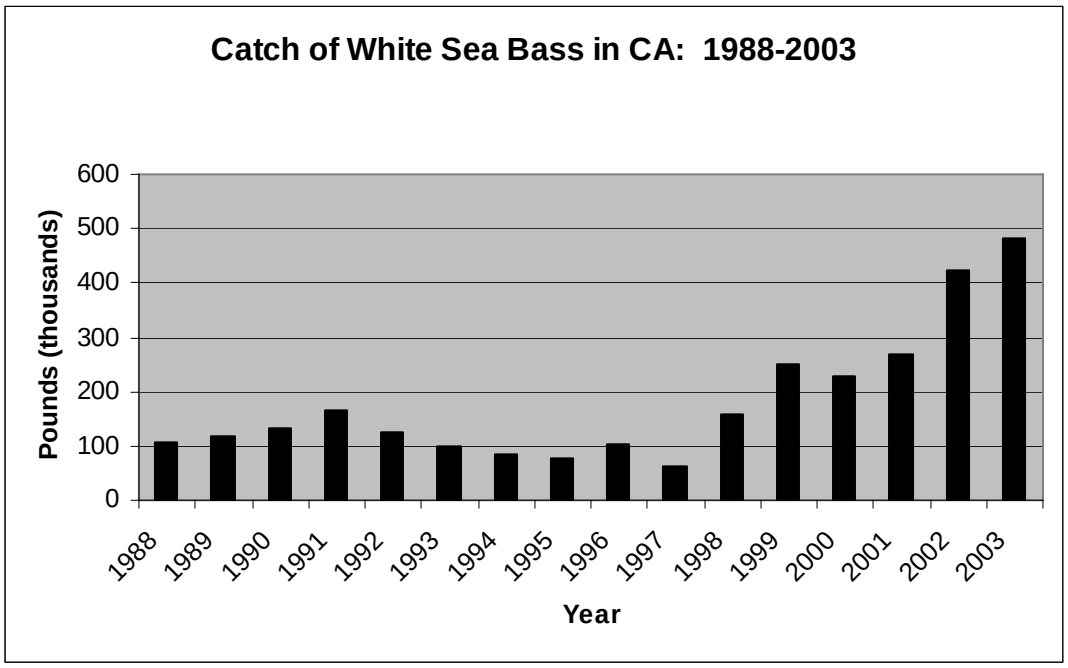

Value of Sea Cucumber in CA: 1988-2003
Thousands $
900
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

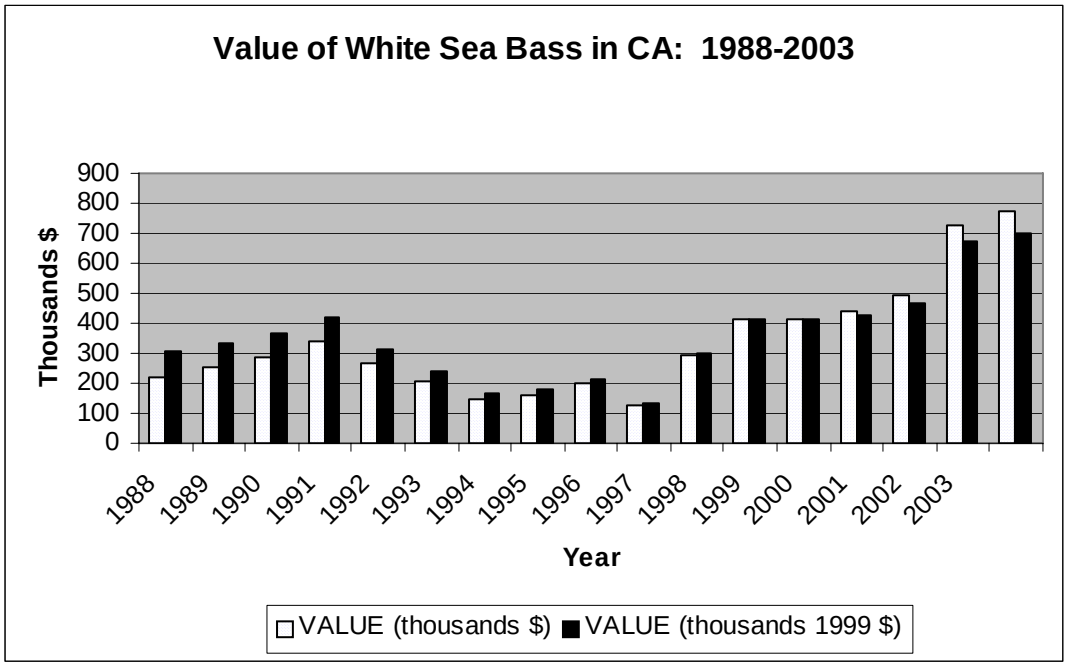
APPENDIX C


Sculpin & Bass Catch in CINMS: 1988-2003
Pounds (thousands)
100
90
80
70
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

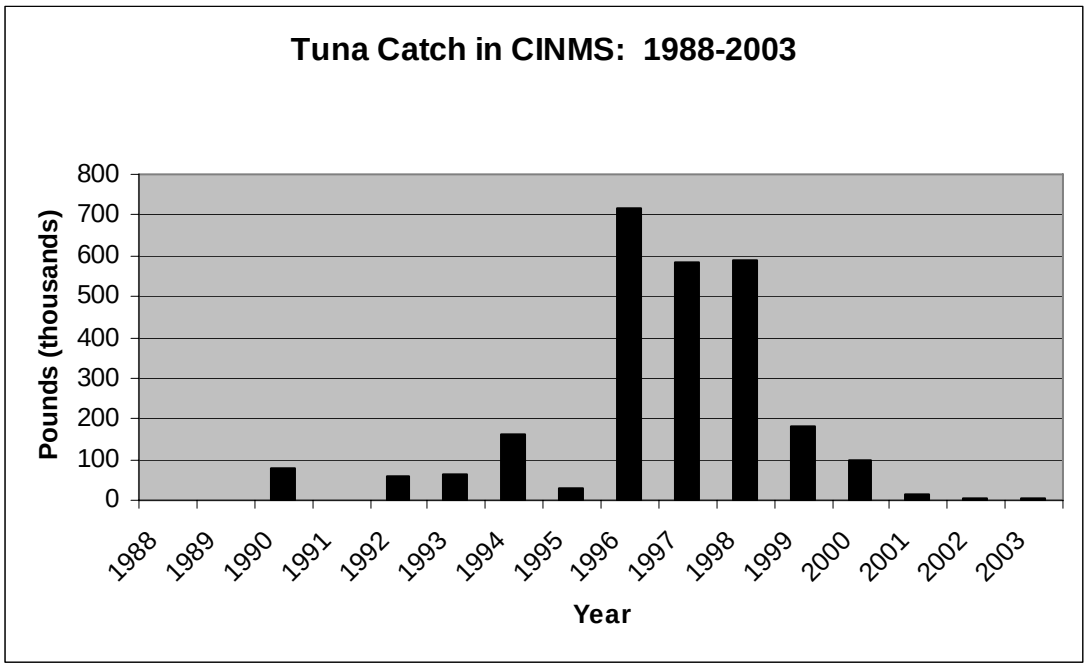

Value of Sculpin & Bass in CINMS: 1988-2003
Thousands $
180
160
140
120
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

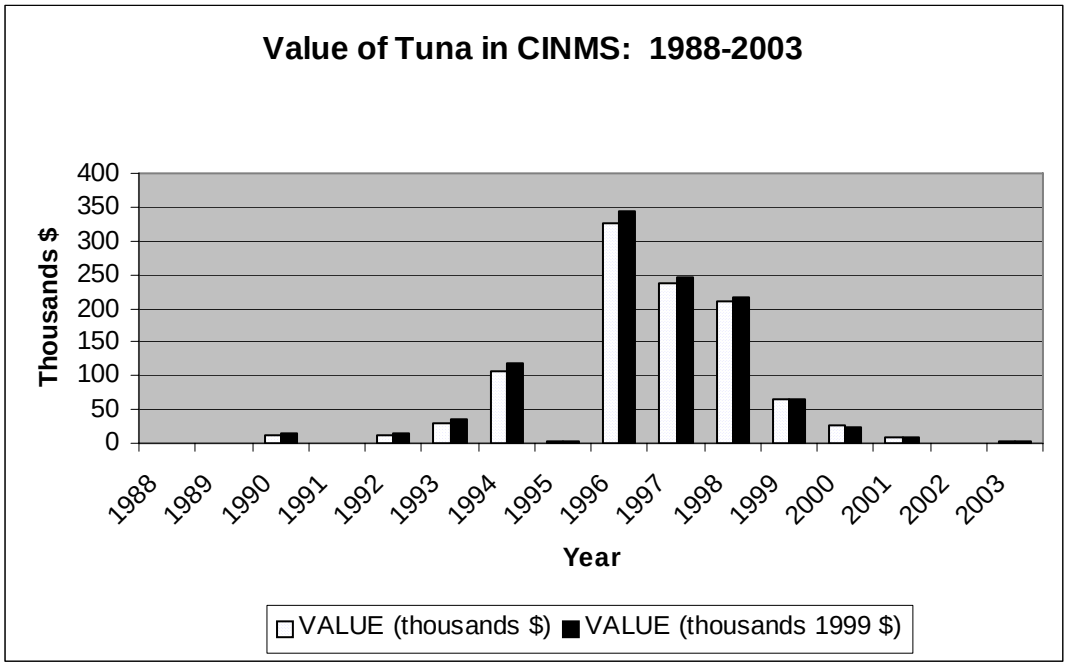
APPENDIX C


Catch of White Sea Bass in CA: 1988-2003
Pounds (thousands)
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

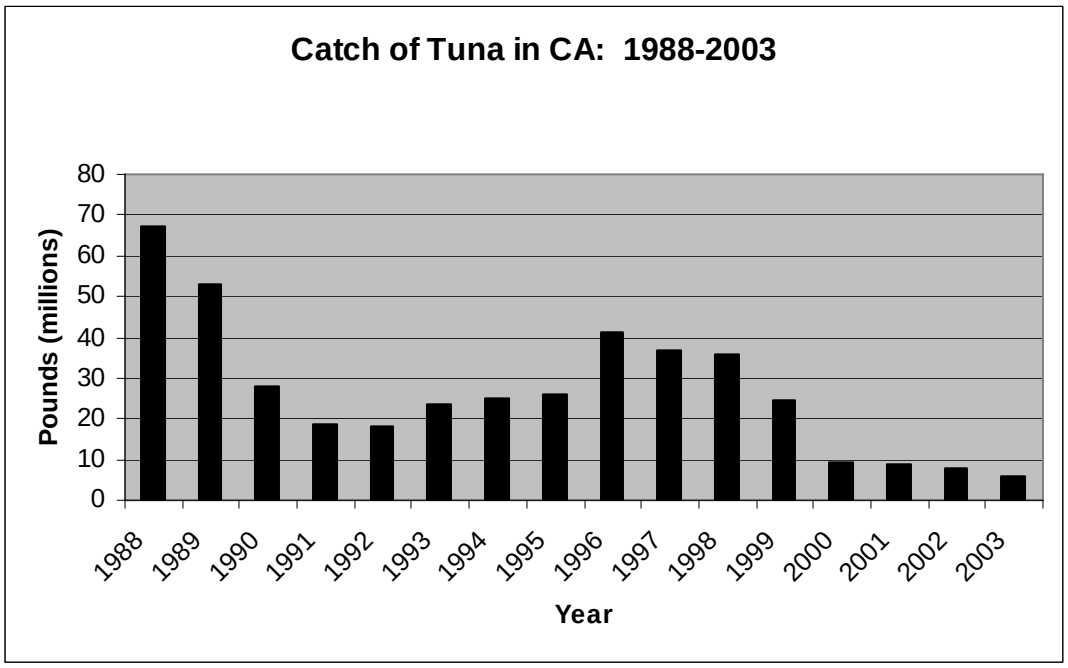

Value of White Sea Bass in CA: 1988-2003
Thousands $
900
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

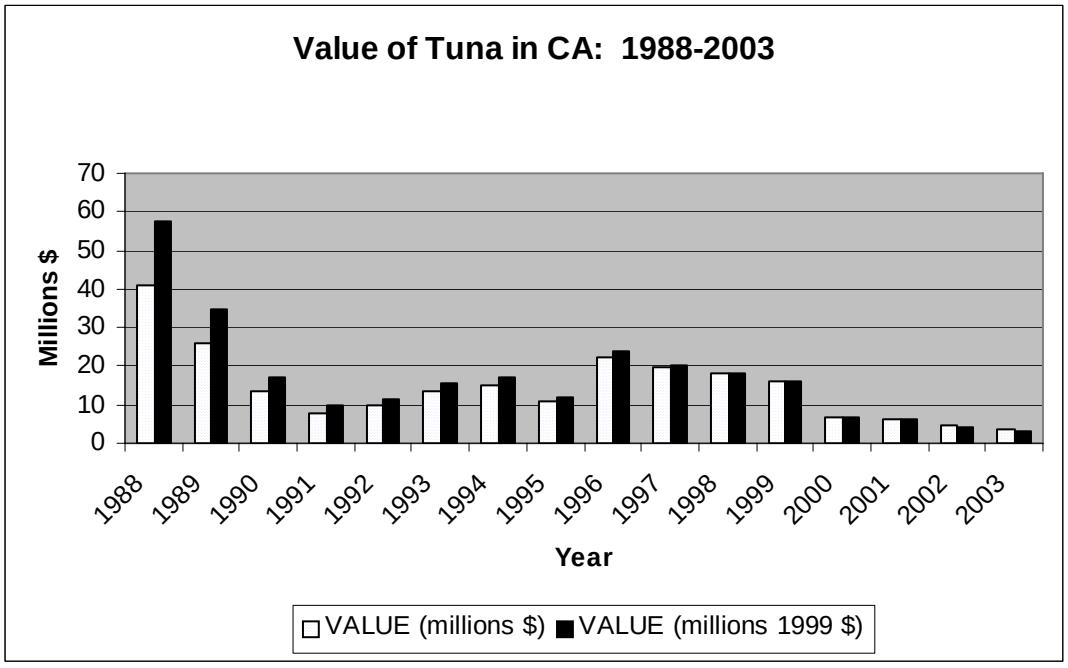
APPENDIX C


Tuna Catch in CINMS: 1988-2003
Pounds (thousands)
800
700
600
500
400
300
200
100
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

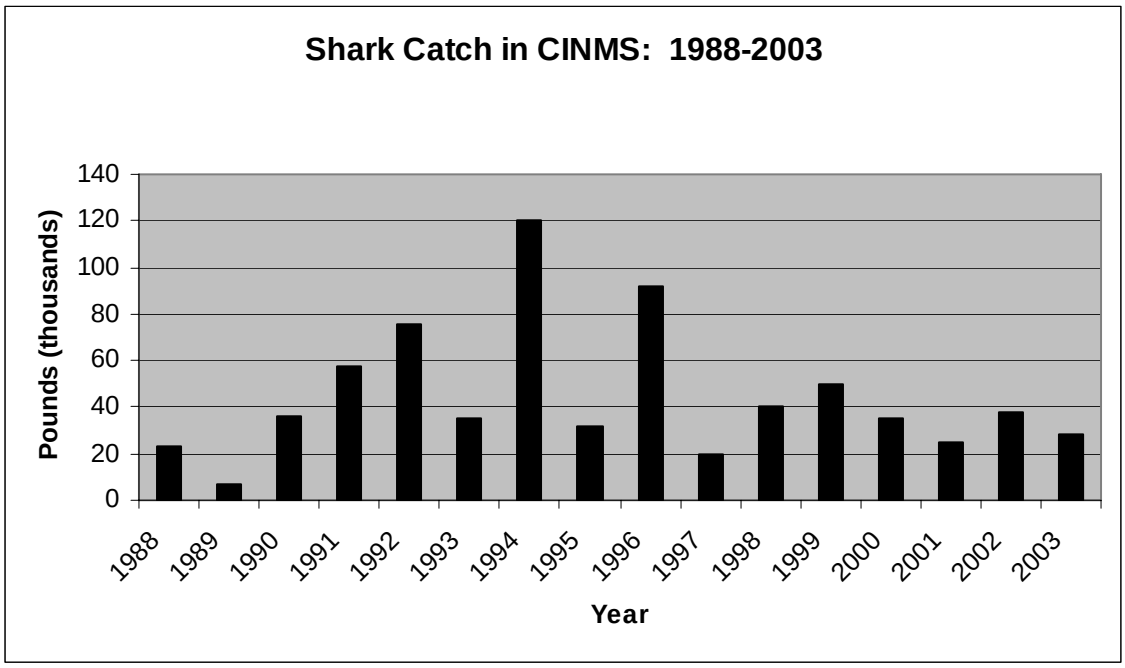

Value of Tuna in CINMS: 1988-2003
Thousands $
400
350
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

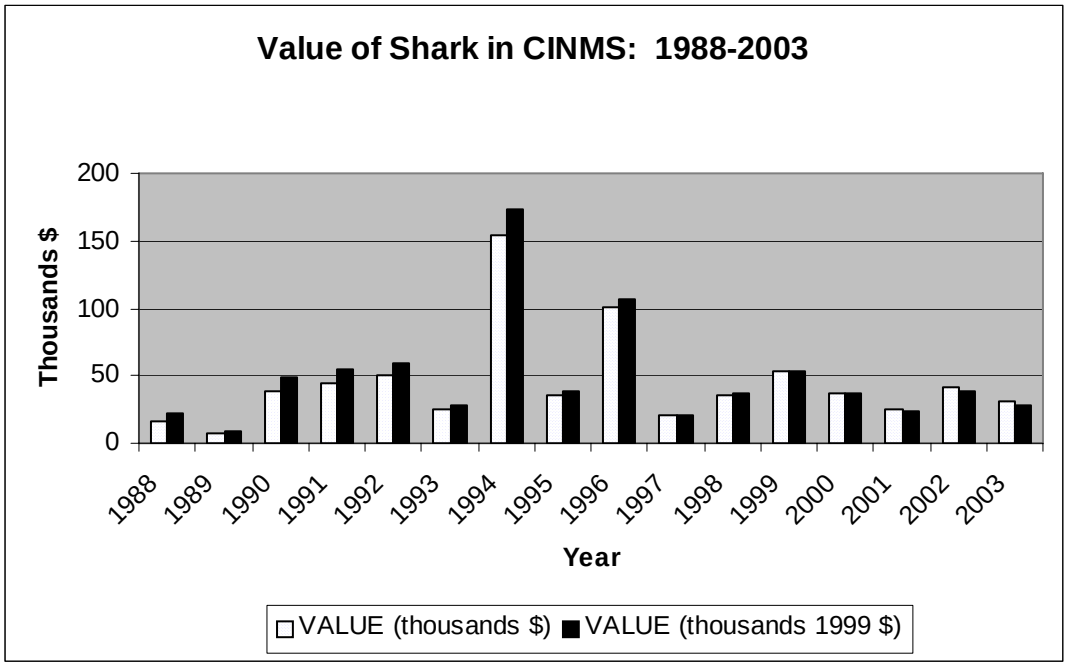
APPENDIX C


Catch of Tuna in CA: 1988-2003
Pounds (millions)
80
70
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

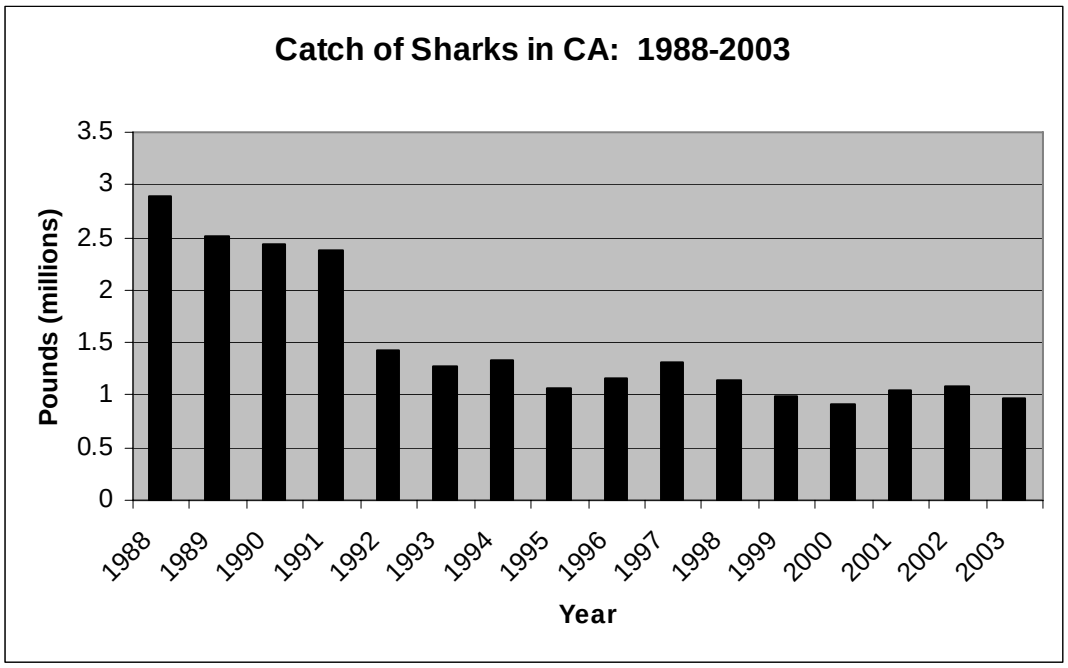

Value of Tuna in CA: 1988-2003
Millions $
70
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

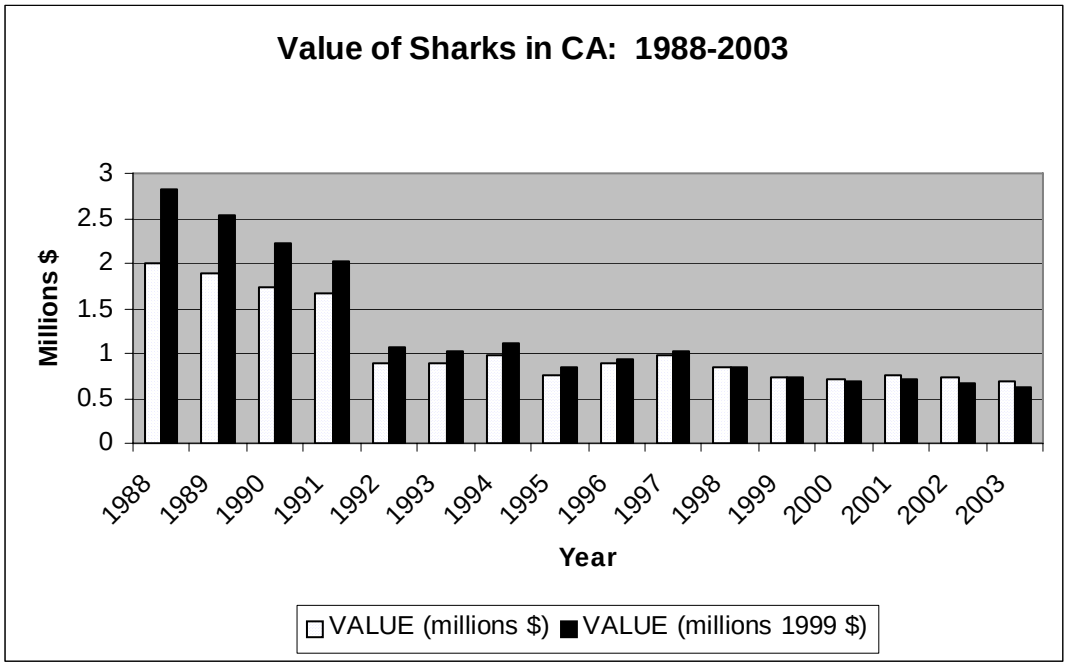
APPENDIX C


Shark Catch in CINMS: 1988-2003
Pounds (thousands)
140
120
100
80
60
40
20
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

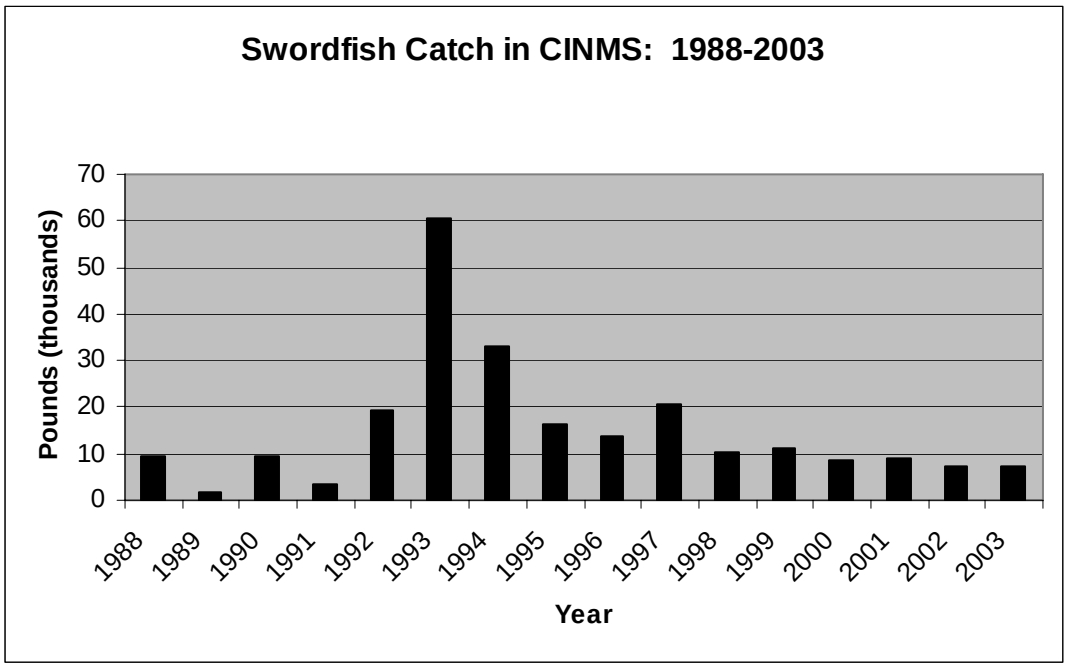

Value of Shark in CINMS: 1988-2003
Thousands $
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

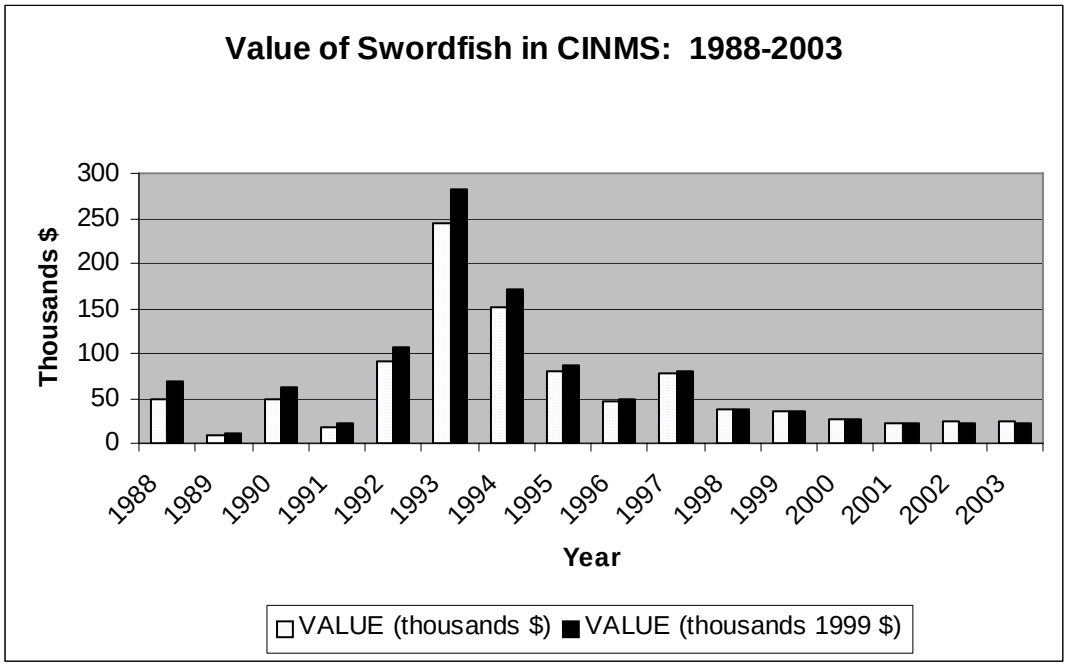
APPENDIX C


Catch of Sharks in CA: 1988-2003
Pounds (millions)
3.5
3
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

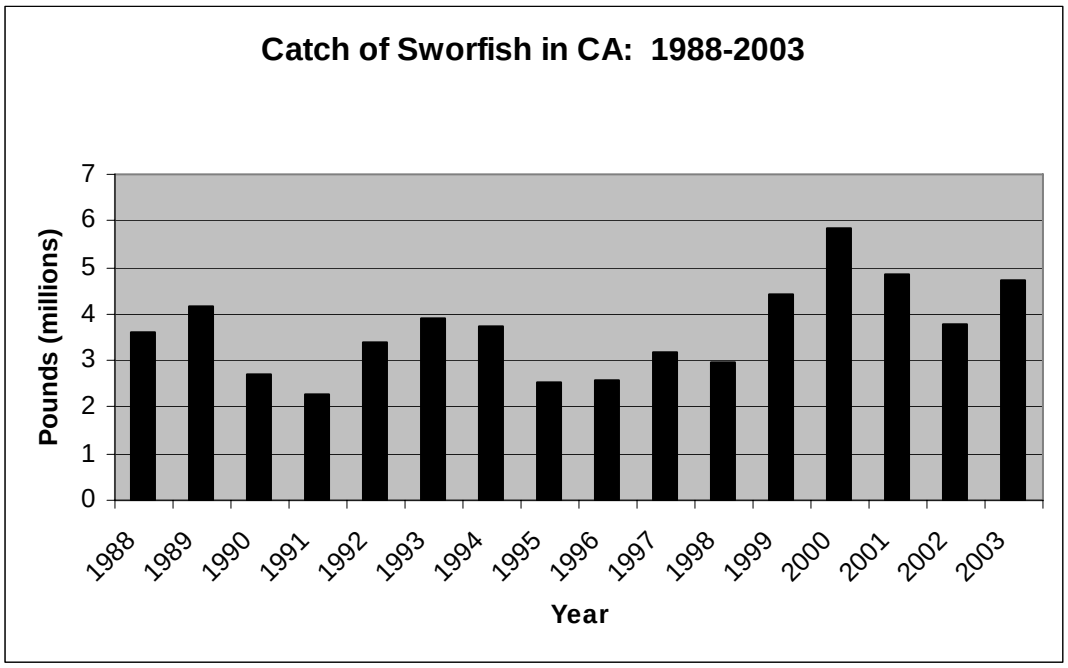

Value of Sharks in CA: 1988-2003
Millions $
3
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

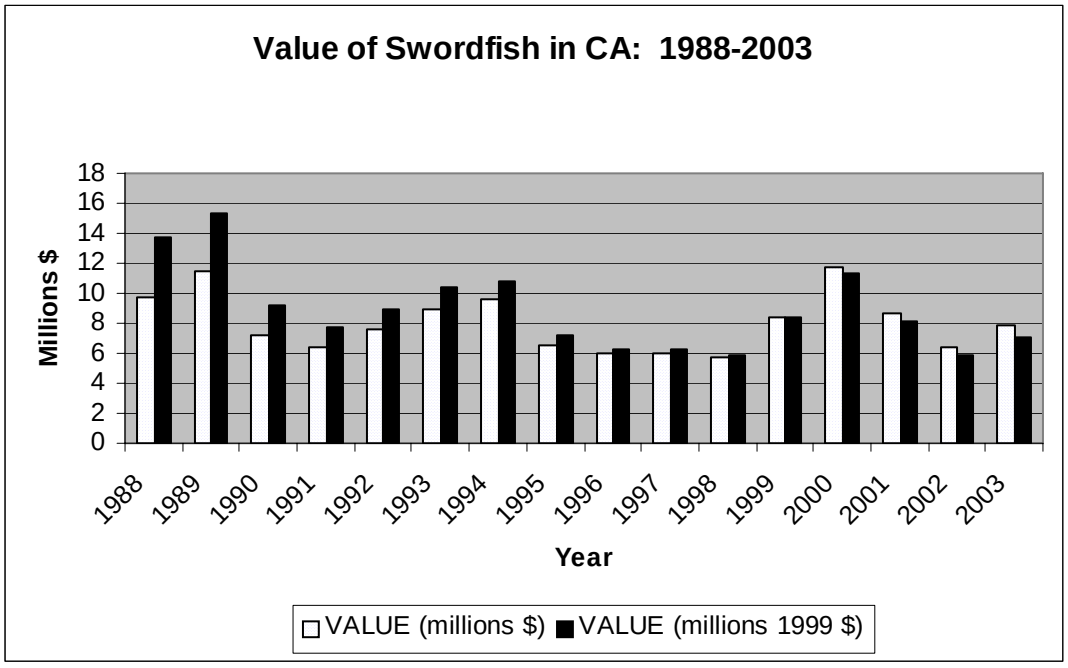
APPENDIX C


Swordfish Catch in CINMS: 1988-2003
Pounds (thousands)
70
60
50
40
30
20
10
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

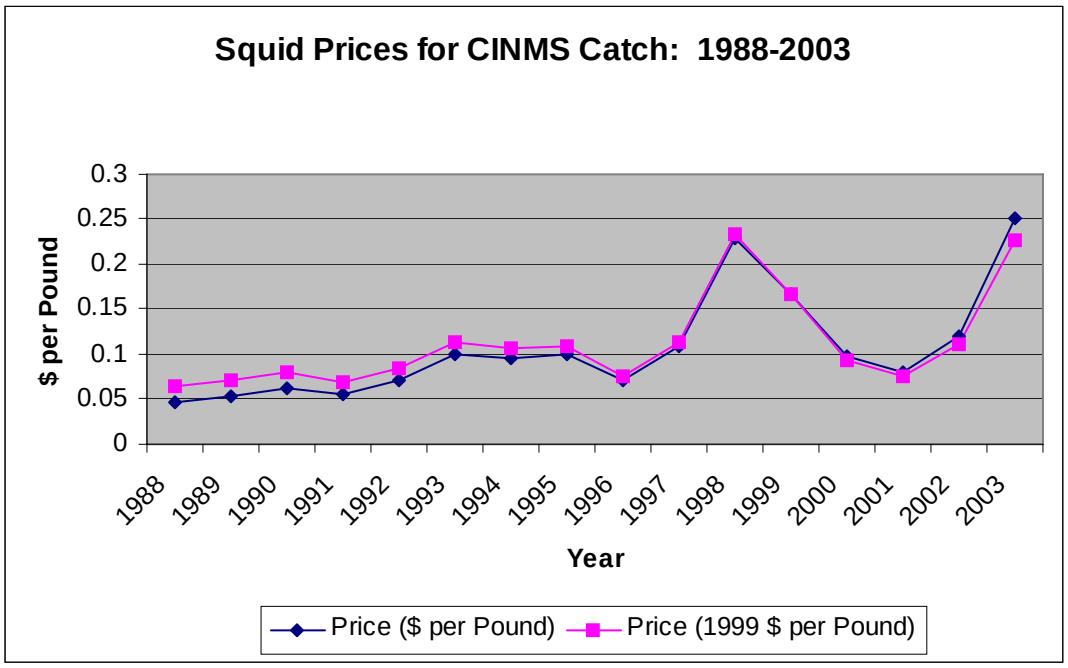

Value of Swordfish in CINMS: 1988-2003
Thousands $
300
250
200
150
100
50
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (thousands $)
VALUE (thousands 1999 $)

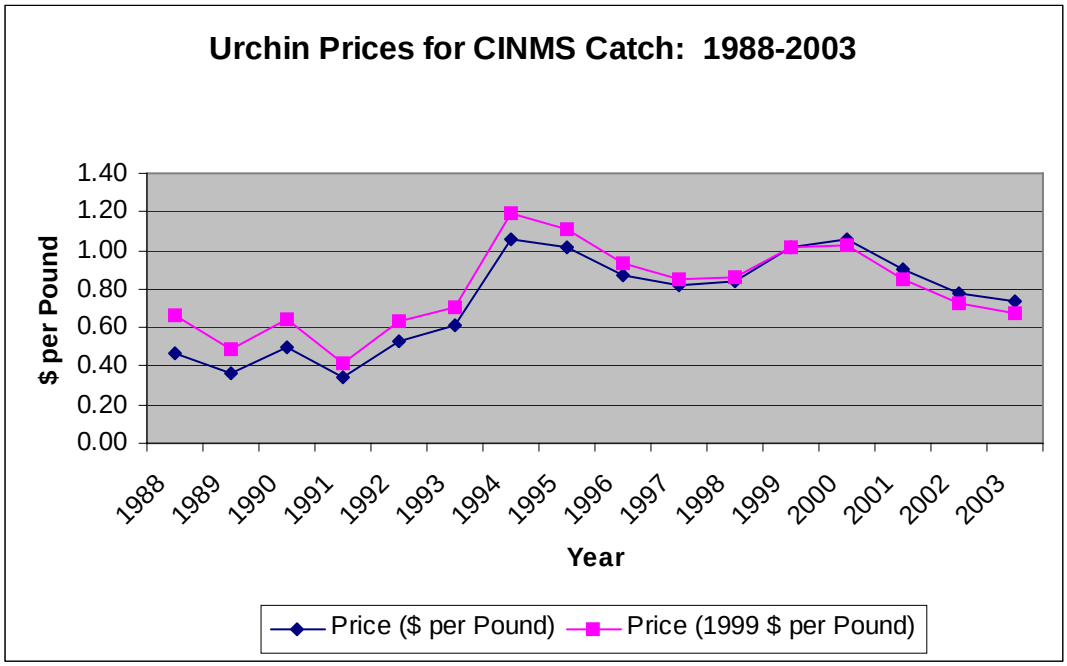
APPENDIX C


Catch of Sworfish in CA: 1988-2003
Pounds (millions)
0
1
2
3
4
5
6
7
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year

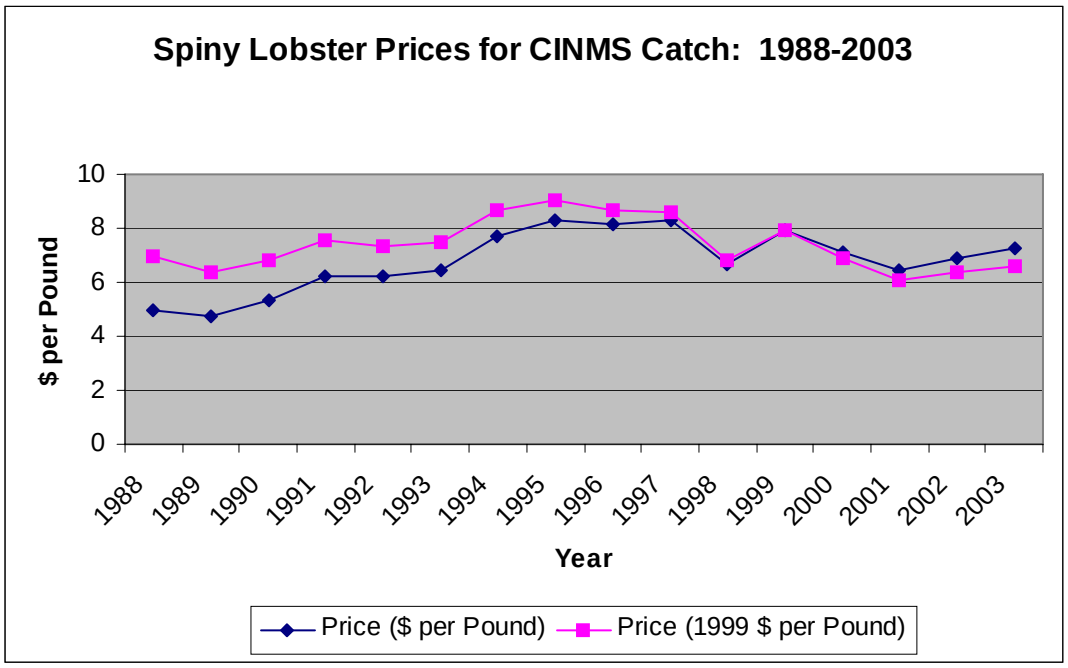

Value of Swordfish in CA: 1988-2003
Millions $
0
2
4
6
8
10
12
14
16
18
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
VALUE (millions $)
VALUE (millions 1999 $)

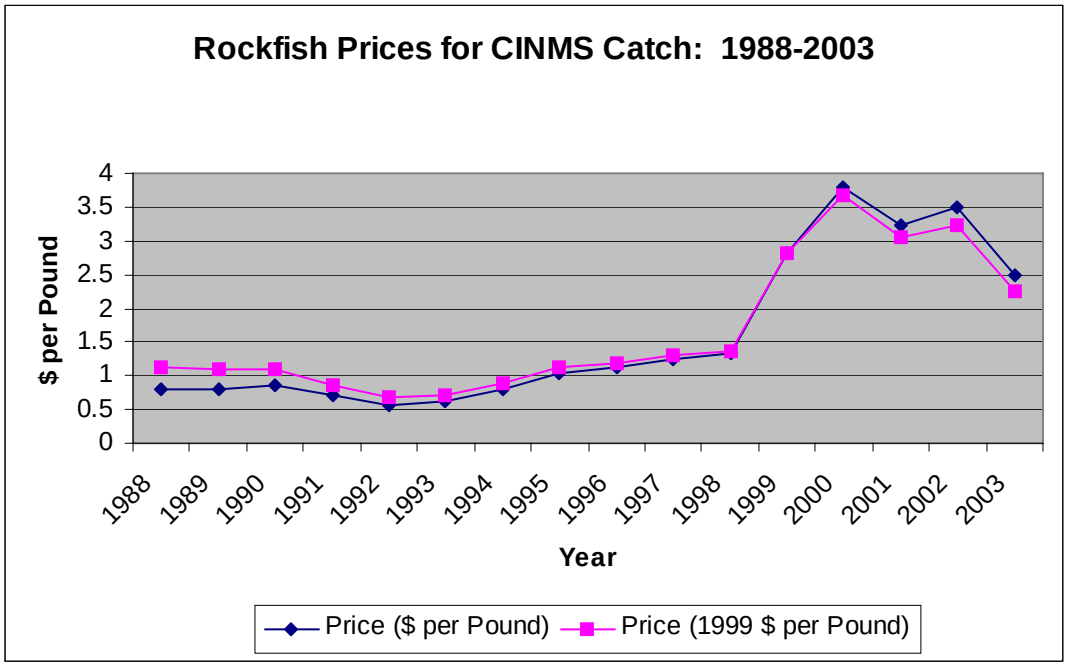
APPENDIX C


Squid Prices for CINMS Catch: 1988-2003
$ per Pound
0.3
0.25
0.2
0.15
0.1
0.05
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

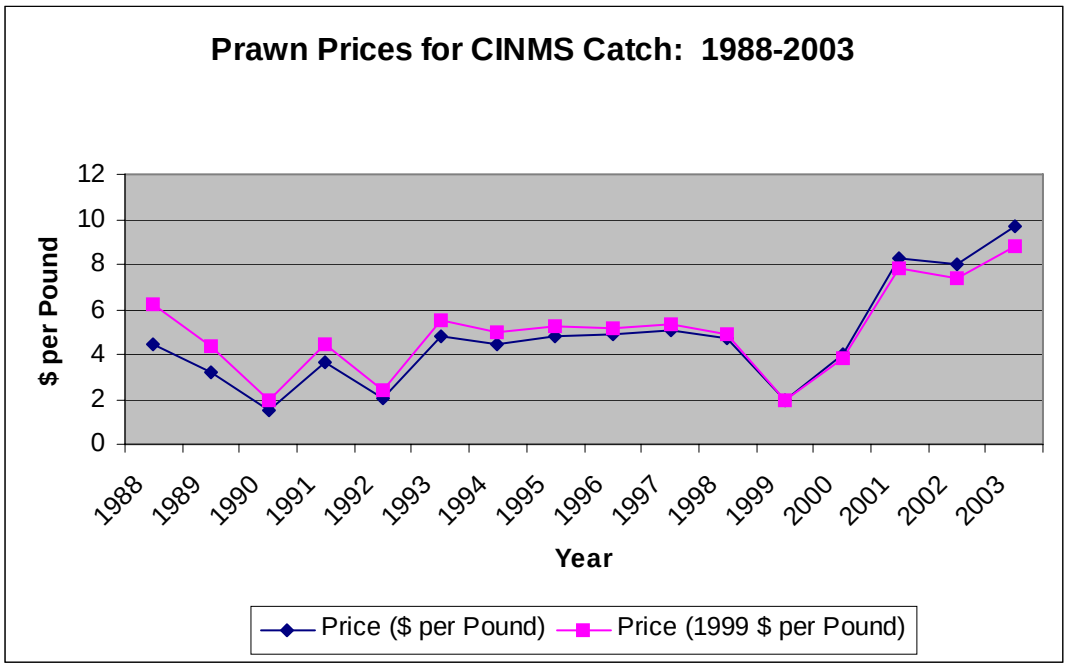

Urchin Prices for CINMS Catch: 1988-2003
$ per Pound
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

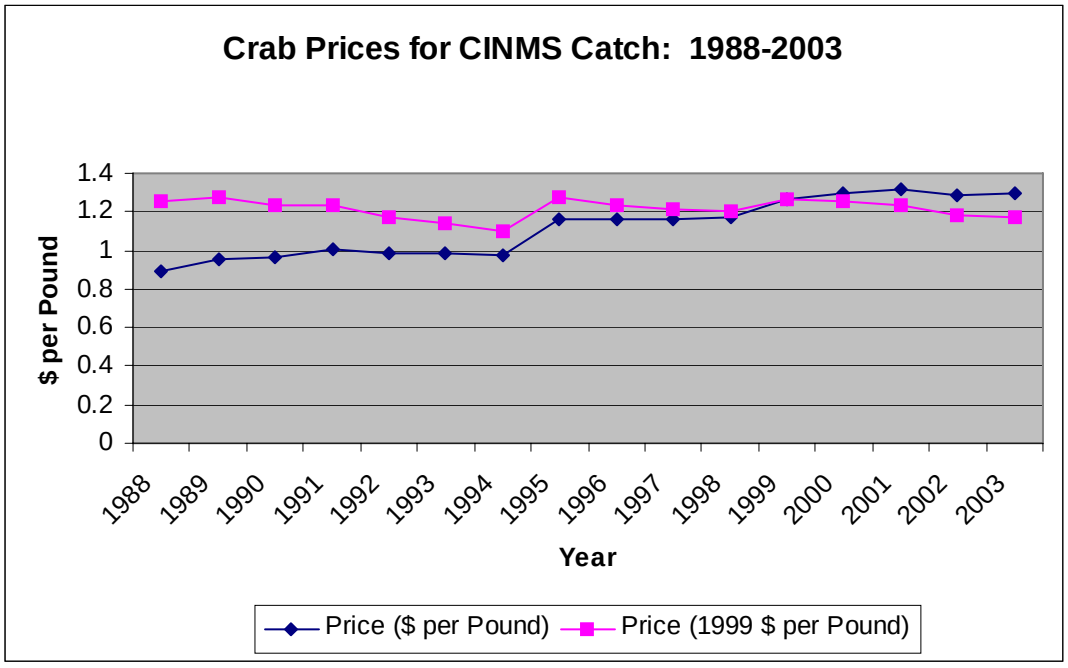
APPENDIX C


Spiny Lobster Prices for CINMS Catch: 1988-2003
$ per Pound
0
2
4
6
8
10
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

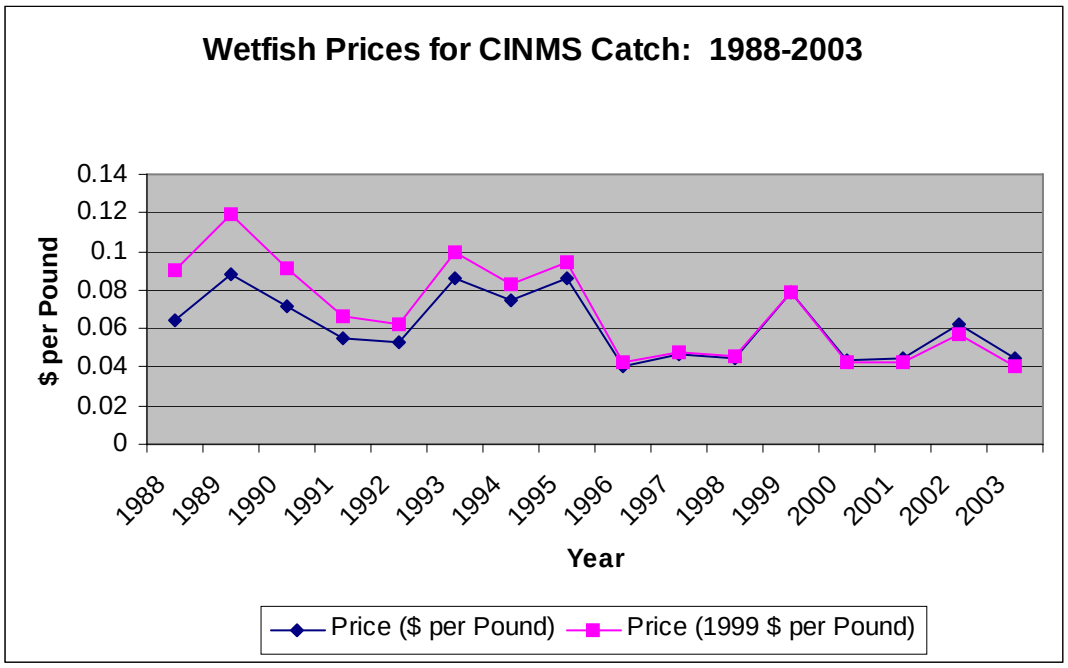

Rockfish Prices for CINMS Catch: 1988-2003
$ per Pound
0
0.5
1
1.5
2
2.5
3
3.5
4
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

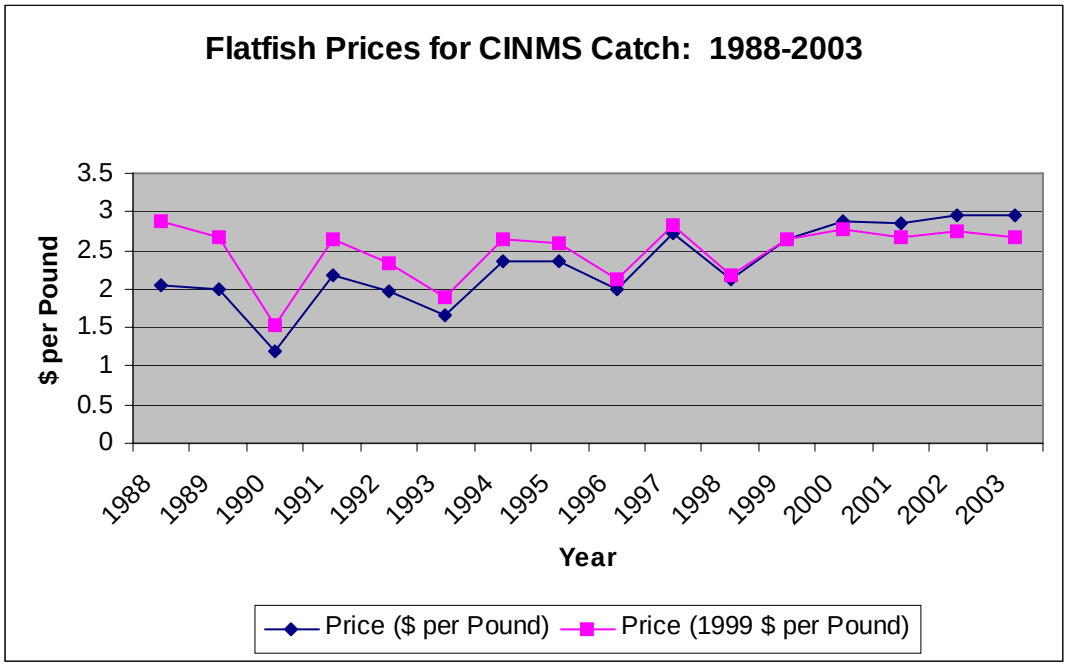
APPENDIX C


Prawn Prices for CINMS Catch: 1988-2003
$ per Pound
12
10
8
6
4
2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

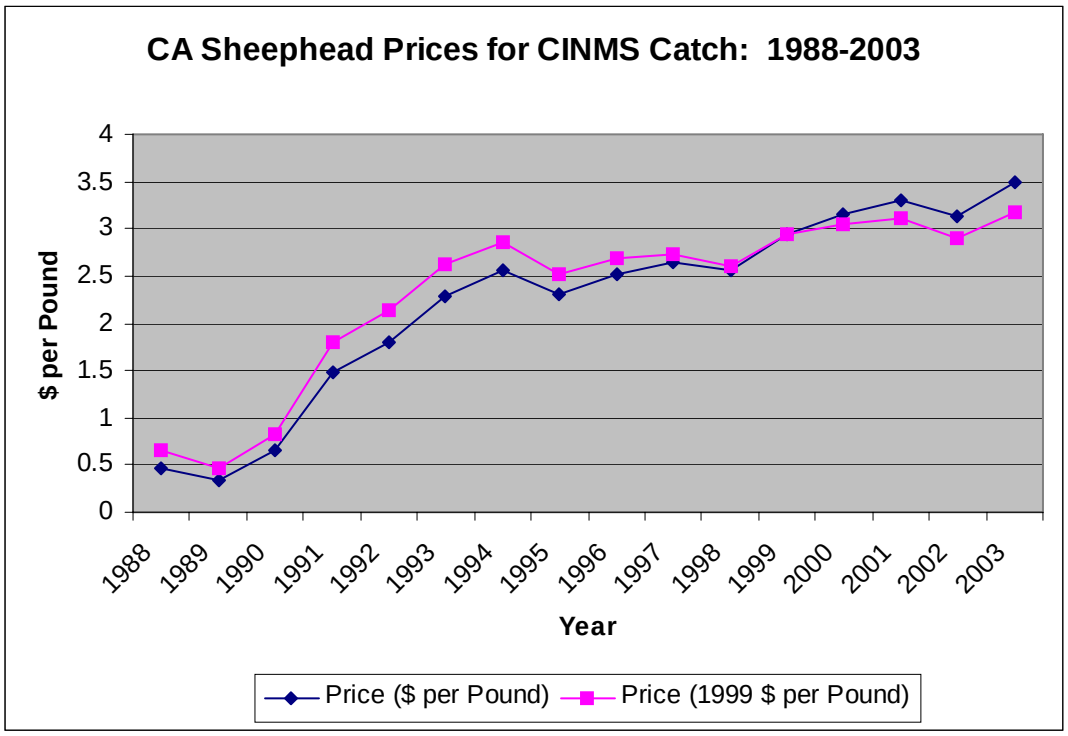

Crab Prices for CINMS Catch: 1988-2003
$ per Pound
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

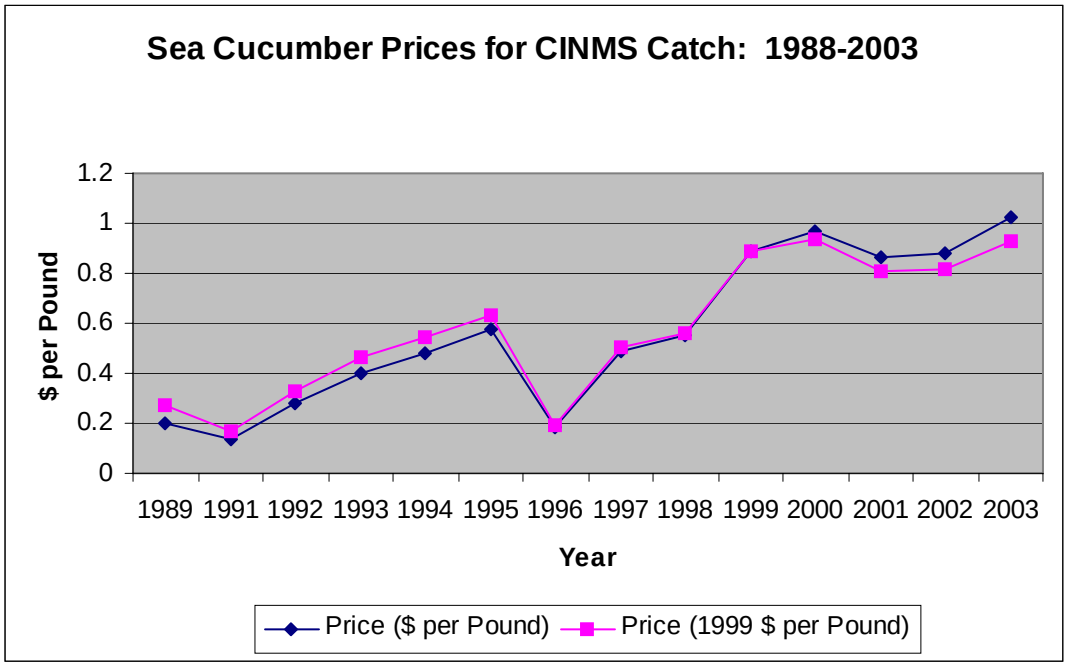
APPENDIX C


Wetfish Prices for CINMS Catch: 1988-2003
$ per Pound
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

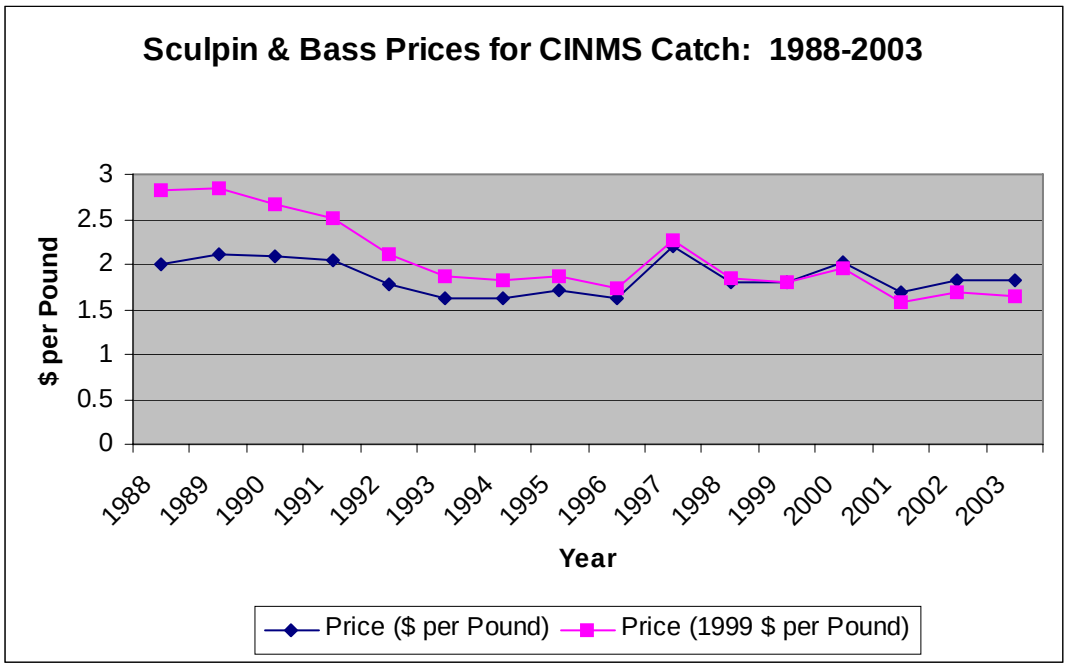

Flatfish Prices for CINMS Catch: 1988-2003
$ per Pound
3.5
3
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

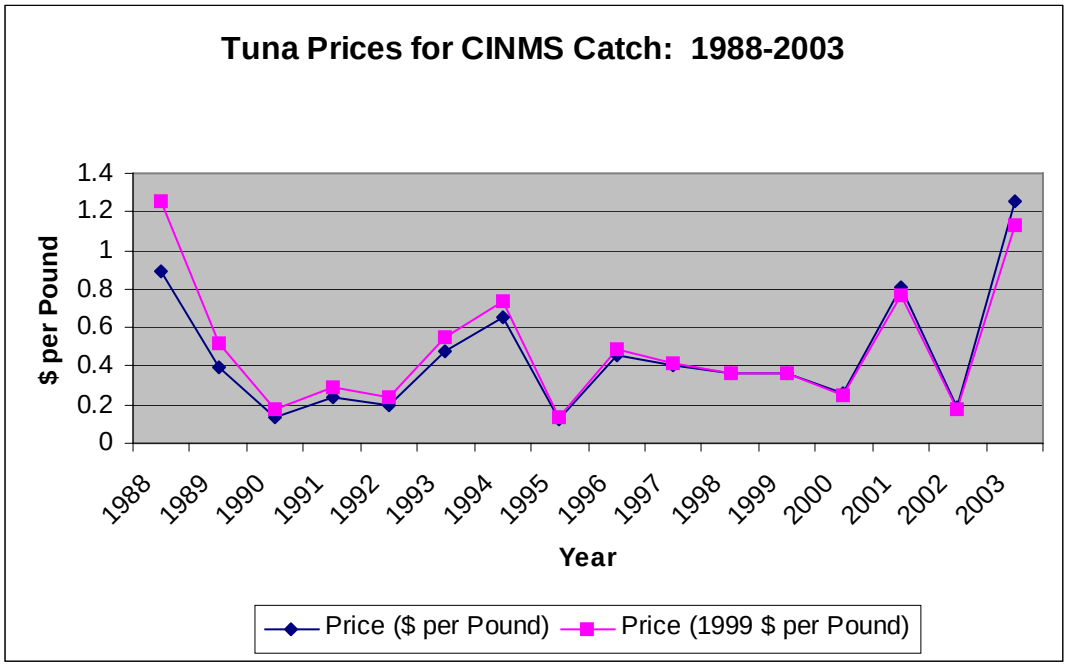
APPENDIX C


CA Sheephead Prices for CINMS Catch: 1988-2003
$ per Pound
0
0.5
1
1.5
2
2.5
3
3.5
4
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)


Sea Cucumber Prices for CINMS Catch: 1988-2003
$ per Pound
0
0.2
0.4
0.6
0.8
1
1.2
1989
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

APPENDIX C


Sculpin & Bass Prices for CINMS Catch: 1988-2003
$ per Pound
3
2.5
2
1.5
1
0.5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)


Tuna Prices for CINMS Catch: 1988-2003
$ per Pound
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

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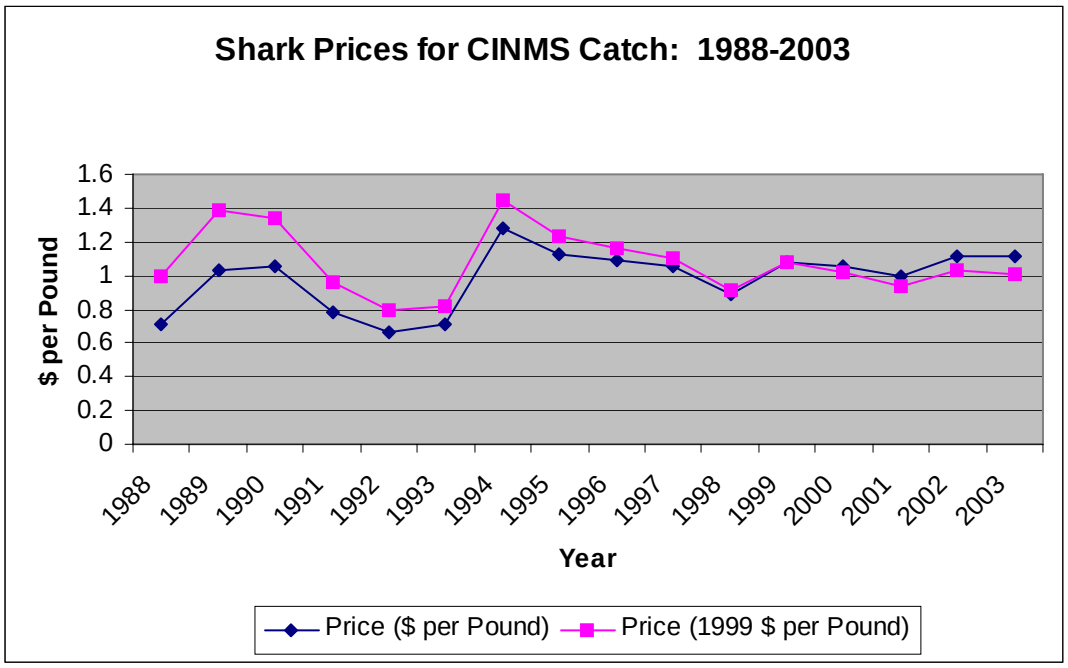
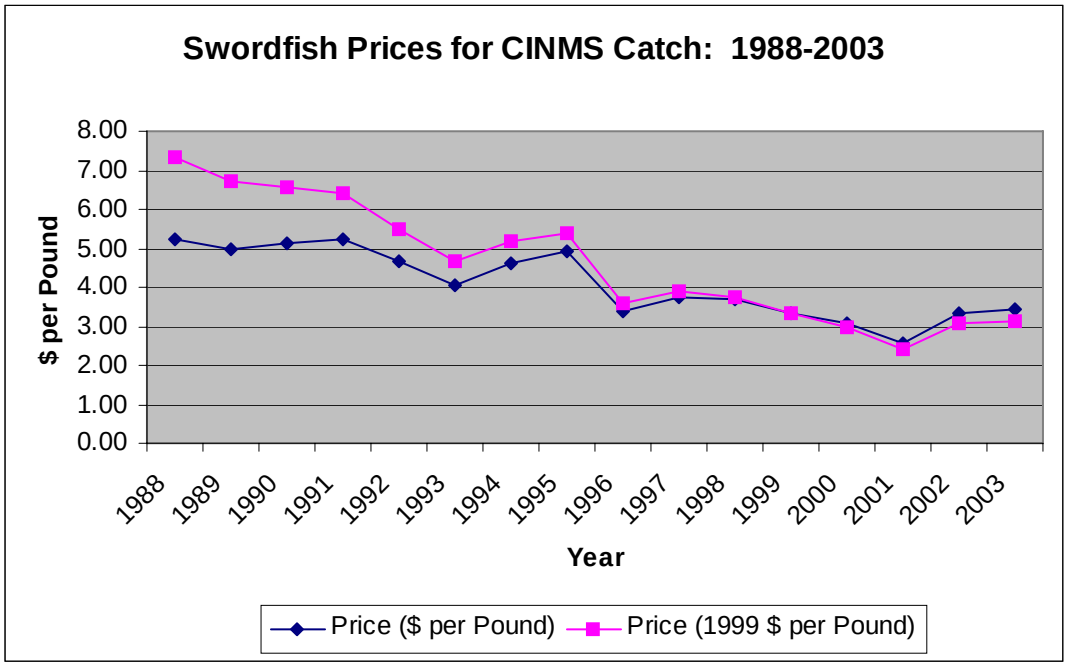
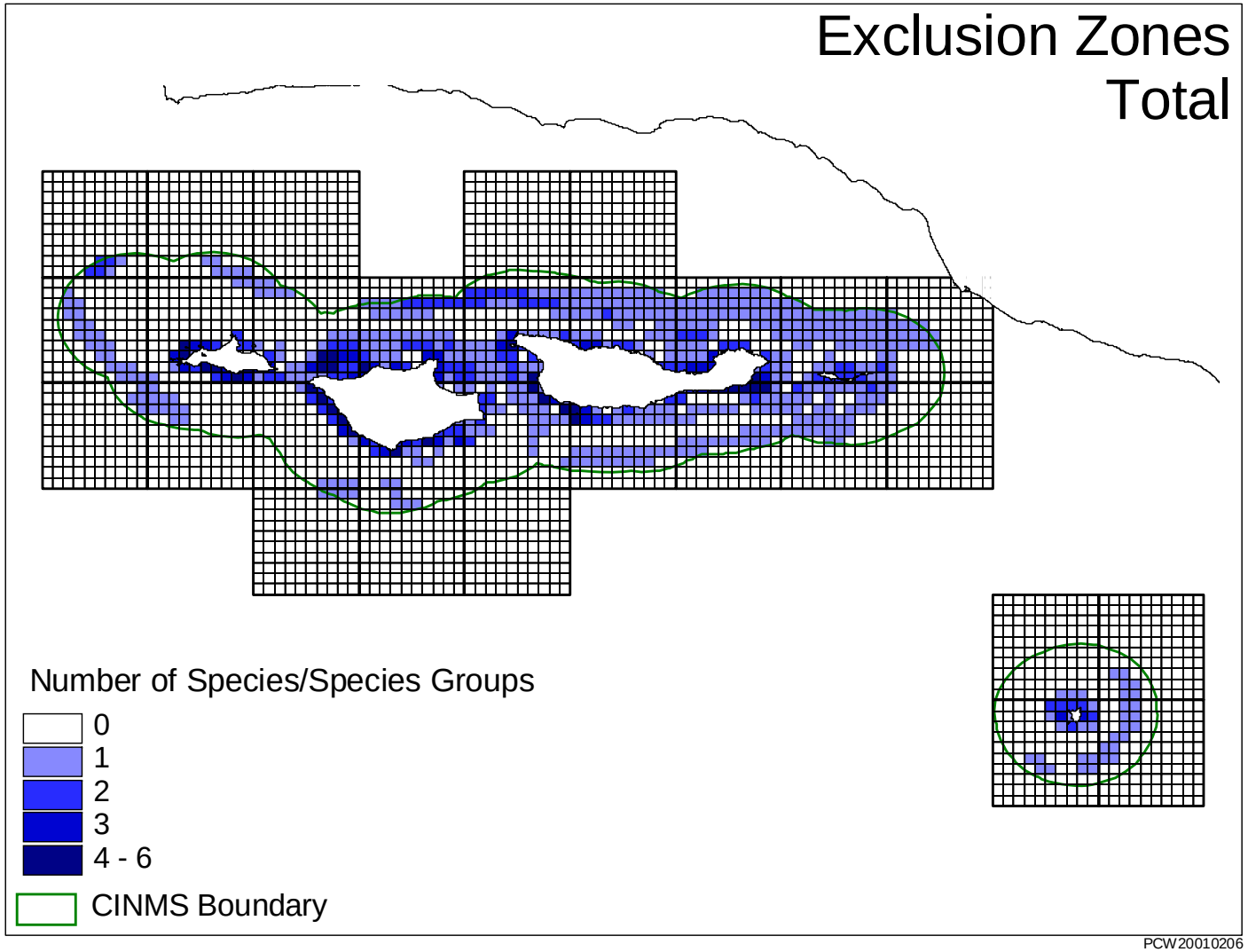
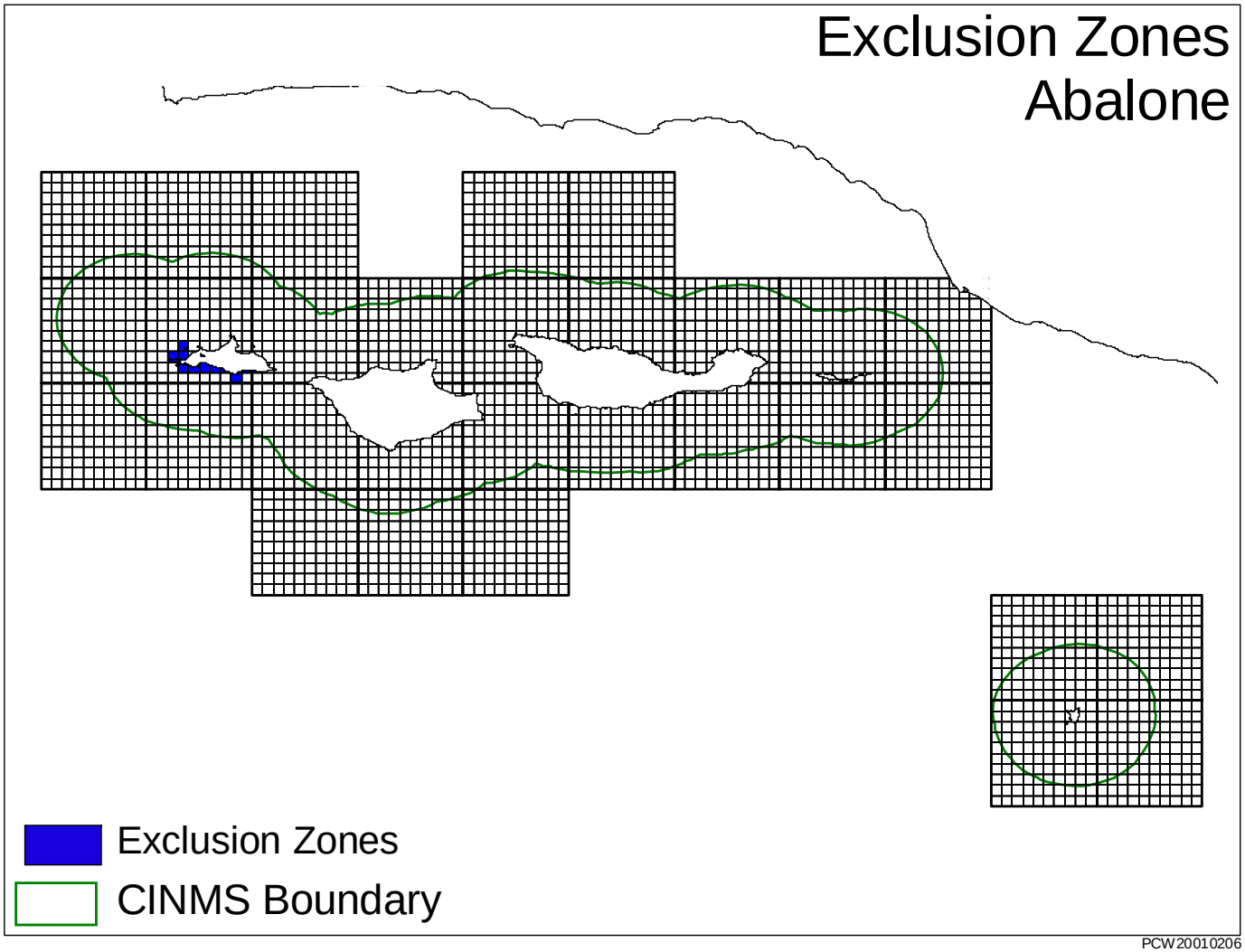

Shark Prices for CINMS Catch: 1988-2003
$ per Pound
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)


Swordfish Prices for CINMS Catch: 1988-2003
$ per Pound
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
Year
Price ($ per Pound)
Price (1999 $ per Pound)

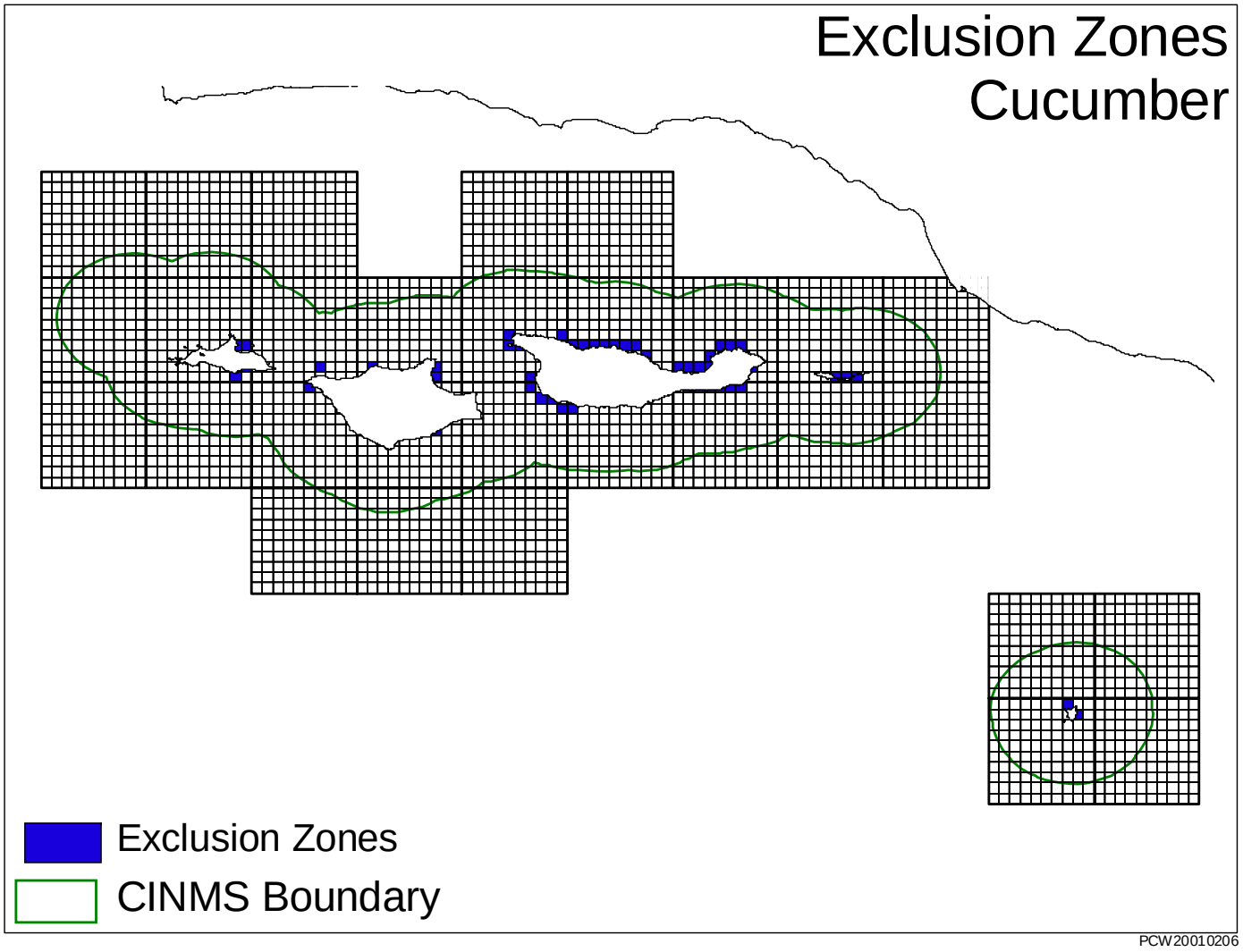
APPENDIX C


Exclusion Zones
Total
Number of Species/Species Groups
0
1
2
3
4 - 6
CINMS Boundary
PCW20010206

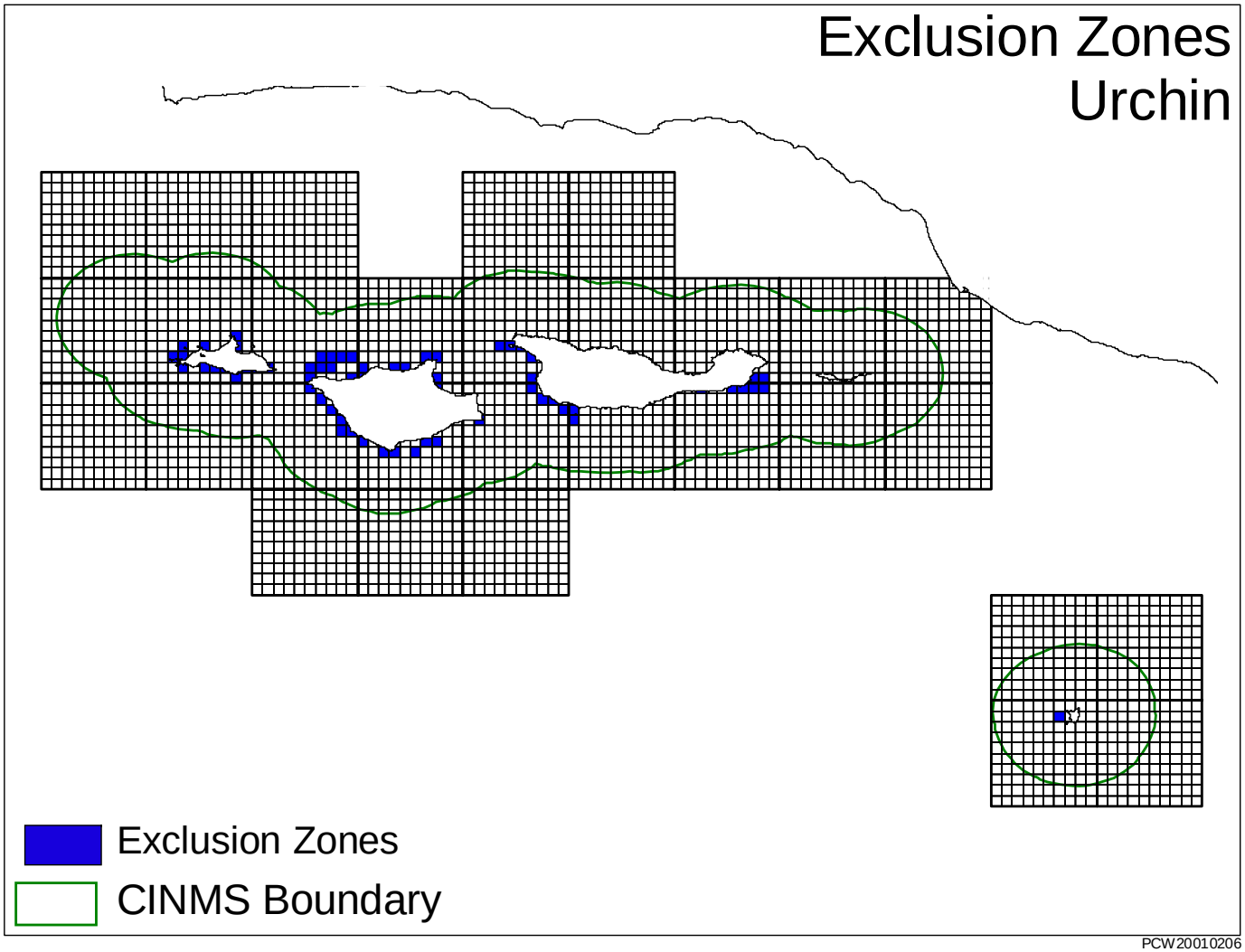
APPENDIX C


Exclusion Zones
Abalone
Exclusion Zones
CINMS Boundary
PCW20010206

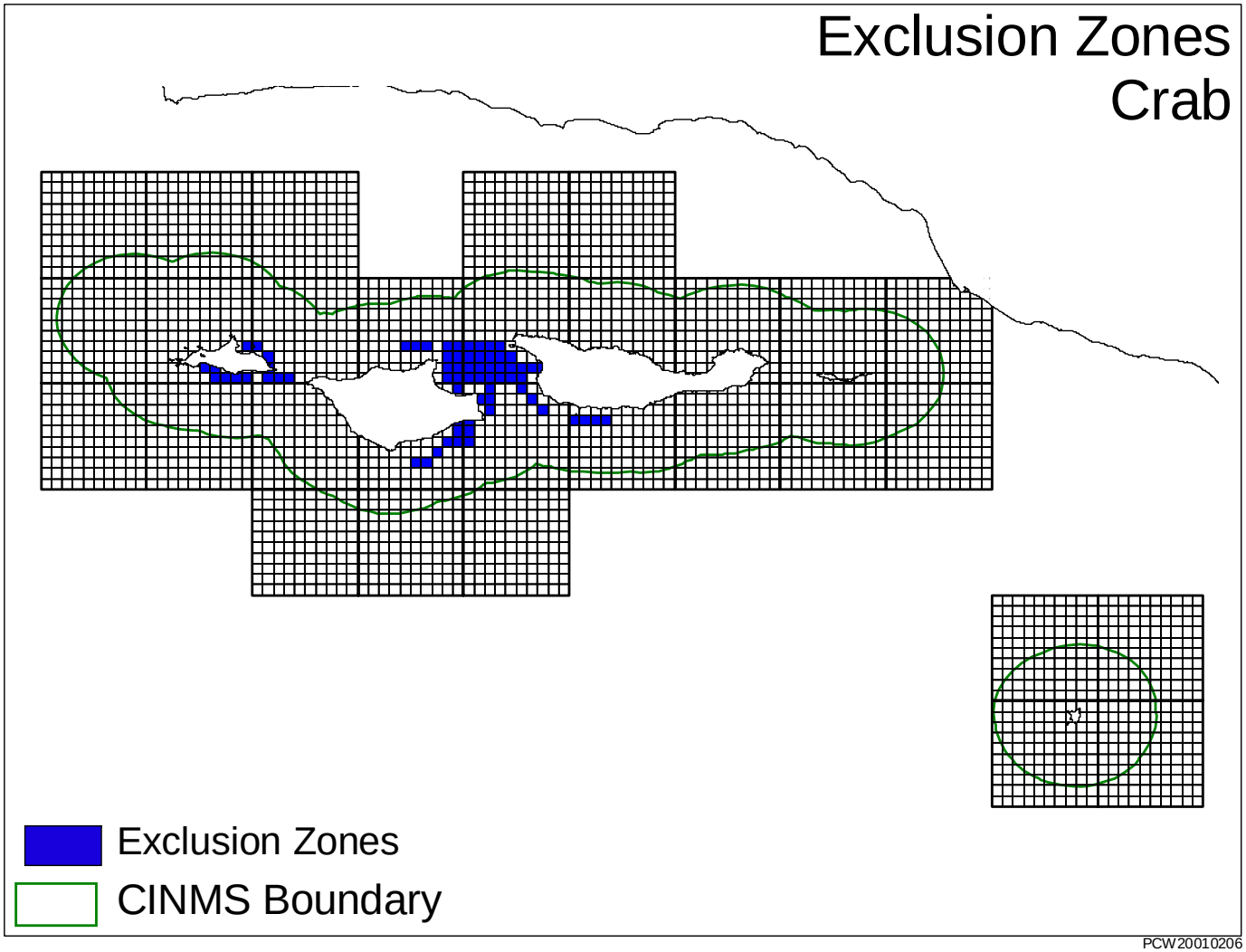
APPENDIX C


Exclusion Zones
Cucumber
Exclusion Zones
CINMS Boundary
PCW20010206

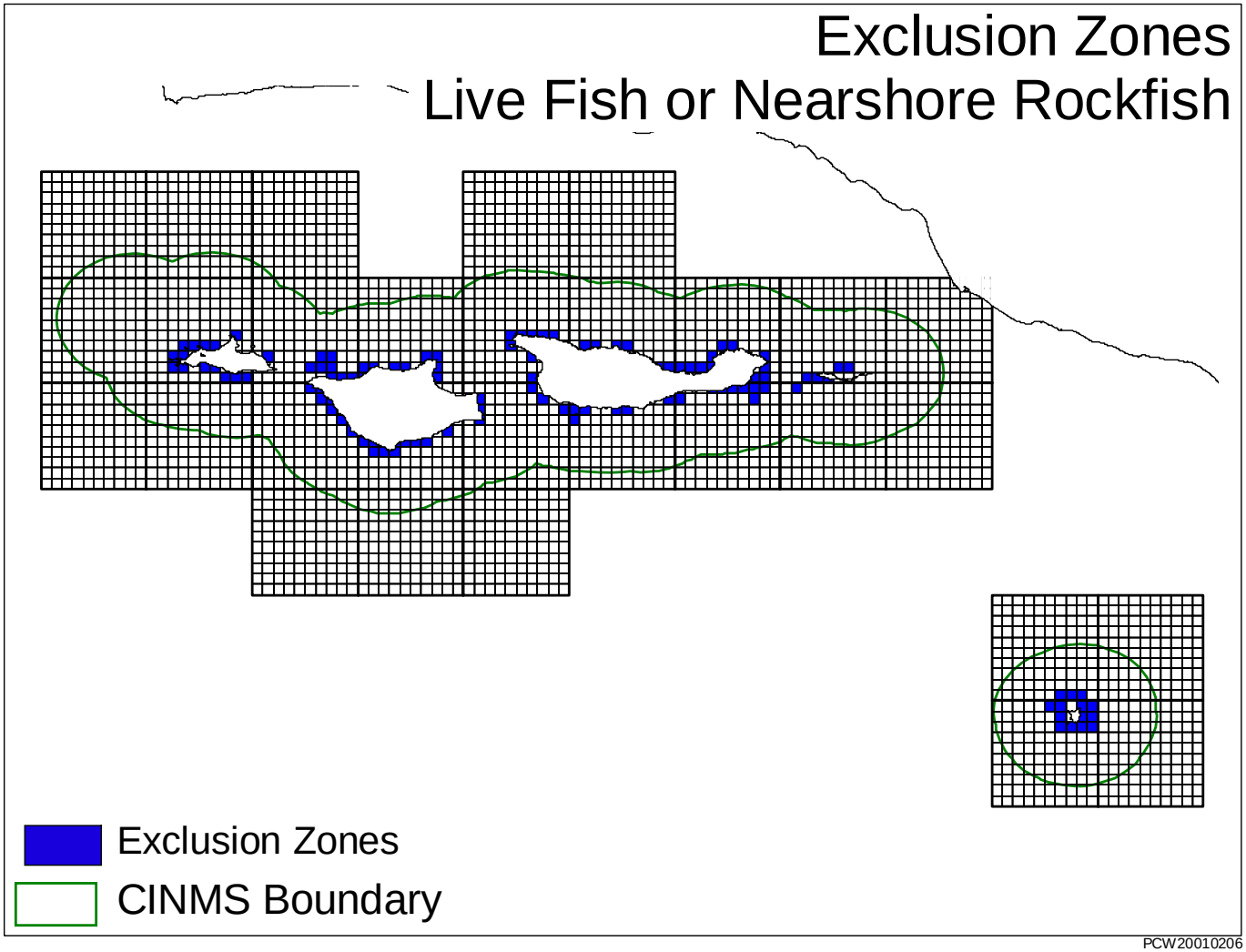
APPENDIX C


Exclusion Zones
Urchin
Exclusion Zones
CINMS Boundary
PCW20010206

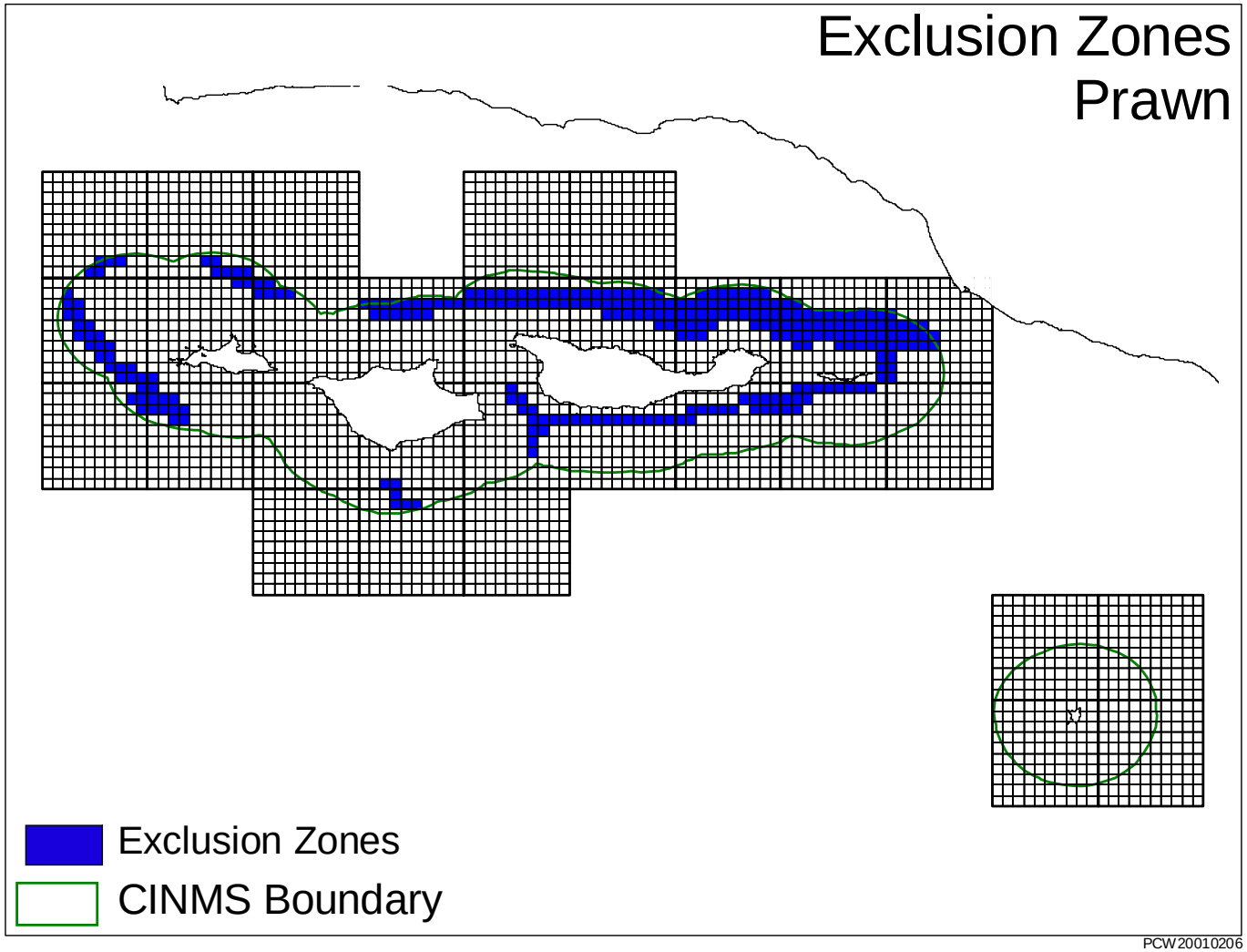
APPENDIX C


Exclusion Zones
Crab
Exclusion Zones
CINMS Boundary
PCW20010206

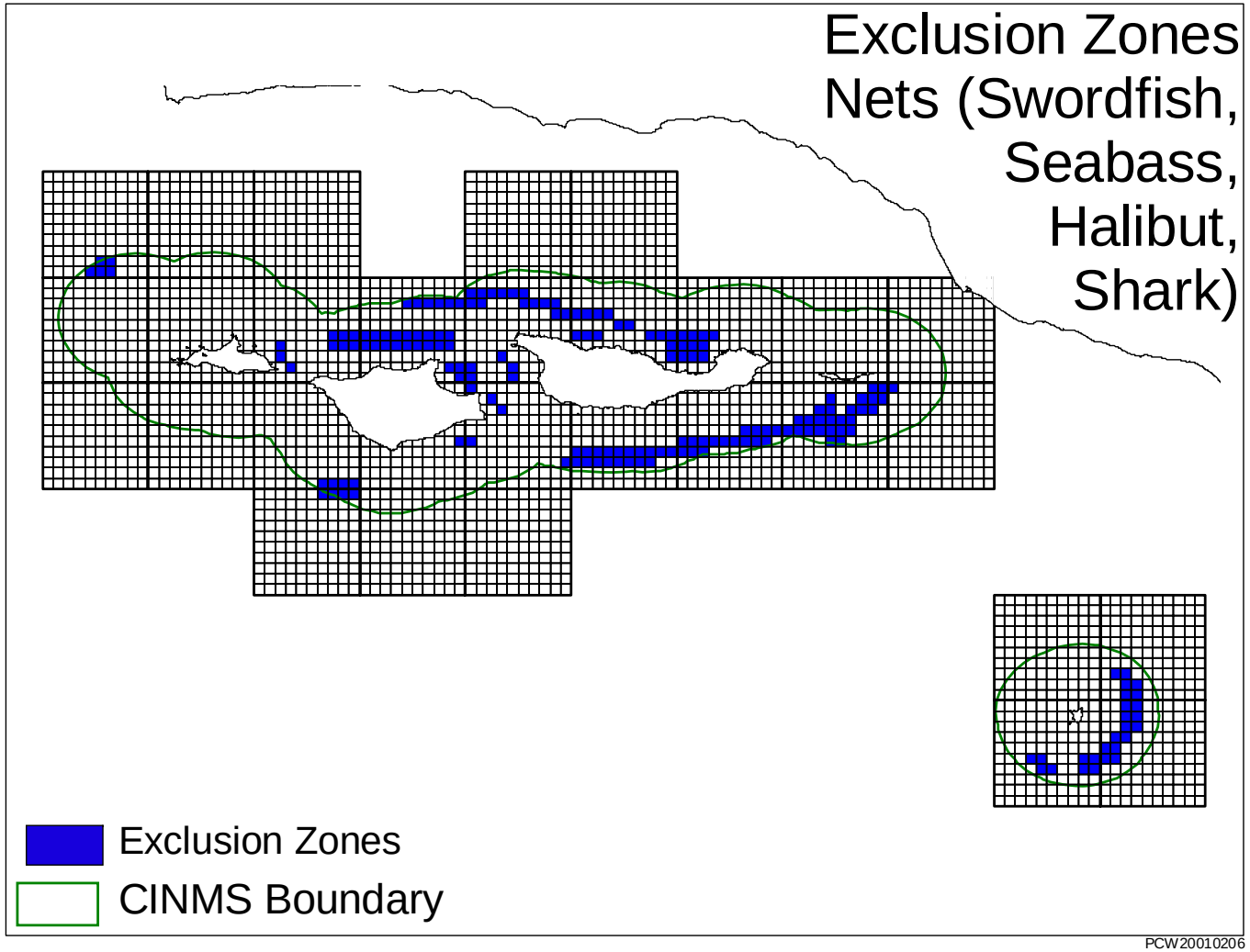
APPENDIX C


Exclusion Zones
Live Fish or Nearshore Rockfish
Exclusion Zones
CINMS Boundary
PCW20010206

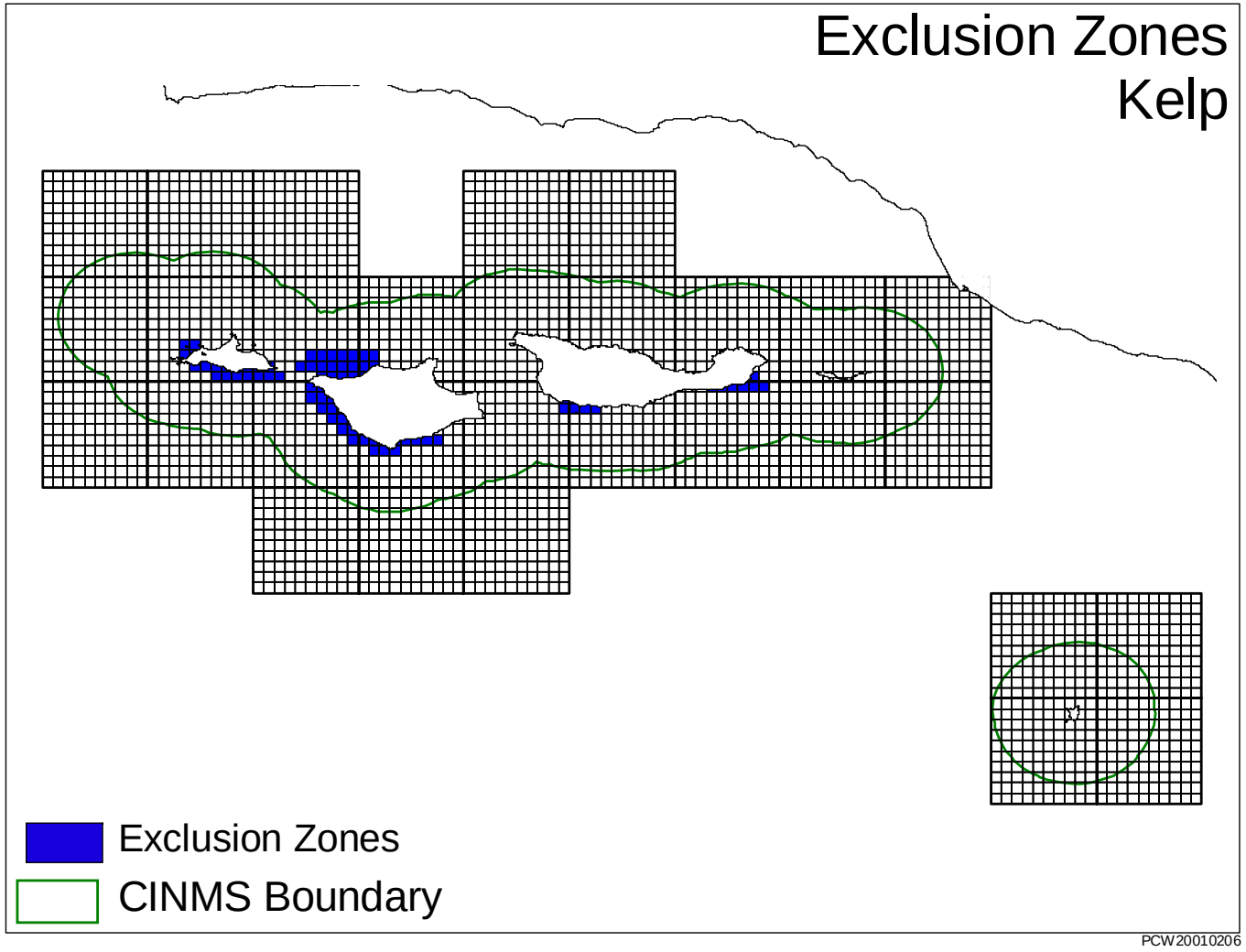
APPENDIX C


Exclusion Zones
Prawn
Exclusion Zones
CINMS Boundary
PCW20010206

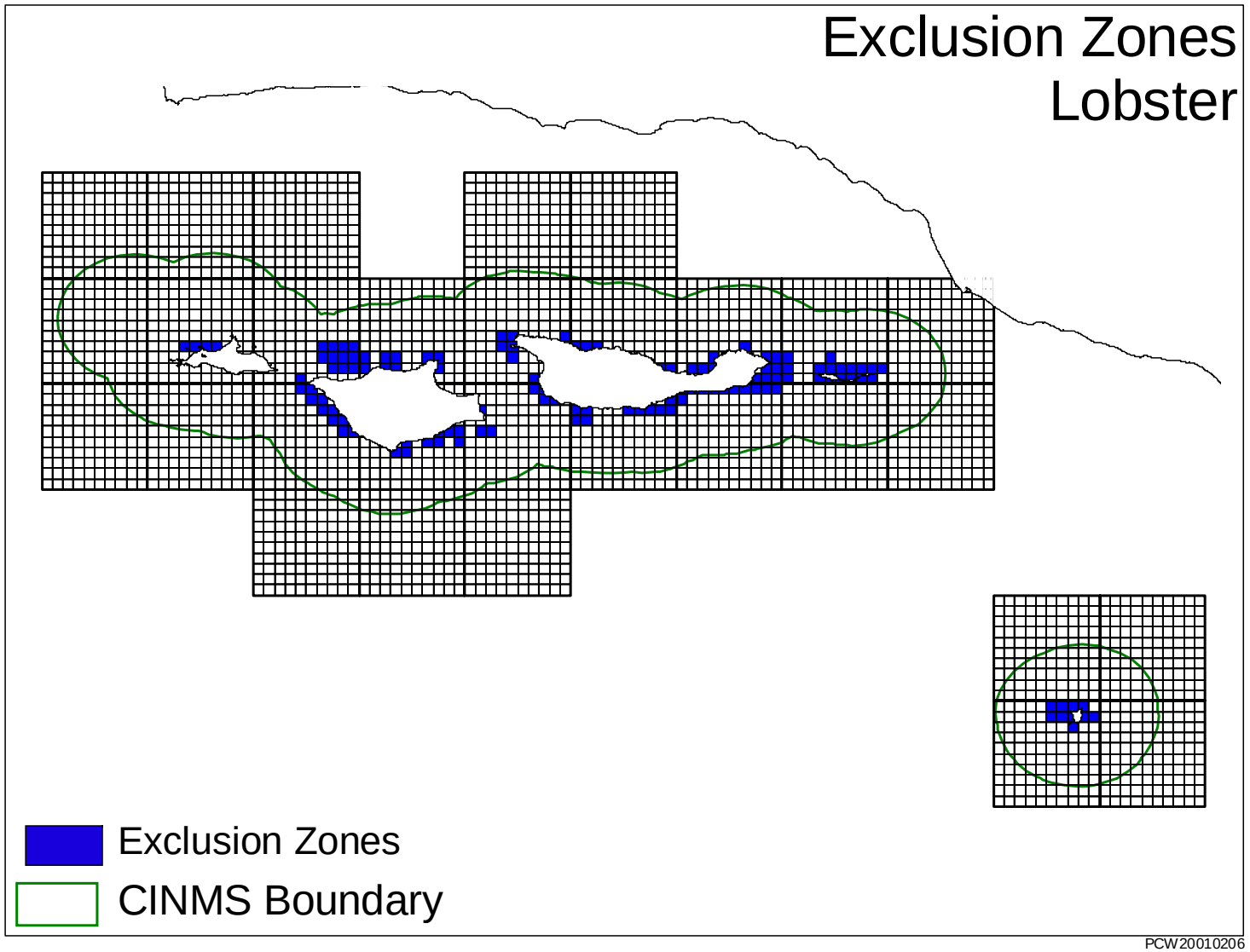
APPENDIX C


Exclusion Zones
Nets (Swordfish,
Seabass,
Halibut,
Shark)
Exclusion Zones
CINMS Boundary
PCW20010206

APPENDIX C


Exclusion Zones
Kelp
Exclusion Zones
CINMS Boundary
PCW20010206

APPENDIX C


Exclusion Zones
Lobster
Exclusion Zones
CINMS Boundary
PCW20010206

APPENDIX C

Recreation

CONSUMPTIVE ACTIVITIES

Charter/party boat fishing

The original data for this activity was collected under contract by Dr. Charles Kolstad of UC Santa Barbara. The charter/party operations in this survey are a *census* of operators, therefore this data represents the population, not a sample. The unit of observation in the survey was a firm, many of which operate multiple boats (the data was not collected by boat). Data was collected in one by one minute square grid cells within the study area. In the Kolstad survey, 18 operators were surveyed for a total of 158,768 person-days of activity in the study area.

These data were updated in March of 2005 using the California Department of Fish and Game log book data from 2003. Because this data did not include person-days and was only available at a 10 by 10 minute resolution, some processing was necessary. Person-days were estimated by using the number of anglers per trip for single day trips. For those observations not designated as single day trips, person-days was calculated by dividing the number of angler hours by eight, then multiplying the result by the number of anglers. To translate this data into the one by one minute grid used in the analysis, the sum of the data in the study area was used as a control total and distributed according to the Kolstad data distribution.

Charter/party boat consumptive diving

This original data was also collected under contract by Dr. Kolstad. The charter/party operations in this survey are a *census* of operators, therefore this data is the population, not a sample. The unit of observation in the survey was a firm, many of which operate multiple boats (the data was not collected by boat). Data was collected in one by one minute square grid cells within the study area. For charter/party boat consumptive diving, 10 operators were surveyed for a total of 17,935 person-days of activity in the study area.

These data were also updated in March of 2005 using the California Department of Fish and Game log book data from 2003. Because this data did not include person-days and was only available at a 10 by 10 minute resolution, the same processing that was done for charter/party boat fishing was necessary.

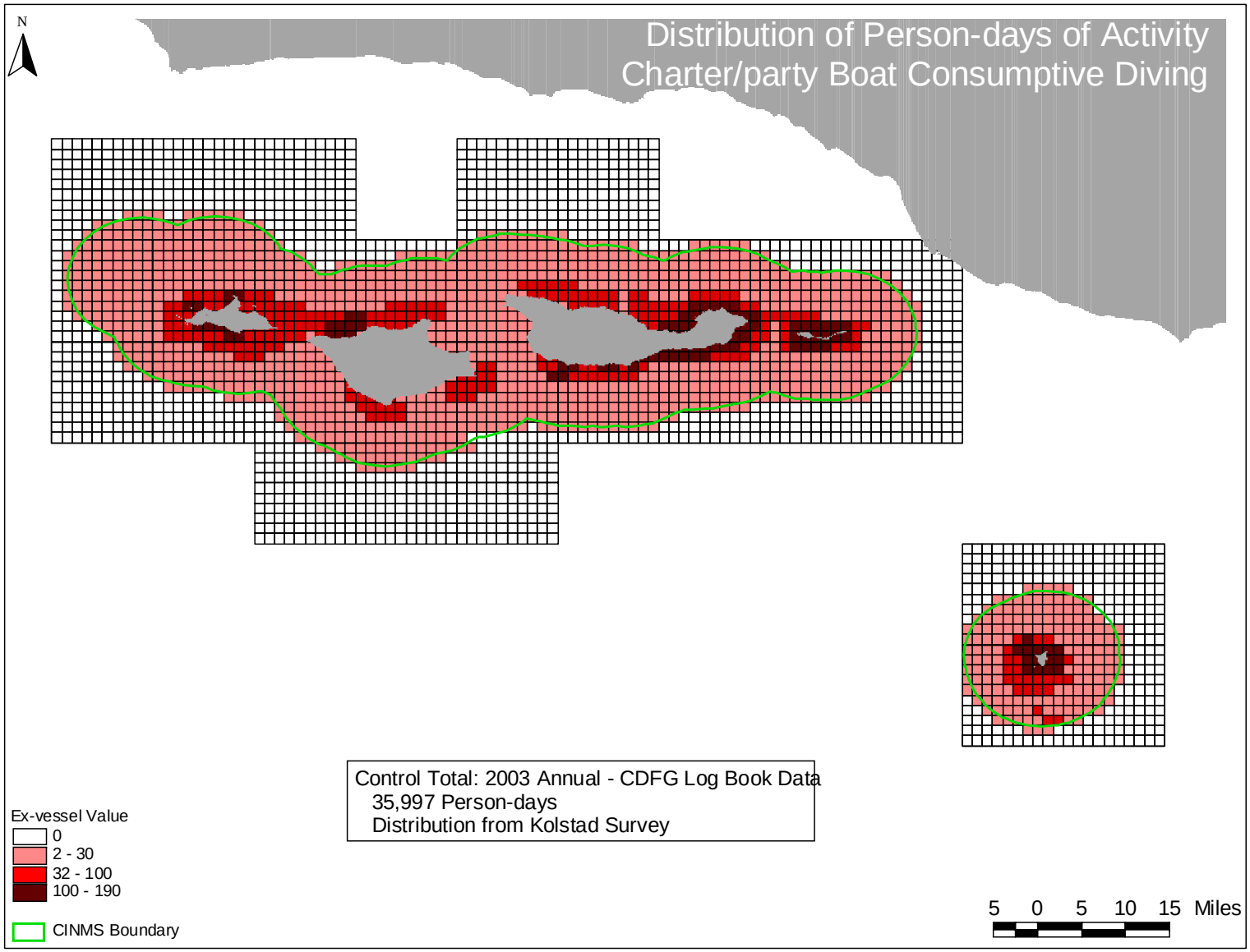
Private boat fishing

The distribution of private boat activities was pieced together using multiple sources of information/data with varying degrees of specificity and geographic coverage. In general, data was placed in the grid cells for which it was available, then using the assumption that the relative distribution was the same for private boat fishing and charter/party boat fishing, values for grid-cell containing no data were estimated based on the relationship between charter/party boat fishing grid-cell values. Data sources included the Channel Islands National Park, The Nature Conservancy, Yacht Clubs (two out of seven contacted), and a Marina. Based on the above methodology, it is estimated that there are 214,015 person-days of private boat fishing annually in the study area.

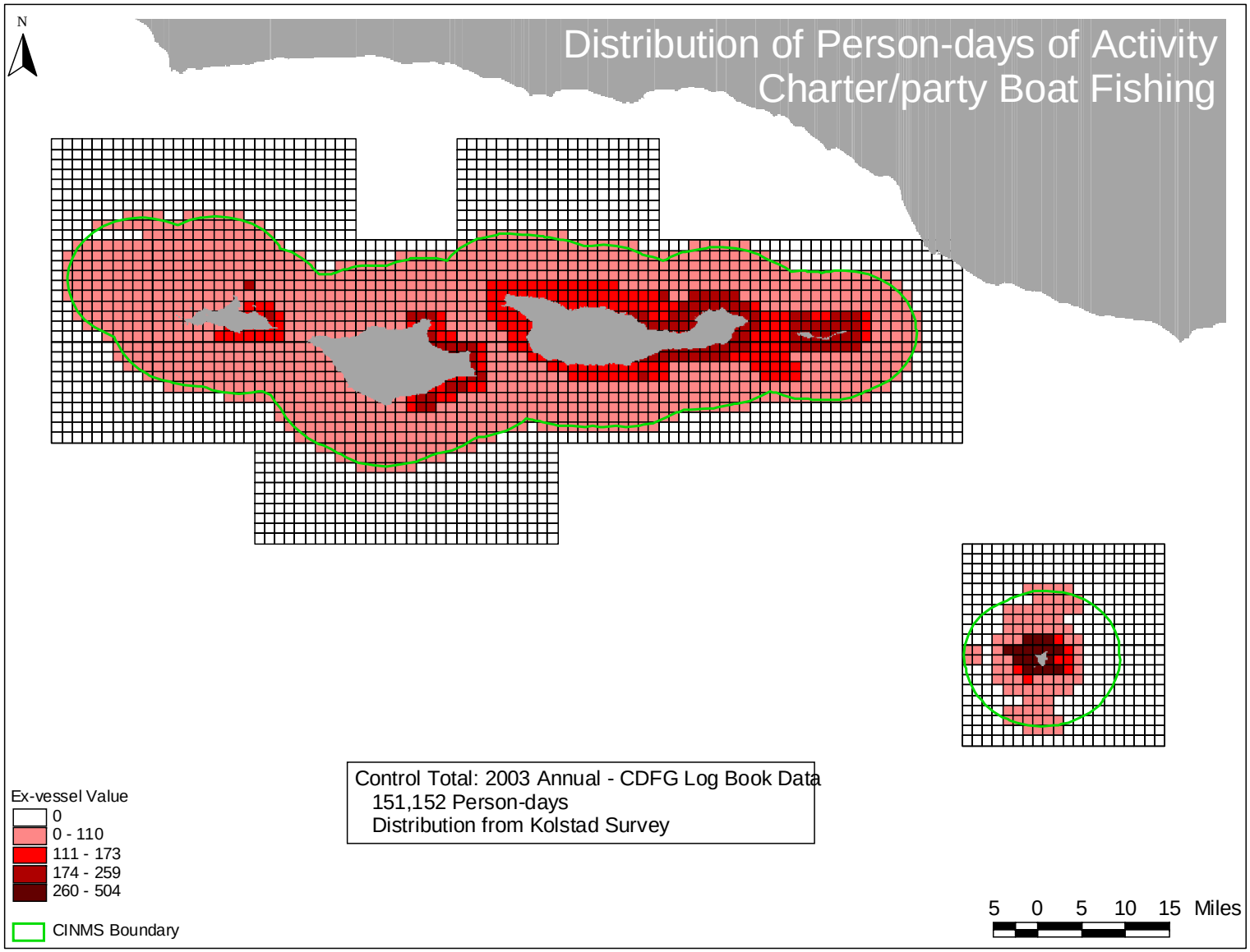
Private boat diving

The distribution of private boat diving was derived in the same way as was private boat fishing. In general, data was placed in the grid cells for which it was available, then using the assumption that the relative distribution was the same for private boat fishing and charter/party boat fishing, values for grid-cell containing no data were estimated based on the relationship between charter/party boat fishing grid-cell values. Data sources included the Channel Islands National Park, The Nature Conservancy, Yacht Clubs, and a Marina. Based on the above methodology, it is estimated that there are 47,190 person-days of private boat fishing annually in the study area.

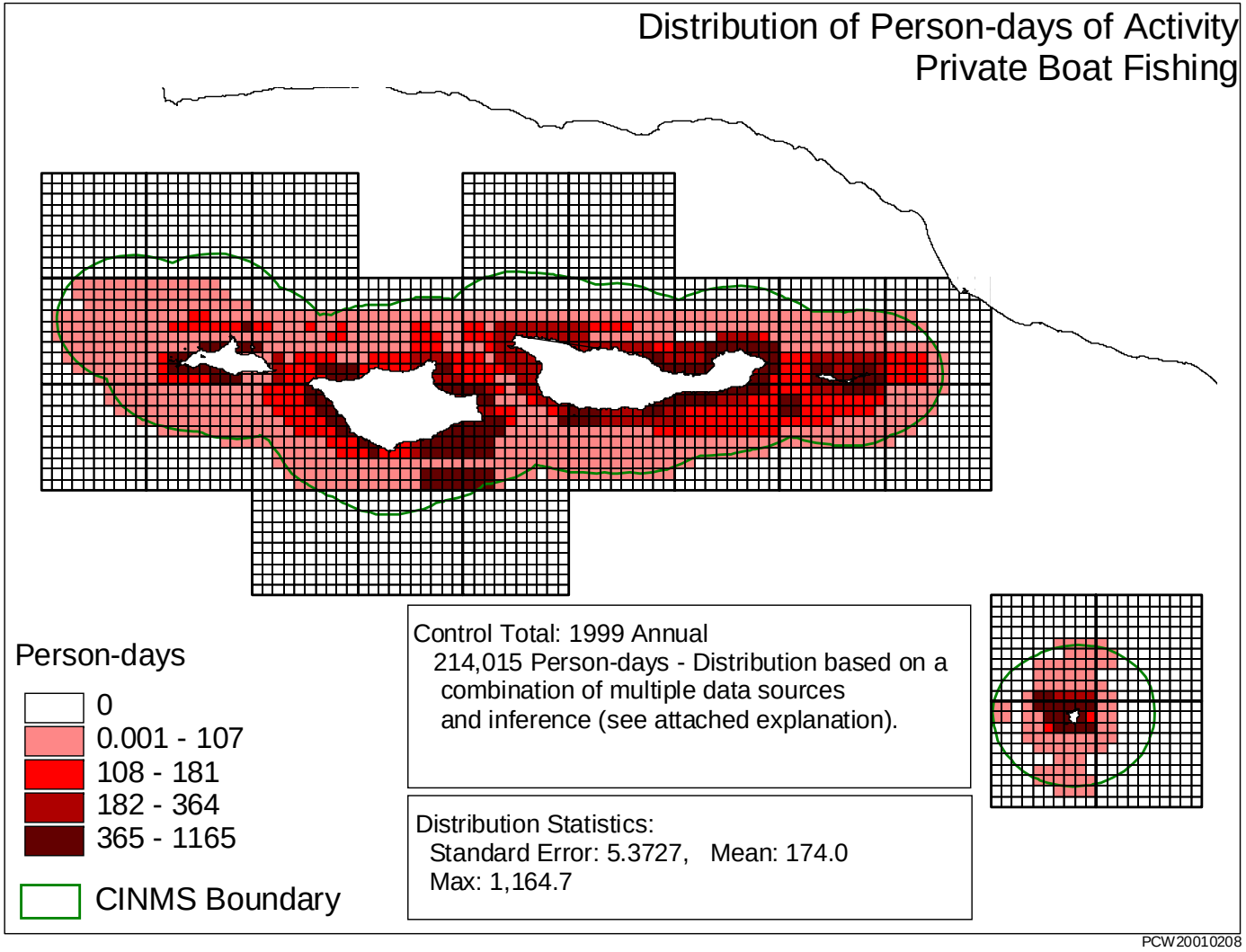
APPENDIX C


N
Distribution of Person-days of Activity
Charter/party Boat Consumptive Diving
Control Total: 2003 Annual - CDFG Log Book Data
35,997 Person-days
Distribution from Kolstad Survey
Ex-vessel Value
0
2 - 30
32 - 100
100 - 190
CINMS Boundary
5 0 5 10 15 Miles
PCW20050316

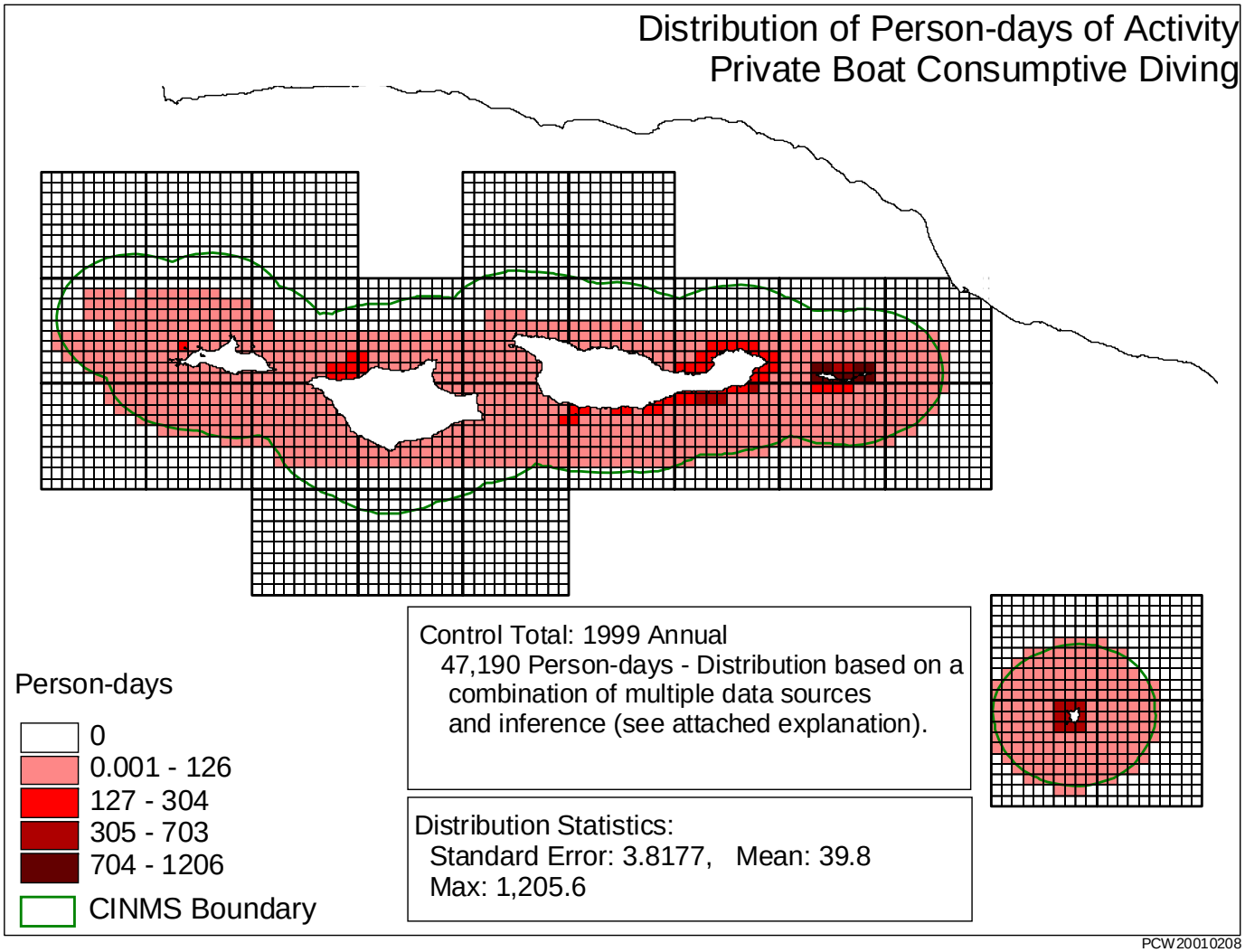
APPENDIX C


N
Distribution of Person-days of Activity
Charter/party Boat Fishing
Control Total: 2003 Annual - CDFG Log Book Data
151,152 Person-days
Distribution from Kolstad Survey
Ex-vessel Value
0
0 - 110
111 - 173
174 - 259
260 - 504
CINMS Boundary
5 0 5 10 15 Miles
PCW20050316

APPENDIX C


Distribution of Person-days of Activity
Private Boat Fishing
Person-days
0
0.001 - 107
108 - 181
182 - 364
365 - 1165
CINMS Boundary
Control Total: 1999 Annual
214,015 Person-days - Distribution based on a combination of multiple data sources and inference (see attached explanation).
Distribution Statistics:
Standard Error: 5.3727, Mean: 174.0
Max: 1,164.7
PCW20010208

APPENDIX C


Distribution of Person-days of Activity
Private Boat Consumptive Diving
Person-days
0
0.001 - 126
127 - 304
305 - 703
704 - 1206
CINMS Boundary
Control Total: 1999 Annual
47,190 Person-days - Distribution based on a combination of multiple data sources and inference (see attached explanation).
Distribution Statistics:
Standard Error: 3.8177, Mean: 39.8
Max: 1,205.6
PCW20010208

APPENDIX C

Recreation

NON-CONSUMPTIVE ACTIVITIES

The impact model for non-consumptive activities is under final review. Parameters will be finalized in the near future. Per-person-per-day consumer's surplus and the sources for the expenditure profile for non-consumptive activities are being examined and if necessary, revised.

Whale watching

This data was collected under contract by Dr. Charles Kolstad of UC Santa Barbara. The charter/party operations in this survey are a *census* of operators, therefore this data represents the population, not a sample. The unit of observation in the survey was a firm, many of which operate multiple boats (the data was not collected by boat). Data was collected in one by one minute square grid cells within the study area. For charter/party boat fishing, 8 operators were surveyed for a total of 25,984 person-days of activity in the study area. We were unable to locate any sources for private boat whale watching.

Non-consumptive diving

This data was also collected under contract by Dr. Kolstad. The charter/party operations in this survey are a *census* of operators, therefore this data is the population, not a sample. The unit of observation in the survey was a firm, many of which operate multiple boats (the data was not collected by boat). Data was collected in one by one minute square grid cells within the study area. For charter/party boat non-consumptive diving, 7 operators were surveyed for a total of 10,776 person-days of activity in the study area. In some cases operators engaged in both consumptive and non-consumptive diving. In these cases the person-days of each was provided separately.

Sailing

This data was also collected as part of Dr. Kolstad's survey. 8 charter sailing operators were surveyed for a total of 4,015 person-days of activity in the study area.

Kayaking/Island Sightseeing

This data was also collected as part of Dr. Kolstad's survey. 4 operators were surveyed for a total of 1,233 person-days of activity in the study area.

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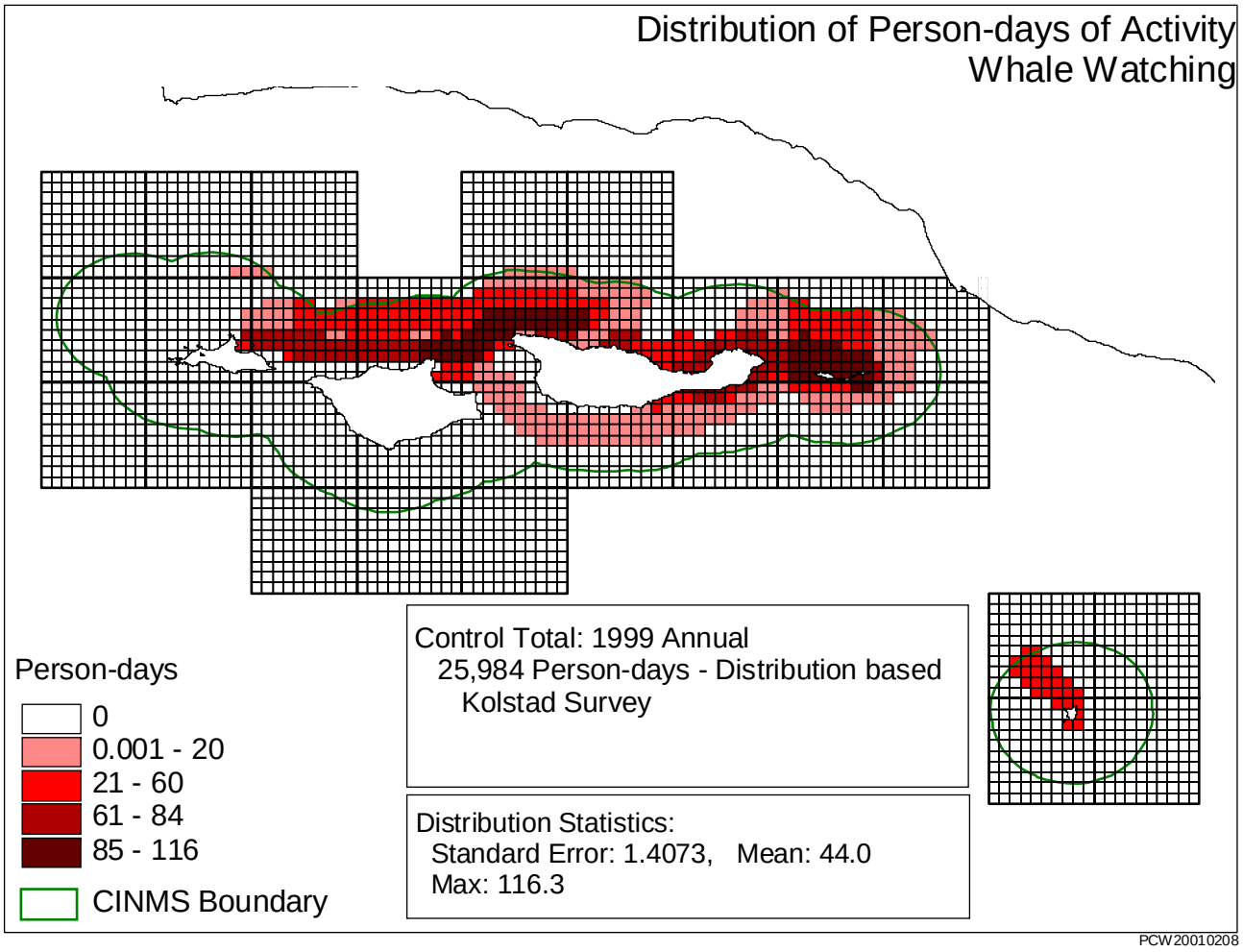
Distribution of Person-days of Activity
Whale Watching
Person-days
0
0.001 - 20
21 - 60
61 - 84
85 - 116
CINMS Boundary
Control Total: 1999 Annual
25,984 Person-days - Distribution based
Kolstad Survey
Distribution Statistics:
Standard Error: 1.4073, Mean: 44.0
Max: 116.3
PCW20010208

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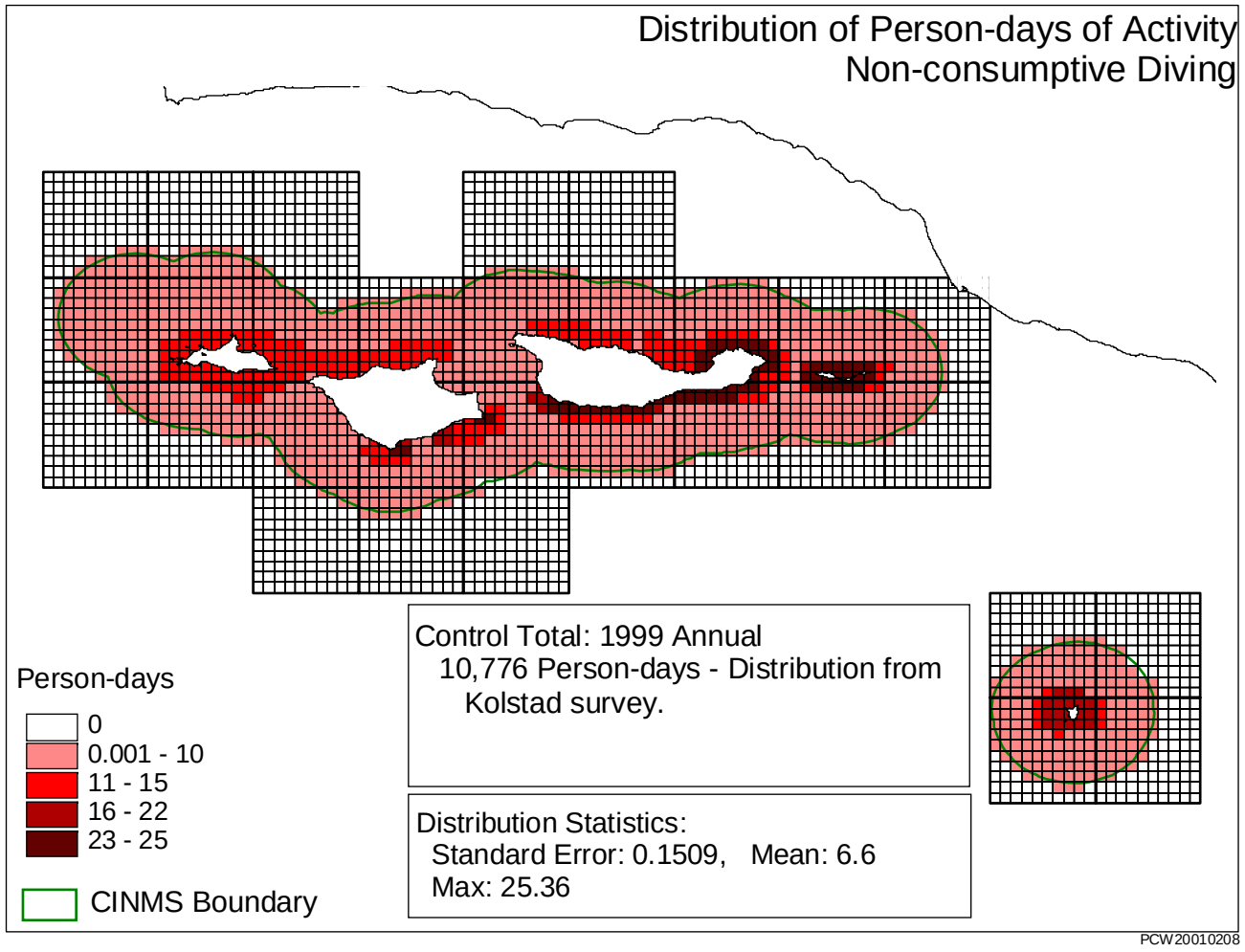
Distribution of Person-days of Activity
Non-consumptive Diving
Person-days
0
0.001 - 10
11 - 15
16 - 22
23 - 25
CINMS Boundary
Control Total: 1999 Annual
10,776 Person-days - Distribution from Kolstad survey.
Distribution Statistics:
Standard Error: 0.1509, Mean: 6.6
Max: 25.36
PCW20010208

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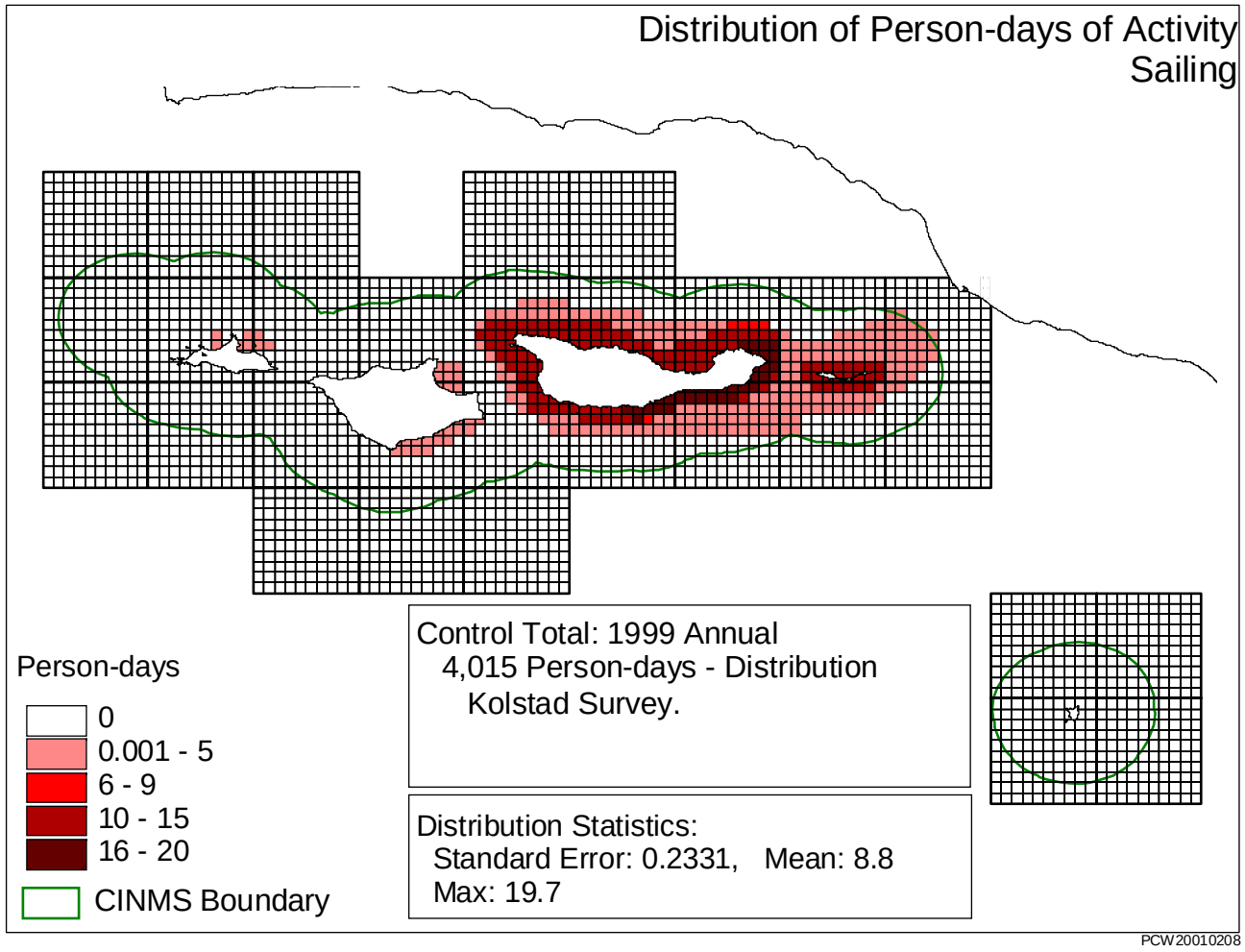
Distribution of Person-days of Activity
Sailing
Person-days
0
0.001 - 5
6 - 9
10 - 15
16 - 20
CINMS Boundary
Control Total: 1999 Annual
4,015 Person-days - Distribution
Kolstad Survey.
Distribution Statistics:
Standard Error: 0.2331, Mean: 8.8
Max: 19.7
PCW20010208

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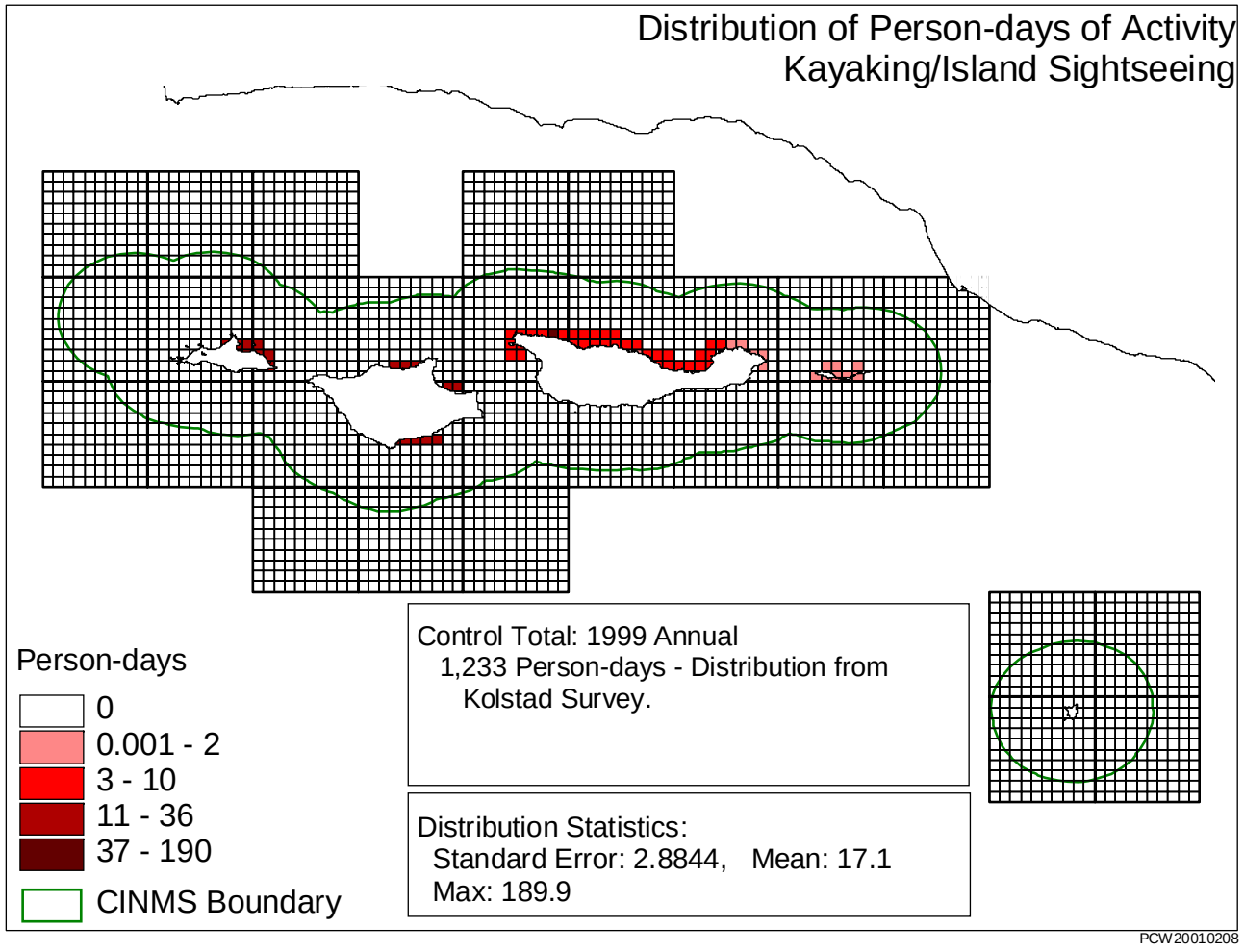
Distribution of Person-days of Activity
Kayaking/Island Sightseeing
Person-days
0
0.001 - 2
3 - 10
11 - 36
37 - 190
CINMS Boundary
Control Total: 1999 Annual
1,233 Person-days - Distribution from
Kolstad Survey.
Distribution Statistics:
Standard Error: 2.8844, Mean: 17.1
Max: 189.9
PCW20010208

APPENDIX C

Baseline Step 1 Analysis - Consumptive Activities

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	19,632,128	5,956,220	7,278,401	32,866,749
Wages and Salaries	7,443,728	537,328	1,236,931	9,217,988
Proprietors Income	1,217,517	99,354	95,429	1,412,300
Total Income	8,661,245	636,683	1,332,360	10,630,288
Employment	457	27	41	525
Charter/Party Boat Diving				
Sales	5,786,598	1,684,720	2,106,130	9,577,448
Wages and Salaries	2,113,480	203,971	243,599	2,561,050
Proprietors Income	377,673	63,073	55,687	496,433
Total Income	2,491,153	267,044	299,286	3,057,483
Employment	131	8	12	151
Private Boat Fishing				
Sales	20,177,334	9,680,748	8,507,079	38,365,161
Wages and Salaries	8,001,923	972,549	920,681	9,895,152
Proprietors Income	750,176	265,022	245,623	1,260,821
Total Income	8,752,099	1,237,570	1,166,304	11,155,973
Employment	334	41	27	403
Private Boat Diving				
Sales	3,020,161	1,008,540	904,554	4,933,255
Wages and Salaries	1,130,245	98,161	105,266	1,333,672
Proprietors Income	171,454	39,525	28,198	239,177
Total Income	1,301,699	137,686	133,464	1,572,849
Employment	50	4	5	59

Baseline Step 1 Analysis - Non-consumptive Activities

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	4,288,380	1,267,416	1,552,630	7,108,426
Wages and Salaries	1,561,168	149,842	179,573	1,890,583
Proprietors Income	281,106	43,773	40,220	365,099
Total Income	1,842,274	193,615	219,793	2,255,682
Employment	104.2	6.6	8.4	119.2
Non-Consumptive Diving				
Sales	1,840,581	543,125	666,286	3,049,992
Wages and Salaries	669,425	64,210	76,988	810,623
Proprietors Income	121,185	18,714	17,182	157,081
Total Income	790,610	82,924	94,170	967,704
Employment	45.3	3.4	3.5	52.2
Sailing				
Sales	711,267	209,536	257,425	1,178,228
Wages and Salaries	258,440	22,265	27,432	308,137
Proprietors Income	47,040	9,703	8,901	65,644
Total Income	305,480	31,968	36,333	373,781
Employment	17.70	1.00	1.70	20.40
Kayaking/Sightseeing				
Sales	257,487	75,344	93,115	425,946
Wages and Salaries	93,189	8,031	9,863	111,083
Proprietors Income	17,339	3,465	3,169	23,973
Total Income	110,528	11,496	13,032	135,056
Employment	6.70	0.80	1.00	8.50

APPENDIX D

Appendix D. Commercial Fishing: Detailed Tables

Tables

APPENDIX D

Table D.1: Commercial Fishing: Impacts of Alternative 1 on Ex Vessel Value by Port and Species Group – Step 1 Analysis

Ports/Species Groups	Additional St Value	%	Federal Value	%	Total: New Value	%	Existing St Value	%	Total: Cumulative Value	%
1. Moss Landing										
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	15.63	0.00	15.63	0.00
Flatfishes	0.00	0.00	0.00	0.00	0.00	0.00	82.14	0.02	82.14	0.02
Total	0.00	0.00	0.00	0.00	0.00	0.00	97.77	0.00	97.77	0.00
2. Morro Bay										
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	290.08	28.00	290.08	28.00
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	276.78	19.77	276.78	19.77
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	122.85	26.36	122.85	26.36
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	560.37	1.03	560.37	1.03
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	130.35	0.02	130.35	0.02
Flatfishes	0.00	0.00	0.00	0.00	0.00	0.00	58.78	0.07	58.78	0.07
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	0.81	0.00	0.81	0.00
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	19.68	0.15	19.68	0.15
Total	0.00	0.00	0.00	0.00	0.00	0.00	1,459.71	0.07	1,459.71	0.07
3. Avila/Port San Luis										
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	1,418.54	10.08	1,418.54	10.08
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	60.76	13.35	60.76	13.35
Flatfish	0.00	0.00	0.00	0.00	0.00	0.00	10.98	0.61	10.98	0.61
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	70.60	1.71	70.60	1.71
Total	0.00	0.00	0.00	0.00	0.00	0.00	1,560.87	0.12	1,560.87	0.12
4. Santa Barbara										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	13,863.67	7.07	13,863.67	7.07
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	472,960.64	14.49	472,960.64	14.49
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	119,329.82	10.00	119,329.82	10.00
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	11,900.19	8.69	11,900.19	8.69
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	620.59	0.15	620.59	0.15
Crab	0.00	0.00	0.00	0.00	0.00	0.00	47,237.45	7.17	47,237.45	7.17
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	7,362.89	11.87	7,362.89	11.87
Flatfish	0.00	0.00	0.00	0.00	0.00	0.00	3,504.00	1.44	3,504.00	1.44
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	2,934.57	3.45	2,934.57	3.45
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	2.84	0.08	2.84	0.08
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	62.10	13.47	62.10	13.47
Sculpin & Bass	0.00	0.00	0.00	0.00	0.00	0.00	2,875.32	3.68	2,875.32	3.68
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	1,388.41	1.46	1,388.41	1.46
Total	0.00	0.00	0.00	0.00	0.00	0.00	684,042.48	9.20	684,042.48	9.20
5. Ventura Harbor										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	332,148.81	12.26	332,148.81	12.26
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	4,454.34	5.06	4,454.34	5.06
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	8,123.42	2.94	8,123.42	2.94
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	1,148.66	3.20	1,148.66	3.20
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	1,576.49	0.51	1,576.49	0.51
Crab	0.00	0.00	0.00	0.00	0.00	0.00	3,719.23	4.35	3,719.23	4.35
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	188.55	5.58	188.55	5.58
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	1,041.44	4.88	1,041.44	4.88
Flatfish	0.00	0.00	0.00	0.00	0.00	0.00	8,158.43	2.51	8,158.43	2.51
Sculpin & Bass	0.00	0.00	0.00	0.00	0.00	0.00	1,707.99	3.11	1,707.99	3.11
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	1.57	0.00	1.57	0.00
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	832.23	1.50	832.23	1.50
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	1,463.21	7.90	1,463.21	7.90
Total	0.00	0.00	0.00	0.00	0.00	0.00	364,564.37	7.50	364,564.37	7.50
6. Channel Islands/Oxnard										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	1,123.37	11.03	1,123.37	11.03
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	167,702.98	7.74	167,702.98	7.74
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	27,484.03	9.03	27,484.03	9.03
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	5,891.89	4.70	5,891.89	4.70
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	3,466.93	1.57	3,466.93	1.57
Crab	0.00	0.00	0.00	0.00	0.00	0.00	7,837.51	8.88	7,837.51	8.88
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	162.98	2.38	162.98	2.38
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	11,861.51	12.44	11,861.51	12.44
Flatfish	0.00	0.00	0.00	0.00	0.00	0.00	11,594.06	5.99	11,594.06	5.99
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	30,542.57	13.19	30,542.57	13.19
Sculpin & Bass	0.00	0.00	0.00	0.00	0.00	0.00	2,269.98	8.27	2,269.98	8.27
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	0.74	0.05	0.74	0.05
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	1,451.65	6.56	1,451.65	6.56
Total	0.00	0.00	0.00	0.00	0.00	0.00	271,390.22	6.81	271,390.22	6.81

APPENDIX D

Table D.1 (Continued)

Ports/Species Groups	Additional St Value	%	Federal Value	%	Total: New Value	%	Existing St Value	%	Total: Cumulative Value	%
7. Port Hueneme										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	841,103.35	8.77	841,103.35	8.77
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	10.88	5.67	10.88	5.67
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	31,192.51	6.20	31,192.51	6.20
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	7.00	0.23	7.00	0.23
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	36.70	11.84	36.70	11.84
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	36.14	7.00	36.14	7.00
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	105.93	14.79	105.93	14.79
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	618.34	22.19	618.34	22.19
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	128.59	13.35	128.59	13.35
Flatfishes	0.00	0.00	0.00	0.00	0.00	0.00	25.45	0.03	25.45	0.03
Total	0.00	0.00	0.00	0.00	0.00	0.00	873,264.89	8.50	873,264.89	8.50
8. San Pedro										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	89,264.06	2.26	89,264.06	2.26
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	3,881.14	0.83	3,881.14	0.83
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	8,959.37	2.36	8,959.37	2.36
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	1,675.15	0.06	1,675.15	0.06
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	350.88	4.39	350.88	4.39
Flatfish	0.00	0.00	0.00	0.00	0.00	0.00	198.81	0.12	198.81	0.12
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	62.49	0.95	62.49	0.95
Sculpin & Bass	0.00	0.00	0.00	0.00	0.00	0.00	1,491.29	1.20	1,491.29	1.20
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	9.35	0.00	9.35	0.00
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	626.40	0.45	626.40	0.45
Crab	0.00	0.00	0.00	0.00	0.00	0.00	65.72	0.12	65.72	0.12
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	29.95	0.39	29.95	0.39
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	10.21	0.11	10.21	0.11
Total	0.00	0.00	0.00	0.00	0.00	0.00	106,624.82	0.93	106,624.82	0.93
9. Terminal Island										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	77,780.26	5.54	77,780.26	5.54
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	5,408.75	0.29	5,408.75	0.29
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	2,207.84	0.20	2,207.84	0.20
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	25.65	0.00	25.65	0.00
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	2.41	0.01	2.41	0.01
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	324.64	0.94	324.64	0.94
Sculpin & Bass	0.00	0.00	0.00	0.00	0.00	0.00	15.76	0.03	15.76	0.03
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	607.74	0.55	607.74	0.55
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	1,601.68	1.52	1,601.68	1.52
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	36.70	0.03	36.70	0.03
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	3,718.15	6.30	3,718.15	6.30
Flatfishes	0.00	0.00	0.00	0.00	0.00	0.00	94.81	0.05	94.81	0.05
Total	0.00	0.00	0.00	0.00	0.00	0.00	91,824.40	0.68	91,824.40	0.68
10. Avalon & Other LA										
Squid	0.00	0.00	0.00	0.00	0.00	0.00	322.91	4.81	322.91	4.81
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	4.16	0.01	4.16	0.01
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.24	0.00
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	637.85	0.22	637.85	0.22
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	668.34	0.10	668.34	0.10
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	100.55	5.24	100.55	5.24
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	8.89	0.03	8.89	0.03
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	56.46	0.89	56.46	0.89
Flatfishes	0.00	0.00	0.00	0.00	0.00	0.00	32.94	0.08	32.94	0.08
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	12.57	1.15	12.57	1.15
Total	0.00	0.00	0.00	0.00	0.00	0.00	1,844.91	0.14	1,844.91	0.14
11. Newport Beach & Dana Point										
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	1.46	0.04	1.46	0.04
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	13.80	0.00	13.80	0.00
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	218.98	0.19	218.98	0.19
Prawn	0.00	0.00	0.00	0.00	0.00	0.00	140.20	0.06	140.20	0.06
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	0.00	0.00	0.00	0.00	0.00	0.00	374.44	0.04	374.44	0.04
12. San Diego										
Urchins	0.00	0.00	0.00	0.00	0.00	0.00	199.36	0.76	199.36	0.76
Tuna	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.00	0.30	0.00
Sharks	0.00	0.00	0.00	0.00	0.00	0.00	61.20	0.03	61.20	0.03
Rockfishes	0.00	0.00	0.00	0.00	0.00	0.00	148.87	0.40	148.87	0.40
Sea Cucumbers	0.00	0.00	0.00	0.00	0.00	0.00	12.95	0.16	12.95	0.16
CA Sheephead	0.00	0.00	0.00	0.00	0.00	0.00	2,254.13	3.65	2,254.13	3.65
Total	0.00	0.00	0.00	0.00	0.00	0.00	2,676.82	0.11	2,676.82	0.11

1. Percents are amount of CINMS value of catch as a percent of total ex vessel value of Port landings (1996-2003 annual average), with a few exceptions. Rockfish, Prawn and Tuna were set at 2003 values due to steeply declining trends. CA Sheephead values were set to the 2000-2003 average. Ports that receive small amounts of catch from the CINMS were set to 2000-2003 averages.

APPENDIX D

Table D.2: Commercial Fishing: Impacts of Alternative 2 on Ex Vessel Value by Port and Species Group – Step 1 Analysis

	Alt. 2									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Ports/Species Groups	Value	%	Value	%	Value	%	Value	%	Value	%
1. Moss Landing										
Rockfishes	5.59	0.00	6.98	0.00	12.57	0.00	15.63	0.00	28.20	0.00
Flatfishes	4.00	0.00	13.23	0.00	17.23	0.00	82.14	0.02	99.36	0.03
Total	9.59	0.00	20.21	0.00	29.79	0.00	97.77	0.00	127.56	0.00
2. Morro Bay										
Urchins	16.90	1.63	0.00	0.00	16.90	1.63	290.08	28.00	306.98	29.63
Spiny Lobsters	14.02	1.00	0.00	0.00	14.02	1.00	276.78	19.77	290.81	20.77
Sea Cucumbers	2.29	0.49	0.00	0.00	2.29	0.49	122.85	26.36	125.14	26.85
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	1,715.99	3.17	1,480.82	2.73	3,196.81	5.90	560.37	1.03	3,757.18	6.93
Rockfishes	46.60	0.01	58.20	0.01	104.80	0.02	130.35	0.02	235.15	0.04
Flatfishes	2.86	0.00	9.47	0.01	12.33	0.01	58.78	0.07	71.11	0.08
Tuna	0.63	0.00	4.93	0.00	5.57	0.00	0.81	0.00	6.38	0.00
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sharks	1.53	0.01	3.42	0.03	4.95	0.04	19.68	0.15	24.63	0.19
Total	1,800.84	0.09	1,556.83	0.07	3,357.67	0.16	1,459.71	0.07	4,817.37	0.23
3. Avila/Port San Luis										
Urchins	82.65	0.59	0.00	0.00	82.65	0.59	1,418.54	10.08	1,501.19	10.67
Sea Cucumbers	1.13	0.25	0.00	0.00	1.13	0.25	60.76	13.35	61.89	13.60
Flatfish	0.53	0.04	1.77	0.00	2.30	0.04	10.98	0.61	13.28	0.64
Wetfish	19.07	0.46	89.56	2.17	108.63	2.63	70.60	1.71	179.23	4.33
Total	103.39	0.01	91.33	0.01	194.72	0.02	1,560.87	0.12	1,755.59	0.14
4. Santa Barbara										
Squid	722.05	0.37	433.23	0.22	1,155.29	0.59	13,863.67	7.07	15,018.95	7.66
Urchins	27,558.38	0.84	0.00	0.00	27,558.38	0.84	472,960.64	14.49	500,519.02	15.34
Spiny Lobsters	6,046.09	0.51	0.00	0.00	6,046.09	0.51	119,329.82	10.00	125,375.91	10.51
Rockfishes	4,254.67	3.11	5,313.11	3.88	9,567.78	6.98	11,900.19	8.69	21,467.96	15.67
Prawn	1,900.38	0.44	1,639.94	0.38	3,540.32	0.83	620.59	0.15	4,160.91	0.97
Crab	1,416.80	0.22	0.00	0.00	1,416.80	0.22	47,237.45	7.17	48,654.25	7.39
CA Sheephead	53.85	0.09	0.00	0.00	53.85	0.09	7,362.89	11.87	7,416.74	11.96
Flatfish	170.59	0.07	564.25	0.23	734.84	0.30	3,504.00	1.44	4,238.83	1.74
Sea Cucumbers	54.66	0.06	0.00	0.00	54.66	0.06	2,934.57	3.45	2,989.24	3.51
Tuna	2.22	0.06	17.30	0.46	19.52	0.52	2.84	0.08	22.36	0.60
Wetfish	16.77	3.64	78.77	17.09	95.54	20.72	62.10	13.47	157.63	34.19
Sculpin & Bass	650.25	0.83	1,822.93	2.33	2,473.18	3.17	2,875.32	3.68	5,348.50	6.85
Sharks	108.12	0.11	241.16	0.25	349.28	0.37	1,388.41	1.46	1,737.69	1.83
Total	42,954.84	0.58	10,110.69	0.14	53,065.53	0.71	684,042.48	9.20	737,108.00	9.91
5. Ventura Harbor										
Squid	17,299.08	0.64	10,379.50	0.38	27,678.58	1.02	332,148.81	12.26	359,827.39	13.28
Urchins	259.54	0.29	0.00	0.00	259.54	0.29	4,454.34	5.06	4,713.88	5.35
Spiny Lobsters	411.59	0.15	0.00	0.00	411.59	0.15	8,123.42	2.94	8,535.01	3.09
Rockfishes	410.68	1.15	512.84	1.43	923.52	2.58	1,148.66	3.20	2,072.18	5.78
Prawn	4,827.58	1.56	4,165.97	1.35	8,993.56	2.91	1,576.49	0.51	10,570.04	3.42
Crab	111.55	0.13	0.00	0.00	111.55	0.13	3,719.23	4.35	3,830.78	4.48
Wetfish	50.92	1.51	239.18	7.07	290.10	8.58	188.55	5.58	478.65	14.16
CA Sheephead	7.62	0.04	0.00	0.00	7.62	0.04	1,041.44	4.88	1,049.06	4.91
Flatfish	397.18	0.12	1,313.75	0.40	1,710.93	0.53	8,158.43	2.51	9,869.36	3.04
Sculpin & Bass	386.26	0.70	1,082.85	1.97	1,469.11	2.68	1,707.99	3.11	3,177.10	5.79
Tuna	1.23	0.00	9.56	0.00	10.79	0.00	1.57	0.00	12.36	0.00
Sharks	64.81	0.12	144.56	0.26	209.36	0.38	832.23	1.50	1,041.60	1.88
Sea Cucumbers	27.26	0.15	0.00	0.00	27.26	0.15	1,463.21	7.90	1,490.47	8.05
Total	24,255.30	0.50	17,848.22	0.37	42,103.52	0.87	364,564.37	7.50	406,667.88	8.37
6. Channel Islands/Oxnard										
Squid	58.51	0.57	35.10	0.34	93.61	0.92	1,123.37	11.03	1,216.98	11.95
Urchins	9,771.68	0.45	0.00	0.00	9,771.68	0.45	167,702.98	7.74	177,474.67	8.19
Spiny Lobsters	1,392.54	0.46	0.00	0.00	1,392.54	0.46	27,484.03	9.03	28,876.57	9.49
Rockfishes	2,106.53	1.68	2,630.57	2.10	4,737.10	3.78	5,891.89	4.70	10,628.99	8.48
Prawn	10,616.59	4.79	9,161.61	4.14	19,778.20	8.93	3,466.93	1.57	23,245.13	10.50
Crab	235.07	0.27	0.00	0.00	235.07	0.27	7,837.51	8.88	8,072.59	9.14
Wetfish	44.01	0.64	206.75	3.02	250.76	3.67	162.98	2.38	413.74	6.05
CA Sheephead	86.74	0.09	0.00	0.00	86.74	0.09	11,861.51	12.44	11,948.25	12.53
Flatfish	564.44	0.29	1,866.99	0.96	2,431.43	1.26	11,594.06	5.99	14,025.50	7.25
Sea Cucumbers	568.94	0.25	0.00	0.00	568.94	0.25	30,542.57	13.19	31,111.51	13.44
Sculpin & Bass	513.36	1.87	1,439.15	5.24	1,952.51	7.11	2,269.98	8.27	4,222.49	15.38
Tuna	0.58	0.04	4.52	0.27	5.10	0.31	0.74	0.05	5.84	0.36
Sharks	113.04	0.51	252.15	1.14	365.19	1.65	1,451.65	6.56	1,816.84	8.21
Total	26,072.03	0.65	15,596.84	0.39	41,668.87	1.04	271,390.22	6.81	313,059.09	7.85

APPENDIX D

Table D.2 (Continued)

	Alt. 2									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Ports/Species Groups	Value	%	Value	%	Value	%	Value	%	Value	%
7. Port Hueneme										
Squid	43,806.62	0.46	26,284.09	0.27	70,090.71	0.73	841,103.35	8.77	911,194.06	9.51
Prawn	33.32	17.35	28.75	14.97	62.07	32.33	10.88	5.67	72.95	37.99
Wetfish	8,423.00	1.67	39,568.68	7.86	47,991.68	9.53	31,192.51	6.20	79,184.19	15.73
Tuna	5.47	0.18	42.58	1.39	48.06	1.57	7.00	0.23	55.05	1.80
Sharks	2.86	0.92	6.37	2.06	9.23	2.98	36.70	11.84	45.93	14.82
Rockfishes	12.92	2.50	16.14	3.13	29.06	5.63	36.14	7.00	65.20	12.64
Spiny Lobsters	5.37	0.75	0.00	0.00	5.37	0.75	105.93	14.79	111.30	15.54
Urchins	36.03	1.29	0.00	0.00	36.03	1.29	618.34	22.19	654.37	23.48
Sea Cucumbers	2.40	0.25	0.00	0.00	2.40	0.25	128.59	13.35	130.98	13.60
Flatfishes	1.24	0.00	4.10	0.01	5.34	0.01	25.45	0.03	30.79	0.04
Total	52,329.22	0.51	65,950.72	0.64	118,279.93	1.15	873,264.89	8.50	991,544.82	9.65
8. San Pedro										
Squid	4,649.08	0.12	2,789.46	0.07	7,438.54	0.19	89,264.06	2.26	96,702.60	2.45
Urchins	226.15	0.05	0.00	0.00	226.15	0.05	3,881.14	0.83	4,107.29	0.88
Spiny Lobsters	453.94	0.12	0.00	0.00	453.94	0.12	8,959.37	2.36	9,413.31	2.48
Wetfish	452.34	0.02	2,124.98	0.07	2,577.32	0.09	1,675.15	0.06	4,252.47	0.14
CA Sheephead	2.57	0.03	0.00	0.00	2.57	0.03	350.88	4.39	353.45	4.42
Flatfish	9.68	0.01	32.01	0.02	41.69	0.02	198.81	0.12	240.50	0.14
Sea Cucumbers	1.16	0.02	0.00	0.00	1.16	0.02	62.49	0.95	63.66	0.97
Sculpin & Bass	337.26	0.27	945.47	0.76	1,282.72	1.03	1,491.29	1.20	2,774.02	2.24
Tuna	7.31	0.00	56.94	0.01	64.25	0.02	9.35	0.00	73.60	0.02
Sharks	48.78	0.04	108.80	0.08	157.58	0.11	626.40	0.45	783.98	0.56
Crab	1.97	0.00	0.00	0.00	1.97	0.00	65.72	0.12	67.69	0.13
Rockfishes	10.71	0.14	13.37	0.17	24.08	0.31	29.95	0.39	54.03	0.70
Prawn	31.26	0.33	26.98	0.29	58.24	0.62	10.21	0.11	68.45	0.73
Total	6,232.21	0.05	6,098.01	0.05	12,330.22	0.11	106,624.82	0.93	118,955.04	1.04
9. Terminal Island										
Squid	4,050.98	0.29	2,430.60	0.17	6,481.57	0.46	77,780.26	5.54	84,261.83	6.00
Urchins	315.16	0.02	0.00	0.00	315.16	0.02	5,408.75	0.29	5,723.90	0.31
Wetfish	596.19	0.05	2,800.71	0.26	3,396.90	0.31	2,207.84	0.20	5,604.74	0.51
Tuna	20.06	0.00	156.15	0.02	176.21	0.02	25.65	0.00	201.86	0.02
Sharks	0.19	0.00	0.42	0.00	0.61	0.00	2.41	0.01	3.02	0.01
Rockfishes	116.07	0.34	144.94	0.42	261.01	0.76	324.64	0.94	585.66	1.70
Sculpin & Bass	3.56	0.01	9.99	0.02	13.56	0.03	15.76	0.03	29.32	0.06
Spiny Lobsters	30.79	0.03	0.00	0.00	30.79	0.03	607.74	0.55	638.54	0.58
Sea Cucumbers	29.84	0.03	0.00	0.00	29.84	0.03	1,601.68	1.52	1,631.52	1.55
Prawn	112.38	0.08	96.98	0.07	209.35	0.14	36.70	0.03	246.05	0.17
CA Sheephead	27.19	0.05	0.00	0.00	27.19	0.05	3,718.15	6.30	3,745.34	6.35
Flatfishes	4.62	0.00	15.27	0.01	19.88	0.01	94.81	0.05	114.70	0.06
Total	5,307.02	0.04	5,655.06	0.04	10,962.08	0.08	91,824.40	0.68	102,786.48	0.77
10. Avalon & Other LA										
Squid	16.82	0.25	10.09	0.15	26.91	0.40	322.91	4.81	349.82	5.21
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wetfish	1.12	0.00	5.28	0.01	6.40	0.01	4.16	0.01	10.56	0.02
Tuna	0.19	0.00	1.47	0.02	1.66	0.03	0.24	0.00	1.90	0.03
Rockfishes	228.05	0.08	284.78	0.10	512.83	0.18	637.85	0.22	1,150.69	0.40
Urchins	38.94	0.01	0.00	0.00	38.94	0.01	668.34	0.10	707.28	0.11
Sea Cucumbers	1.87	0.10	0.00	0.00	1.87	0.10	100.55	5.24	102.42	5.34
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	27.21	0.09	23.48	0.08	50.69	0.17	8.89	0.03	59.58	0.20
CA Sheephead	0.41	0.01	0.00	0.00	0.41	0.01	56.46	0.89	56.87	0.90
Flatfishes	1.60	0.00	5.30	0.01	6.91	0.02	32.94	0.08	39.84	0.10
Sharks	0.98	0.09	2.18	0.20	3.16	0.29	12.57	1.15	15.73	1.44
Total	317.20	0.02	332.59	0.02	649.80	0.05	1,844.91	0.14	2,494.70	0.19
11. Newport Beach & Dana Point										
Tuna	1.14	0.03	8.89	0.25	10.03	0.28	1.46	0.04	11.50	0.32
Rockfishes	4.93	0.00	6.16	0.00	11.09	0.00	13.80	0.00	24.89	0.01
Urchins	12.76	0.01	0.00	0.00	12.76	0.01	218.98	0.19	231.74	0.20
Prawn	429.31	0.19	370.48	0.17	799.79	0.36	140.20	0.06	939.99	0.42
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	448.15	0.05	385.53	0.04	833.68	0.09	374.44	0.04	1,208.11	0.13
12. San Diego										
Urchins	11.62	0.04	0.00	0.00	11.62	0.04	199.36	0.76	210.98	0.80
Tuna	0.24	0.00	1.85	0.00	2.09	0.00	0.30	0.00	2.39	0.00
Sharks	4.77	0.00	10.63	0.00	15.40	0.01	61.20	0.03	76.60	0.03
Rockfishes	53.22	0.14	66.47	0.18	119.69	0.32	148.87	0.40	268.56	0.72
Sea Cucumbers	0.24	0.00	0.00	0.00	0.24	0.00	12.95	0.16	13.19	0.16
CA Sheephead	16.48	0.03	0.00	0.00	16.48	0.03	2,254.13	3.65	2,270.61	3.68
Total	86.57	0.00	78.94	0.00	165.51	0.01	2,676.82	0.11	2,842.33	0.11

1. Percents are amount of CINMS value of catch as a percent of total ex vessel value of Port landings (1996-2003 annual average), with a few exceptions. Rockfish, Prawn and Tuna were set at 2003 values due to steeply declining trends. CA Sheephead values were set to the 2000-2003 average. Ports that receive small amounts of catch from the CINMS were set to 2000-2003 averages.

APPENDIX D

Table D.3: Commercial Fishing: Impacts of Alternative 3 on Ex Vessel Value by Port and Species Group – Step 1 Analysis

	Alt. 3									
	Additional St		Federal		Total: New		Existing St		Total: Cumulative	
Ports/Species Groups	Value	%	Value	%	Value	%	Value	%	Value	%
1. Moss Landing										
Rockfishes	5.13	0.00	7.44	0.00	12.57	0.00	15.63	0.00	28.20	0.00
Flatfishes	14.73	0.00	21.22	0.01	35.95	0.01	82.14	0.02	118.09	0.03
Total	19.86	0.00	28.66	0.00	48.52	0.00	97.77	0.00	146.29	0.00
2. Morro Bay										
Urchins	13.04	1.26	0.97	0.09	14.02	1.35	290.08	28.00	304.09	29.35
Spiny Lobsters	12.98	0.93	0.00	0.00	12.98	0.93	276.78	19.77	289.76	20.70
Sea Cucumbers	5.35	1.15	0.00	0.00	5.35	1.15	122.85	26.36	128.20	27.51
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	1,715.99	3.17	4,548.46	8.39	6,264.45	11.56	560.37	1.03	6,824.82	12.59
Rockfishes	42.75	0.01	62.05	0.01	104.80	0.02	130.35	0.02	235.15	0.04
Flatfishes	10.54	0.01	15.19	0.02	25.73	0.03	58.78	0.07	84.51	0.09
Tuna	0.71	0.00	5.76	0.00	6.46	0.00	0.81	0.00	7.27	0.00
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sharks	1.87	0.01	5.49	0.04	7.35	0.06	19.68	0.15	27.04	0.21
Total	1,803.23	0.09	4,637.92	0.22	6,441.15	0.31	1,459.71	0.07	7,900.85	0.38
3. Avila/Port San Luis										
Urchins	63.78	0.45	4.76	0.03	68.54	0.49	1,418.54	10.08	1,487.08	10.57
Sea Cucumbers	2.65	0.58	0.00	0.00	2.65	0.58	60.76	13.35	63.40	13.93
Flatfish	1.97	0.03	2.84	0.00	4.81	0.03	10.98	0.61	15.78	0.63
Wetfish	22.20	0.54	91.12	2.20	113.32	2.74	70.60	1.71	183.92	4.45
Total	90.59	0.01	98.73	0.01	189.31	0.02	1,560.87	0.12	1,750.19	0.14
4. Santa Barbara										
Squid	1,083.07	0.55	722.04	0.37	1,805.12	0.92	13,863.67	7.07	15,668.78	7.99
Urchins	21,263.88	0.65	1,588.70	0.05	22,852.58	0.70	472,960.64	14.49	495,813.22	15.19
Spiny Lobsters	5,594.18	0.47	0.00	0.00	5,594.18	0.47	119,329.82	10.00	124,924.00	10.47
Rockfishes	3,903.25	2.85	5,664.53	4.13	9,567.78	6.98	11,900.19	8.69	21,467.96	15.67
Prawn	1,900.38	0.44	5,037.22	1.18	6,937.61	1.62	620.59	0.15	7,558.19	1.77
Crab	4,601.70	0.70	0.00	0.00	4,601.70	0.70	47,237.45	7.17	51,839.15	7.87
CA Sheephead	53.85	0.09	0.00	0.00	53.85	0.09	7,362.89	11.87	7,416.74	11.96
Flatfish	628.29	0.26	905.42	0.37	1,533.72	0.63	3,504.00	1.44	5,037.72	2.07
Sea Cucumbers	127.90	0.15	0.00	0.00	127.90	0.15	2,934.57	3.45	3,062.48	3.60
Tuna	2.48	0.07	20.19	0.54	22.66	0.61	2.84	0.08	25.51	0.68
Wetfish	19.52	4.23	80.14	17.38	99.66	21.62	62.10	13.47	161.76	35.09
Sculpin & Bass	961.81	1.23	2,902.94	3.72	3,864.75	4.95	2,875.32	3.68	6,740.07	8.63
Sharks	131.80	0.14	386.98	0.41	518.78	0.55	1,388.41	1.46	1,907.19	2.01
Total	40,272.11	0.54	17,308.17	0.23	57,580.28	0.77	684,042.48	9.20	741,622.76	9.97
5. Ventura Harbor										
Squid	25,948.51	0.96	17,298.85	0.64	43,247.36	1.60	332,148.81	12.26	375,396.17	13.85
Urchins	200.26	0.23	14.96	0.02	215.23	0.24	4,454.34	5.06	4,669.56	5.30
Spiny Lobsters	380.83	0.14	0.00	0.00	380.83	0.14	8,123.42	2.94	8,504.24	3.07
Rockfishes	376.76	1.05	546.76	1.52	923.52	2.58	1,148.66	3.20	2,072.18	5.78
Prawn	4,827.58	1.56	12,796.17	4.14	17,623.75	5.70	1,576.49	0.51	19,200.24	6.21
Crab	362.31	0.42	0.00	0.00	362.31	0.42	3,719.23	4.35	4,081.54	4.78
Wetfish	59.27	1.75	243.36	7.20	302.63	8.95	188.55	5.58	491.18	14.53
CA Sheephead	7.62	0.04	0.00	0.00	7.62	0.04	1,041.44	4.88	1,049.06	4.91
Flatfish	1,462.87	0.45	2,108.12	0.65	3,570.98	1.10	8,158.43	2.51	11,729.41	3.61
Sculpin & Bass	571.33	1.04	1,724.40	3.14	2,295.73	4.18	1,707.99	3.11	4,003.72	7.30
Tuna	1.37	0.00	11.16	0.00	12.52	0.00	1.57	0.00	14.09	0.00
Sharks	79.00	0.14	231.96	0.42	310.97	0.56	832.23	1.50	1,143.20	2.06
Sea Cucumbers	63.77	0.34	0.00	0.00	63.77	0.34	1,463.21	7.90	1,526.99	8.24
Total	34,341.48	0.71	34,975.73	0.72	69,317.22	1.43	364,564.37	7.50	433,881.59	8.93
6. Channel Islands/Oxnard										
Squid	87.76	0.86	58.51	0.57	146.27	1.44	1,123.37	11.03	1,269.64	12.46
Urchins	7,539.77	0.35	563.32	0.03	8,103.10	0.37	167,702.98	7.74	175,806.08	8.11
Spiny Lobsters	1,288.45	0.42	0.00	0.00	1,288.45	0.42	27,484.03	9.03	28,772.48	9.46
Rockfishes	1,932.54	1.54	2,804.56	2.24	4,737.10	3.78	5,891.89	4.70	10,628.99	8.48
Prawn	10,616.59	4.79	28,140.71	12.71	38,757.30	17.50	3,466.93	1.57	42,224.24	19.07
Crab	763.50	0.86	0.00	0.00	763.50	0.86	7,837.51	8.88	8,601.01	9.74
Wetfish	51.24	0.75	210.36	3.07	261.59	3.82	162.98	2.38	424.58	6.21
CA Sheephead	86.74	0.09	0.00	0.00	86.74	0.09	11,861.51	12.44	11,948.25	12.53
Flatfish	2,078.90	1.07	2,995.87	1.55	5,074.78	2.62	11,594.06	5.99	16,668.84	8.61
Sea Cucumbers	1,331.17	0.57	0.00	0.00	1,331.17	0.57	30,542.57	13.19	31,873.74	13.77
Sculpin & Bass	759.32	2.77	2,291.79	8.35	3,051.11	11.11	2,269.98	8.27	5,321.10	19.38
Tuna	0.65	0.04	5.27	0.32	5.92	0.36	0.74	0.05	6.66	0.41
Sharks	137.80	0.62	404.61	1.83	542.41	2.45	1,451.65	6.56	1,994.06	9.01
Total	26,674.44	0.67	37,475.01	0.94	64,149.44	1.61	271,390.22	6.81	335,539.66	8.41

APPENDIX D

Table D.3 (Continued)

Ports/Species Groups	Alt. 3 Additional St Value	%	Federal Value	%	Total: New Value	%	Existing St Value	%	Total: Cumulative Value	%
7. Port Hueneme										
Squid	65,709.63	0.69	43,806.03	0.46	109,515.67	1.14	841,103.35	8.77	950,619.02	9.92
Prawn	33.32	17.35	88.31	46.00	121.63	63.35	10.88	5.67	132.51	69.02
Wetfish	9,805.88	1.95	40,258.75	8.00	50,064.63	9.94	31,192.51	6.20	81,257.14	16.14
Tuna	6.09	0.20	49.70	1.62	55.80	1.82	7.00	0.23	62.79	2.05
Sharks	3.48	1.12	10.23	3.30	13.71	4.42	36.70	11.84	50.41	16.26
Rockfishes	11.85	2.30	17.20	3.33	29.06	5.63	36.14	7.00	65.20	12.64
Spiny Lobsters	4.97	0.69	0.00	0.00	4.97	0.69	105.93	14.79	110.90	15.49
Urchins	27.80	1.00	2.08	0.07	29.88	1.07	618.34	22.19	648.22	23.26
Sea Cucumbers	5.60	0.58	0.00	0.00	5.60	0.58	128.59	13.35	134.19	13.93
Flatfishes	4.56	0.01	6.58	0.01	11.14	0.01	25.45	0.03	36.59	0.05
Total	75,613.20	0.74	84,238.88	0.82	159,852.08	1.56	873,264.89	8.50	1,033,116.97	10.05
8. San Pedro										
Squid	6,973.59	0.18	4,649.02	0.12	11,622.61	0.29	89,264.06	2.26	100,886.66	2.56
Urchins	174.49	0.04	13.04	0.00	187.53	0.04	3,881.14	0.83	4,068.67	0.87
Spiny Lobsters	420.02	0.11	0.00	0.00	420.02	0.11	8,959.37	2.36	9,379.38	2.47
Wetfish	526.61	0.02	2,162.04	0.07	2,688.65	0.09	1,675.15	0.06	4,363.79	0.15
CA Sheephead	2.57	0.03	0.00	0.00	2.57	0.03	350.88	4.39	353.45	4.42
Flatfish	35.65	0.02	51.37	0.03	87.02	0.05	198.81	0.12	285.83	0.17
Sea Cucumbers	2.72	0.04	0.00	0.00	2.72	0.04	62.49	0.95	65.22	0.99
Sculpin & Bass	498.84	0.40	1,505.62	1.21	2,004.47	1.62	1,491.29	1.20	3,495.76	2.82
Tuna	8.15	0.00	66.45	0.02	74.60	0.02	9.35	0.00	83.96	0.02
Sharks	59.46	0.04	174.59	0.13	234.05	0.17	626.40	0.45	860.45	0.62
Crab	6.40	0.01	0.00	0.00	6.40	0.01	65.72	0.12	72.12	0.14
Rockfishes	9.82	0.13	14.26	0.18	24.08	0.31	29.95	0.39	54.03	0.70
Prawn	31.26	0.33	82.86	0.88	114.12	1.21	10.21	0.11	124.33	1.32
Total	8,749.59	0.08	8,719.25	0.08	17,468.84	0.15	106,624.82	0.93	124,093.65	1.08
9. Terminal Island										
Squid	6,076.44	0.43	4,050.92	0.29	10,127.36	0.72	77,780.26	5.54	87,907.62	6.26
Urchins	243.17	0.01	18.17	0.00	261.34	0.01	5,408.75	0.29	5,670.09	0.30
Wetfish	694.07	0.06	2,849.56	0.26	3,543.63	0.32	2,207.84	0.20	5,751.46	0.52
Tuna	22.35	0.00	182.26	0.02	204.60	0.02	25.65	0.00	230.25	0.02
Sharks	0.23	0.00	0.67	0.00	0.90	0.00	2.41	0.01	3.31	0.01
Rockfishes	106.48	0.31	154.53	0.45	261.01	0.76	324.64	0.94	585.66	1.70
Sculpin & Bass	5.27	0.01	15.91	0.03	21.18	0.04	15.76	0.03	36.94	0.07
Spiny Lobsters	28.49	0.03	0.00	0.00	28.49	0.03	607.74	0.55	636.23	0.58
Sea Cucumbers	69.81	0.07	0.00	0.00	69.81	0.07	1,601.68	1.52	1,671.49	1.58
Prawn	112.38	0.08	297.87	0.21	410.25	0.28	36.70	0.03	446.95	0.31
CA Sheephead	27.19	0.05	0.00	0.00	27.19	0.05	3,718.15	6.30	3,745.34	6.35
Flatfishes	17.00	0.01	24.50	0.01	41.50	0.02	94.81	0.05	136.31	0.08
Total	7,402.88	0.06	7,594.39	0.06	14,997.27	0.11	91,824.40	0.68	106,821.67	0.80
10. Avalon & Other LA										
Squid	25.23	0.38	16.82	0.25	42.05	0.63	322.91	4.81	364.96	5.43
Spiny Lobsters	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Wetfish	1.31	0.00	5.37	0.01	6.68	0.01	4.16	0.01	10.84	0.02
Tuna	0.21	0.00	1.72	0.03	1.93	0.03	0.24	0.00	2.17	0.04
Rockfishes	209.21	0.07	303.62	0.11	512.83	0.18	637.85	0.22	1,150.69	0.40
Urchins	30.05	0.00	2.24	0.00	32.29	0.00	668.34	0.10	700.63	0.11
Sea Cucumbers	4.38	0.23	0.00	0.00	4.38	0.23	100.55	5.24	104.93	5.47
Crab	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Prawn	27.21	0.09	72.12	0.24	99.33	0.33	8.89	0.03	108.22	0.36
CA Sheephead	0.41	0.01	0.00	0.00	0.41	0.01	56.46	0.89	56.87	0.90
Flatfishes	5.91	0.01	8.51	0.02	14.42	0.04	32.94	0.08	47.35	0.12
Sharks	1.19	0.11	3.50	0.32	4.70	0.43	12.57	1.15	17.27	1.58
Total	305.11	0.02	413.91	0.03	719.02	0.05	1,844.91	0.14	2,563.93	0.19
11. Newport Beach & Dana Point										
Tuna	1.27	0.04	10.38	0.29	11.65	0.32	1.46	0.04	13.11	0.37
Rockfishes	4.52	0.00	6.57	0.00	11.09	0.00	13.80	0.00	24.89	0.01
Urchins	9.85	0.01	0.74	0.00	10.58	0.01	218.98	0.19	229.56	0.20
Prawn	429.31	0.19	1,137.96	0.51	1,567.27	0.70	140.20	0.06	1,707.47	0.76
Wetfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	444.96	0.05	1,155.64	0.12	1,600.60	0.17	374.44	0.04	1,975.03	0.21
12. San Diego										
Urchins	8.96	0.03	0.67	0.00	9.63	0.04	199.36	0.76	209.00	0.80
Tuna	0.26	0.00	2.16	0.00	2.42	0.00	0.30	0.00	2.72	0.00
Sharks	5.81	0.00	17.06	0.01	22.87	0.01	61.20	0.03	84.07	0.04
Rockfishes	48.83	0.13	70.86	0.19	119.69	0.32	148.87	0.40	268.56	0.72
Sea Cucumbers	0.56	0.01	0.00	0.00	0.56	0.01	12.95	0.16	13.52	0.17
CA Sheephead	16.48	0.03	0.00	0.00	16.48	0.03	2,254.13	3.65	2,270.61	3.68
Total	80.92	0.00	90.75	0.00	171.66	0.01	2,676.82	0.11	2,848.48	0.11

1. Percents are amount of CINMS value of catch as a percent of total ex vessel value of Port landings (1996-2003 annual average), with a few exceptions. Rockfish, Prawn and Tuna were set at 2003 values due to steeply declining trends. CA Sheephead values were set to the 2000-2003 average. Ports that receive small amounts of catch from the CINMS were set to 2000-2003 averages.

APPENDIX E

Appendix E. Consumptive Recreation: – Detailed Tables

Page

APPENDIX E

Step 1 Analysis - Consumptive Activities - Existing State Alternatives

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	1,982,725	601,344	734,983	3,319,052
Wages and Salaries	751,541	54,245	124,916	930,702
Proprietors Income	123,072	10,007	9,609	142,687
Total Income	874,613	64,252	134,524	1,073,389
Employment	46	3	4	53
Charter/Party Boat Diving				
Sales	610,031	289,562	747,441	1,647,034
Wages and Salaries	222,151	15,627	16,471	254,249
Proprietors Income	65,155	1,261	1,114	67,530
Total Income	287,306	16,888	17,585	321,779
Employment	14	2	1	17
Private Boat Fishing				
Sales	2,670,013	1,281,026	2,184,332	6,135,371
Wages and Salaries	1,058,873	128,686	121,841	1,309,400
Proprietors Income	99,269	35,067	32,500	166,836
Total Income	1,158,142	163,753	154,341	1,476,236
Employment	44	5	4	53
Private Boat Diving				
Sales	775,228	258,878	232,190	1,266,296
Wages and Salaries	290,116	20,409	40,434	350,959
Proprietors Income	44,010	5,110	3,646	52,766
Total Income	334,126	25,519	44,080	403,725
Employment	13	1	1	15

APPENDIX E

Step 1 Analysis - Consumptive Activities - Additional State - Alternative 1

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	28,522	8,630	10,463	47,615
Wages and Salaries	10,816	780	1,803	13,399
Proprietors Income	1,763	145	139	2,046
Total Income	12,579	925	1,941	15,445
Employment	0.70	0.05	0.05	0.80
Charter/Party Boat Diving				
Sales	1,171	378	601	2,150
Wages and Salaries	427	32	65	524
Proprietors Income	85	5	5	95
Total Income	512	37	70	619
Employment	0	0	0	0
Private Boat Fishing				
Sales	38,386	18,410	31,378	88,174
Wages and Salaries	15,223	1,850	1,753	18,826
Proprietors Income	1,427	504	467	2,398
Total Income	16,650	2,354	2,220	21,224
Employment	0.60	0.15	0.05	0.80
Private Boat Diving				
Sales	817	312	397	1,526
Wages and Salaries	306	22	35	363
Proprietors Income	53	6	4	63
Total Income	359	28	39	426
Employment	0	0	0	0

Step 1 Analysis - Consumptive Activities - Federal - Alternative 1

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	70,550	21,435	26,270	118,255
Wages and Salaries	26,757	1,933	4,440	33,130
Proprietors Income	4,377	358	344	5,078
Total Income	31,134	2,290	4,784	38,208
Employment	1.6	0.1	0.2	1.9
Charter/Party Boat Diving				
Sales	2,668	784	980	4,432
Wages and Salaries	973	94	112	1,179
Proprietors Income	177	28	25	230
Total Income	1,150	122	137	1,409
Employment	0.1	0.0	0.0	0.1
Private Boat Fishing				
Sales	76,329	27,594	24,191	128,114
Wages and Salaries	30,271	10,731	9,026	50,027
Proprietors Income	2,836	1,916	1,776	6,528
Total Income	33,107	12,647	10,801	56,555
Employment	1.00	0.25	0.35	1.60
Private Boat Diving				
Sales	2,282	761	679	3,722
Wages and Salaries	854	60	120	1,034
Proprietors Income	129	15	11	155
Total Income	983	75	131	1,189
Employment	0	0	0	0

APPENDIX E

Step 1 Analysis - Consumptive Activities - Additional State - Alternative 2

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	405,231	122,955	150,207	678,393
Wages and Salaries	153,671	11,093	25,534	190,299
Proprietors Income	25,118	2,054	1,973	29,144
Total Income	178,789	13,147	27,507	219,443
Employment	9.4	0.6	0.9	10.8
Charter/Party Boat Diving				
Sales	101,462	29,631	37,076	168,169
Wages and Salaries	37,136	3,585	4,287	45,008
Proprietors Income	6,567	1,116	984	8,667
Total Income	43,703	4,701	5,271	53,675
Employment	2.2	0.3	0.4	2.9
Private Boat Fishing				
Sales	304,140	145,925	248,830	698,895
Wages and Salaries	120,616	14,659	13,878	149,153
Proprietors Income	11,308	3,994	3,702	19,005
Total Income	131,924	18,653	17,581	168,158
Employment	5.00	0.65	0.45	6.10
Private Boat Diving				
Sales	21,752	7,266	6,526	35,544
Wages and Salaries	8,140	573	1,134	9,847
Proprietors Income	1,235	143	102	1,481
Total Income	9,375	716	1,237	11,328
Employment	0.40	0.05	0.05	0.50

Step 1 Analysis - Consumptive Activities - Federal - Alternative 2

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	954,719	289,756	354,050	1,598,525
Wages and Salaries	362,097	26,141	60,153	448,391
Proprietors Income	59,161	4,844	4,654	68,659
Total Income	421,258	30,985	64,807	517,050
Employment	22.2	1.4	1.9	25.5
Charter/Party Boat Diving				
Sales	129,720	33,405	27,211	190,336
Wages and Salaries	47,275	5,813	4,170	57,258
Proprietors Income	7,604	1,907	1,686	11,197
Total Income	54,879	7,720	5,856	68,455
Employment	2.7	0.1	0.6	3.4
Private Boat Fishing				
Sales	603,298	289,452	493,598	1,386,348
Wages and Salaries	239,256	29,077	27,530	295,863
Proprietors Income	22,430	7,923	7,343	37,697
Total Income	261,686	37,000	34,874	333,560
Employment	10.00	1.30	0.80	12.10
Private Boat Diving				
Sales	31,160	10,408	9,343	50,911
Wages and Salaries	11,661	821	1,626	14,107
Proprietors Income	1,769	205	146	2,121
Total Income	13,430	1,026	1,772	16,228
Employment	0.50	0.05	0.05	0.60

APPENDIX E

Step 1 Analysis - Consumptive Activities - Additional State - Alternative 3

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	416,159	126,289	154,357	696,805
Wages and Salaries	157,809	16,287	18,842	192,938
Proprietors Income	25,803	3,374	3,241	32,418
Total Income	183,612	19,661	22,083	225,356
Employment	9.7	0.59	0.89	11.2
Charter/Party Boat Diving				
Sales	103,725	30,264	37,762	171,751
Wages and Salaries	37,967	3,671	4,377	46,015
Proprietors Income	6,705	1,145	1,010	8,860
Total Income	44,672	4,816	5,387	54,875
Employment	2.3	0.3	0.4	3.0
Private Boat Fishing				
Sales	314,605	150,946	257,392	722,943
Wages and Salaries	124,766	15,158	14,366	154,290
Proprietors Income	11,697	4,130	3,827	19,654
Total Income	136,463	19,288	18,193	173,944
Employment	5.20	0.68	0.42	6.30
Private Boat Diving				
Sales	21,173	7,074	6,356	34,603
Wages and Salaries	7,924	558	1,103	9,585
Proprietors Income	1,203	140	100	1,442
Total Income	9,127	697	1,203	11,027
Employment	0.30	0.05	0.05	0.40

Step 1 Analysis - Consumptive Activities - Federal - Alternative 3

	Direct	Indirect	Induced	Total
Charter/Party Boat Fishing				
Sales	1,398,939	406,642	509,642	2,315,223
Wages and Salaries	530,594	103,760	121,527	755,881
Proprietors Income	1,137	331	293	1,761
Total Income	531,731	104,092	121,820	757,642
Employment	32.5	2.2	2.7	37.4
Charter/Party Boat Diving				
Sales	157,999	45,927	57,560	261,486
Wages and Salaries	57,998	5,506	6,449	69,953
Proprietors Income	10,401	1,719	1,519	13,639
Total Income	68,399	7,225	7,968	83,592
Employment	3.7	0.3	0.4	4.4
Private Boat Fishing				
Sales	830,792	398,602	679,677	1,909,071
Wages and Salaries	329,475	40,042	37,912	407,429
Proprietors Income	30,888	10,911	10,113	51,912
Total Income	360,363	50,953	48,025	459,341
Employment	13.70	1.73	1.17	16.60
Private Boat Diving				
Sales	34,439	11,500	10,315	56,254
Wages and Salaries	12,888	907	1,796	15,591
Proprietors Income	1,955	227	162	2,344
Total Income	14,843	1,134	1,958	17,935
Employment	0.60	0.05	0.05	0.70

APPENDIX F

Appendix F. Non-Consumptive Recreation – Detailed Tables

APPENDIX F

Step 1 Analysis - Non-consumptive Activities - Existing State Alternatives

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	644,785	190,504	233,447	1,068,736
Wages and Salaries	234,683	24,113	28,900	287,696
Proprietors Income	42,308	6,928	6,365	55,601
Total Income	276,991	31,041	35,265	343,297
Employment	15.7	0.9	1.4	18.0
Non-Consumptive Diving				
Sales	342,379	100,925	123,925	567,229
Wages and Salaries	124,448	6,835	17,101	148,383
Proprietors Income	22,606	4,676	4,291	31,573
Total Income	147,054	11,510	21,392	179,956
Employment	8.5	0.6	0.9	10.0
Sailing				
Sales	68,922	20,337	24,949	114,208
Wages and Salaries	25,066	2,239	2,584	29,889
Proprietors Income	4,538	943	866	6,347
Total Income	29,604	3,182	3,450	36,236
Employment	1.70	0.10	0.20	2.00
Kayaking/Sightseeing				
Sales	74,859	21,905	27,071	123,835
Wages and Salaries	27,093	2,439	2,763	32,295
Proprietors Income	5,041	1,007	921	6,970
Total Income	32,134	3,447	3,684	39,265
Employment	2.00	0.10	0.20	2.30

APPENDIX F

Step 1 Analysis - Non-consumptive Activities - Additional State - Alternative 1

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	10,523	3,108	3,810	17,441
Wages and Salaries	3,829	43	49	3,921
Proprietors Income	191	34	30	254
Total Income	4,020	77	78	4,175
Employment	0.3	0.0	0.0	0.3
Non-Consumptive Diving				
Sales	3,479	1,022	1,258	5,759
Wages and Salaries	1,262	113	130	1,505
Proprietors Income	232	47	43	322
Total Income	1,494	160	173	1,827
Employment	0.1	0.0	0.0	0.1
Sailing				
Sales	3,347	988	1,212	5,547
Wages and Salaries	1,218	110	124	1,452
Proprietors Income	220	46	42	308
Total Income	1,438	156	166	1,760
Employment	0.10	0.00	0.00	0.10
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

Step 1 Analysis - Non-consumptive Activities - Federal - Alternative 1

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-
Non-Consumptive Diving				
Sales	11,681	3,432	4,226	19,339
Wages and Salaries	4,238	406	487	5,131
Proprietors Income	778	117	108	1,003
Total Income	5,016	523	595	6,134
Employment	0.30	0.05	0.05	0.40
Sailing				
Sales	7,363	2,174	2,666	12,203
Wages and Salaries	2,679	233	282	3,195
Proprietors Income	484	101	92	677
Total Income	3,163	334	375	3,872
Employment	0.02	0.00	0.00	0.02
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

APPENDIX F

Step 1 Analysis - Non-consumptive Activities - Additional State - Alternative 2

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	13,572	4,010	4,914	22,496
Wages and Salaries	4,940	474	568	5,982
Proprietors Income	890	139	127	1,156
Total Income	5,830	613	695	7,138
Employment	0.30	0.00	0.10	0.40
Non-Consumptive Diving				
Sales	33,369	9,873	12,083	55,325
Wages and Salaries	12,155	1,398	942	14,495
Proprietors Income	2,181	459	422	3,062
Total Income	14,336	1,857	1,364	17,557
Employment	0.80	0.00	0.10	0.90
Sailing				
Sales	3,347	988	1,212	5,547
Wages and Salaries	1,218	110	124	1,452
Proprietors Income	220	46	42	308
Total Income	1,438	156	166	1,760
Employment	0.10	0.05	0.05	0.20
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

Step 1 Analysis - Non-consumptive Activities - Federal - Alternative 2

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	58,484	17,277	21,174	96,935
Wages and Salaries	21,285	2,042	2,448	25,776
Proprietors Income	3,839	596	548	4,983
Total Income	25,124	2,639	2,996	30,759
Employment	1.40	0.10	0.10	1.60
Non-Consumptive Diving				
Sales	41,530	12,231	15,030	68,791
Wages and Salaries	15,087	1,296	1,606	17,989
Proprietors Income	2,749	566	519	3,834
Total Income	17,836	1,862	2,125	21,823
Employment	1.00	0.10	0.10	1.20
Sailing				
Sales	10,041	2,964	3,635	16,640
Wages and Salaries	3,653	330	373	4,356
Proprietors Income	660	138	126	924
Total Income	4,313	468	499	5,280
Employment	0.20	0.00	0.00	0.20
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

APPENDIX F

Step 1 Analysis - Non-consumptive Activities - Additional State - Alternative 3

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	42,529	12,575	15,399	70,503
Wages and Salaries	15,486	1,487	1,782	18,755
Proprietors Income	2,784	435	400	3,619
Total Income	18,270	1,922	2,182	22,374
Employment	1.00	0.10	0.10	1.20
Non-Consumptive Diving				
Sales	34,361	10,167	12,443	56,971
Wages and Salaries	12,517	1,121	1,295	14,933
Proprietors Income	2,245	473	429	3,147
Total Income	14,762	1,594	1,724	18,080
Employment	0.80	0.10	0.10	1.00
Sailing				
Sales	3,347	988	1,212	5,547
Wages and Salaries	1,218	110	124	1,452
Proprietors Income	220	46	42	308
Total Income	1,438	156	166	1,760
Employment	0.10	0.00	0.00	0.10
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

Step 1 Analysis - Non-consumptive Activities - Federal - Alternative 3

	Direct	Indirect	Induced	Total
Whale Watching				
Sales	205,505	60,760	74,410	340,675
Wages and Salaries	74,829	7,183	8,607	90,619
Proprietors Income	13,459	2,099	1,929	17,487
Total Income	88,288	9,282	10,536	108,106
Employment	5.00	0.30	0.40	5.70
Non-Consumptive Diving				
Sales	57,653	16,974	20,864	95,491
Wages and Salaries	20,941	1,793	2,233	24,968
Proprietors Income	3,819	786	721	5,325
Total Income	24,760	2,579	2,954	30,293
Employment	1.40	0.10	0.10	1.60
Sailing				
Sales	11,991	3,533	4,340	19,864
Wages and Salaries	4,357	370	468	5,195
Proprietors Income	793	164	150	1,107
Total Income	5,150	534	618	6,302
Employment	0.30	0.05	0.05	0.40
Kayaking/Sightseeing				
Sales	-	-	-	-
Wages and Salaries	-	-	-	-
Proprietors Income	-	-	-	-
Total Income	-	-	-	-
Employment	-	-	-	-

APPENDIX G

Response to the American Sports Fishing Association Sponsored Report and Revisions of Economic Impact Estimation for Recreation Activities

American Sports Fishing Association Report

On March 7, 2002, the American Sports Fishing Association (ASA) in cooperation with the United Anglers of Southern California released a report developed by Robert Southwick of Southwick Associates, Inc of Fernandina Beach, Florida entitled "*The Economic Effects of Sportsfishing Closures in Marine Protected Areas: The Channel Islands Example*". The report is posted on the ASA web site (http://www.asafishing.org). A press conference was held in Long Beach, California at the Fred Hall Fishing Tackle and Boat Show announcing the report and its' basic findings.

The report's stated goal was to broaden understanding of the economic issues related to the proposed Marine Protected Areas within the Channel Islands National Marine Sanctuary. Unfortunately, the report instead applies blatantly bad science in what can only be described as "pure advocacy analysis". The report attacks the methods employed by us in our Step 1 analysis of four marine reserve alternatives, which we had done while advising the Marine Reserve Working Group (MRWG). The MRWG was charged with developing alternatives for marine reserves in the Channel Islands National Marine Sanctuary (CINMS). The four alternatives were labeled A, B, C, and D and definitions, maps and our Step 1 analyses were posted on the CINMS web site (http://www.cinms.noaa.gov/MRWGsocioec/panel.html).

The report made several claims about our report, some true and some false. The most important claim was that our method underestimates the impacts of marine reserves on the local and regional economies. We show here that the opposite is true. The data and methods we employed actually overestimate the economic impacts from recreational fishing on the local and regional economy and overstate the impacts from marine reserves in the CINMS on the local and regional economy. Below we address all the issues mentioned in the ASA sponsored report.

Inclusion of Durable Good and Annual Expenses in Economic Impact Analyses. The ASA reports main criticism of our estimates of economic impact of fishing is that we did not include equipment purchases and other expenses that are not related to specific fishing trips. This would include items such as rod & reels, boats & motors, vacation homes, fishing vehicles, clothing, magazines, club dues and license fees. These are labeled "Annual Expenditures" in the report by Gentner, Price and Steinback (2001) entitled "*Marine Angler Expenditures in the Pacific Coast Region, 2000*". This report included detailed trip expenditures by fishing mode (e.g., shore, charter/party boat and private household rental boat) and resident status (e.g., coastal residents and nonresidents). Annual expenditures were reported by resident status. Estimates were provided for the Southern California region.

The author of the ASA report divides the annual expenditures by the annual number of days of fishing and adds this to the spending per day for trip expenditures to arrive at a total spending per day. There is nothing wrong with this, if the purpose is to estimate the economic impact of the recreational fishing industry on the local or regional economy. However, ***it is not appropriate to include the annual expenditures in analyses of marginal changes in the total numbers of days of fishing caused by a change in management strategies or regulations.*** By marginal changes we mean relatively small percents of total activity, which we will show is the case for the currently proposed marine reserve alternatives in the CINMS, as well as the previous ones we analyzed for the MRWG.

Why is it not appropriate to include annual expenditures in the analysis of marine reserves? First, the decision to purchase a rod, reel, boat, motor, vacation home, fishing license, etc. is not related to the decision to fish on any given day. As Gentner, Price and Steinback (2001) mention, those that fished the most days had higher expenditures on annual expenditure items. This is expected, since a person who only fishes a couple of days a year most likely cannot justify the large expenditure required to purchase a boat, motor, fishing vehicle or vacation home. But whether a person chooses to fish on any given day doesn't determine expenditure on annual expenditure items, such as boats and motors. So any event that changes a

small portion of a person's total fishing activity would not be expected to have any impact on the spending on annual items.

Nobel Laureate economist, James Tobin, first developed a statistical method for estimating changes in durable good expenditures (Tobin 1958). Tobin recognized that, in any given year, only a small portion of people purchase a specific durable good. Durable goods by their nature have useful lives, often extending many years. A person doesn't purchase a boat or even a rod and reel each time they go fishing. For analyzing and predicting changes in durable good expenditures, Tobin developed what is now called the "Tobit Model" that model accounts for the fact that, in any given year, only a small portion of people will actually make a purchase. Number of days of fishing might be included as an explanatory variable of the decision to purchase equipment or other annual expenditure items, but it is most likely that days would not explain very much of the variation in the data, and would have only some small marginal impact. The assumption that one could simply divide the total annual expenditures by the annual number of days of fishing, and then apply that to a change in the number of days would prove to be terribly wrong by this analysis.

Most likely, there is some threshold on the proportion of a person's fishing days impacted which might impact the decision of whether to make a purchase of an annual expenditure item. We don't have full information on all the days spent fishing or all the days people might use their boats, vacation homes, etc., while recreating. However, we know that in 1999 CINMS charter/party boat fishing accounted for 25.7% of all the charter/party boat fishing in Southern California. In addition, we know that private household/rental boat fishing in the CINMS accounted for 21% of all the private household/rental boat fishing in Southern California. We also know the amount of activity potentially impacted by each proposed marine reserve alternative.

Let's take the Preferred Alternative as an example. The current preferred alternative for the network of marine reserves in the CINMS cover 25% of the CINMS waters. It would potentially impact 16.23% of the charter/party boat fishing and 17% of the private household/rental boat fishing. So on net, only 4.2% of all the charter/party boat fishing in Southern California is potentially impacted by the preferred alternative. Similarly, on net only 3.6% of the private household/rental boat fishing would potentially be impacted by the preferred alternative. Across both types of fishing, 3.8% of Southern California boat fishing would potentially be impacted by the preferred alternative (Table G.1). Therefore, the potential impact of the preferred alternative network of marine reserves in the CINMS has only a small marginal impact on the total days of marine recreational fishing in Southern California and would therefore would be expected to have no impact on the purchase of annual expenditure type items. Spending on these types of items would not be appropriate to include in the analysis of marine reserves in the CINMS.

Table G.1 CINMS as a Percent of Southern California Recreational Fishing, 1999

	Number of Fishing Trips (Days)		
	Charter/Party Boat Fishing	Private Household/ Rental Boat Fishing	Total Boat Fishing
S. California	617,000	1,019,000	1,636,000
CINMS	158,768	214,015	372,783
Marine Reserve Preferred Alternative	25,767	36,381	62,148
% of S. CA in CINMS	25.73	21.00	22.79
Preferred Alternative as Percent of CINMS	16.23	17.00	16.67
Preferred Alternative as Percent of S. CA	4.18	3.57	3.80

Sources: National Marine Fisheries Service, Marine Recreational Fishing Statistics Survey (NMFS-MRFSS), http://www.st.nmfs.gov/st1 and Kolstad Survey of recreational charter/party/guide services for the CINMS.

When would it be appropriate to include annual expenditure items in an economic impact analysis? As the above discussion stated, there might be some threshold level of activity impacted that might start to impact people's decision to purchase annual expenditure items. For fishing licenses, if a certain high proportion of days were impacted and there were no substitute places to go fishing, a person might quit participating in fishing and not buy a fishing license. If they own a vacation home or a boat and motor, they may decide to sell them as well. Over the long-term, if fishing capacity is lowered by the marine reserves, this could result in some smaller number of new entrants into the fishery and thereby lower the amount of spending on new equipment and other annual expenditure items. But the majority of experiences suggest, and the most likely expected outcome is that, over the long-term, fishing capacity will be expanded by marine reserves through the replenishment of areas outside the protected areas.

Even in the short-term, the analysis would have to employ the techniques developed by Tobin (1958) to analyze how the marine reserves would possibly change the purchase of annual expenditure items. And, as discussed above, the amount of impact would be less than simply the percent of days of fishing impacted. For example, if the entire CINMS were made into a marine reserve, 25.7% of the charter/party boat fishing and 21% of the private household/rental boat fishing in southern California would be potentially impacted. This amount of impact might reach the threshold level and require analysis of the impacts on annual expenditure items. But as was pointed out, the impact would be much less than the percents of total activity impacted, since days of fishing would not be the only explanatory variable in the model explaining the decision to purchase an annual expenditure item (i.e., the Tobit Model).

Substitution. Our Step 1 analyses simply add up the activity currently taking place within the proposed marine reserve areas and apply the assumption that all is lost. No account is taken of people's ability to substitute or relocate their fishing activities to other fishing sites. Under the preferred alternative, only 25% of the CINMS waters are included in the proposed network of marine reserves leaving 75% of the CINMS plus all the areas outside the CINMS for people to find other fishing sites. Thus, we would expect that our Step 1 estimates are overestimates of impact. We don't have a model to tell us how much substitution might take place, and what the net impact will be either in the short or long term. However, some substitution is likely, and to the extent people are able to find suitable substitute fishing sites, this will lower estimates of impact that we make in our Step 1 analyses.

The ASA report claim that we had underestimated the potential economic impact is totally driven by their inclusion of annual expenditure items in their revised estimates. As we have shown above, this is not good economics and not good science, and represents "pure advocacy analysis".

Residency Status and the Multiplier Impacts. The author of the ASA report apparently did not understand our multiplier analysis and made claims that this was a further reason why our estimates of the impact of marine reserves were underestimates. We understand why this mistake could be made since we never published a report explaining our multiplier analysis, although we explained it to the MRWG and the public at several public meetings during the two-year MRWG process.

Actually, our multiplier analysis is related to the definition of where fishermen live relative to the place where they accessed the CINMS and spend their money locally for fishing trips. We used a range of multipliers (2.0 to 2.5 for income and 1.5 to 2.0 for employment). These multipliers are "Keynesian" type multipliers and are within the range of multipliers we would expect for counties like Santa Barbara, Ventura and Los Angeles counties, which have fairly diverse economies and would be expected to have relatively high multipliers. The range of multipliers was used to develop upper and lower bound estimates of impact. One of the reasons was that we did not have any information on where the people lived that accessed the CINMS from each county. By applying the multipliers to all fishermen spending, the assumption is that all fishermen are nonresidents of the county from which they accessed the CINMS. That means that none of the fishermen that accessed the CINMS from a Santa Barbara port live in Santa Barbara. Results will clearly be overstated because some percent are likely to be local residents. The reason for this result is that economists generally don't apply multipliers to local spending because it double-counts local spending. Spending by local residents is part of the multiplier process from basic or export industries, which bring new dollars into the community.

Our application of the multipliers to all spending seriously overstates the economic impacts of marine reserves. It would be much more reasonable to assume that some portion of those that accessed the CINMS from Santa Barbara county ports are local residents of Santa Barbara County, and similarly for the other two counties. We used the range of multipliers to account for some of the resident status problem, however, information from the National Marine fisheries Service, Marine Recreational Fishing Statistics Survey (NMFS-MRFSS) suggests that the range of multipliers is not a big enough adjustment to account for the possible overstatement of impact.

NMFS-MRFSS data for 1999 shows that 86.71% of the Southern California marine recreational fishing trips (days) for charter/party boat fishing were made by coastal residents. For private household/rental boat fishing, the estimate was 96.86%. Coastal residency doesn't give us precise enough information to extrapolate this to saying that those same percentages should apply to each county in the impact area. But it does indicate that our analysis overstates the impact by applying multiplier analysis to all fishermen expenditures.

We have developed two sets of estimates. One using our original assumption that 100% are nonresidents and therefore the multipliers are applied to all expenditures. The second set of estimates is based on the assumption that 50% accessed the CINMS from the county of their residence. We include only the direct sales, income and employment impacts for residents and the direct and multiplier impacts for nonresidents. Given the percentages of coastal residents for Southern California cited above, this is still likely to lead to an overestimate of impact, but our range of multipliers may now give a truer picture of the range of potential impacts. In our Step 1 analyses, we would still refer to the upper bound estimates as representing "maximum potential loss".

Import Substitution/Double Counting Economic Impact. As stated above, in local or regional economic impact analysis, the inclusion of resident spending impact is usually not done because it is already accounted for in the multiplier analyses of basic or export industries. Nonresident fishermen that bring new dollars into a county spend money, which is received by local businesses and they spend it on inputs of production, including wages and salaries for labor and a return to the business as profit. These workers and business owners spend a portion of their incomes in the local economy and thus the ripple or multiplier

impacts. Some of the workers and business owners that received income through this multiplier impact will spend it locally on fishing trips in the CINMS. So this portion of resident spending would be double-counted.

We recognize that by including resident spending impacts, even only the direct impacts, does involve double counting. The reason for including it has to do with the "***import substitution***" argument. Import substitution means that the multiplier impact would be reduced from all basic or export industry spending, if the fishermen would substitute to fishing sites outside the local county. The multiplier impacts would be less without this spending. Local businesses have an incentive to keep this activity in the local area. So, this is another reason that supports our calling our Step 1 analysis estimates "maximum potential loss".

There is a gray area where resident direct impacts may not be double counting and which may not require the assumption of import substitution to count the impact. This would be the case of income earned from sources unrelated to work in the county of residence and spending. A good example is retirement and pension income. This source of income represents new dollars into the community and is thus a basic or export industry. Dollars of spending here have their own multiplier impacts that are not double counted. To the extent that local residents are spending from these sources of income for recreational fishing in the CINMS it is appropriate to include not only the direct impacts, but also the multiplier impacts of such spending.

As the above discussion indicates, our Step 1 analyses will tend to overestimate economic impacts of marine reserves on the recreational fishing community and associated industries in the local and regional economies. This is true even with our assumption of 50% local residency.

Outdated Expenditure Information. The ASA report also charged that we were using outdated expenditure information and therefore our estimates of spending and income and employment impacts were underestimated. It is true that the expenditure profiles that we used were based on a 1985 and a 1991 study. At the time we started the MRWG process in 1999, the expenditure report by the Gentner, Price and Steinback (2001) was not available. We knew the study was underway but were not aware the estimates were available to apply to the current six alternatives analyzed in this report. However, the new estimates of trip expenditures or spending per person per day are lower than those from the two older studies. This lowers our estimates of the impacts of the marine reserves even further.

Table G.2 shows the derivation of the updated spending profiles for charter/party boat and private household/rental boat fishing. Expenditures were reported by residency status (e.g., coastal residents versus nonresidents of coastal areas) in the first two columns. The third column reports the weighted average for residents and nonresidents using the year 2000 distribution between residents and nonresidents. The fourth column reports the same expenditures using the 1999 distribution of residents and nonresidents and also adjusts year 2000 dollars to 1999 dollars using the Consumer Price Index for all Urban Workers for All Items 1982-84=100. Our baseline activity estimates and impact estimates are for year 1999. As it turns out, some of our expenditures are higher for 1999 than for 2000 because the weights are higher for nonresident charter/party boat fishermen. Also, for charter/party boat fishing, we substitute our estimates of charter/party boat fees for those in the 2000 study because our estimates were based on a census, not a sample, of charter/party boat fishing in the CINMS, and our estimates vary by county. For charter/party boat fishing, our charter/party boat fees are higher for Santa Barbara and Los Angeles counties and lower for Ventura County than the 2000 study for all of Southern California (see footnote 5 of Table G.2).

APPENDIX G

Table G.2. Updated Spending Profiles for Recreational Fishermen in S. California, 2000

	Charter/Party boat			
	Residents	Non-residents	Weighted 2000 $ [1]	Weighted 1999 $ [2]
Food	$12.62	$38.01	$15.69	$15.47
Lodging	$1.18	$59.55	$8.25	$8.65
Private transportation	$9.78	$65.62	$16.54	$16.64
Public transportation	$0.51	$253.90	$31.20	$33.07
Boat fuel	$0.00	$0.00	$0.00	$0.00
Charter/Party Fees [5]	$55.43	$37.40	$53.25	$51.31
Access/Boat Launch Fees	$0.96	$2.95	$1.20	$1.18
Equipment Rental	$1.81	$34.97	$5.83	$6.01
Bait & Ice	$0.27	$2.32	$0.52	$0.52
Total	$82.56	$494.72	$132.47	$132.87
	Private Household/Rental boat			
	Residents	Non-residents	Weighted 2000 $ [3]	Weighted 1999 $ [4]
Food	$7.54	$17.53	$7.93	$7.60
Lodging	$0.52	$23.33	$1.42	$1.20
Private transportation	$7.07	$74.87	$9.74	$8.90
Public transportation	$0.03	$61.43	$2.45	$1.89
Boat fuel	$12.88	$21.97	$13.24	$12.74
Charter/Party Fees	$0.00	$0.00	$0.00	$0.00
Access/Boat Launch Fees	$1.54	$2.37	$1.57	$1.52
Equipment Rental	$0.72	$7.71	$1.00	$0.91
Bait & Ice	$6.87	$11.02	$7.03	$6.77
Total	$37.17	$220.23	$44.38	$41.52

1. Weight for residents on charter/party boats for year 2000 is .8789. Non-residents is .1211.
2. Weight for residents on charter/party boats for year 1999 is .8671. Non-residents is .1329. Consumer Price Index-All Urban Consumers-All Items 1982-84=100 was 172.2 for year 2000 and 166.6 for 1999. Conversion factor from 2000 to 1999 dollars is equal to 172.2 divided by 166.6 or 1.0336.
3. Weight for residents on private household/rental boats for year 2000 is .9606. Non-residents is 0.0394.
4. Weight for residents on private household/rental boats for year 1999 is .9686. Non-residents is 0.0314.
5. Since our effort involved a census of operators in the CINMS, we substitute the fees derived from the Kolstad survey: Santa Barbara $60.74; Ventura $47.62; and Los Angeles $59.95.

Sources: Gentner, Price and Steinback (2001) for Marine Angler Expenditures.
CPI, U.S. Dept. of Labor, Bureau of Labor Statistics, http://data.bls.gov/cgi.bin/surveymost
1999 and 2000 Number of Trips, NMFS, http://www.st.nmfs.gov/st1/recreational/database/queries/index.html

Table G.3 shows the expenditure profiles we used from the two older studies. For charter/party boat fishing, the estimates ranged from $153.35 to $166.47 per person per day (depending on county of access) from the older studies versus $129.18 to $142.30 from the new updated study or about a 14.5% to 15.8% reduction in the average spending per person per day. For private household/rental boat fishing, the reduction was even greater. The older studies produced an estimate of $71.73 per person per day. The new updated study produced an estimate of $41.52 per person per day or a 42% reduction. Thus, incorporating the new updated information will reduce greatly the estimated impact of marine reserves on recreational fishing spending and the associated economic impact on income and employment in the local economies, not increase it as the ASA report asserts. Again, the ASA report author failed to mention this fact because it did not support their contention. They were practicing “pure advocacy analysis” and did not want to mention anything that did not support their position. This represents blatantly bad science.

Table G.3. Old Expenditure Profiles for Recreational Fishing

Expenditure	Expenditures Per Person Per Day (1999 $) Charter/Party Boat Fishing	Private Household/ Rental Boat Fishing
Boat Fees [1]	$47.62 - $60.74	$0.00
Boat Fuel	$0.00	$19.00
Food, Bev. & lodging	$69.21	$16.21
Transportation	$14.30	$14.30
Equipment Rental	$22.22	$22.22
Total	$153.35 - $166.47	$71.73

1. Boat fees used were actual by county and activity from the Kolstad survey. Charter/party boat fishing for Santa Barbara County was $60.74, Ventura County was $47.62 and Los Angeles County was $59.95.

Table G.4 shows a summary of the implications of both updating the expenditure profiles and our assumptions about residency and the use of multipliers on Step 1 level analysis of the marine reserve alternatives for the CINMS. Our original methods, as applied to MRWG alternatives A, B, C, D, E and I as found on the CINMS web site greatly overstated the potential economic impacts of the marine reserves associated with recreational fishing. Table G.4 shows an overstatement on income impact, assuming 100% nonresidents, between 16.7 % and 54.95 % and on employment of between 20 % and 52.94 % for the existing six marine reserve alternatives. For all consumptive recreation activities, the overstatement of income impacts were between 24.82% and 26.25 % and for employment between 25.80 % and 27.97 %. Using the 50% residency assumption, the income impacts were overstated by between 41.69 % and 68.47 %, and employment impacts were overstated by between 40.12 % and 64.71 %. For all consumptive recreation activities, the overstatement of income impacts were between 47.37 % and 48.37 % and employment impact between 44.44 % and 45.76 %.

Table G.4 Impact on Step 1 Analysis of Consumptive Recreation by Including Updated Spending Profiles for Fishing and the Assumption about Percent that are Local Residents

Alternative	Acitivity	Percent Changes from Original Step 1 Analysis: 100 % Nonresidents [1] Income	100 % Nonresidents [1] Employment	50% Residents [2] Income	50% Residents [2] Employment
1	Consumptive Recreation	-26.25	-27.97	-48.37	-45.76
	Charter/Party Boat Fishing	-16.70	-20.27	-41.69	-40.54
	Private household/rental boat fishing	-54.95	-52.94	-68.46	-64.71
2	Consumptive Recreation	-25.37	-26.46	-47.76	-44.44
	Charter/Party Boat Fishing	-16.70	-20.59	-41.69	-40.20
	Private household/rental boat fishing	-54.95	-51.79	-68.46	-64.29
3	Consumptive Recreation	-25.30	-26.81	-47.71	-44.93
	Charter/Party Boat Fishing	-16.70	-20.00	-41.69	-40.00
	Private household/rental boat fishing	-54.95	-52.78	-68.47	-63.89
4	Consumptive Recreation	-25.17	-26.14	-47.62	-44.81
	Charter/Party Boat Fishing	-16.74	-20.42	-41.72	-40.14
	Private household/rental boat fishing	-54.95	-52.24	-68.46	-64.18
5	Consumptive Recreation	-24.82	-25.80	-47.37	-44.52
	Charter/Party Boat Fishing	-16.73	-20.37	-41.71	-40.12
	Private household/rental boat fishing	-54.95	-51.28	-68.46	-64.10
Preferred	Consumptive Recreation	-25.41	-26.21	-47.79	-44.66
	Charter/Party Boat Fishing	-16.74	-20.18	-41.72	-40.35
	Private household/rental boat fishing	-54.95	-51.67	-68.46	-63.33

1. Original Step 1 assumption was that all those that accessed the CINMS from Santa Barbara were not residents of Santa Barbara and multipliers were applied to income and employment estimates. The same is true for those that accessed the CINMS from Ventura or Los Angeles counties. Percent changes here are only for updating the spending profiles for charter/party boat fishing and private household/rental boat fishing using the year 2000 NMFS study (see Table G.2).
2. Here the assumption used is that 50 percent of all trips for all consumptive recreation activities were made by residents of the county from where they accessed the CINMS. Direct expenditures, income, and employment are counted for residents and multiplier impacts are applied to the 50 percent that are nonresidents of the county from which they accessed the CINMS.

Conclusion

On the positive side, the ASA report indirectly led to its stated goal of broadening understanding of the economic issues related to the proposed Marine Protected Areas within the Channel Islands National Marine Sanctuary. We were forced to address some issues specifically that had previously not been addressed and we were able to incorporate the latest expenditure estimates for recreational fishing, which should improve our estimates of the potential economic impact of marine reserves. This provides a better starting point for our Step 2 analyses, which take into account other factors that might increase or decrease our estimates of potential losses from Step 1 analyses. On the negative side, the ASA report was exposed for blatantly bad science and exposed the ASA for supporting “pure advocacy analysis”. In that respect, the ASA report did not serve the recreational community well.

APPENDIX H

Table H.1 Estimated Quality Elasticities from Marine Recreation Literature[1]

Study/Topic/Quality Attribute	Base Consumer's Surplus (CS)	Percent Change in Quality Attribute (QA)	Change in CS for Change in QA	Quality Elasticity
1. Cameron (1988)/Pacific Salmon/ Catch Rate	$34.22	100	$3.13	0.09
2. Agnello and Han (1992)/Multi-Species, Long Island Sound, NY/ Catch Rate	$23.84	100	$5.95	0.25
3. Agnello and Han (1992/Multi-Species, Long Island Sound, NY/ Catch Rate	$23.84	20	$1.31	0.27
4. Kaoru (1991)/Multi-Species, Albermarle Sound, NC/Catch Rate	$3.09	25	$0.25	0.32
5. Kaoru (1991)/Multi-Species, Albermarle Sound, NC/Catch Rate	$1.97	25	$0.25	0.51
6. Morey, Rowe and Watson (1991)/ Atlantic Salmon/Catch Rate	$96.00 (Mean)	100	$60 (Mean)	0.63
7. Morey, Rowe and Watson (1991)/ Atlantic Salmon/Catch Rate	$83.00 (Median)	100	$66 (Median)	0.80
8. Cameron (1992)/Red Drum, TX/ Catch Rate	$238.00	50	$88	0.74
9. Huppert (1989)/Striped Bass and Salmon, San Francisco Bay Area/ Catch Rate	$77.00	100	$141	1.83
10. Leeworthy (1990)/King Mackerel, West Coast, FL/Catch Rate	$56.40	50	$45	1.60
11. Leeworthy (1990)/King Mackerel, East Coast, FL/Catch Rate	$56.40	50	$122	4.33
12. Kaoru and Smith (1990)/Multi-Species, NC Sounds/Catch Rate	$4.30	25	$7.09	6.60
13. Kaoru and Smith (1990)/Multi-Species, NC Sounds/Catch Rate	$39.11	25	$11.07	1.13
14. Bockstael, et al (1989)/Boating, Swimming and Fishing in Chesapeake Bay/Water Quality-Nutrients[2]	$1.61 - $139.22	20	$0.77 - $13.98	0.24 - 1.29

1. The first 13 results are all are based on fishing studies done on the marine environment from Freeman (1995). Value ealsticities were calculated based on information summarized in Tables 2, 3 and 5 in Freeman (1995).

2. The ranges of value elasticities were calculated from results found in Bockstael, et al (1989) and the detailed calculations can be found in Wiley and Leeworthy (1999).

APPENDIX H

Table H.2 Comparison of Consumptive and Nonconsumptive Recreation Values[1]

Activity	Number of Studies	Number of Estimates	Mean $ Person-day	Median $ Person-day	SE of Mean	Range of Estimates $
Fishing	39	122	$35.89	$20.19	$3.42	1.73 - 210.94
Wildlife Viewing	16	157	$30.67	$28.26	$1.38	2.36 - 161.59
Swimming	9	12	$21.08	$18.19	$4.46	1.83 - 49.08
Nonmotorized boating	13	19	$61.57	$36.42	$13.76	15.04 - 263.68

1. From Rosenberger and Loomis (2001).