Identification and Feasibility of Sustainable Fishing and Marketing Practices for Coastal Pelagic Species Harvested at the Moss Landing Commercial Harbor

Prepared for

The Coastal Conservancy and the Moss Landing Marine Laboratories

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Table of Contents

Table of Figures

EXECUTIVE SUMMARY

In November, 2007, Moss Landing Marine Laboratories (MLML) purchased property in Moss Landing Harbor occupied by a wetfish offloader to provide a permanent home for the NSF (National Science Foundation) owned Research Vessel Point Sur. MLML identified an opportunity to partner with the local fishing industry, to create a sustainable fishery that could save local jobs and to promote a partnership that would benefit research, education and fishing interests. MLML has the opportunity to develop the property into a multi-use fishing operations facility, serving research and education co-located with sustainable fish offloading facilities.

Dr. Fredric Kropp of the Monterey Institute of International Studies and Dr. Roxanne Zolin of the Naval Postgraduate School and Queensland University of Technology were contracted by the Coastal Conservancy to work with the MLML to investigate the feasibility of a public private partnership to manage the resources. The primary objective of this project was to identify and examine markets for coastal pelagic species (CPS) --- primarily, sardine, anchovy, mackerel and squid --- that could be used to transform the existing low-value high-volume catch model to a higher-value lower volume management of the catch This involved gathering information about the market and distribution channels for CPS, identifying new product and market opportunities for MLML and evaluating the opportunities and making recommendations. Thirty-six interviews were conducted with representatives from the government, national and local interest groups, local restaurants, local and chain grocers, academia, fish processors and fishing operations.

Four scenarios were developed to examine the consequences of different sets of actions. Two of the scenarios, closing the wetfish offloading facility and maintaining the status quo of leasing the wetfish offloading facility were not recommended because of the negative economic and social impacts on the Moss Landing Community. The other two scenarios involved growing the market for CPS. Sardines were identified as having the most potential in the near-term. (Note, we recognize that market and environmental conditions may change over time and that there may be opportunities for other CPS in the future.) Based upon our analysis we focused on marketing sardines for human consumption and higher-value non human consumption.

Key Findings:

- The LOHAS (Lifestyles of Health and Sustainability) market segment represents a good potential target market. People in the LOHAS segment are more conscious about the food they eat, their health and the environment. Estimates of the number of people in this group vary from 19 to 30 percent of the adult US population.
- A “Monterey Sustainable” brand could appeal to this group, especially people living in the tri-county area of Monterey, Santa Cruz and San Benito.
- Fresh Moss Landing sardine fillets may be a good product for the LOHAS market. The product matches the LOHAS group’s needs.
- A sustainable fishery certification from the Marine Stewardship Council, Friend of the Sea, or another certifying body could enhance the value of the fish for the LOHAS group.
- Based on experiences with canned sardines that are spiced and packed in oil, many people perceive (misperceive) sardines as boney, fishy and oily. A public relations campaign would need to be developed to change perceptions and build demand.

- To exploit the opportunity ML fishers need to consistently catch sardines larger than 50 grams; contracts are needed with distributors guaranteeing regular supply of larger fish.
- In order to realize sustainability in this fishery, sustainability in the infrastructure is required. Currently this would involve the reconstruction of docks, off loading and processing equipment and the coordination of co-sited facilities.
- A demonstration project to catch the sardines and fillet them, as well as to help develop the market, is a logical next step.
- International markets for sardines and other CPS are strong, however, with only a few exceptions; for example, bait for South African tuna fishing, the demand conforms to the low-value high-volume model.
- These activities may be more than MLML can undertake as an owner of a wetfish offloading facility. A public private partnership could be formed to align the goals and activities of environmental non-government organizations, industry and government stakeholders and contribute towards gaining the sustainability certification, promoting the brand and lobbying for legislation that protects fish without damaging the fishing industry.

This plan could substantially increase the market value of fish sold while reducing the size of the CPS catch at Moss Landing and creating a fishing industry that is sustainable, not only in terms of the CPS populations, but also in terms of having a viable, sustainable fishing industry.

1. Introduction

In November, 2007, Moss Landing Marine Laboratories (MLML) purchased property in Moss Landing Harbor to provide a permanent home for the NSF (National Science Foundation) owned Research Vessel Point Sur. The property was occupied by a wetfish offloader. MLML identified an opportunity to partner with the local fishing industry, to create a sustainable fishery that could save local jobs and to promote a partnership that would benefit research, education and fishing interests. MLML has the opportunity to develop the property into a multi-use fishing operations facility, serving research and education co-located with a sustainable fish offloading facilities.

The purpose of this report is to explore the feasibility of the new sustainable fishery facility and to facilitate the public-private partnership dialogue with the local fishing industry. In addition, recognizing that fisheries have changed in the past and are likely to change in the future, recommendations need to be adaptable to meet the future conditions of the fishery.

Background

Moss Landing is the largest commercial fishing port in central California[3]. Over the past twenty years, the commercial fishing industry in California, including Moss Landing, declined precipitously, both in pounds landed and in revenue generated[4]. Rockfish, halibut, billfish, tuna and salmon are some of the most impacted species. This decline is a result of several interrelated factors including declining fish stocks, increasing regulation on fisheries, and fewer fishers and vessels. During this same period, landings of coastal pelagic species (CPS) - which include sardines, squid, mackerel and anchovies - increased significantly.

Most of the wetfish offloaded in Moss Landing are distributed to the bulk protein market, e.g., tuna farms and long-line bait. For the purposes of this report, "wetfish," is defined as the commercial anchovy, mackerel, sardine, squid and coastal tuna markets[5]. Fishers receive a low price, often less than five cents per pound, for these species, necessitating high volume catches for economic viability[6]. This low-value high-volume business model may eventually lead to over-fishing and the depletion of coastal pelagic species (CPS) populations. In addition to impacting the sustainability of CPS itself, depletion of CPS could also impact higher trophic species and species that are higher in the food chain, along the central coast such as birds, whales, salmon and tuna[7].

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[3]Pomeroy, Caroline and Dalton, Michael, "Socio-Economic of the Moss Landing Commercial Fishing Industry," June 2003

[4] For more details of the California Wetfish Industry, see Hackett, Steven C. and Krachey, Matther, "An Economic Overview of the California Wetfish Industry Complex," http://ca-seafood.ucdavis.edu/news/wetfish/wf_econ.pdf. For more details of trends in the Monterey Bay Sanctuary, see Starr, Richard M., Cope Jason M., and Kerr, Lisa A., "Trends in Fisheries and Fishery Resources Associated with the Monterey Bay National Marine Sanctuary from 1981-2000," http://ca-seafood.ucdavis.edu/news/wetfish/wf_econ.pdf.

[5] Though not identical, this definition is compatible with the definition used for the California Wetfish Industry by Pomeroy, Caroline, Hunter, Monica and Los Huertos, Marcos, http://ca-seafood.ucdavis.edu/news/wetfish/wf_prof.pdf

[6] Identified in interviews.

[7] Kenneth Coale, MLML.

The CPS fishery currently conforms to a low-value high-volume model. As market prices are very low, fishers need to catch a high volume of fish in order to survive economically. Market forces and the resulting fishing practices put pressure on key species in the Monterey Bay ecosystem, species upon which many others depend. This study examines existing patterns of the commercial fishing industry and wetfish offloading at the Moss Landing Harbor (MLH), as well as perceptions of future needs. As such, it examines existing and potential markets for CPS, in particular, sardines. It investigates models of capture, processing and distribution that can potentially result in a higher-value lower-volume model for the CPS fishery. A higher-value lower-volume model would reduce the catch of CPS while preserving fisher and fisher-related jobs. At the same time, the higher-value lower-volume model could minimize the impact on the trophic cascade in the coastal zone, so that long-term stability in both fisheries and ecosystems can be achieved. We examine possible models of public-private partnerships to help achieve these goals.

This study examines current conditions in the Moss Landing area, existing and possible new markets for the catch, and possible new practices and governance structures. The principal investigators are Kenneth Coale of the Moss Landing Marine Laboratories (MLML), Fredric Kropp of the Monterey Institute of International Studies, and Roxanne Zolin of the Naval Postgraduate School and the Queensland University of Technology. Peder Hanson was the project manager, and Rafael Burgos, Ryan Peck and Neal Reardon, graduate students at the Monterey Institute of International Studies were research associates on this project.

2. Project Objectives

The primary objective of this project is to develop higher-value lower-volume management of the CPS catch through developing the human consumption and other potential markets. This involves:

1. Gathering information about the market and distribution channels for CPS
2. Identifying new product and market opportunities for MLML
3. Evaluating the opportunities and make recommendations.

3. Scope

Discussions were held between the project's principal investigators, other people at the Moss Landing Marine Laboratories and the Coastal Conservancy, fishers, processors, and those involved in the wetfish industry and other interested parties. Given the large number of possible directions that could be followed, a more limited focus was identified. This project was charged with identifying methods and markets that would lead to a higher-value lower-volume catch that would enhance the sustainability of the fishery and the economic viability of the local fishing industry. This requires an understanding of current conditions and future possibilities as well as a possible public-private partnership to coordinate future activities.

The study methodology is described in Section 4. Section 5 presents descriptions of the Moss Landing Harbor, the trophic ecology of the coastal pelagic species, the business environment, and relevant legislation and environmental conditions. Readers familiar with these may wish to skip to Sections 6 -8 which presents analysis, recommendations and conclusions.

4. Methodology

Multiple methods were employed to conduct this study including a review of relevant literature, database research, discussions with MLML staff and interested parties, a series of structured interviews with a wide group of stakeholders, and market analyses. Key highlights of the interviews are presented below and are integrated in Section 5, Overview, and subsequent sections of the report. The list of interview respondents, their affiliations, and contact information appears in Appendix 1: List of Interview Respondents.

We identified and explored the viability of expanding existing markets and developing new markets. Additionally, we examined alternative approaches to managing the catch and resources, including a public-private partnership. In order to understand the impacts of possible different strategies, four scenarios were created and are described, in detail, in Section 6, Analysis. The scenarios involve the role MLML and a public private partnership could play in resource management, offloading and market development.

Respondents were selected from several groups including fishers, wetfish offloaders, distributors, government, local not-for-profit associations and the local fishing community. A snowball interviewing approach was used, in which interviewees were asked if they could suggest others who should be interviewed in any of the target categories.

The interviews were semi-structured. A short list of relevant "starter" questions was used to ensure specific topics were addressed. In addition, the interviewers followed the respondents' train of thought.

Interview Results: Key Findings

Thirty-six interviews were conducted between September, 2007 and March, 2008. Respondents included representatives from the government, national and local interest groups, local restaurants, local and chain grocers, academia, fish processors and fishers. Highlights of the interviews are presented below. Please see Appendix 1 for a list of the interview respondents, affiliations and contact information.

Sardine Markets and Constraints

- Current markets for sardines –include South Africa for long-line bait, Thailand for canning (sardines less than 50grams) Australia for tuna farming, and Japan for human consumption.
- Japan has multiple ways to process sardines, but selling a butterfly filet is one way to market them to Japan with proper PR and marketing.
- Future markets for sardines include targeting burgeoning LOHAS (Lifestyles of Health and Sustainability) market and high end, organic pet food. Re-establish a strong California brand.
- Overall, respondents felt that there was only a limited local demand for sardines with some of it focused in ethnic markets.
- Value-added processing in California is prohibitively expensive because of energy and labor costs.
- The fishing industry as a whole is resistant to change and innovative suggestions for changing the industry may be met with resistance.

Marketing Opportunities

- Use restaurants and festivals to promote sardines. Cooperate with Seafood Watch in getting sardines onto the menus of local restaurants. Moss Landing has the potential to establish a brand name among this growing market.
- Developing a brand name for Monterey sardines could include certification from one of the international organizations that provide an eco-label, for example, the Marine Stewardship Council (MSC) - and Friend of the Sea.
- Look towards oceanographic and historical tourism to augment and perhaps replace, to a certain degree, the traditional fishing industry.

Threats and Opportunities

- Long-term viability of the fishing industry is a potential issue because of over-fishing, loss of value-generating fisheries, and new regulations.
- Moss Landing has become economically depressed and there is a need to adapt quickly. The non-consumptive value of Monterey Bay is already higher than that of its consumptive uses.
- Other long-term solutions may include an inter-tradable quota system (ITQ), or a Limited Access Privilege Program (LAPP), where fishers either purchase quotas at an auction, or are grandfathered in based on past catch shares.
- Moss Landing Marine Laboratories (MLML) can become an honest fish buyer who purchases a specific, sustainable product for a premium price.
- Fishing-related infrastructure needs to be improved. This includes a harbor that is dredged, clear and navigable and docks that are in good shape. Facilities need to be clean and sound and investments need to be made in processing equipment, e.g., pumps, ice machines, fork lifts, etc.
- Purchase value-added equipment to decrease operating costs for fishers (e.g., an ice machine for MLH), or increases the local value-added after offloading has occurred, such as, a grading machine, canning facility, filleting equipment, and/or a head, gut, and tail machine.
- There are multiple groups with shared goals and/or shared interests that can lead to a public-private partnership.

5. Overview Moss Landing Harbor (MLH)

This section was developed using existing published sources, the interviews described above and in Appendix 1, and through discussions with MLML and key stakeholders.

Moss Landing Harbor (MLH) is one of the most important commercial fishing ports in California, both in pounds landed and in ex-vessel revenues.[8] Based on data from the National Ocean Economics Program,[9] in 2006, Moss Landing ranked 15th nationally in landed weight of

[8] Pomeroy, Caroline and Dalton, Michael, "Socio-Economic of the Moss Landing Commercial Fishing Industry," June 2003

[9] http://noep.mbari.org/LMR/topPortsResults.asp?selRegions=All&selYears=2006&selOut=display&GoSearch.x=33&GoSearch.y=9

fish (55.3 million pounds) and 76th in landed value ($4.9 million). These figures show that the current model for fishing offloading at Moss Landing conforms to a high-volume low-value model, approximately 8.86 cents per pound. As a basis of comparison, Honolulu is a low-volume high-value model; it ranks 38th in landed weight (20.9 million pounds) and 4th in value ($54.6 million)[10], approximately $2.61 per pound, almost 30 times higher than Moss Landing.

Over the period from 1999-2004, an average of approximately 55.5 million pounds of fish, worth $7.5 million, were landed at MLH annually. The catch represents approximately 85% of the 63.8 million pounds and 70% of the value of fish caught in the Monterey Bay Area. The Moss Landing fishing industry has 125 residents and 175 non-residents working in fishing operations. There are nine local businesses that support the fishing industry and the Harbor has ten additional employees. There are seven resident, and dozens of non-resident, fish buyers at Moss Landing. Although buying occurs in the Harbor, fish are processed in other parts of Monterey County and outside of the county. Processing does not create revenue in MLH.

The average fisher family receives 80% of their household income from the industry.[11] In addition, the fishing industry contributes to the economic viability of other businesses that provide goods and services to the fishers and their vessels. A conservative estimate of the annual contribution of the average small fisher operation to the local economy surpasses $720,000.[12]

Salmon, groundfish, and highly migratory species were the main sources of MLH revenue from 1981-2001. In more recent years, west coast groundfish were severely regulated. Highly migratory species boomed in the 80s and busted in the 90s while the number of vessels remained steady in MLH. Over the past decade, MLH depends increasingly on coastal pelagic species (CPS) such as sardines, squid and anchovies. Table 1 summarizes the poundage and value of different fish landed in MLH.

Table 1: Poundage and Volume of Fish Landed at Moss Landing in 2006 ($20,000 minimum value of catch)[13]

MOSS LANDING	Pounds	Value (ex-vessel)	Price per Pound
Sardine, Pacific	39,020,078	$1,637,325	$0.04
Sablefish	505,136	$628,670	$1.24
Anchovy, northern	16,808,634	$559,772	$0.03
Prawn, spot	21,204	$264,194	$12.46
Squid, market	1,088,944	$245,473	$0.23
Thornyhead, shortspine	89,737	$227,009	$2.53
Salmon, Chinook	28,945	$177,631	$6.14
Halibut, California	52,071	$171,995	$3.30
Crab, Dungeness	66,641	$152,334	$2.29
Thornyhead, longspine	158,863	$147,771	$0.93
Sole, Dover	411,360	$123,030	$0.30

[10] Ibid
[11] Dalton, M., and Pomeroy, C., "Socio-Economic of the Moss Landing Commercial Fishing Industry," June 2003
[12] Ibid
[13] California Department of Fish and Game, http://www.dfg.ca.gov/marine/landings03/table18pub.pdf, price per pound calculated from information on contained in original table.

Sole, petrale	93,849	$104,514	$1.11
Swordfish	37,044	$103,845	$2.80
Rockfish, group rosefish	155,130	$40,309	$0.26
Tuna, albacore	34,560	$34,132	$0.99
Mackerel, jack	306,578	$28,978	$0.09
Rockfish, group slope	27,045	$24,100	$0.89
Rockfish, blackgill	29,424	$22,249	$0.76
Rockfish, bank	25,929	$21,052	$0.81
Grenadier	91,268	$20,114	$0.22
Other	238,594	$142,729	$0.60
Moss Landing Totals	59,291,034	$4,877,226	$0.08

As shown in Table 1, in 2006, sardines, anchovies and squid represented more than 97% of total commercial landings and are the dominant revenue-generating species. The quota on sardines often goes unfilled due to low price attributed to competitive pressures from foreign countries including Mexico, Ecuador, and Peru. When sardine prices drop below a certain threshold, fishers target substitute species.[14]

Pomeroy and Dalton (2003) identify three interrelated sets of challenges to the Moss Landing commercial fishing industry: regulatory constraints, short-term and long-term economic challenges, and infrastructure and maintenance needs. Total allowable catch is an example of a short-term economic challenge as, all things equal, a lower total allowable catch leads to lower fishing revenues. Decreasing revenues make it more difficult to meet the cost of slip fees and basic vessel repairs/maintenance and negatively impact support businesses that operate in MLH as well as the Harbor itself. As fishing revenues decrease, support businesses become less economically viable. Given the long-term uncertainty of fisher revenues and the lack of current alternate sources of revenue, it becomes increasingly difficult to fund maintenance and repair of MLH operations, e.g., dredging, dock repair and bulk heading.[15] Pomeroy and Dalton conclude that external support for the Harbor may be necessary as commercial fishery revenues continue to decline along with access to fisheries, access to markets, and increasing operating costs. We address some possibilities later in this report.

Business Environment

For the purposes of this report "wetfish," is defined as the commercial anchovy, mackerel, sardine, squid, and coastal tuna markets. It is heavily concentrated by species though not by vessel. The MLH wetfish industry relies on export markets and long-term, familial business relationships. Processors perform the majority of value-addition (approximately two-thirds of value added) rather than the fishers themselves.[16] The majority of sardines and squid are exported.

[14] Ibid
[15] Ibid
[16] Hacket

The wetfish capture industry, that is, the actual fish harvesting from the ocean onto the boat, is subject to high levels of competition from abroad. The industry has little to no vertical integration, with fishers relying on both formal and informal long-term contracts with specific processors. It is relatively easy for fishers to switch between species based on market prices, target species abundance and weather. Squid are a favored species, representing over half of the landings (in terms of pounds) and about two-thirds of ex-vessel revenue, in 2000.

The wetfish receiving and processing industry is concentrated with a high cost to enter. Processors are often significantly vertically integrated, with the majority of West Coast firms taking a multiple-species, multiple-market approach. Though quality is important for both human consumption and bait markets, processed wetfish are largely viewed as a commodity.[17]

Sardines

Virtually all current markets for Moss Landing sardines are overseas. The highest price paid per pound for MLH sardines is from South African tuna fishers who use the sardine for long line bait.[18] Over 100 tons of sardines are sold to these interests annually. Sardines are also shipped to Thai canneries and to Japan for use in a school lunch program.

Sardines are high in protein and omega fatty acids. They may be sustainably harvested because of their abundance and quick recruitment rate, low level in the food chain, and status as a pelagic species. They are also highly regulated[19]. Though sardines have a historic significance in Monterey Bay, they have not been canned in California for many years. The last was by the Monterey Fish Company which closed, partially as a function of higher energy prices. Canning is in California has not been cost effective since 2004, as the cost of the can is significantly more than the value of the sardines. Thailand is now a major global sardine cannery owing to cheap energy and labor costs. Fish sold to the Thai market must be no less than 50 grams and these buyers will purchase as much product as is available.

Sardines often are not popular in mainstream US markets because they are often perceived as small, oily, and boney.[20] Sardines are viewed more favorably in Asian markets and sardines are used in Japanese school lunch programs. A Japanese processor fillets, breads and deep fries sardines. Access to this market is achieved through a broker based in San Francisco. The quality standards for these fish are the highest of any of the markets currently served. They desire fish weighing between 60 and 80 grams with high fat and oil content.

There are also ethnic niches in the US --- e.g., Italian, French, Filipino, and Indian markets --- where sardines are consumed. Sardines in the Monterey Bay are typically 80 grams, a small but sufficient size for human consumption.

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[17] Fletcher, K., and Wallace, R., Understanding Fisheries Management: A Manual for Understanding the Federal Fisheries Management Process, Including Analysis of the 1996 Sustainable Fisheries Act, Second Edition, 2001

[18] Joe Roggio, Controller, Del Mar Seafood, in a conversation on January 25, 2008

[19] For further details, see 2007 Pacific Stick Assessment, November 2006 Scientific and Statistical Committee Statement, and 2004 Stock Assessment Review Panel Report, http://www.pcouncil.org/cps/cpssafe/0607safe/APP1_Sardine_Assessment_2007.pdf

[20] This perception is based on experiences with canned sardines that are packed in oil and spices. Even though fresh sardines fillets that are broiled, roasted or prepared in other ways are not small, oily or boney this perception (misperception) is still held by many people.,

Squid

Market squid are the most harvested among California coastal pelagic species. More than 30 million tons were harvested in 2003.[21] The vast majority of squid are sent to Chinese and Taiwanese processors who prepare them for human consumption markets in the US, Europe, East Asia the Philippines and Australia. Approximately 10% of the catch is used for crab trap bait[22].

Squid receive a higher price per pound than all other wetfish and were the top commercial species harvested in MLH in revenue terms, from 1993-2003, excluding the El Niño year of 1998. Landing increases were supported by market demand in China and Europe. The squid fishery is not concentrated - only 15% of the catch is harvested by the top four vessels. Squid fishers have exclusive relationships with processors, who limit the allowable harvest by each vessel. This prevents an excess of supply and subsequent drop in prices. There are, however, concerns that the squid practices --- e.g., the use of lights and setting nets near egg cases, thereby, catching egg-laying females --- in the Monterey Bay may not be sustainable. In addition, the management of prices by processors cannot control external events. For example, there has been a decline in squid demand and prices due to a 45% tariff imposed by China on squid imports.[23]

Anchovies

A third, less economically valuable coastal wetfish species is the anchovy. Although anchovies can be used for human consumption, local anchovies are only used for bait or reduced into fishmeal. Anchovies and sardines are natural competitors, and the size of the two populations is negatively correlated in the Monterey Bay. The anchovy harvest grew from 17,000 tons, in 1965, to a high of 120,000 tons, in 1974. Since then, there have been dramatic fluctuations and an overall downward trend in anchovy landings. In 2006, slightly more than 8,000 tons of anchovies were landed in Moss Landing. The decrease in anchovy landings is due to market constraints (e.g. low demand and price) rather than biological limitations. Anchovy fishing is highly concentrated, with 50-70% of the catch harvested by the top four vessels. [24] At this point, there is no indication that the current harvest of anchovies is unsustainable.[25]

Mackerel

Mackerel was the top ranked finfish harvested in pounds from 1984 – 1991. Landings have since declined as a function of higher prices and demand for sardine and squid. Recent harvest levels are around 300,000 pounds per year. The majority of this harvest is sold for crab trap bait and to Asian food markets. Again, at this point, there is no indication that the current harvest of anchovies is unsustainable.[26]

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[21] Pomeroy, Caroline and Dalton, Michael. 2005. Market channels and value added to fish landed at Monterey Bay area ports. California Sea Grant College Program. University of California, San Diego

[22] Joe Roggio, Controller, Del Mar Seafood, in a conversation on December 19, 2007

[23] Ibid

[24] Ibid

[25] For more details, see Status of the Pacific Coast Coastal Pelagic Species Fishery and Recommended Acceptable Biological Catches, Srock Assessment and Fishery Evaluation 2007, http://www.pcouncil.org/cps/cpssafe/0607safe/APP1_Sardine_Assessment_2007.pdf

[26] Ibid

Trophic Ecology of the Coastal Pelagic Species

Monterey Bay, like other upwelling systems, is extremely productive, supporting a rich and diverse biological community. Wind-driven upwelling brings cold, nutrient-rich water to the sunlit surface where phytoplankton grow, absorbing nutrients and fixing carbon dioxide. This primary production supports both zooplankton and small fish populations. The coastal pelagic species form a key link in the flow of energy from the phytoplankton and zooplankton to larger species such as birds, salmon, sea lions, dolphins and whales. The rich abundance of coastal pelagic species makes the Monterey Bay a primary feeding ground for humpback whales, salmon and birds of all kinds. As such, the supply of the coastal pelagic species directly affects the health, abundance and prosperity of all higher trophic species in the Monterey Bay. Due to its importance as a link in the flow of biological energy, ensuring healthy stocks of CPS is not only essential to the sustainability of the Monterey Bay ecosystems, but also to the Monterey Bay economy, which depends on the ecosystem's consumptive (fishing industry, recreational fishing) and non-consumptive (tourism, whale watching) uses. The concern over forage species has recently moved some to suggest that they are not regulated well enough and that sustainable catch limits should reflect their value to other organisms that eat them.

Relevant Legislation and Environmental Condition

There are two tiers of regulation that affect the MLH: federal and state. The National Marine Fisheries Service (NMFS), an agency of the National Oceanographic and Atmospheric Administration (NOAA), regulates waters from 3 to 200 miles from shore. Regulations follow the directives of the 1976 Magnuson-Stevens Fishery Conservation and Management Act (Magnuson Act) and the 1996 Sustainable Fisheries Act. The Magnuson Act established eight regional fishery management councils on a national level including the Pacific Fishery Management Council (PFMC), whose jurisdiction overlaps with that of the state of California. Their combined primary regulatory tools are "limited entry," which attempts to avoid reaching Total Allowable Catch (TAC) too quickly; "essential fish habitat" (EFH), which considers habitat needs against commercial harvesting practices; and "marine protected areas" (MPAs), which establish stricter catch restrictions on certain geographic areas.[27] Pomeroy and Dalton (2005, p.1) identify that the Magnuson Act, the National Environmental Policy Act and the Regulatory Flexibility Act "require consideration of the 'human dimension' in the design and implementation of federal actions that affect the human and biophysical environments[28].

The California Department of Fish and Game (CDFG) regulates coastal waters to three miles from shore. The CDFG has limited jurisdiction and can be superseded by the federal government if it is deemed to be improperly managing the waters. In 1997, California established the Marine Region to coordinate both policy and operations of the state's marine jurisdiction. It manages California's marine resources under the authority of laws and regulations established by the State Legislature, the Department of Fish and Game, and the Pacific Fishery Management Council.

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[27] Fletcher, K., and Wallace, R., Understanding Fisheries Management: A Manual for Understanding the Federal Fisheries Management Process, Including Analysis of the 1996 Sustainable Fisheries Act, Second Edition, 2001

[28] Pomeroy, Caroline and Dalton, Michael (2005), "Market Channels and Value Added to Fish Landed at Monterey Bay Area Ports," http://repositories.cdlib.org/csgc/rcr/MA05_01/

Important regulations and laws currently implemented by the Marine Region include the Marine Life Management Act (1999), which requires the development of Fishery Management Plans (FMPs), and the Marine Life Protection Act (1999), which requires the development of Marine Protected Areas (MPAs).[29] The Marine Life and Protection Act and Marine Protected Areas are described in more detail in Appendix 2.

Some stakeholders are concerned with current management of the fisheries and have developed new ideas to help maintain a healthy fishery, including inter-tradable quotas. Inter-tradable quotas are a long-term solution proposed by some academics and NGOs such as The Nature Conservancy and Environmental Defense. This method has been successful elsewhere, including the high-value lobster fishery off Maine and the Icelandic Herring industry.[30] The effect of ITQs is to privatize' fish stocks by 'giving' each fisherman an allotted share of the fishery. An ITQ system is perceived by advocates as feasible in Monterey Bay and could be enforced with relative ease due to the limited number of ports. However, an ITQ will only work in an environment where the total allowable catch is being harvested, which is currently is not the case with many CPS in the Monterey Bay. The California Department of Fish and Game could initiate this, but a study outlining the specifics of implementation would cost between $100,000 and $200,000.[31]

Aquaculture is not allowed in the sanctuary. NOAA has found that aquaculture is unsustainable for finfish production because of their position at a higher trophic level. However, shellfish may be a potentially sustainable solution. NOAA has a bill before Congress to allow aquaculture in the sanctuary, but this is highly controversial and is being fought by conservation organizations including Environmental Defense.

6. Analysis

In this section we use the information gathered through published sources, interviews and discussions with MLML and key stakeholders to develop four scenarios for analytical purposes (described below).

After obtaining an understanding of the existing conditions and current markets for CPS, we examined potential new markets and new ideas that could help fulfill the goals of this study, balancing the sustainability of the fishery and the socio-economic viability of the community. We examined growing domestic and foreign markets as well as the development of new products. In addition, at a conceptual level, we examined other ideas that could potentially help meet the goals of this study. This includes the development of a public-private partnership and alternative business ideas, such as tourism and aquaculture.

We developed four different scenarios to help us understand the impacts of different strategies:

- Scenarios One: Cease Offloading Operations at MLML
- Scenario Two: Maintain the Status Quo

[29] California Department of Fish and Game Website: www.dfg.ca.gov

[30] Arnason, Ragnar, "The Icelandic Individual Transferable Quota System: A Descriptive Account." *Marine Resource Economics*. VIII No. 3 (1993): 201-18

[31] Dr. Jason Scorse, Monterey Institute of International Studies, International Environmental Policy Department, Personal Interview.

- Scenario Three: Realistic Market Growth
- Scenario Four: Optimistic New Products and New Markets.

Scenarios One: Cease Offloading Operations at MLML and Scenario Two: Maintain the Status Quo, are not recommended. They are described in some detail as a basis for understanding the consequences of taking either of these two options. Scenario Three: Realistic Market Growth is the recommended option and is described in substantially greater detail. Scenario Four: Optimistic Market Growth represents some possibilities for the future. A quick summary of these ideas and their viability is shown in Table 2 and will be described in more detail later in the study. An analytical framework is shown in Table 3.

Table 2: Quick Reference Grid of New Product and New Market Opportunities Considered

Specific Market	Potential	Accessibility/ Barriers to Entry	Competition	Notes
California Restaurants and Hotels	Moderate	Accessible, low prices, recipes needed	Strong int'l competition, "local" branding exists	Best to start locally and expand. Distribution networks exist Must develop consumer demand.
California Culture-Specific "Ethnic" Markets	Small to Moderate	Price points must be low. This market less interested in "local" branding.	International suppliers are cheaper.	International competitors cannot sell fresh fillets. Not enough demand in this market alone to make processing profitable.
Local (Tri-County) Distributors	Small to Moderate	Accessible. Local restaurants willing to try/promote sardines.	Competition, if any would be amongst other fish suppliers.	Small market opportunity for fresh fillets. May be the best place to start increasing awareness.
Aquarium Feed	Small	Accessible. Little-no processing, nearby, in-line with MLML values.	Existing supplier has strong relationship with Aquarium.	May do little to raise value of fish. Provides an additional local outlet for local product.
Institutional Food	Moderate to Large	Propose CPS to companies that supply institutions with food. E.g., Aramark	Complicated, competition unknown. Likely price competitive.	Opportunity is there, although entering in food supplier's distribution could be difficult.
Diet Supplements	Small	Local producer uses Norwegian-sourced fish	Would have to become part of supply chain	Difficult at best
Anchovy Paste	Small	Higher manufacturing costs, need for more equipment.	Variety of Spanish and French products, low price.	Small market, PPE required, low price, existing competitors.
Local Preparation	Small	High variable production costs (energy)	Stiff international competition pushes price points below profitable level	This category considers both canning and fresh fillet production. The fillet market may, in the future, have the best chance of making local production profitable.
Develop a "Sustainably Harvested" Monterey Bay Brand Differentiated for Quality	Small commodity market, even for a "premium" sardine product	Must work with certifying body.	None locally	Difficult to develop profitable consumer-based product here. Business-to-business products (from Del Mar and Monterey Fish) are recognized for quality

Analysis of New Product and New Market Opportunities

Developing new products and new markets involves investment and risk. The ideal situation is low investment, high return and low risk. However, risk and return are often coupled – higher return may involve higher risks. The analytical structure shown in Table 3 (below) was used to assist in the evaluation of the product and new market opportunities considered in Table 2. Each opportunity represents either an existing or new market combined with an existing or new product.

Table 3: Product and Market Development Strategies

	Existing Market	**New Market**
Existing Product	Market penetration Lowest risk	New market development Medium risk
New Product	New product development Medium risk	Product and market innovation Highest risk

Market penetration involves putting more effort behind selling the existing product to the existing market. These strategies are usually the lowers risk because the product has been developed and the market is known. An example of this strategy is selling more sardines for animal consumption.

New product development, introducing a new product to an existing market is has a higher risk, but often less than the other strategies. An example if this is to create a new sardine product for animal consumption.

New market development strategy involves selling an existing product to a new market. For example, selling sardines for use in aquaculture. This strategy may be slightly higher risk because of the uncertainty involved with learning the needs and wants of a new market.

Product and market innovation strategies have the highest category of risk because there is the uncertainty of both new product development and market development. An example of this is selling fresh sardine fillets to new consumer markets.

This analysis can help us identify the risks associated with various new product or market opportunities, but it does not address the potential returns of these opportunities. We will do this separately for each opportunity in the sections that follow.

Scenario 1: Cease Offloading Operations at MLML – Not Recommended

Closing the off-loading operations at MLML would have severe negative effects on the local economy, the fishing industry and on MLML. Closing the MLML wetfish offloading operations could have an even stronger impact given that two of the current offloaders, Bay Fresh and EMK, announced plans to leave the industry. Implicit to this approach is a belief that local fisheries have been on the decline for some time. It is possible that natural and man-induced fluctuations in fish availability and associated revenues may not provide a stable economic base

for ML in the future. In short, this approach includes, but also moves past the fishers, off-loaders, distributors and processors model for industry at MLH.

By allowing Del Mar's lease to expire and not replacing it with another offloader, MLML would have to find an alternative use for the property, i.e. redevelop, or absorb the loss of income. There would be more room for marine operations, less seagull contamination of MBARI and other neighboring buildings, less truck traffic, and less discharge into the harbor.

Redevelopment Business Opportunities

Instead of developing existing and new markets for sardines, there are other possible non-consumptive uses for the facility that could be expanded and developed. These opportunities center on tourism and recreational uses and aquaculture. Moss Landing is attracting more tourists each year who support restaurants, places of lodging, kayaking, whale watching, and other local businesses. Tourism has historically been a mainstay of Monterey Bay and will probably continue to do so. Of great strategic importance is Moss Landing's proximity to Monterey and Santa Cruz and the potential to offer a different tourist experience.

Moss Landing's development of tourism with differentiated recreational opportunities would serve to bolster the fishing industry across the Monterey Bay. Its rich history provides an opportunity for cultural/historical tourism that may capitalize on the romanticized fishing industry itself. This opportunity is being investigated by the Monterey Bay National Marine Sanctuary through its Team OCEAN (Ocean Conservation Education Action Network) program. Given its location, eco-tourism emphasis, and strong relationship with local stakeholders, Team OCEAN is a viable partner and NOAA has expressed explicit interest in a tourism partnership further incorporating Moss Landing.[32]

Current tourist attractions include, for example, a trip on a commercial fishing boat – assuming sport species populations remain healthy. Tourists may also enjoy a joint whale and bird watching trip that derives revenue from the natural endowment of ML as well as Elkhorn Slough.

MLML could take the opportunity to open an on-site restaurant (that may house offices as well) that serves sustainably-harvested fish and features a vista of the offloading operations and the historical roots of the fishing community. There would be concerns, however, that establishing a restaurant would preclude using the site as a Marine Operations Facility as the parking and sewer capacity alone would use available space and resources. Something smaller, e.g., a small market, might be a viable alternative.

The space owned by MLML is large enough to potentially hold a restaurant. At the southern end of their property could be enough space for a dockside restaurant. As the Cannery Row example shows, customers are willing to pay a premium to eat seafood on the water – especially if this is where the fish are caught.

The consequences of redevelopment

The consequences of redevelopment can be evaluated at a number of different levels:

1. The consequences for MLML.
2. The consequences for the Moss Landing Harbor and fishing community.

[32] Culberg, Columbine. Personal Communication. January 24, 2008.

3. The consequences for the CPS populations.

Consequences for MLML

Redevelopment of the site will impact MLML financially and in terms of their research access to a vibrant fishing community. MLML is most capable of assessing the impact of such a closure on the research interests, such as the reduction in skilled workers in the local community or the closure of associate businesses such as marine spare parts distributors.

The financial risks include:

1. The loss of rental income,
2. The need to invest capital in site redevelopment, e.g. building a restaurant facility,
3. The difficulties associated with renting a facility in an industry in which MLML has relatively less knowledge or expertise,
4. The risk that after redevelopment the site may not be attractive to potential leasers for some unforeseen reason.

Consequences for the Moss Landing Harbor and fishing community

If MLML does not lease their offloading operations and Bay Fresh and EMK close their operations Sea Harvest would become the sole wetfish offloader in the Moss Landing Harbor. From an economic and social perspective, having the buying power in the hands of a single offloader/distributor could have strong negative impacts on MLH. Fishing operations (sellers) will have to sell to the one remaining offloader in MLH at an assumed lower price or travel to Santa Cruz, Monterey or other ports to get a higher price, if possible. Transporting CPS to other ports will increase fuel costs and reduce operating margins .This will make it less profitable to conduct a fishing operation at Moss Landing.

As numbers of fishing operations and fish revenues decrease, MLH will collect less revenue. Maintaining the docks and dredging the waterways becomes less feasible and public funds for such operations may be reduced.

If Sea Harvest also discontinues operations this could lead to the collapse of Moss Landing as an active commercial fishing community. This will put at jeopardy the local economy and the identity of Moss Landing as a fishing community. The rich skills of the Moss Landing's fishing workforce will dissipate and the economic shift could become permanent. The nature of Moss Landing changes forever and there is extreme dislocation of the workforce and negative economic impacts in the short to medium term.

Without knowing the catch that would be landed in MLH, it is difficult to estimate the economic impacts. During the period of 1999-2004, the value of the average annual catch of fish landed at MLH was approximately $7.5 million.[33] If the revenues were to decline by half, as a function of the closure of up to three wetfish offloading facilities, the direct loss would be approximately, $3.75 million. In addition, there would be a multiplier effect, that is, decreased spending by fishers would result in decreased spending by merchants, services, etc. The indirect regional

[33] Dalton and Pomeroy 2003), op. cit.

multiplier effect is 1.47[34]. Therefore the direct impact of a 50 percent decrease in catch would be a loss of $3.75 million. The direct and indirect impacts of a 50 percent decrease in catch would be approximately $5.5 million. Again, this is based on the assumption that closing three of the four wetfish offloading facilities would decrease the catch by 50 percent.

In addition to the dollar figure, there is a multiplier effect 7.7 for employment. What this means is that 7.7 jobs are created or lost for every million dollars of direct impact. Hence a reduction of $3.75 million in fishing revenues would result in a corresponding loss of approximately 29 jobs.[35]

Consequences for the CPS populations

The loss of the Moss Landing fishing community does not guarantee protection for the CPS. These fish can swim from Canada to Mexico and past the USA's 200 mile coastal zone. This means that the CPS populations can be equally fished by foreign fishing fleets. Indeed, without local fishing operations to police local waters poaching could increase. Therefore no predictions can be made for the protection of CPS if Moss Landing fishing operations were to close.

Scenario Two: Maintain the Status Quo – Not Recommended

In the current situation the wetfish offloading facility is leased to Del Mar Co. The lease was renewed from November 27, 2006, to November 26, 2008, when it will be up for renewal. Although it is not possible to predict if Del Mar Co. will be interested in renewing the lease at that time, indications are given that the Del Mar Co.'s corporate strategy may be to withdraw from the Monterey Bay area to focus on operations in Ventura, Watsonville and Oregon..

In this scenario MLML's major role in the Moss Landing fishing industry is as a landlord to one of the few remaining wetfish offloaders. This scenario is based upon the assumption that, other than MLML and the Harbor offloading facility, the other wetfish offloaders will close down sometime in the next few years.

Although the reduction in wetfish offloading operations increases the market power of the MLML operation, the reason for closures have to do with the poor returns and investment confidence in the fishing industry. This means that, should Del Mar Co. not renew their lease, MLML may have a hard time finding an alternative tenant for the facility. There will be very limited funds for infrastructure improvement, including docks, piles, piers, dredging, etc. It will be difficult to maintain a sustainable operation.

The logical conclusion of Scenario Two is very similar to Scenario One, the redevelopment of the site for alternative industry, such as tourism. The economic impacts would be less severe since there would be more than one wetfish offloader operating in the harbor. Our assumption is that there might be a minor loss in revenue for the total catch. For example, if there were a 10 percent decrease in direct revenue, there would be a negative impact of approximately $1.106 million in revenue and 6 jobs, including both the direct and indirect impacts.

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[34] This figure was provided by Terry Tillman, Marine Science Specialist (Fisher's Economist), Marine Region, California Department of Fish and Game. It originates from the Regional Impact Multiplier Study, Bureau of Economic Analysis, Department of Commerce, and is based on 2000 data for Monterey County.
[35] Op cit.

Thus, unless MLML undertakes a more active role in the CPS industry it appears as though all roads lead to redevelopment of the site for alternative uses.

Scenario Three: Realistic Growth Scenario - Recommended

In analyzing the potential for market expansion, especially to a higher value lower volume model for CPS landed in MLH, sardines have the most potential for growth. Sardines are the largest catch. At a landed price of approximately 22 cents per pound (developed from Table 1), fishers receive a much higher price for squid than for sardine (4 cents per pound), anchovy (3 cents per pound) and mackerel (9 cents per pound for mackerel). The market for squid is already developed for human consumption and there are questions to the sustainability of the squid market. Anchovy and mackerel offer lower potential. Anchovy are smaller, tend to have lower market value, and will be difficult to fillet because of their size. The mackerel market will be more difficult to develop for higher-value human consumption. Therefore, we identify opportunities for growth of existing sardine markets and development of new potentially higher value markets. We also recognize that market and environmental conditions may change over time and that there may be opportunities for other CPS, however, we focus on sardines as they have the most immediate potential. They are carefully managed and not overfished at the moment.

In the current market sardines are a commodity product for both fishing related operations and consumer seafood. One of the key strategies to creating a sustainable fishery/industry is to move away from the low value/high volume model currently in place in the Moss Landing. Sardines can potentially play a role in this transition. There are two broad approaches to creating this positive change: one, deriving higher value from the fish already caught, and two, diversifying the business models currently found in MLH.

Since we see this scenario as the recommended, most realistic option, we develop this scenario more fully. Therefore we describe the sardine market and opportunities in much greater detail. In addition, we discuss alternative business opportunities and public-private partnerships.

The Sardine Market

In considering markets for the four CPS it became clear that new markets for sardines could potentially offer the greatest economic impact. Part of this is a function of the human consumption market for squid is already developed with nearly 90% of product offloaded at Moss Landing eventually feeding people. Anchovy and mackerel harvests are traditionally much lower percentages for human consumption (< 10%) compared to that of either squid or sardine and, again, perceived to offer lower potential. Anchovy are smaller than sardines and mackerel has a stronger flavor making them less attractive for human consumption and there appear to be fewer new options for human consumption.

Deriving higher value from sardines offloaded in MLH can be realized by transforming from a low value high volume market to a higher value lower volume market. In general this entails shifting from fish feed market channels to human consumption channels which can offer higher prices. However, a full boatload of sardines can hold up to 90 tons of fish and since not all can be processed for human consumption. Alternate higher value uses need to be identified. The baitfish industry out of South Africa and the gourmet pet food industry on the East Coast of the U.S. which pay a higher price for sardines are notable exceptions. Therefore, the greatest impacts

on improving the downstream value of Moss Landing CPS exists in finding higher value, human consumption markets for sardine, as well as new non human consumption markets.

Sardines are abundant due to warmer water temperatures and population recovery during the moratorium from 1974 to 1986. As harvesters and net exporters of sardines, Mexico, Ecuador, and Peru dominate the international supply, setting market prices at $60 - $100 per ton.[36] The top current markets, by volume, for high quality sardines-as-a-seafood are: France (16,800 tons), Germany (13,300 tons), and the UK (14,600 tons). Italy, Denmark, and Spain also represent important destination markets for processed sardines.[37] Morocco is currently the leading supplier of sardines to the EU, followed by Portugal.[38]

Global Markets for Human Consumption

Increase Exports to Foreign Human-Consumption Markets

Japan and Thailand

Japan is the biggest importer of seafood, in terms of volume and value[39]. In 2006, Japan imported a little less than $14 billion and 3.53 million tons of fish, dominated by shrimp, tuna, and salmon.[40] The Japanese seafood consumer is sophisticated, and seafood quality standards are higher in Japan than in China or the US[41]. Seafood is consumed fresh or frozen (46%) with another large portion salted, dried, or smoked (38%). Because of the emphasis placed on quality and freshness, most of the high-value species in the Japanese market are harvested locally. However, levels of domestic catch have been declining, a problem Japan is attempting to curtail through TAC quotas in their Exclusive Economic Zone (EEZ). Japan was once the world's largest producer of sardines is now more reliant on imports to satisfy domestic demand[42]. Japan imports a large proportion of inexpensive fish, 46% of which is used for feed meal[43].

The Japanese seafood industry is a mature market with the majority of business – over $10 billion in revenues a year - going to three main processors: Maruha Group, Nippon Suisan Kaisha, and Kyokuyo Company. These processors are all highly integrated, from actual fishing vessels to processors and distributors. Many of the processors perform fishing operations abroad, and have boats ranging from Alaska to Asia[44]. In sum the market can be described as: large, mature, sophisticated, and competitive.

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[36] National Fisherman, "Market Report, Pacific Sardines," Vol. 81, No. 1, Page 16, May 2000
[37] Ibid
[38] O'Sullivan, G., Fish Info Network Market Report on Sardines, April 2007. <http://www.eurofish.dk/indexSub.php?id=3434>, September 2007

[39] Fisheries and Aquaculture Department. Country Profile – Japan. Pulled February 2, 2008 <http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=FI-CP_JP.xml&lang=en>
[40] http://www.fao.org/corp/google_result/en/?cx=018170620143701104933%3Aqq82jsfba7w&q=japan+fish+imports&cof=FORID%3A9#1007, pulled June 26, 2008.
[41] Joe Roggio, Controller, Del Mar Seafood, in a conversation on December 19, 2007
[42] Sonu, Sunee. Sardine Fisheries, Trade, and Market of Japan. NOAA technical memorandum. November 2001.
[43] Fisheries and Aquaculture Department. Country Profile – Japan. <http://www.fao.org/fi/website/FIRetrieveAction.do?dom=countrysector&xml=FI-CP_JP.xml&lang=en>, Retrieved January 24, 2008
[44] Kyokuyo Fishery Homepage. Accessed December 2007. <http://www.kyokuyo.co.jp>

Analyzing the potential to export seafood products from Moss Landing to the Japanese market is essential. This will require a greater understanding of tariffs by species, on a per pound basis. A possible method to circumvent this could be selling to a US-based arm of one of the three main seafood processors.

In Japan, sardine are processed into fried "fish sticks" that are provided in school lunch programs. The Monterey Fish Company sources product for this purpose with sardine typically in the 60-100 gram weight range.

Both Del Mar and the Monterey Fish Company provide sardine to canning operations in Bangkok, Thailand. The fish sourced here must be at least 50 grams, meaning not all fish captured in Monterey Bay are appropriate for these buyers.

Increasing sales to either of these groups would increase the amount of local product being consumed by people, though that may not include many Americans. The transportation requirements do diminish the environmental benefits of more localized consumption.

The major obstacle to expanding these markets is ensuring the size of the caught fish. Efforts (such as reducing tonnage caught or using different nets that only capture larger fish) would need to be taken to increase the general size of the fish in regional waters. Alternatively, a "sporadic supply" sales arrangement could be proposed wherein fish are sold when they meet the size requirements, which may not happen consistently. A lower purchase price could be negotiated in exchange for the risk of periodic low supply. This arrangement would be different from the current situation by the increased sale of larger fish to these human consumption markets. Less fish would then be sold for bait and aquaculture feed.

The European Market

The global market for sardine processing and marketing is mature, with a high cost of entry for new participants. As will be described below, this is particularly true for Europe which is the largest market for high quality sardines. Demand for sardines is multi-tiered with a variety of preferences for consumption including fresh, salted, prepared, and frozen. Tuna farms in Australia are an important market for frozen sardines. Exports of canned sardines to Indonesia, South America, and the EU represent the most important destinations for sardines harvested in Monterey Bay.

Value-adding packing and marketing efforts have increased over the past decade. One of these is "refreshed" sardines, which are frozen within one hour of capture and then defrosted immediately before consumption. Refreshed sardines command a high price compared to other preparation methods.[45] Smoked and pre-marinated fillets have gained acceptance in both Asian and Australian markets.[46] A benefit of this method is the ability to differentiate the product through flavoring.

The French pioneered niche canning that incorporates information on the fat content of the fish, capture methods, and processing guidelines. Grades include à l'ancienne, Millésime, and the Label Rouge certification, regulated by the French Standards Agency.[47] À l'ancienne grade fish

[45] Pitts, Gordon. *Sea Change in Fisheries*, The Globe and Mail, March 18th 2006.
[46] Fremantle Sardine Co, Company Website <http://www.fremantlesardine.com.au/profile.htm>, September 2007.
[47] O'Sullivan, G. "Adding Value in a mature seafood market: the French canned sardine industry," <http://www.eurofish.dk/indexSub.php?id=1729&easysitestatid=270194164> November 2003, September 2007

must be gutted, headed, and laid in the can by hand, fried in oil instead of steamed, and matured for several months. The top French canner, Chancerelle, is a leader in à l'ancienne sardines.[48] Millésime certification is the limited edition of à l'ancienne sardines which were caught between May and June, when fat content is highest. These sardines are packed in iron cans instead of aluminum, and marked with a recommended year for consumption.[49]

Label Rouge is the most widely known certification in the French market. It is based on strict quality and traceability standards enforced at the raw material and processing levels. The canner Gendreau was the first French canner to obtain Label Rouge certification in 2001. This gradation denotes that the sardines must be landed (brought to the dock) no more than 12 hours after being caught, delivered to the factory within 4 hours, and processed within 24 hours of being delivered. The minimum fat content is 8%. These sardines are then fried in sunflower oil and preserved in extra virgin olive oil for 4 months. Lastly, the name of the boat and fishing date are clearly written on the can.[50]

Localization of marketing efforts is a key issue in penetrating the international sardine market due to the great range of consumer preferences, as well as varied levels of access to sardines and willingness to pay. For example, when entering the French market one must take into account not only dietary preferences, but more subtle local preferences of eating sardines at home (73% of the time), which are fresh (50% of the time) and arrive through a mass distribution retail channel (75% of the time).[51] Even with localization, it will be difficult to overcome much of the obstacles and establish a strong presence in the human consumption market in Europe. The market is mature with strong established players and the costs of market building and competing are very high.

Domestic Markets for Human Consumption

Though recognition of the nutritional value of coastal pelagic finfish is increasing, it may be difficult to build economically profitable local markets. Currently, sardines are much less popular in mainstream US markets than other fish because they are perceived by some as small, oily, and boney[52]. However, this perception may be based on past experiences of canned sardines that are seasoned and packed in oil. In reality, sardines are not oily when served fresh grilled, fried or bakes. None-the-less, the perception (or misperception) remains in some consumers' minds. Demand is inconsistent and relatively small at this time. Therefore it is important that any efforts to serve local or domestic markets may be done in conjunction with a concerted promotion plan. Those efforts could also serve as the basis for a new local brand.

Sardine fishing has long been an important component of the Monterey county economy and culture. Moss Landing is the port with the highest revenue-generating fishing activity in Monterey Bay and it is also where the vast majority of sardines are offloaded (17.4 million pounds in 2003).[53] As such, with some changes in fishing practices, Moss Landing Harbor may be able to supply the latent demand for environmentally sustainable, local and

[48] Ibid.
[49] Ibid.
[50] Ibid.
[51] Makrid, M. & Associates, "Aquaculture Industry Market Assessment," August 2002.
[52] Identified in interviews
[53] Pomeroy, Caroline and Michael Dalton. 2005. Market channels and value added to fish landed at Monterey Bay area ports. California Sea Grant College Program. University of California, San Diego.

historically/culturally rich seafood to local markets including restaurants and grocery stores. A marketing strategy targeting this demand could successfully see Monterey Bay sardines on the dinner plates of locals and tourists alike.

Even though there is potential, there also are barriers to realization. In reality, latent, local demand for sardines pales in comparison to the tonnage offloaded in MLH. The majority of weight would still need to move to other markets through other market channels. Sardine markets have been characterized as niche markets traditionally limited to consumers of Italian, Sicilian, Japanese, Filipino and Indian heritage. Differentiating the product may be essential to its successful entry into more traditional markets e.g., fillets, smoked, and marinated). Whole Foods is the only retail venue that has breached the wider market with sardines.[54]

Sardines are more popular in some ethnic markets, including people from some East Asian, Philippine and Indian descent. There are, however, some possibilities for growth and development. These options are described below.

Lifestyles of Health and Sustainability

A growing number of consumers are more conscious about the food they eat and the health and environmental consequences contained therein. The term LOHAS (Lifestyles of Health and Sustainability) has been applied to this group. It is hard to quantify the number of people in the LOHAS segment. A website devoted to LOHAS, states that approximately 19% of the adult population or 41 million people falls into the LOHAS segment.[55] The Worldwatch Institute estimates the group to be 30 percent of the US population. [56] In addition, it would be difficult to extrapolate the percentages to the tri-county region of Monterey, Santa Cruz and San Benito counties. Notwithstanding, the number is significant. Therefore, we consider the domestic LOHAS market as a possible target, giving most attention to the LOHAS group located in California, especially the tri-county region of Monterey, Santa Cruz and San Benito counties. Whole Foods is one example of a retail chain that sells to the LOHAS market. In addition, more traditional full service supermarkets, such as Safeway, are developing organic and health oriented brands to serve the LOHAS market.

Several distributors target these markets, buying and selling foods with higher quality standards, including those that are organic or harvested in what may be considered a sustainable manner. One example is Vital Choice Wild Seafood & Organics, an online store for high quality seafood, including sardines packed in organic olive oil. In our discussions with Vital Choice, they expressed some interest in a sustainably labeled frozen sardine.

Developing a 'Monterey Sustainable' brand may be a key strategy to maximizing value. Not only would this brand capitalize on the well-known and rich history of the Monterey Bay, but it fits the LOHAS target. Sustainable branding or certification activities represent an opportunity to directly add value to finished products. The Marine Stewardship Council (MSC) and Friend of the Sea (FOS) are two large certification bodies with partially overlapping criteria for

[54] Grocery Charade interviews
[55] http://www.lohas.com/about.html, pulled June 26, 2008.
[56] Halweil, Brianink, Lisa Mastny, Erik Assadourian, Linda Starke, Worldwatch Institute (2004). *State of the World 2004: A Worldwatch Institute Report on Progress Toward a Sustainable Society*. W. W. Norton & Company, 167.

sustainability – the fundamental difference being that FOS will certify farmed products. Through contracts with partners, both bodies have certified certain species of sardines, mackerel, and anchovies.

Monterey Fish Company, the last sardine cannery to operate in Monterey Bay, used a local California label to add value – a strategy which could be effective if used in partnership with local restaurants. Our interviews identified, however, that some restaurateurs, complain that sustainably harvested seafood increases costs and squeezes profit margins. Thus, for a certification effort to be economically viable, the public would need to perceive that sustainably harvested sardines have some added value before they would be willing to pay more for a certified product.

We identified some of the largest suppliers of seafood (including CPS) to restaurants in the state. They have various requirements for products they would carry, however, their greatest concern is restaurant demand for these products. If and where demand exists, the distribution channels are in place to deliver products. The demand would need to be created. As with much of the restaurant-related markets, fresh fillets are favored over processed product.

Some distributors serve market segments for whom CPS are a more integral part of the diet. These "ethnic" markets include a variety of groups in the US and California including individuals of East Asian, Filipino, and Indian descent. Unfortunately few distributors or grocers in these segments expressed interest in a local or sustainably harvested product. Price is the major obstacle. Overseas canned products are cheaper and the perceived value for local product is not as high here as it may be with the LOHAS market. Additionally, local vendors who sell fresh sardines often buy directly from fishers. The size of the local ethnic market is marginal, and the economics of supplying fresh product to non-local vendors are not favorable. In addition, the cost of growing this market is most probably much higher than the potential revenue gains.

We identified several possible sardine markets for human consumption in the local tri-county area. Proximity to Moss Landing minimizes problems of distribution. A key issue, however, is developing and sustaining demand from restaurants and grocers in the area.

In summary, the LOHAS market in the tri-county area and in California represents a potential target for growing the market. Local restaurants may be willing to experiment with sardines, especially if recipes are provided. Ethnic markets represent a much lower market potential as they appear satisfied with the current lower cost options.

Local fresh sardine fillets

In an effort to increase the percentage of the Moss Landing sardine catch consumed by humans, especially to the LOHAS market, consideration should also be paid to the possibility of bringing a new product to market, fresh sardine fillets. Fillets present the same nutritional value as whole fresh or canned sardines, but do so without many of the barriers to consumption that the other products present. An all-meat product removed of head, tail, internal organs and major bone structures would be more similar to other protein products that Americans currently buy.

The benefits of eating sardines has been publicized with greater frequency in recent months and years[57], though appeal for current products remains steadily low. Sardines fillets represent an appealing protein source, with high levels of Omega-3 and Omega-6 fatty acids. They are relatively inexpensive and can be sold as organic and/or sustainable. Moreover, the fish have significantly lower mercury counts than fish from higher trophic levels; they are plentiful in the eastern Pacific Ocean and can be captured with a relatively low carbon footprint. It is reasonable to believe that a fresh sardine fillets with fewer of the negative aspects of canned sardine may sell better than products currently available to American consumers.

Unfortunately fresh fish often sold whole and within one day of harvest, can only be sold locally to their port of landing, or refrigerated and transported quickly to other markets. This could limit distribution via road to the San Francisco Bay area, from San Francisco to San Jose, unless the refrigerated product is flown to other markets. The five counties surrounding the Bay have a total population of approximately five million people. This is a sizable market but would take concerted marketing effort to develop relationships between distributors and end users. In addition filleting, packaging and refrigeration facilities would be needed at Moss Landing to process the fish as soon as possible after landing.

The fresh sardine fillets could be distributed directly to restaurants, in fish markets, but also in the seafood sections of grocery stores. Inclusion on the Whole Foods fresh fish counter would target consumers who prefer nutritional and healthy products. Another option is to locate local distributors, grocers or restaurateurs who would buy fresh, raw sardines and prepare them as desired.

It may also be beneficial to find another name for fresh sardine fillets. Just as squid is also known as calamari, sardine could be sold under a different name which may alleviate some aversion among American consumers to the word “sardine.” Adopting an alternative name for the fresh sardine fillets could avoid the negative sardine stereotype of being “oily and smelly”.

Restaurants

Restaurants also have questions concerning the demand for sardines as a menu item. The main challenge appears to be customer preference for a whitefish with lighter flavor. The oily and fishy flavor of sardines can be a deterrent to potential consumers. Some restaurants serve sardines as appetizers while others vehemently deny that there may be demand for it.

The majority of restaurants are open to, if not enthusiastic about the prospect of serving sustainable fish. In fact, many local restaurants participate in the Seafood Watch Program. This program requires restaurants to serve sustainably harvested fish. The main complaint that restaurants express is the lack of availability of sustainably harvested fish. The supply is not able to meet the demand.[58]

Fortunately, many local restaurants are willing to experiment with sardine recipes, but it is likely an orchestrated communications plan would be necessary to increase public awareness and favor for such dishes. The cost-benefit relationship may justify investing in developing this market.

[57] Bon Appetit magazine, February 2008
[58] Restaurant interviews

Grocers

Similar to restaurants grocers have mixed opinions on the successful sale of fresh sardine products. While there is limited interest among certain grocers, including Whole Foods and certain cultural niche markets, their perception of demand is minimal, especially in comparison to the total weight offloaded at Moss Landing Harbor.

As a market opportunity by itself, it is unlikely that the sale of fresh sardine to local grocers would be economically feasible. However, as part of a more grand branding effort of Monterey sardines, grocers would be a vital partner in raising awareness and increasing the presence of sardines in the area. Grocers have stated interest in trial sales of new sardine products. However, in order to sustain that demand and ensure the long-term viability of these efforts, a communications and public outreach campaign must be at the focal point of joining both the restaurant and grocer channels.

Target Institutional Markets

Consider introducing the breaded, fried fillets used in Japanese schools. These are already being produced with sardines from the Monterey Fish Co. and we can explore options to bring some to American institutions.

On the institutional side, there may be an untapped potential in larger institutions such as the California penal system, the California State University system, K-12 schools and the military. In general, food service for these institutions is provided under contract with larger vendors. Targeting the vendors who provide catering services would be the best way to access these markets. We attempted several times to contact the larger vendors; however, they were not willing to discuss the project with us. It is impossible to "read the tea leaves." It is possible that there reluctance to discuss this with us represented a lack or interest. It is also possible that they were too busy to discuss hypothetical purchases. This sector represents an unknown market.

An Example in Value Added

In most of the discussion that precedes this section, the prices that were used were ex-vessel; that is, they reflect the price the fishers received at the boat. In this section, we try to show the impact of the value added by shifting a small percentage of the sardine catch to higher-value human consumption. Before discussing the numbers, we assume that most of the value added would not go to the fishers, however, a small portion might. Higher value of fillets would probably increase the ex-vessel price, albeit, marginally.

In discussions with people at MLML, we were told that sardine fillets could possibly sell for $8 per pound. Without being able to estimate the value added at each stage of the process, we made some very conservative estimates of prices for fillet at $2 per pound. We then calculated how converting five percent of the catch to higher value fillets for human consumption. These are shown below in Table 4.

Table 4 Value Sardine Catch; current value compared to 5% filleted for human consumption*

		Current Sardine Catch			Projected Value		
	Price per pound	**% catch**	**Pounds**	**Revenue**	**% catch**	**Pounds**	**Revenue**
Fillet	$ 2.000	0%	-	$ -	5%	1,951,004	$3,902,008
Fillet Scrap	$ 0.015	0%	-	$ -	4%	1,560,803	$ 23,412
Whole	$ 0.042	100%	39,020,078	$1,637,325	83%	32,386,665	$1,358,980
Pieces	$ 0.035	0%	-	$ -	9%	3,511,807	$ 122,913
Total			39,020,078	$1,637,325		39,020,078	$5,407,313

* Assumes 4% scrap and 9% pieces as a result of the filleting process.

Calculations of this nature are based on and are very sensitive to the assumptions used in the calculations. Notwithstanding, increasing human consumption by only 5% increases the value of the catch by $3,769,988, which is more than three times as much as the current value of the catch. Given the increases in value added that might be created by selling to the LOHAS market, restaurants and local grocers, a demonstration project would of filleting sardines is compatible with this scenario.

Monterey Bay Aquarium

The Monterey Bay Aquarium uses CPS to feed many of their fish. With daily routines feeding their live specimens whole fish, and the nutritional value of ML sardines, the aquarium may be a local outlet for ML sardines. The Aquarium and its Seafood Watch program may also be valuable partners in any other efforts to promote local seafood consumption.

Communications, Public Outreach and Product Sourcing

A marketing strategy must be comprehensive and must incorporate all interested parties for two reasons: one, to strengthen the campaign so as to grow local demand from all sides; and two, to share the cost/burden of the actual marketing efforts. Marketing campaigns are very expensive. Though it is extremely difficult to estimate the cost of a major marketing campaign without first specifying the target market, the size of the campaign the objectives and the media mix, a comprehensive marketing campaign to develop the market for sardines would most likely cost in the millions. A marketing campaign with more tightly defined efforts, e.g., raising awareness and trial in the tri-county area would cost substantially less. If possible, marketing strategies should incorporate as many stakeholders as possible. MLML, Environmental Defense, The Nature Conservancy, the Coastal Conservancy, the Monterey Bay Aquarium/seafood watch, MBARI, California Wetfish Producers Association (CWPA), Monterey County, California Fish & Game, Moss Landing Harbor, Del Mar Co., Monterey Fish Co., local restaurants and grocers could all play a role in the campaign, For some, it would be input, for others financing and design.

Coordinated efforts will lead to the growth of local demand from multiple sides. Restaurants could pass out samples on Fisherman's Wharf (Domenico's already does this), grocery stores could do the same at their fish counters, local newspapers could run ads and feature articles that hark back to the historical value of sardines to Monterey, and the Department of Commerce could include 'the history of sardines in Monterey' in tourist brochures. Public relations spots on local radio and television could inform the benefits of local sardines to the region.

Partners in the marketing effort for sardines could include target festivals such as the Festa Italia, the Monterey County Fair, and other summer festivals with stands, tables and/or booths that disperse key information on the sustainability and local, historical value of Moss Landing Sardines. Finally, these same partners could target regional farmer's markets around the Monterey Bay to continue spreading the word and the image of the Monterey Bay sardine. The Seafood Watch Program would increase its outreach and join in the proactive marketing efforts to further its own mission "to empower consumers and businesses to make choices for healthy oceans[59]." In addition, these marketing efforts could be bolstered by a partnership with the Sardinistas who share many goals with MLML within their vision of incorporating sardines into the American diet.

Gain Sustainable Certification

We identified sustainability certification outfits for seafood products. The Marine Stewardship Council and Friend of the Sea are two groups that own and license a brand name to other brands or products. Certified products then display a small label on their products identifying them as sustainable.[60] It may be possible to either utilize one of these branding products to distinguish the sustainable nature of sardine harvest. West coast CPS harvested by purse seining generally meet or exceed all criteria for sustainability by these two organizations. . The Marine Stewardship Council certification costs from $35,000 to $500,000 depending upon the complexity of the fishery. Funding may be available through the Sustainable Fisheries Fund. Friend of the Sea's Eco-label brand certification costs approximately 5,000 Euros and 2,000 Euros per year. While sustainability certification is desirable, it is economic feasibility will depend upon which market opportunities are selected.

The designation of locally sourced product as "sustainable" is consistent with the ideals of the Coastal Conservancy and the Moss Landing Marine Laboratories. However, the economic feasibility of these efforts is not as clear. This topic will be discussed further in the Section 8, which is dedicated to these certification options.

Public-Private Partnership

We present a very brief overview of a public private partnership in this scenario. It is described in greater detail in Section 7. The basic premise of this type of partnership is that the problems of managing environmental resources to create a sustainable fishing industry are too large for any individual or small number of groups. System-wide problems, such as protection of fishing stocks, require systemic solutions. Without cooperative efforts, there is little likelihood that individual efforts will result in a solution to the problem.

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[59] http://www.mbayaq.org/cr/cr_seafoodwatch/sfw_aboutsfw.asp

[60] The Marine Stewardship Council and Friend of the Seas use different criteria for determining brand sustainability. This is discussed further in the section titled _____

There is an opportunity to create an organization, or association or organizations, with the mission of sustainable management of coastal pelagic species. Strategies to achieve a sustainable fishing industry include:

- Self-regulation through an organization representing those wishing to protect CPS, the fishing industry and other stakeholders
- Monitoring fish populations for size and number
- Assisting fishing operations to increase the size of fish caught, while reducing the volume
- Assisting fishing operations etc. to market the catch to higher value markets
- Assisting legislators to develop legislation that protects CPS while maintaining a viable fishing industry.

The Public-Private Partnership opportunity is described in greater detail in Section 7.

Scenario Four: Optimistic New Product and New Market Options

Scenario four is a continuation of scenario three. In essence, it involves doing everything in scenario three plus a more aggressive, more expensive growth strategy.

Food supplements

CPS have many properties associated with a healthy diet including essential fatty acids. Various producers around California and the United States value high quality and fresh fish inputs. These inputs may be either whole fish or parts not used in other processing procedures. For example, after a filleting process the head, innards and tails could be used in dietary supplements. A company called Nordic Naturals has a sales office in Watsonville. Unfortunately their products are produced in Norway, where they use fish harvested from the North and Norwegian Seas. However, their growing business is an encouraging example of innovative products which are marketed effectively. A taskforce from the public private partnership could try to identify other supplement companies that might be willing to partner with fishers from MLH.

Local canned sardines

The feasibility of preparing CPS products locally was examined. Of note is that the Monterey Fish Company's canning operations were closed due to the California energy rate increases from 2000-01.[61] This will only become less viable given the current rise in the price of oil. The market for canned CPS is extremely competitive filled with many international producers who can provide product much less expensive than a California-based producer. In addition to the traditional sardine canned in oil, other canning processes include pressure-fried "broasted"[62] products. Due to high variable production costs, the feasibility of any processing in California is minimal, at best

Unfortunately, the appeal of canned sardine among American consumers is also minimal. Part of this is due to the presentation of the product. Canned sardines are nearly whole fish and while are presented without the head or tail, still contain bones and other organs. Then they are packed

[61] Sal Tringalli, President, Monterey Fish Company, in a conversation on January 9, 2008
[62] Diane Pleschner-Steele, California Wetfish Producers Association, in a conversation on November 12, 2007

in oil that heightens a strong "fishy" smell. This combination creates a product that is not as popular among American consumers as it is among consumers in other locales.

One possible strategy would be to emulate the French style of sardine canning previously described. This would produce a specialty product that would have the dual challenges of building the market and competing with the traditional French brands.

Appendix 3 provides information about trends towards increased energy and labor prices in California.

Local fresh sardine fillets

As described in Scenario 3, fresh sardine fillets offer potential to fulfilling a higher-value lower-volume model. The major difference between Scenario 3 and Scenario 4 is that the fillets would be more aggressively marketed in this scenario involving a more expensive marketing campaign.

Vacuum Packing or freeze dried

Alternatives to fresh sardine fillets include vacuum packed, frozen or freeze dried. By vacuum packing, freezing or freeze drying, the seller could extend the shelf life and avoid the oily, "fishy" presentation that turns many Americans away from canned sardines. Moreover, packaged fillets could be pre-marinated, spiced, or in some way infused with some other flavor that is appealing to domestic markets. These fillets would either be ready to use out of the package, or may require a short thawing period or quick microwave heating. These Packaged fresh sardine fillets could be distributed through specialty grocery store chains, like Trader Joe's. Alternatively, by working with a frozen foods distributor, a successful online sales/distribution model could prove very profitable for this, a niche product.

A variety of recipes would need to be developed or instructions provided describing how the fillets could be barbequed.

Anchovy paste

Anchovy paste is a product combining anchovies, vinegar, spices and water. It is sold in a tube and is used in a variety of cooking procedures as well as a cracker topping. We considered processing opportunities for local anchovies, including the possibility of combining different fish into pastes. Unfortunately, the barriers of local production apply here as well. Variable costs such as labor and energy are much higher than in other countries that produce competing products. Moreover, the time required to recover infrastructure and machinery capital outlays is very long. Anchovy paste is popular in the United Kingdom and Australia, where it is sold in most supermarkets. Although anchovy paste is a staple product in these markets, it is price competitive commodity.

Other product distribution alternatives

The alternative to local processing is to send raw product directly overseas for processing, be it freeze dried, frozen or canned. This would not require involvement from MLML or any Moss Landing-based operation. To take advantage of this option the ML wetfish offloading operation has to find the appropriate distributors, create contracts to deliver a certain minimum size sardines. The risk is that the fishing operations may not deliver the larger size fish on a reliable

basis. . If a guaranteed supply is not possible, contracts can be made for sporadic delivery of larger fish. In all cases there is a tradeoff between the level of confidence in the supply and price, with greater confidence being rewarded by higher price.

Aquaculture

Local and domestic aquaculture operations are growing and represent another potential market for sardines as a feedstock. Though human markets may be more profitable, it is possible that certain CPS may be attractive to some aquaculture operations, including fish farms along the west coast. Supplying domestic aquaculture operations would decrease the transportation and environmental costs required to move the products currently harvested at Moss Landing. However, it remains to be determined if partnering with an aquaculture operator is in agreement with the environmental goals of the Moss Landing Marine Lab.

There is also an opportunity for aquaculture development. Monterey Bay Abalone on Wharf #2 in Monterey is an example of how this can be a low impact and profitable business that provides for the market and not only protects, but enhances natural resources. In addition, abalone in particular is a high-value species that will receive higher prices on the market than CPS.

7. Public Private Partnerships

A Public-Private Partnership (PPP) is "loosely defined as cooperative institutional arrangements between public and private sector actors" (Hodge and Greve, 2005, p. 1). PPPs have been conceptualized as a new form of governance structure, development strategy or contracting system. In this section we investigate the opportunity to use PPP as a new business form, possibly in combination with traditional legal business forms, to create a legal entity that could support MLML in achieving their environmental, business and research objectives.

Many environmental problems are larger than the sum of their constituent parts. Individual interests may compound the problems, especially when dealing with depletion of natural resources. This is the nature of the Tragedy of the Commons. Originally developed by William Foster Lloyd, in 1832,[63] and later popularized by Garret Harden[64] in 1968, the Tragedy of the Commons is a social dilemma. In short, the commons is being over-grazed and the entire community would benefit if grazing were limited. But at the individual level, if every one else is grazing sheep on the commons, it is counter to one individual's self-interest to stop. Without cooperative efforts, there is little likelihood that individual efforts will result in a solution to the problem. For example, if one fishing operation refrains from catching smaller fish to help CPS to repopulate that is unlikely to assist the CPS populations since others have not also changed their fishing behavior.

The tragedy of the commons is that in a market economy it appears to be in the individual's best (short term) interests to collect as much of a free public resource as possible, which can lead to the exhaustion of that resource. One example of this, in the fisheries context, is the depletion of

[63] William Foster Lloyd (1832), *Two Lectures of the Checks to Population*, Oxford, England, Oxford University Press.
[64] Garrett Hardin (1968), "The Tragedy of the Commons," *Science* Vol. 169, No. 3859, 1243-1248.

cod on the Grand Banks of Newfoundland. Hence many forms of legislation designed to protect public natural resources in effect create some form of constraints on the resource at some place in the supply chain. Examples of constraint-based natural resource protection include fishing licenses, harvest quotas, and seasonal fishing "open seasons", which imply closed seasons.

This legislation typically has externalities for businesses in the industry, for example making it necessary for fishing operations to catch as much as possible during an "open season" and remain idle for the rest of the year. Thus legislation can have a doubly negative effect on the fishing industry by not only limiting the amount of the resource available, but encouraging less profitable business practices and reducing confidence in the future of the industry. Lack of confidence in the future of the industry also discourages businesses from investing in better facilities that could maximize the value of the catch and the return on the fish which are caught. These dynamics lead to valuable fish resources being used for low value animal food rather than higher value human consumption.

In the case of Moss Landing, multiple stakeholders have a mutual interest in a fishing industry that looks to the future to determine its present actions. On their own, these stakeholders --- including fishers, scientists, off-loaders, processors, small business owners, the harbor, environmental groups, community organizations, interest groups and government officials --- seek to benefit the people, the planet and the economic potential contained within their respective realms. However, recent trends demonstrate that mutual interests are not being well-served as the fishery and industry decline.

A key strategy to combat these *lose-lose* environmental/economic conflicts is to look for mutual gains and alignment of goals through strategic partnering. When multiple stakeholders' interests and resources are considered together, more can be achieved than one individual, or one organization, can achieve alone. Pooling resources and interests in the fishing industry in Moss Landing may be the solution that can save a floundering local economy. A central unifying organization that plays the role of a coordinator or an ombudsman could facilitate cooperation and influence legislation to retain confidence in the fishing industry. This is the role of the PPP, to align stakeholders' goals and facilitate problem solving that addresses the needs of the major stakeholder groups to protect fish populations while maintaining a viable fishing industry.

Appendix 4 shows the government and non-government fishing organizations with their members, goals, activities, geographic area, type of fish and interest in research, marketing and lobbying. It is possible that with the help of organizations, such as the Alliance for Communities of Sustainable Fisheries, this mosaic of organizations could be mobilized into a whole, similar to the WCSFC described in this section of the report.

PPP Objectives

There are four objectives, which MLML and their wetfish offloading facility will have difficulty achieving without the help of a PPP. They are:

1. Increase the value of CPS without increasing size of the catch,
2. Gain a Sustainability Certification,
3. Gain Cooperative Market development for CPS,
4. Influence regulation to protect CPS without harming the fishing industry.

The first objective is to increase the local value of CPS. By doing so, the local fishing industry can sidestep the low-value commodity export conundrum that it is currently facing. This strategy can include the reintroduction of value-added operations to Monterey County (e.g., head, gut, tail; and broasting) and/or fishery certification (MSC, FOS), resulting in higher prices for the human consumption market. But market forces may not be sufficient for these new product and new market strategies to work. The fishing operations have to be rewarded for catching larger fish and the increasing returns to fishing operations should not be dissipated by encouraging more fishing operations to enter the market.

The second objective, achieving a sustainability certification is too expensive for any one business in the Moss Landing fishing industry. It could, however, be achieved by key stakeholders acting together.

The third public private partnership objective is dedicated to collective marketing. Developing new markets for higher value products, such as packaged goods, requires a considerable investment in marketing to create awareness of the brand and create a favorable brand image. This strategy will aim to increase demand locally, regionally, and perhaps nationally for Monterey Bay seafood/CPS. These efforts can focus on the health benefits of Monterey Bay fish, the historical/cultural value of the industry, and the sustainability of the operations. Achieving these objectives is also likely to be beyond the capacity of an individual business, such as the wetfish offloading operation. However, a focused collective marketing program, with a consistent message, could be effective.

The fourth objective involves creating enough confidence in the protection and sustainability of the CPS that it would influence environmental legislation. This goal is not to merely remove or reduce legislation but to have legislation that protects the fish populations without unintended negative consequences for the fishing industry. The first objective is to increase the value of the catch and hence the profitability of the industry. Typically, a higher-valued catch would attract more fishers. Therefore, a mechanism needs to be developed to avoid overfishing. MLML researchers could play a key role in monitoring the catch and provide information to various stakeholders. Also when legislators or regulators want to achieve a public policy goal, such as decreasing the size of the fishing industry, consultations within the PPP could find better ways to achieve that goal. One example is a boat buyout where the lead organization will survey fishers to see at what price they would be willing to leave the industry. The lowest bids get the contract.

Although the Moss Landing fishing operations might refrain from catching smaller, younger fish and reduce their size of their catch, this will not resolve the tragedy of the commons because pelagic fish can swim from Moss Landing as far as Canada of Mexico. The pelagic fish population will not be protected unless significant portions of the area from Canada to Mexico, i.e., the whole USA West Coast, are protected from excessive fishing of smaller size fish. If the fish populations are not protected the relevant government bodies are unlikely to refrain from greater and greater fishing restrictions. Therefore, in order to protect fish populations and reduce protective legislation, a structure needs to be established that encourages others to refrain from catching smaller fish throughout the west coast of North America. To do this we propose the establishment of an organization we call the West Coast Sustainable Fishing Cooperative.

Over fishing and increasing government restrictions

The marketing opportunities available to the Moss Landing wetfish offloading operations may be more profitable and reduce the impact of fishing operations. However, they will not significantly

change the impact of fishing on the pelagic fish populations on the west coast of North America. It is unlikely that any one member of the supply chain --- fishers, offloaders, distributors and/or retailers --- will be able to resolve the tragedy of the commons created by competition for scarce fish resources. But as a group they may be able to affect change.

In the next section of the report we describe an industry organization that could address the interdependent issues of over fishing and increasing government regulation of the pelagic fishing operations.

West Coast Sustainable Fishing Cooperative (WCSFC)

The West Coast Sustainable Fishing Cooperative is proposed as a PPP organization that represents individuals, organizations and governing bodies who want to achieve sustainable CPS populations and fishing industries on the West Coast of North America.

WCSFC's mission is to achieve a profitable and sustainable fishing industry on the west coast of North America now and in the future.

The goals of WCSFC are to:

1. Increase the size of pelagic fish caught and support a sustainable fishery
2. Maintain employment and profits in the fishing industry
3. Influence legislation to facilitate the achievements of these goals.

Many organizations exist in the geographic area with similar objectives. The job may be to bring these organizations together under the umbrella of WCSFC and have them agree to the charter of WCSFC. For example, organizations that represent the fishing industry exist as do organizations that represent environmental protection of fishing populations. They could join WCSFC if they agreed to the fundamental principles of working together for the projection of CPS and a viable fishing industry.

West Coast Sustainable Fishing Cooperative

Vision: Sustainable fish population and profitable North American West Coast fishing industry now and in the future.

Mission: Research based cooperative management of North American West Coast fish stock for a sustainable and profitable fishing industry.

Financial members: Offloaders, fishers & researchers

Public members: Supporters of sustainable fishing on the West Coast

WCSFC Organization Structure

Although the WCSFC could start small, it will need to design an organization capable of undertaking for a range of activities in a large geographic area. Legal advice should be sought to decide what type of legal entity the WCSFC should adopt, such as 501(c3) or Limited Liability Company. Regardless of the type of legal entity, WCSFC will need a Board of Directors elected by financial voting members, who will recruit and appoint a President/CEO. (See Figure 2)

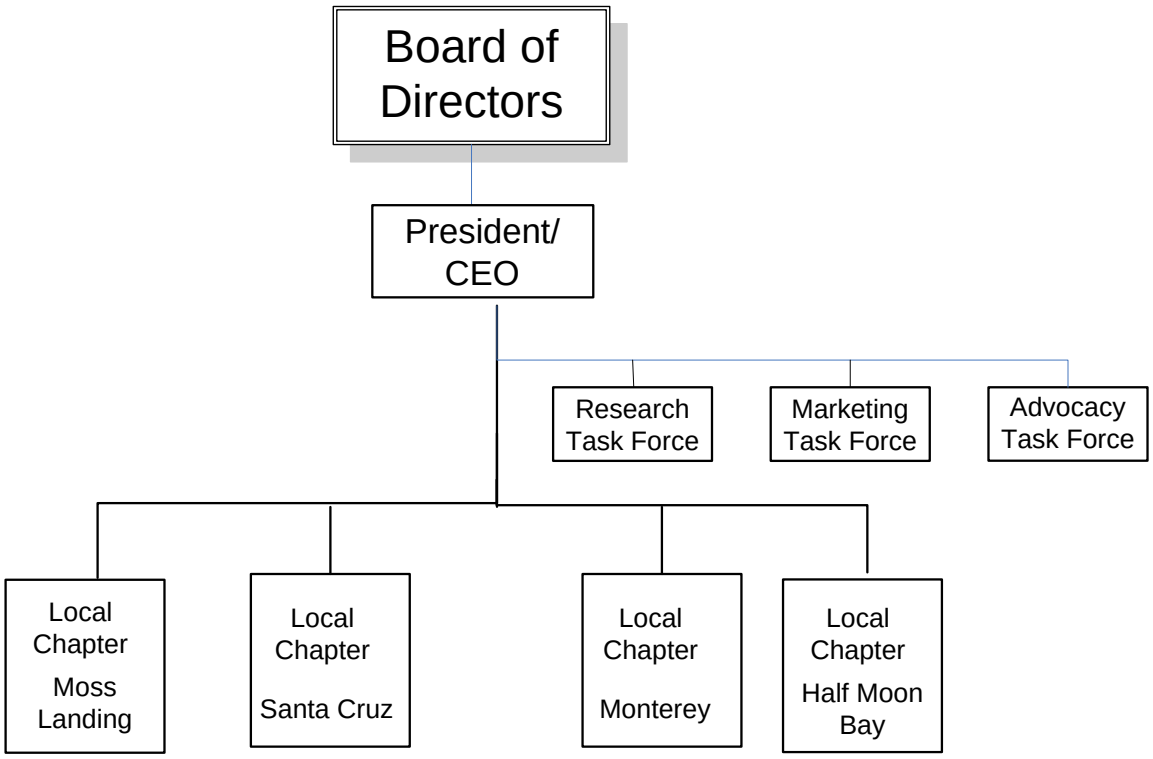

Figure 1: WCSFC Organization Structure

Membership

Financial members could be recruited from industry and interested organizations, such as environmental groups. "Financial members" are called as such because their livelihood depends on the fishing industry and they are thus expected to make a significant financial contribution. Non-financial, public membership could be offered to individuals of the local community and other supporters. Non-financial members are asked to make a small contribution to cover the administrative costs of membership. In addition, there could be supporting non-financial members who would pay a higher membership fee that would help defray organizational expenses.

Local Chapters

WCSFC is unlikely to be successful if the local fishing communities in which it operates do not support it. Therefore a primary focus has to be in seeking community participation and providing avenues for community support

The local community chapter will be the fundamental group, i.e., everyone will be a member of a local Chapter, but not everyone has to join a task force or special interest group. The first and founding chapter would likely be the Moss Landing Chapter. As other communities join they will start by forming their own chapter, such as the Monterey Chapter or Santa Cruz Chapter. Local chapters will report to the Board of Directors through the President.

Existing organizations, which agree to comply with the principals and rules of WCSFC, can join as a Local Chapter. The Local Chapters have two overarching goals: increasing WCSFC membership and fund raising. Local Chapters will mobilize volunteer support and engage in fund raising to support their own projects and to those of the WCSFC.

As mentioned previously, existing organizations in local areas could join WCSFC if they are willing to adopt WCSFC principles of protecting CPS populations and a viable fishing industry. Appendix 4 shows government and non-government organizations with an interest in the Moss Landing fishing industry. Fishing organizations exist in Miss Landing, Monterey and Santa Cruz.

Task Forces: Research, Marketing and Advocacy

WCSFC has three major functions, which will each require a central Task Force:

1. Research activities to facilitate self-management
2. Cooperative marketing activities to achieve WCSFC goals
3. Advocacy and Lobbying activities to influence legislation.

The three Task Forces: Community, Research, Marketing and Advocacy will also report to the Board of Directors through the President. A committee of the Board of Directors, chaired by the President, will select members of the Task Force. Each Task Force will be supported volunteers recruited from the Local Chapters by the Task Force to support their mission. Each Local Chapter will be encouraged to have a representative on the three Task Forces.

Research Task Force

Self-management of fish populations will require information about the size and volume of catch and monitoring of fish populations. Wetfish offloaders will be asked to allow collection of fish data. This research data will be used to provide feedback to fishing operations on the average, range and standard deviation of fish size. Research data will also be extremely valuable to the cooperative marketing activities. The research taskforce can help disseminate research finding through the community.

Cooperative Marketing Task Force

In addition to marketing WCSFC, there is great potential for cooperative marketing that will increase the value of the catch. A Cooperative Marketing Task Force should be formed to undertake these activities. Initiatives could be taken, such as certifying the fishing operations as sustainable or development of local brands or products.

The task force would provide the Board of Directors with an annual Marketing Strategy and Plan with an associated budget for approval. The task force would be responsible for strategic direction of the WCSFC, including:

1. Positioning and image of the WCSFC relative to other fishing industry and environmental organizations. In the marketing context positioning refers to the perception of image in the mind of the target market. In the context of the WCSFC, positioning is the perceptions that stakeholders and the general public have of the WCSFC. It is important for the centralized Cooperative Marketing Task Force to develop a positioning statement and materials, such as logos, to ensure a coordinated image for WCSFC.

2. Communication campaigns including websites and centralized promotions. The goals of these campaigns would be to increase awareness of WCSFC and attract new members and new Chapters to join. Local promotions can be handled in conjunction with the local Chapters. Specialized promotions would be handled in conjunction with the associated Task Force, for example, membership campaigns would be created for the Community Task Force.
3. Sales Promotions for CPS and related products designed for the new target markets. This would include festivals and other activities.
4. Public Relations, including the development of relationships with influential media.

The Marketing taskforce can organize volunteers for activities, such as publishing a "Moss Landing Cookbook" of favorite family fish recipes. The benefit of having a Cooperative Marketing Task force is that it will concentrate members with useful marketing skills into one team and make their growing knowledge and contacts available to the other Task Forces and Local Chapters.

Advocacy Task Force

The primary objective of the Advocacy Task Force is to influence government legislation with respect to coastal pelagic fish and fishing. To achieve this, the Advocacy Task Force will initiate and strengthen relationships with people within government, industry and environmental groups, and other interested parties such as the Moss Landing Marine Laboratories.

Members of the Advocacy Task Force will prepare draft position statements for submission to the Board of Directors for endorsement. Highly significant or controversial position statement may be presented to Financial and or Public Membership groups for endorsement. The Advocacy Task Force will work with local Chapters and SIGS to identify and develop valuable contacts.

Establishment of the WCSFC

A number of suggestions are offered for the establishment of the WCSFC in the Moss Landing, Monterey and Santa Cruz areas. First an Interim Steering Committee should be established to guide the development of the new organization until a Board of Directors can be elected from a body of members. The Interim Steering Committee should be a group of about five local individuals who will make a personal commitment to work on the steering committee for about a year. These people can be drawn from industry, civic organizations, public interest groups, and the local communities.

Initial goals include:

1. Establishing the WSCFC organization structure
2. Creating awareness and generating community participation
3. Establishing local chapters in Moss Landing, Monterey and Santa Cruz.

When these goals have been achieved the new organization should have sufficient membership to nominate and vote for the Board of Directors.

Town Hall Meetings

Town Hall meetings can be held to create awareness, facilitate community input and participation, and to raise initial funds through membership fees and donations. These meetings should be held in convenient public buildings, like a school or city council chambers.

The goal of the Town Hall meeting is to engage in dialogue with the local community as a basis for collective action. To achieve this goal, discussions will be facilitated on topics such as "What does sustainable fishing mean for coastal pelagic fishing?" For example to explore a topic meeting participants can be divided into smaller groups of five or six participants to discuss the topic. These smaller groups would then report their observations back to the whole meeting. In this way individuals can have their opinions heard and included in the group decision making.

This process could also help gather information about how proposed activities could affect various community groups, for example, before making a commitment to using nets with larger holes to catch larger fish the community could identify and discuss the issue from different perspectives. Town Hall Meetings can be facilitated by independent people experienced in group facilitation to avoid perceived bias and facilitate participation. At each Town Hall meeting attendees can be asked to nominate others who might be interested in attending future events.

Local Activities

Local activities can also be designed to encourage public participation, such as the development of a Community Fishing History Mural by a local High School (See inset).

Community Fishing History Mural

The objective of the Community Fishing History Mural is to elicit from the community the importance of the Fishing Industry to the identity and economy of the local community. Materials needed include a large wall covered in drawing paper, many sets of colored marker pens, about five minutes for instructions and fifteen minutes for participants to make contributions and 20 minutes for a plenary feedback session. The instructions begin with an introduction to the activity, and a request to participants to draw on the timeline important evens in the history of the local fishing industry. At the end of the drawing time individuals are asked to volunteer descriptions of what they drew, starting with the oldest events first. After the exercise the Community Fishing History Mural can be used to create a written fishing community history and provide information for advertising and P.R. activities.

Establishing WCSFC will take time and commitment. Ideally MLML could support the development of such an organization and become a financial member. If the idea of SCSFC is not taken up enthusiastically by members of the fishing industry, environmental groups and local fishing communities it will not be successful. We suggest that MLML hold a public meeting to gauge public support for the idea.

8. Sustainable Fishery Certification of Moss Landing

In evaluating possible alternatives for the Moss Landing fishery, the idea of certifying CPS has been mentioned many times. Throughout the globe there are fish stocks that have been labeled as sustainably harvested species. These species go through a certification body that evaluates the health of the fishery, the fish resources being extracted, and the manner of extraction. The end-product is thus branded with an Eco-label that adds value to the product. Consumers can use their purchasing power to buy sustainably harvested fish species. In essence these conscious consumers "buy good" and "do good" at the same time.

We identified two organizations that certify pelagic fish species that are in accordance with the Moss Landing fishery. The Marine Stewardship Council and Friend of the Sea are organizations that certify sustainably managed fish resources and marine ecosystems. The next section will identify the procedures to certification and the necessary fees and costs to obtain a possible certification for Moss Landing pelagic species.

Marine Stewardship Council

The Marine Stewardship Council (MSC) is an international non-profit organization that works to improve the management of fish resources and marine ecosystems throughout the globe. This organization certifies sustainably managed fish resources and brands them with an Eco-label that gives consumers the power to choose responsibly caught fish. MSC follows the UN Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries and the International Standards Organization. The MSC vision statement states the following: *To safeguard the world's seafood supply by promoting the best environmental choice.*

Principles

- The maintenance and re-establishment of healthy populations of targeted species;
- The maintenance of the integrity of ecosystems;
- The development and maintenance of effective fisheries management systems, taking into account all relevant biological, technological, economic, social, environmental and commercial aspects; and
- Compliance with relevant local and national local laws and standards and international understandings and agreements[65]

Certification Criteria

The above items must be in accordance with the following three principles of a sustainable fishery:

1. A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted; the fishery must be conducted in a manner that demonstrably leads to their recovery.

[65] Website 1: http://www.msc.org/assets/docs/fishery_certification/MSCPrinciples&Criteria.doc

2. Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.
3. The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable.[66]

Process and Payment

The process of accreditation through the MSC includes the following items.

1. Pre-assessment
2. Full-assessment
3. Annual audits
4. Chain of custody
5. Logo licensing

The fees to certification according the MSC range from $35,000 to $500,000, depending on the complexity of the fishery. The Sustainable Fisheries Fund based in the United States is a private fund that provides grants to fisheries anywhere in the world specifically to pay for work related to MSC certification. The following flow chart demonstrates the assessment process in achieving a sustainable fishery:

[66] Website 1: http://www.msc.org/assets/docs/fishery_certification/MSCPrinciples&Criteria.doc

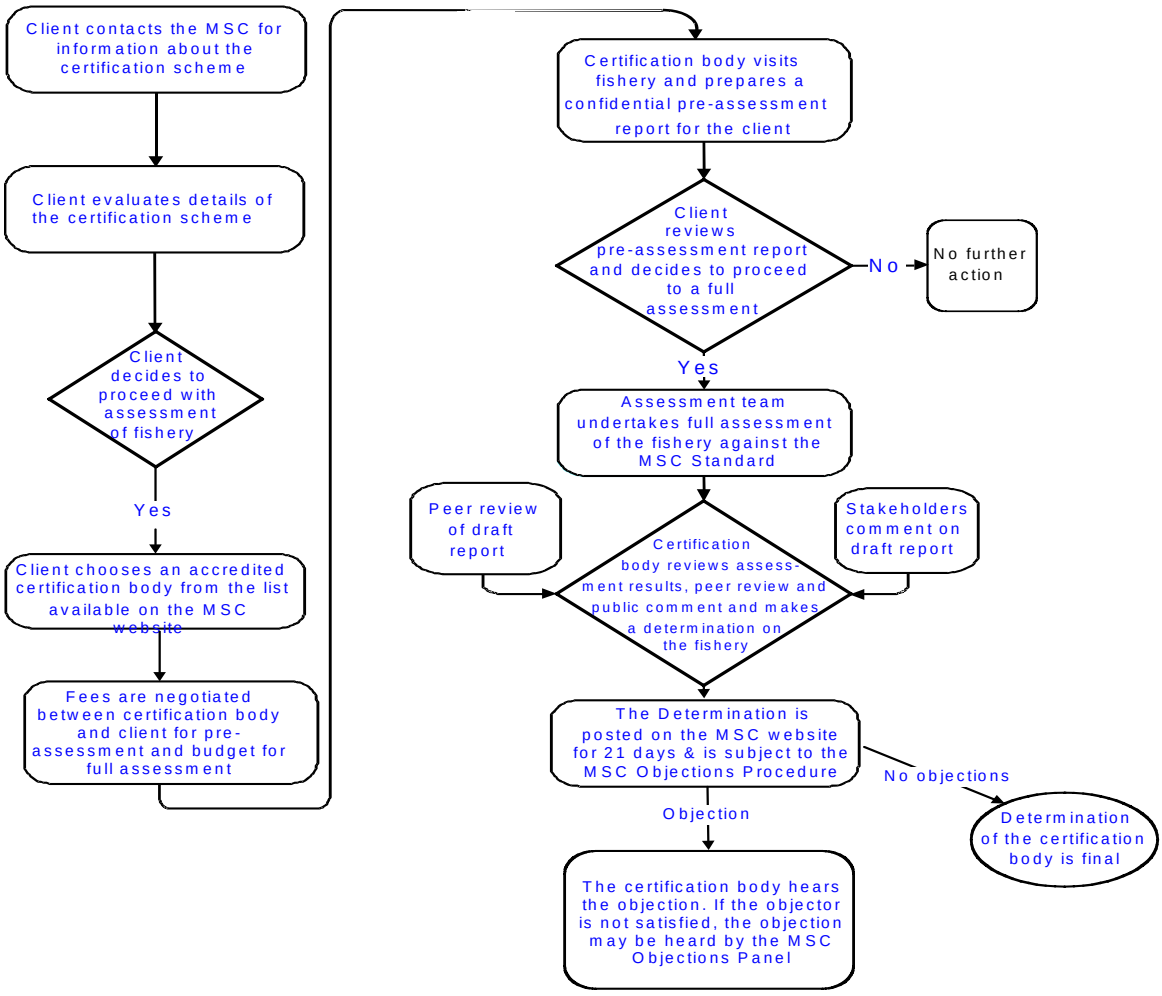

Figure 2: Marine Stewardship Council Certification Procedure Flow Chart

Friend of the Sea (FOS)

Friend of the Sea (FOS) is another international non-profit organization that promotes sustainable management of fish resources and brands them with an Eco-label. FOS also follows the UN Food and Agriculture Organization (FAO) Code of Conduct for Responsible Fisheries, and uses their principles as direct guidelines to reach certification.

The FOS mission statement states the following: *To certify and promote seafood from sustainable fisheries and aquaculture.*

Principles

1. Be consistent with the 1982 United Nations Convention on the Law of the Sea and the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management

of Straddling Fish Stocks and Highly Migratory Fish Stocks, the FAO Code of Conduct for Responsible Fisheries and the World Trade Organization (WTO) rules and other relevant international instruments.

2. Recognize the sovereign rights of States and comply with all relevant laws and regulations.
3. Be of a voluntary nature and market-driven.
4. Be transparent, including balanced and fair participation by all interested parties.
5. Be non-discriminatory; do not create unnecessary obstacles to trade competition.
6. Provide the opportunity to enter international markets.
7. Establish clear accountability for the owners of schemes and the certification bodies in conformity with international standards.
8. Incorporate reliable, independent auditing and verification procedures.
9. Be considered equivalent if consistent with the FAO guidelines.
10. Be based on the best scientific evidence available, also taking into account traditional knowledge of the resources provided that its validity can be objectively verified.
11. Be practical, viable and verifiable.
12. Ensure that labels communicate truthful information.
13. Provide for clarity.
14. Be based, at a minimum, on the minimum substantive requirements, criteria and procedures outlined in the FAO guidelines.
15. The principle of transparency applies to all aspects of the scheme including its organizational structure and financial arrangements.[67]

Certification Criteria

The method and procedure is quite similar to that of the MSC, therefore certification goes through similar processes. A representative of FOS presented us with some important information in relation to the pelagic species from the Moss Landing fishery.

Some mackerel, sardines, anchovies and tuna products have already been certified, even though from different stocks than those mentioned. In general pelagic fisheries are healthier and have a lower impact as they do not touch the seabed, have higher selectivity and are more fuel efficient.[68] Moss Landing CPS fit well with FOS sustainable fisheries certification.

Friend of the Sea's main criteria is based on the status of the fish stock, whether or not the targeted species was over fished. The targeted fish stock must be in compliance with data provided by NOAA's National Marine Fisheries Service (NMFS) in relation to the pelagic

[67] Friend of the Sea Website. http://www.friendofthesea.org/news.php?viewStory=27
[68] Paolo Bray, Director, Friend of the Seas, in a conversation on January 17, 2008

species of our interest. Monitoring of CPS size and populations are already implemented through Pacific Fishery Management Council, CPS SAFE[69].

Process

Friend of the Sea designated Monterey Bay CPS as being in compliance with their certification standards. According to the organization's representative the next step would be an audit, which would consist of verifying if pelagic species were in compliance with existing regulation (mesh size, minimum size, net specifications, fishing area and depth, etc).[70] Timing of the audit would depend on the number of vessels to verify, so they cannot estimate precisely right now, but an approximated figure was given of 3 audit days.

Payment

The process as mentioned begins with an audit that would initially cost approximately 5,000 Euros. On top of this fee FOS insists in engaging in joint marketing to promote what would be approved as sustainable Friend of the Sea fisheries. As for processing companies (fishmeal or canneries), they would be allowed to use the FOS logo on products, after undergoing a traceability audit (chain of custody) and contributing to the current yearly fee of 2,000 Euros.

Under the costs for certification, the organization representative mentioned that the targeted species would undergo an extensive marketing venture through their contacts in the seafood industry. They partake in a yearly trade show in the US, where they promote certified fish products under the FOS brand. They also place the targeted species on various seafood websites, including FOS website, where international supporters and buyers can see sustainable fish products like a possible Moss Landing certified fish product.

Certification comparison

Although both certification organizations follow similar guidelines, FOS has a lower price in which it charges for the audit. According to NMFS data Moss Landing pelagic species such as Pacific Chub Mackerel, Pacific Sardine, Jack Mackerel and Northern Anchovy are in compliance with FOS certification. An interview with the MSC is in the process so more details from their certification process can be answered.

So far it seems that possibly certifying some of the pelagic species from Moss Landing seems to be more cost effective and straightforward with FOS. As far as what the MSC offers, there are funds available through the Sustainable Fisheries Fund, a program available through the Resources Legacy fund.

[69] Pacific Fishery Management Council, 2007
[70] Bray, Paolo. Interviewer Rafael Burgos. Phone conversation. Monterey, Ca. January 2008

8. Conclusions/Recommendations

As described earlier in the report, MLML acquired a property in Moss Landing Harbor to provide a permanent home for the NSF Research Vessel Point Sur. The property it acquired was occupied by a wetfish offloader. This presented MLML with an opportunity to partner with the local fishing industry, to create a sustainable fishery that could save local jobs and benefit research, education, and fishing interests. One of the key elements of this study was to explore the viability of transforming the fishery from a low-value high-volume model to a higher-value lower-volume model. As a part of the effort, we examined current practices and current markets. We also explored the possibility of developing new practices and new markets. We developed four scenarios to help us examine alternate sets of actions. In addition, we examined the concept of a public-private partnership to help manage the CPS.

Discontinuing the wetfish offload operations at the site acquired by MLML would have strong negative consequences on the Moss Landing economy. Maintaining a status quo, that is, leasing the operation is most probably not sustainable. Though the short-term economic impact of maintaining the status quo is not as severe as closing the wetfish offloading facility, it would still have negative impacts on the Moss Landing economy.

Moving from a low-value high-volume model to a higher-value lower-volume model is possible but not easy. It requires strengthening existing markets and developing new markets that focus on higher value human consumption and other higher value markets. For reasons described in the report, we view sardines as the cornerstone of this effort. We focus on sardines as they have the most immediate potential. They are carefully managed and are currently not overfished. At the same time, we recognize that market and environmental conditions may change over time and that there may be opportunities for other CPS in the future.

Although there are other opportunities, we view a group called LOHAS (Lifestyles of Health and Sustainability) as an appropriate target. Estimates of the number of people in this group vary from 19 percent of the adult population to 30 percent of the US population. People in the LOHAS group are more conscious about the food they eat, their health, and the environment. A "Monterey Sustainable" brand could be appealing to this group, especially to locals in the tri-county Monterey, Santa Cruz, and San Benito area.

Fresh Moss Landing sardine fillets may be the right product for the LOHAS market. Fillets present the same nutritional value as whole fresh or canned sardines, but do so without many of the barriers to consumption that the other products present. The fillets would have the head, tail, internal organs, and major bone structures removed. Sardines fillets represent an appealing protein source, with high levels of Omega-3 and Omega-6 fatty acids. They are relatively inexpensive and can be sold as organic and/or sustainable. They match the wants and needs of the LOHAS group

Demand would need to be built. Based on their experiences with canned sardines, many consumers perceive (misperceive) sardine as boney, fishy and oily. It may also be beneficial to find another name for fresh sardine fillets. Just as squid is also known as calamari, sardine could be sold under a different name which may alleviate some aversion among American consumers to the word "sardine." Adopting an alternative name for the fresh sardine fillets could avoid the negative sardine stereotype of being "oily and smelly".

Although opportunities exist to increase revenue while reducing the size of the CPS catch at Moss Landing, creating a sustainable fishing operation is likely to require more investment than is available to any one member of the fishing industry. Opportunities, such as product development, brand development, sustainable fishing certification or influencing legislation, are likely to be beyond the available resources of MLML and their wetfish offloading facility. A public-private partnership could assist MLML, the Moss Landing fishing industry, environmental groups and legislators, and other stakeholders achieve a sustainable CPS population and fishing industry.

It is important to have a demonstration project to "show we can do it." This can be funded by numerous sources including members of the public private partnership and state agencies.

Appendix 1: List of Interview Respondents

	Affiliation	Name/Position	Contact Info
1	Sanctuary Stainless, Moss Landing fisherman and property owner.	Dave Jablonski, founder, owner, and metalworker	(831) 633-3867 7532 Sandholdt Rd #1, Moss Landing, CA 95039
2	Sardinistas, a sardine advocacy group	Scott Hennessey	hennesseyst@comcast.net
3	National Oceanic and Atmospheric Administration,	Matt Brookhart, Policy Coordinator	831-647-1920 x 104 Matt.Brookhart@noaa.gov 99 Pacific St, Bldg. 200 Suite K, Monterey, Ca 93940
4	Monterey Abalone Company	Art Seevey, Owner	(831) 646-0350 160 Municipal Wharf #2, Monterey, CA 93940 art@montereyabalone.com
5	Monterey Institute of International Studies, Environmental Policy Department	Jason Scorse, Professor and Natural Resource Economist	831-647-3548 460 Pierce Street, Monterey, CA 93940 jason.scorse@miis.edu
6	National Oceanic and Atmospheric Administration, Marine Protected Areas	Charles Wahle, MPA Science Institute Director	831-242-2052 Charles.Wahle@noaa.gv
7	Seafood Watch	Corey Peet Aquaculture Research Analyst	(831) 647-6827 886 Cannery Row, Monterey, CA 93940 cpeet@mbayaq.org
8	Environmental Defense	Rod Fujita, Marine Ecologist	(415) 293-6050 123 Mission St, 28th Floor, San Francisco, CA 94105 RFujita@environmentaldefense.org
		Kate Bonzon, Fisheries Specialist	(415) 293-6050 123 Mission St, 28th Floor, San Francisco, CA 94105 kbonzon@environmentaldefense.org
9	California Wetfish Production Association	Diane Pleschner-Steele, Executive Director	(805) 350-3231 PO Box 1951, Buelton, CA 93427 wetfishinfo@earthlink.net dplesch@earthlink.net
10	Seafood Watch, Outreach Program	Sheila Bowman, Outreach Manager Serena Pring Federman, Outreach Specialist	(831) 647-6871 886 Cannery Row, Monterey, CA 93940 sbowman@mbayaq.org (831) 647-6873 spring@mbayaq.org

	Affiliation	Name/Position	Contact Info
11	Natural Resource Defense Council, Ocean Policy	Kate Wing, Senior Ocean Policy Analyst	(415) 815-6100 111 Sutter St, 20th Floor, San Francisco, CA 94104 kwing@nrdc.org
12	Natural Resource Defense Council, Center for Market Transformation	Laura Pagano, Staff Attorney, Oceans Program	(415) 815-6100 111 Sutter St, 20th Floor, San Francisco, CA 94104 lpagano@nrdc.org
13	Safeway Grocer	Fish counter clerk	831-393-2090 815 Canyon Del Rey Blvd., Del Rey Oaks, CA 93940
14	Mi Tierra Grocer	Fish counter clerk	(831) 394-8113 1000 Broadway Ave, Seaside, CA 93955
15	Filipinas Market	Fish counter clerk	
16	Oriental Foods	Fish counter clerk	
17	La Morenita Grocer	Fish counter clerk	(831) 394-3770 1876 Fremont Blvd Seaside, CA 93955
18	Filipino Indian Market	Fish counter clerk	(831) 393-9175 1914 Fremont Blvd, Seaside, CA
19	Asian Market	Fish counter clerk	(831) 384-3000 3056 Del Monte Blvd. # 105, Marina, CA
20	Marina Produce & Imports (Central American and Asian Products)	Fish counter clerk	(831) 384-8213 3070 Del Monte Blvd, Marina, CA 93933
21	Anonymous Food Market	Fish counter clerk	Marina, CA 93933
22	Save Mart Grocer	Fish counter clerk	831 384 1442 270 Reservation Rd, Marina, CA 93933
23	Whole Foods Grocer	Fish counter clerk	(831) 333-1600 800 Del Monte Center, Monterey, CA 93940
24	Café Fina and Dominico's Restaurants	Anonymous	831-372-5200, 1-800-THE-FINA Fisherman's Wharf No. 1
25	Passionfish Restaurant	Ted Walter, Chef	831-655-3311 701 Lighthouse Ave , Pacific Grove, CA 93950
26	Chef's Pride (Distributor to Fishwife and Turtle Bay Taqueria)	Jefferson Seay, Manager	831 212 0638
27	Ol' Factory Café	Kevin Moody, Chef	831.39.GREEN (cafe) 831.394.6000 (office) 1725 Contra Costa St. Sand City, Ca 93955 manager@olfactorycafe.com
28	Monterey Fish House Restaurant	Anonymous	Carmel - 659-4671 Monterey- 373-4647 2114 Del Monte Ave, Monterey, CA 93940

	Affiliation	Name/Position	Contact Info
29	Del Mar Seafood	Joe Roggio, Controller	(831) 763-3000 331 Ford St.,Watsonville, CA 95076 Jroggio771@aol.com
30	Monterey Fish Company	Salvatore Tringali, President	(831) 775-0522 960 S. Sanborn Rd, Salinas, CA 93901 salt@montereyfishcompany.com
31	L Wise Consulting	Henry Pontarelli, Market Researcher	(805) 528-4587 Wisehen@gmail.com
32	Shorebank Enterprises Cascadia	Mike Dickerson, Executive Vice President	Office: (360) 642-4265 Ext 143 , Fax (360) 642-4078 Cell: (503) 791-8944 mdickerson@sbpac.com P.O. Box 826 - 203 Howerton Way SE Ilwaco, WA 98624 www.sbpac.com
33	Friend of the Seas	Paolo Bray, Director	HQ (EU): 39-348-565-0306 info@friendofthesea.org Skype: friend.of.the.sea
34	Faces of California Fishing	Kathleen Goldstein, Promotional Agent	Cell: (202)841.0295 Green Fish Communications,11135 Schuylkill Rd. Rockville, MD 20852
35	National Oceanic and Atmospheric Administration	Columbine Culberg	Work: (805)963-3238 x10 Columbine.Culberg@noaa.gov
36	National Oceanic and Atmospheric Administration	Michael Bell	Cell: (805) 441-1460

Appendix 2: Marine Life Protection Act and Marine Protection Areas

Marine Life Protection Act

Some fishers complain that marine protected areas hurt smaller fishing operations disproportionately. They also feel that they are not the most efficient form of protection for pelagic species, as these fish swim in and out of MPAs. Academics and conservation groups point to the necessity and effectiveness of no-take zones, citing their success in regenerating fish stocks and boosting harvest levels on the outskirts of the MPA borders. However, no comprehensive cost-benefit analysis has been performed regarding marine protected areas off the California coast.

In 1999, the California State government passed the Marine Life Protection Act (MLPA). This law mandates a statewide network of Marine Protected Areas (MPAs, described later in this section). The MLPA is being constructed and implemented by a series of key stakeholders, including the California Resources Agency, the CDFG, the Resource Legacy Foundation, NOAA, the Science Advisory Team (SAT), and the MLPA Blue Ribbon Task Force. The MLPA goals are:[71]

1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems
2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted
3. To improve recreational, educational, and study opportunities provided by marine ecosystems that are subject to minimal human disturbance, and to manage these uses in a manner consistent with protecting biodiversity
4. To protect marine natural heritage, including protection of representative and unique marine life habitats in California waters for their intrinsic value
5. To ensure that California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines
6. To ensure that the state's MPAs are designed and managed, to the extent possible, as a network

The MLPA objectives are: [72]

1. To develop a Draft Master Plan Framework
2. To develop alternate proposals for MPAs
3. Draft recommendations on long-term funding sources for MPA implementation and management

[71] "Marine Life Protection Act Initiative," California Department of Fish and Game, <http://www.dfg.ca.gov/mlpa>, September 2007

[72] Ibid

4. Draft recommendations to increase coordination between state and federal agencies with authority to manage marine resources
5. Secure agreement among state agencies to complete implementation of Master Plan by 2011

The MLPA implemented along the Central Coast of California on September 21, 2007 is known as the Central Coast Study Region. The Central Coast Study Region consists of 29 MPAs that are currently being established from San Mateo County to Santa Barbara County, specifically from Pigeon Point to Point Conception.[73] Even with the implementation of these fishing restrictions, over 90% of waters within the Central Coast Study region will remain open for fishing.[74]

The fishing industry is one of many stakeholders that will be influenced by the MLPA initiative. The fishing industry within the Central Coast Study region has been affected in the past; not only by regulations but also by the actual fishing practices being used that have lowered overall yield. Categories, corresponding to low fish stocks have been denominated as the following:[75]

- "Depressed" indicates a declining trend has occurred over a period of time.
- "Over-fished" indicates that any stock size needs change in management practices for rebuilding that stock.
- "Depleted" indicates (determines) that a species or population stock is below its optimum sustainable population.

Marine Protected Areas (MPAs) Within the MLPA

The Department of Fish and Game defines MPAs as a discrete geographic marine or estuarine area seaward of the high tide line or the mouth of a coastal river, including any area of inter-tidal or sub-tidal terrain, together with its overlying water and associated flora and fauna that has been designated by law, administrative action, or voter initiative to protect or conserve marine life and habitat.[76]

The MPAs being implemented within California's coastline include various diversifications of what is known as a protected area. The breakdown of these different types of Marine Protected Areas that are being implemented through the MLPA initiative is the following:[77]

- Fifteen State Marine Conservation Areas (SMCA), which limit recreational and commercial fishing
- Thirteen "No-Take" State Marine Reserves (SMR); a total of 85 square miles
- One State Marine Recreational Managed Area (SMRMA); Morro Bay State Marine Recreational Management Area, where recreational fishing is limited or restricted

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[73] "Landmark 'Central Coast' Marine Protected Areas Will Be in Effect Sept. 21," California Department of Fish and Game, <http://www.dfg.ca.gov/mlpa/newsroom_083107.asp> August 31, 2007

[74] "Landmark 'Central Coast' Marine Protected Areas Will Be in Effect Sept. 21," California Department of Fish and Game, <http://www.dfg.ca.gov/mlpa/newsroom_083107.asp> August 31, 2007

[75] MLPA Central Coast Regional Stakeholder Group Central Coast Regional Profile, (September, 2005 v.3.0)

[76] "Definitions," California Department of Fish and Game, <http://www.dfg.ca.gov/mlpa/defs.asp>, September 2007

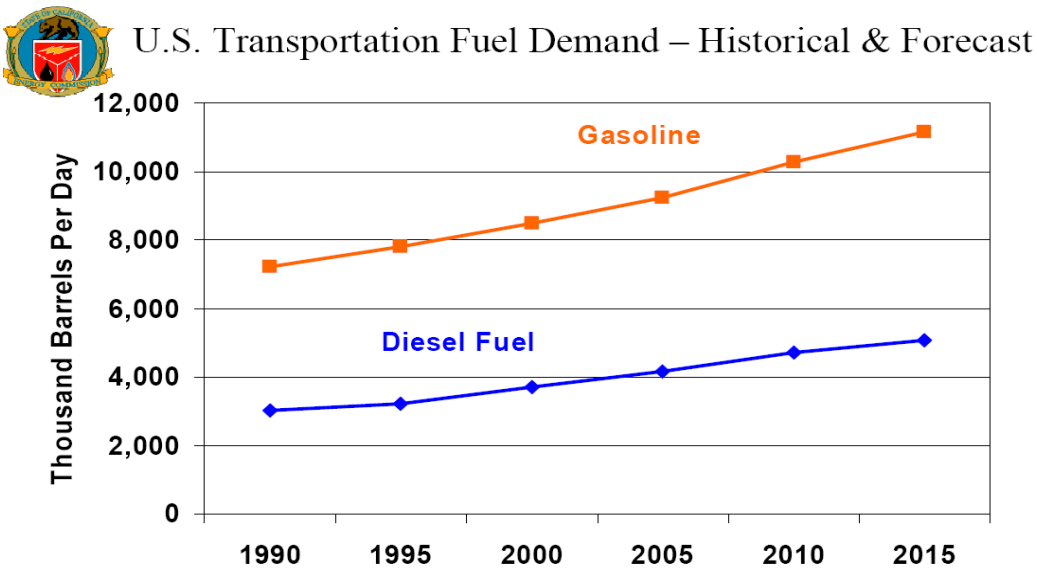
[77] "Landmark 'Central Coast' Marine Protected Areas Will Be in Effect Sept. 21," California Department of Fish and Game, <http://www.dfg.ca.gov/mlpa/newsroom_083107.asp> August 31, 2007

Appendix 3 California Energy and Labor Prices

Increased operating costs, most notably labor and utility costs, present the largest financial obstacles to processing commodity fish products in the state of California.

An overview of rising petroleum prices since the mid 1990s

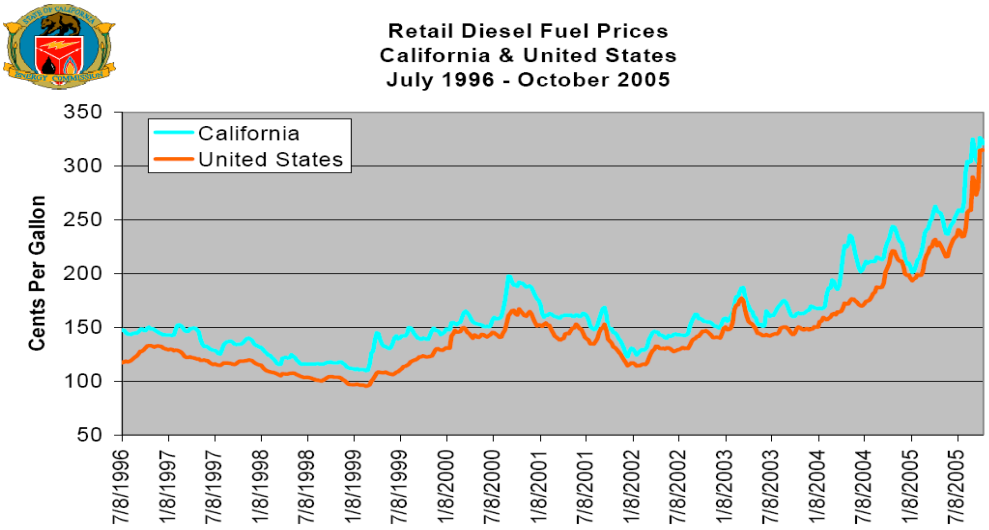
California has one of the largest growing demands for fuel prices, for both gasoline and diesel consumption. The following information will summarize a past and present look at California fuel prices in comparison with the rest of the United States. All the following charts are from the California Energy Commission website.[78]



U.S. gasoline demand greater than diesel fuel & forecast to increase at faster rate.
Source: EIA Annual Energy Outlook 2005

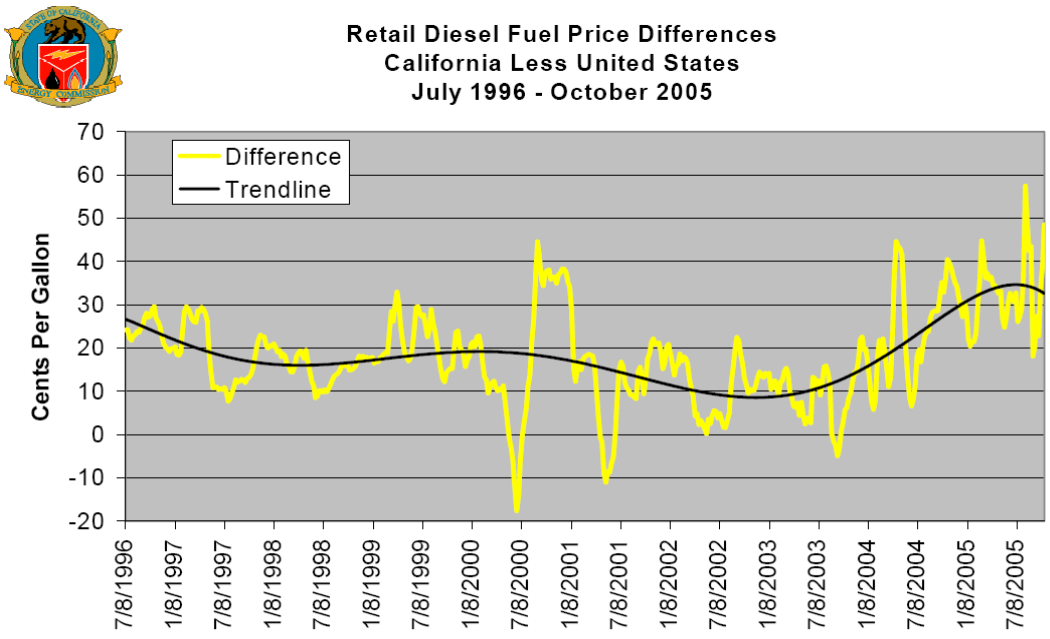
The above chart compares gasoline and diesel production in the United States. The next chart compares diesel prices between California and the rest of the Unites States.

[78] http://www.energy.ca.gov/2005publications/CEC-999-2005-022/CEC-999-2005-022.PDF



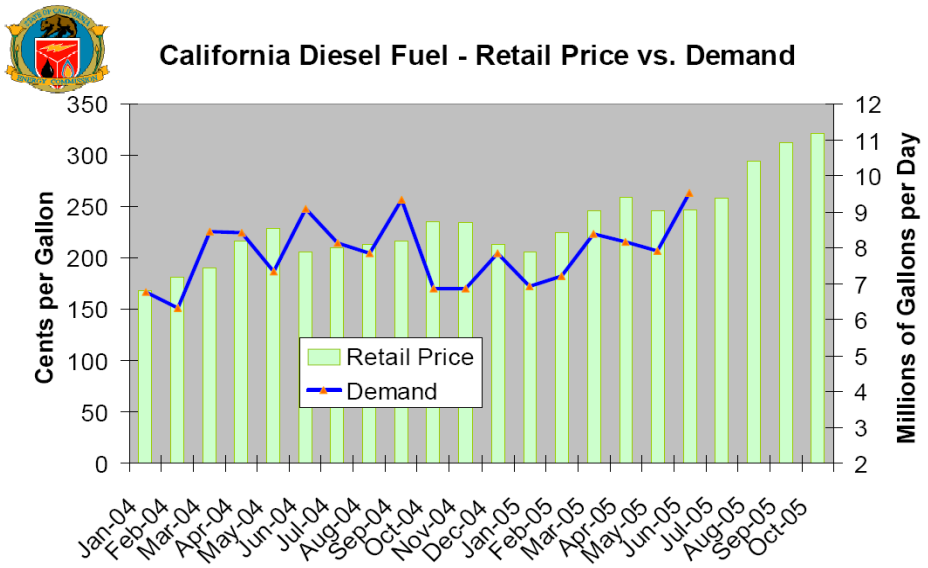
California and U.S. prices continue to rise due to increasing cost of crude oil
California normally more expensive than U.S. average

The next chart shows diesel fuel prices without California in the overall picture.



California retail price has averaged 18.2 cents higher than U.S. since 1996.
Difference has been increasing over the last couple of years.

This final chart shows a detailed look at diesel prices in relation to demand from 2004 to 2005.



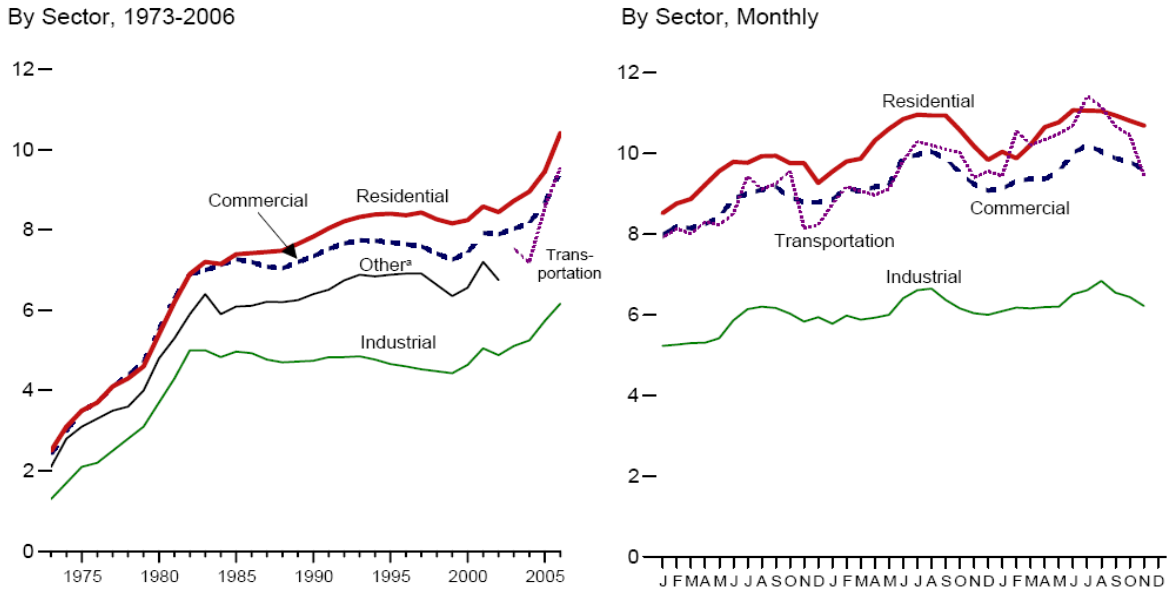
Diesel fuel demand has less seasonal variability.

Source: EIA for retail price & Board of Equalization for taxable sales.

Fuel prices as seen from the above charts are currently on the rise, but electricity prices are also facing spikes in prices. The charts below show increasing prices in electricity by sector and what they look on a monthly basis.[79]

Average Retail Prices of Electricity

(Nominal cents per hour)

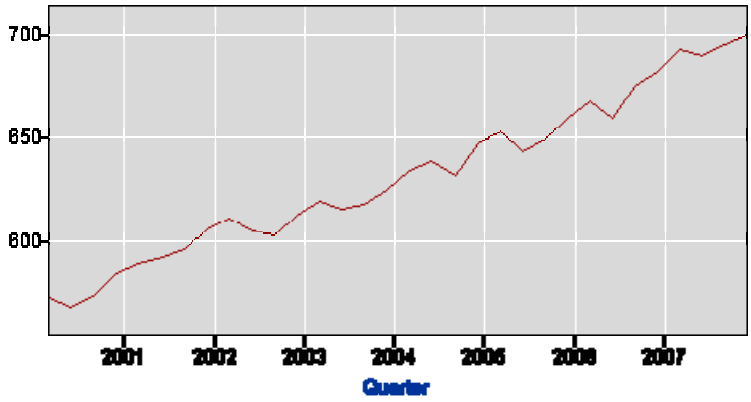


Weekly labor wages (US Department of Labor website)[80]

[79] http://www.eia.doe.gov/mer/pdf/pages/sec9_13.pdf

[80] http://www.bls.gov/data/

(Y axis = dollars on a weekly basis)



Appendix 4 Stakeholders in the Moss Landing Fishing Industry

Information				Analysis				
Fishers Organization	**Members**	**Goals**	**Procedures**	**Local**	**Type of fish**	**Research**	**Marketing**	**Lobbying**
WCSFC	Fishers Offloaders Community	Collaborate to protect pelagic fish & fishing Research Marketing Lobbying	Form: cooperative Catch larger fish Measure catch Market for human consumption Lobby for self-regulation	Canada to Mexico	Pelagic	Measure catch	Distribution for human consumption Promote human consumption	Self-regulation
Alliance for Communities of Sustainable Fisheries	-Fishers -Non-profit marine protection agencies	To support sustainable fisheries and enhance cultural, historical and conservation to give a voice to local community	By promoting, preserving and enhancing economic valuation of fish species.	California coastal communities	All commercial fish species	Use best and most current oceanographic, socio-economic, and fisheries science is accurately compiled	The linkage between healthy sustainable fisheries, marine conservation, and coastal communities is firmly established in the public mind.	That this science is readily available to the public for use in crafting and promoting public policy
Monterey Commercial Fishers' Association	-Fishers	?	?	Half Moon Bay to San Luis Obispo	All?	N/A	?	None
Moss Landing Commercial Fishers's Association	-Fishers -Western Fishboat Owners Association -Albacore Association	Use marketing tools to promote locally caught fish species. (Specifically salmon, crab, albacore and herring.)	Diverse marketing tools to promote locally caught fish species. Work with west coast buyers. (Kathy Fosmark has knowledge in cookbook recipes for different fish species.) Also fishers apart of association pay fees for assessment.	Moss Landing	salmon, crab, albacore and herring	Survey species to collect data for Harvest Guidelines that go into the Pacific Fishery Management Council	Promote local fish species Work with buyers where information is provided about prices and catch	None

Table Continued …

Information				Analysis				
Fishers Organization	**Members**	**Goals**	**Procedures**	**Local**	**Type of fish**	**Research**	**Marketing**	**Lobbying**
Environmental Defense	-Fishers -Scientists Government	Engage fishers in the business of sustainable fishing	Work directly with fishers, scientists and regulators	California Coast (area of interest from our project?)	All commercial and non-commercial fish species under consideration	Best practices for fishers, species protection and economic viability. All with a sustainable approach	Marketing sustainable fish products	Lobby government and possible donors
The Nature Conservancy	-Scientists -Fishers -NGOs	Goal is to protect and restore the most resilient examples of ocean and coastal habitats in ways that benefit marine life, local communities and economies	Conservancy scientists and staff work in the water and around the world to develop new tools and strategies.	US coastal states, Caribbean, Central and South America, Asia-Pacific	All commercial and non-commercial fish species under consideration	-Identify critical habitat -Stakeholder analysis -Support public policy -Utilize low cost	Assesses how market forces can be used to create economic incentives to conserve ocean and coastal lands and resources.	Lobby government and possible donors
California Coastal Conservancy	-Local government -Public agencies -NGOs -Private landowners	A state agency that acts with others to preserve, protect and restore the resources of the California Coast.	Entrepreneurial techniques that purchase, restore, protect and enhance the resources of the coast	California Coast	Focus on coastal resources	Assessing the value of the California Coast	Intention if any through marketing is to make the coast accessible to people	Lobby for funding towards government and possible donors
Pacific Coast Federation of Fishermen's Association (PCFFA)	-Fishers -NGOs	Trade and commercial fishers's association that assure rights for individual commercial fishers	A federation of many different port and fishers's marketing associations. It is funded principally through assessments on catches, collected at the local port level	US west coast, San Diego to Alaska	Salmon, Dungeness and rock crab, squid, herring, swordfish, shark, blackcod, rockfish, albacore, sea cucumber, California halibut and flounder, urchin and abalone	Catch assessment	Market small and medium-sized businesses that catch fish for consumption	Lobby local, state and federal governments assuring commercial fishers's rights to a long-term fishing way of life

Appendix 5 Value of the catch in the Tri-County Area*

Market Penetration	Uses per Year	Lbs per Use	Total Lbs/Yr	Value at $.05 / Lb	Value at $.50 / Lb	Value at $5 / Lb
1%	1	0.5	3,579	$179	$1,789	$17,894
1%	1	1	7,158	$358	$3,579	$35,788
1%	1	2	14,315	$716	$7,158	$71,575
1%	6	0.5	21,473	$1,074	$10,736	$107,363
1%	6	1	42,945	$2,147	$21,473	$214,726
1%	6	2	85,890	$4,295	$42,945	$429,452
1%	12	0.5	42,945	$2,147	$21,473	$214,726
1%	12	1	85,890	$4,295	$42,945	$429,452
1%	12	2	171,781	$8,589	$85,890	$858,904
2%	1	0.5	7,158	$358	$3,579	$35,788
2%	1	1	14,315	$716	$7,158	$71,575
2%	1	2	28,630	$1,432	$14,315	$143,151
2%	6	0.5	42,945	$2,147	$21,473	$214,726
2%	6	1	85,890	$4,295	$42,945	$429,452
2%	6	2	171,781	$8,589	$85,890	$858,904
2%	12	0.5	85,890	$4,295	$42,945	$429,452
2%	12	1	171,781	$8,589	$85,890	$858,904
2%	12	2	343,561	$17,178	$171,781	$1,717,807
5%	1	0.5	17,894	$895	$8,947	$89,469
5%	1	1	35,788	$1,789	$17,894	$178,938
5%	1	2	71,575	$3,579	$35,788	$357,877
5%	6	0.5	107,363	$5,368	$53,681	$536,815
5%	6	1	214,726	$10,736	$107,363	$1,073,630
5%	6	2	429,452	$21,473	$214,726	$2,147,259
5%	12	0.5	214,726	$10,736	$107,363	$1,073,630
5%	12	1	429,452	$21,473	$214,726	$2,147,259
5%	12	2	858,904	$42,945	$429,452	$4,294,518

* Tri-County Population 715,753US Census Bureau