

Chapter 4. Consumptive Uses and Socioeconomic Considerations

This chapter presents a summary characterization of consumptive uses (i.e., commercial and recreational fishing activities), describes potential displacement resulting from the establishment of MPAs and Special Closures under the Proposed Project and its alternatives, and identifies any likely indirect physical effects on the environment resulting from displacement of consumptive uses. Discussion of CEQA-related impacts on air quality, biological resources, cultural resources, nonconsumptive recreational uses, population and employment, public services and utilities, vessel traffic, and water quality can be found in Chapters 5 to 7.

4.1. CEQA Application of Socioeconomic Factors

State CEQA Guidelines Regulation 15131 states that “economic or social effects shall not be treated as significant effects on the environment.” Unlike the Congressional Budget Office and its financial assessments of federal policy changes, CEQA does not require the determination or presentation of dollar amounts associated with the costs or benefits of a policy change or project implementation. Therefore, no significance criteria for the Proposed Project’s socioeconomic impact on commercial and recreational consumptive uses are to be established. CEQA does, however, concern itself with economic or social effects when these impacts cause a physical effect on the environment (Bass et al. 1999). Consequently, this linkage between the potential economic or social changes of commercial and recreational consumptive use and the indirect effect on the physical resources on which those industries depend will be discussed further in this chapter. Detailed analysis of the potential socioeconomic effects of the Proposed Project can be found separately in the Ecotrust Report (Scholz et al. 2008).

4.2. Characterization of Fishing Port Complexes in Study Region

For the purposes of monitoring and compiling statistics on commercial fishery landings, CDFG organizes California’s ports geographically into nine port complexes. The north central coast study region includes two port complexes in their entirety—Bodega Bay and San Francisco. In addition, the two southernmost ports in the Fort Bragg complex—Point Arena and Anchor Bay—are also located within the study region.

During the 1992-2006 period, average annual commercial landings in the north central coast study region totaled nearly 17 million pounds with an average annual ex-vessel value of almost \$18 million. Important ports in the study region in terms of both volume and value include Bodega Bay, Point Arena, San Francisco, and Princeton-Half Moon Bay.

One hundred five market categories of fishes and 14 market categories of invertebrates were landed in the north central coast study region ports and port

complexes (not including estuarine categories that only occur outside the study region)¹. A market category may include more than one species. These numbers attest to the high value and diversity of fishery resources in the north central coast study region. It should be noted, however, that some of the important fisheries occur primarily or entirely outside of the study region (e.g., tunas, Dover sole, thornyhead, sablefish, slope rockfish, grenadier).

A brief profile of each port complex grouping is provided below.

Southern Fort Bragg Port Complex—Point Arena/Anchor Bay

Port Arena and Anchor Bay are part of the Fort Bragg port complex and are the only two ports from this complex within the study region. These two ports are located approximately 130 and 115 miles north of San Francisco, respectively. In 2006, there were 31 commercial vessels, 33 commercial fishermen, and 17 processors that reported landings in Point Arena with none reported for Anchor Bay. The top ten fisheries with landings in this ports in 2006, in order of importance (total value landed), were red urchin, salmon, Dungeness crab, nearshore finfish, lingcod, shelf rockfish, California halibut, thornyheads (non-trawl), skates/rays/sharks and other flatfish.. The total value of all landings in this port complex in 2006 was less than half a million dollars, with over half a million pounds landed. The total value for all landings in Point Arena in 2006 was \$432,430. In a 2006 federal socioeconomic study to consider the needs of fishing communities, the County of Mendocino was classified as “most vulnerable” with high levels of dependence on commercial fishing and low levels of resilience. The town of Point Arena, located within Mendocino County, was classified as “vulnerable” utilizing the same criteria (CDFG 2007a).

Bodega Bay Port Complex

The Bodega Bay Port complex includes various ports north of San Francisco including Dillon Beach, Timber Cove, Marshall, Bodega Bay, Inverness, Point Reyes, Marconi Cove, Bolinas and Tomales Bay. In 2006, there were 302 commercial vessels, 311 commercial fishermen, and 84 processors that reported landings in these ports. The top ten fisheries landed in these ports in 2006, in order of importance (total value landed), were Dungeness crab, salmon, nearshore finfish, tuna, Dover sole/thornyhead/sablefish (trawl), "other" flatfish, California halibut, shelf rockfish, roe herring, and slope rockfish/ grenadier. The total value of all landings in 2006 was over five million dollars with more than two million pounds landed. In the 2006 federal socioeconomic study, the town of Bodega Bay was classified as “vulnerable” with high levels of dependence on commercial fishing and low levels of resilience (CDFG 2007a).

¹ Because market categories may contain multiple species, landings numbers do not correspond exactly to the number of species landed. In addition, the landings totals could include species harvested outside of the study region's boundaries, but landed in study region ports.

San Francisco Bay Port Complex

The San Francisco Bay Port complex includes various ports in and around San Francisco Bay including Princeton/Half Moon Bay, San Francisco, Sausalito, Richmond, Oakland, and Berkeley. The latter five ports are not located within the north central coast study region; however, fisheries which contribute to the majority of landings in these ports occur primarily within the study region. In 2006, there were 271 commercial vessels, 270 commercial fishermen, and 114 processors that reported landings in these ports. The major fisheries landed in these ports in 2006, in order of importance (total value landed), were Dungeness crab, California halibut, salmon, Dover sole/sablefish/thornyhead (trawl), "other flatfish," sablefish (non-trawl—line and trap), nearshore finfish, slope rockfish/grenadier, shelf rockfish, and lingcod. The total value of all landings in 2006, excluding Princeton/Half Moon Bay, was over six and a half million dollars with more than three million pounds landed. In the 2006 federal socioeconomic analysis, the city of Oakland was classified as "vulnerable" with high levels of dependence on commercial fishing and low levels of resilience (CDFG 2007a).

Princeton/Half Moon Bay Port Complex

Princeton and Half Moon Bay are a subset of the San Francisco Bay port complex where major commercial landings occur (second highest landings pounds and value in the north central coast study region). They are located approximately 30 miles south of San Francisco. The majority of commercial landings occur in Princeton at Pillar Point Harbor, where processing facilities exist, although small landings do occur along the beach in Half Moon Bay. In 2006, there were 163 commercial vessels, 175 commercial fishermen, and 72 processors that reported landings in these ports. The top ten fisheries landed in these ports in 2006, in order of importance (total value landed), were Dungeness crab, salmon, California halibut, other flatfish, sablefish (non-trawl—line and trap), sanddab, tuna, nearshore finfish, lingcod, and Dover sole/sablefish/thornyhead (trawl). The total value of all landings in 2006 was near five million dollars with close to 3 million pounds landed (CDFG 2007a).

4.2.1. Commercial Fishing

Commercial fisheries that have the greatest potential to be impacted by the implementation of new or expanded MPAs are those that occur primarily or significantly within state waters of the north central coast study region and target primarily residential, nonmigratory species, or species such as squid which are highly mobile but spawn and are harvested, in nearshore waters. The nearshore waters along the coast contain large rocky reefs, kelp beds, and expanses of soft bottom that provide habitats for numerous species. These may include nearshore and shelf rockfishes, lingcod, cabezon, kelp greenling, California halibut, butterflyfish, jacksmelt, surfperches, squid, Dungeness crab, and rock crab (CDFG 2005).

Live fish trapping for rockfish, cabezon, and other nearshore species occurs primarily in the shallower waters near the coastline. Hook-and-line fisheries catch a

variety of species on hand lines, longlines, rod-and-reel, and trolled gear. Species caught in hook-and-line fisheries include salmon, rockfish, and California halibut. Gill nets are used in Tomales Bay for the Pacific herring roe fishery. The use of gill nets, and trawl gear are limited elsewhere within state waters (i.e., trawls are allowed within the California Halibut Trawl Grounds, gill nets are allowed in SF Bay, seines are allowed all over the state). Commercial drift gill netting for pelagic sharks and swordfish occurs outside the study region in the open waters throughout portions of the Pacific Ocean (CDFG 2002a). Traps or pots are used in the Dungeness crab fishery. Red sea urchins are collected by hand-held rake by divers using a compressed air system (CDFG 2007a).

4.2.1.1. Commercially Harvested Species

The commercial fisheries that are located in the north central coast study region and/or are economically important to fishing communities in the north central coast study region, and had landings in the years 2003 through 2006 are listed below (in descending order of average annual landings for all combined port complexes):

- **Finfishes:** Salmon, Dover sole/thornyheads/sablefish (trawl), other flatfish, California halibut, coastal pelagics, sanddabs, swordfish, roe herring, slope rockfish/grenadier, sablefish (non-trawl—line and trap), tuna, shelf rockfish, nearshore finfish, skates/rays/sharks, croaker, lingcod, surfperch, thornyheads (non-trawl), Dover sole (non-trawl), and smelt.
- **Invertebrates:** Dungeness crab, market squid, red sea urchin, and rock crab.

Market categories of species that are fished in state waters and may receive direct benefits from MPAs include those listed below (in descending order of average annual landings):

- **Finfishes:** Other flatfish, California halibut, sanddab, herring, shelf rockfish, nearshore finfish, sharks, croaker, lingcod, surfperch and smelt.
- **Invertebrates:** Dungeness crab, red sea urchin, rock crab.

Because San Francisco Bay and its freshwater tributaries are not within the north central coast study region, species or species groups that are normally only found within the bay or its tributaries were excluded from all San Francisco port complex analyses below. These freshwater and estuarine species include roe herring, herring eggs on kelp, bay shrimp, brine shrimp, Sacramento blackfish, carp, yellowfin goby, longjaw mudsucker, staghorn sculpin, shad, threespine stickleback, sucker, brown bullhead, hardhead, and bullfrog. However, some species or species groups may be caught either within the bay or in ocean waters in the study region, and landed at the same San Francisco Bay ports. These include California halibut, surfperches, shark unspecified, and leopard shark. Bay-caught fish and ocean-caught fish cannot be separated effectively from landing receipts; therefore, data for the San Francisco Bay port complex

should be interpreted with this in mind. Tomales Bay and Bodega Bay are within the study region, so the herring fishery is included in the analyses for these ports, but freshwater species caught elsewhere but landed in these ports were excluded.

Fishery profiles including landings by market categories within the north central coast study region can be found in Appendix III of the Regional *Profile of the North Central Coast Study Region* (CDFG 2007a).

Aquaculture and Kelp Harvesting

Giant Kelp

Giant kelp (*Macrocystis* sp.) was first harvested along the California coast during the early 1900s. Many harvesting companies operated from San Diego to Santa Barbara beginning in 1911. Those companies primarily extracted potash and acetone from kelp for use in manufacturing explosives during World War I. In the early 1920s, having lost the war demand, kelp harvesting virtually stopped. In the late 1920s, giant kelp was again harvested off California (CDFG 2002a).

Giant kelp is now primarily harvested in California to supply food to several aquaculture companies for rearing abalones. It is also used for the herring-roe-on-kelp fishery in San Francisco Bay. Giant kelp is one of California's most valuable living marine resources, and in the mid-1980s supported an industry valued at more than \$40 million a year. The annual harvest has varied from a high of 395,000 tons in 1918 to a low of less than 1,000 tons in the late 1920s. Such fluctuations in landings are primarily due to changes in availability of kelp due to climate and natural growth cycles, as well as market supply and demand. During the 10-year period 1970 to 1979, the average annual harvest was nearly 157,000 tons, while from 1980 to 1989 the average annual harvest was only 80,400 tons. The harvest was low in the 1980s because the kelp forests were devastated by the 1982–1984 El Niño and accompanying storms, and by the 200-year storm that occurred in January 1988. In most areas, beds of giant kelp recovered quickly, with the return of cooler, nutrient-rich waters. Annual harvests in California increased to more than 130,000 tons in 1989 and more than 150,000 tons in 1990 (CDFG 2002a).

Administrative kelp bed areas in California waters are numbered from north to south (see Title 14 California Code of Regulations Section 165.5 (j)(1)), are defined by compass bearings from known landmarks, and applicable commercial regulations pertain to the harvest of giant kelp or bull kelp (*Nereocystis lutkeana*) only. All state waters, including southern offshore islands, are numbered in the kelp regulations section although not all areas contain kelp beds. The administrative kelp beds are classified as closed, leasable, leased (to the state), or open. Closed beds may not be harvested. Leased beds provide the exclusive privilege of harvesting to the lessee. Open beds may be harvested by anyone with a kelp harvesting license (CDFG 2007a).

There are eight administratively numbered kelp beds within the study region. These include Point Ano Nuevo to Pescadero Point (Bed 224), Pescadero Point to Point Montara (Bed 225), Point Montara to Fort Point (Bed 226), Fort Point to Point Reyes (Bed 301), Point Reyes to Duncan's Point (Bed 302), Duncan's Point to Gualala Point (Bed 303), Gualala Point to Iverson Point (Bed 304), and Iverson Point to Point Arena (Bed 305). All of these kelp beds are closed to the leasing of kelp and no harvest is allowed.

No kelp or other aquatic plant may be harvested in a state marine reserve or state marine park. Between April 1 and July 31, a kelp harvester may not harvest bull kelp from a non-leased bed that lies partially or totally within the boundary of the Monterey Bay National Marine Sanctuary (MBNMS); however, bull kelp may be removed from beaches within the MBNMS during the seasonal closure (CDFG 2007a).

At least one commercial harvester of non-kelp, edible seaweed exists in the north central coast study region. CDFG issues licenses for these activities (CDFG 2007a).

State Water Bottom Leases

Tomales Bay, Drakes Estero, and Pillar Point Harbor have active state water bottom leases where oysters, clams, mussels, and abalone are grown for commercial sale and consumption. There are 12 active leases in Tomales Bay covering 513 acres and two active leases in Drakes Estero covering 1,060 acres. The presence of active leases and commercial production is inconsistent with the designations of state marine reserve or state marine park, but active leases and commercial production may be consistent with state marine conservation area designations depending on allowable uses proposed (CDFG 2007a).

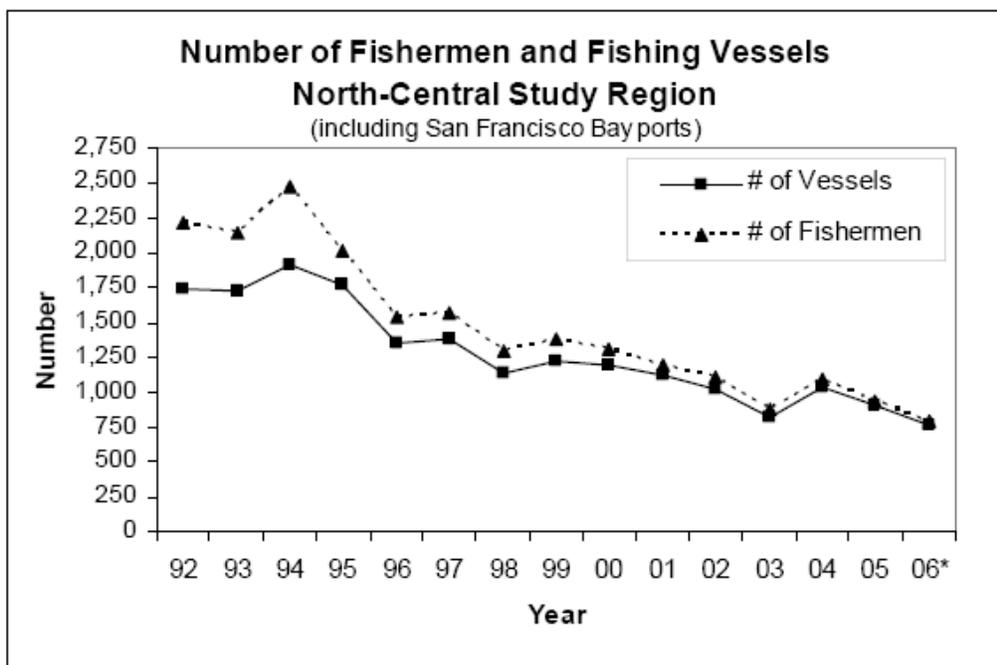
4.2.1.2. Commercial Fishing Industry Trends

During the past 25 years, there has been a statewide trend of a decreasing number of fishermen and commercial fishing vessels participating in California's commercial fisheries. From 1980 to 2004, the number of commercial fishing licenses sold statewide has declined by 69%, from approximately 20,400 to 6,300. Since 1988, a decline in licenses sold has occurred every year and has averaged 3.7% per year (CDFG 2005). Within the north central coast study region, the overall number of commercial fishermen and fishing vessels also has declined (See Chart 4-1 below). In 1992, there were approximately 2,200 commercial fisherman and 1,750 commercial vessels reported in the study region. By 2006, those numbers dropped to approximately 800 and 750, respectively (CDFG 2007a).

In general, total landings in the study region and each port area have declined over the period 1992 through 2006 (Chart 4-2). Total values have varied over these years, and show no consistent trend. Some practices have added value to landings over time, such as landing and selling fish live (e.g., nearshore rockfish) and the way some fish species are handled at sea (e.g., tuna processed for sushi-grade).

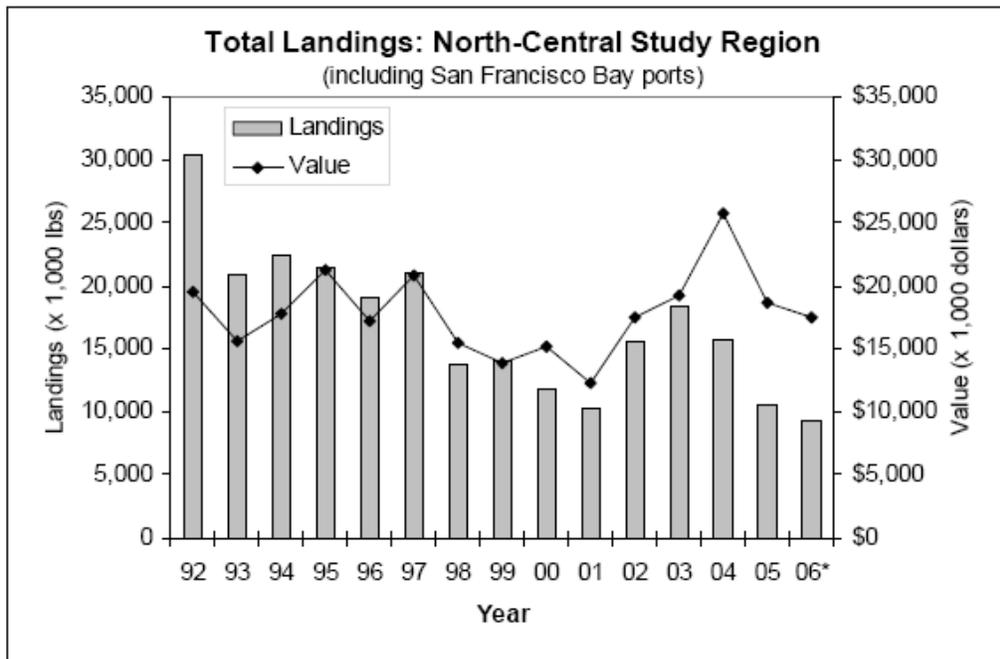
These trends are due to a combination of many factors, including aging fishery participants; fleet overcapitalization; relatively recent information that the status of stocks of some shelf rockfish species is poor; recent information that rockfishes are not as productive and live longer than once thought; increasingly restrictive fishery management regulations to reduce fishing effort (e.g., through the implementation of restricted access fisheries or area-based fishery closures); attempts to reduce bycatch of overfished species or other species of concern; and attempt to reduce potential habitat damage from certain types of fishing gear (e.g., from the use of bottom trawls with large roller gear).

Chart 4-1. Total Number of Commercial Fishermen and Vessels for All Ports within the North Central Coast Study Region and San Francisco Bay (1992–2006)



Source: CDFG 2007a.
*Data for 2006 are preliminary.

Chart 4-2. Total Landings and Values for All Ports within the North Central Coast Study Region and San Francisco Bay (1992-2006)



Source: CDFG 2007a.

* Data for 2006 are preliminary.

Note: Values were adjusted for inflation (2006\$).

In addition, oceanographic conditions during the last two decades of the 20th century have not been conducive to the successful annual recruitment of young rockfishes of many species. However, fishery scientists have seen much stronger recruitment during the several years since 2000, which may indicate a return to more favorable oceanographic conditions for this important group of fishes (CDFG 2005).

4.2.2. Recreational Fishing

Recreational fishing is a significant industry and activity along national coastlines, and in California. Nationally, saltwater fishing draws almost 21.3 million recreational anglers, accounting for 10.3% of the American population 16 years or older (Leeworthy 2001). Second only to Florida, the state of California contains more than 2.7 million residents who saltwater fish (Pendleton and Rooke 2006)(CDFG 2005). Various forms of recreational fishing occur throughout the north central coast study region.

The distribution of recreational fishing effort varies by mode of fishing and availability of access. Some modes have the capability of traveling to fishing areas further from port and during varying ocean conditions than other modes, such as kayaks, which are limited to protected areas closer to launch sites. The following are modes of recreational fishing that occur within the north central coast study region

(CDFG 2007a). Not all of these modes are common (e.g., poke-poling) and not all of them occur throughout the north central coast study region.

- **Boat-based Modes**

- Commercial passenger fishing vessels (CPFVs)
- Private and rental skiffs
- Kayaks (angling, diving, or free-diving)

- **Shore-based modes**

- Beach and bank fishing
- Fishing from manmade structures
- Poke-poling
- Spearfishing, either by free-diving or scuba
- Shore picking (abalone)

Boat-based Modes

A discussion of the ranges of boat-based modes of recreational fishing can be found in sections 7.4—Recreation (for kayaks) and 7.6—Vessel Traffic (for CPFVs/private and rental skiffs) of this document.

Boat-based anglers and divers generally have a target species or species group in mind when they head out to fish, although some anglers or divers fish for whatever happens to be available in their region. Primary target species/species groups in this region are Chinook salmon, rockfishes, lingcod, cabezon, kelp greenling, California halibut, sanddabs, and albacore. Additional effort (excluding divers) is directed towards the recreational harvest of Dungeness crab using traps, often in combination with trips for finfish target species.

Shore-based Modes

Beach and Bank

The beach and bank mode consists of shore-based anglers but also includes divers or anglers entering the water directly from the shore. Primary target species/species groups in this region are surfperches, jacksmelt, anchovy, halibut, nearshore rockfishes, including greenlings, lingcod, and cabezon (CDFG 2007a).

Some of the frequently used shore access areas in ocean and estuarine waters north of the San Francisco Bay entrance include Point Arena, Anchor Bay, Ocean Cove, Timber Cove, Fort Ross, Goat Rock, Doran, Lawson's Landing, and Point Reyes. South

of the San Francisco Bay entrance shore access points include Baker Beach, Pillar Point, Princeton, and Half Moon Bay (CDFG 2007a).

Manmade Structures

Manmade structures consist of piers, jetties and breakwaters; if these structures are public, a fishing license is not required. Primary target species/species groups in this region for anglers fishing from manmade structures are Pacific sardine, northern anchovy, jacksmelt, surfperches, white croaker, nearshore rockfishes, cabezon, and monkey-face prickleback (CDFG 2007a).

These structures are relatively limited within the north central coast study region. Some of these include: Doran, Lawson's pier, Fort Baker pier, Pacifica pier, and Princeton pier and jetty (CDFG 2007a).

Free-diving and Shore Picking—Abalone

Free-diving and shore picking modes include anglers harvesting red abalone from rocky intertidal and subtidal zones (north of the Golden Gate Bridge). Free-divers enter the water from skiffs, kayaks, or shore. The use of scuba and "hookah" equipment are prohibited to harvest red abalone. Anglers also harvest red abalone by wading out into the shallow rocky intertidal areas at low tides and pry abalone off rocky substrate: this practice is called "rock-picking" or "shore-picking" (CDFG 2007a).

Red abalone may only be harvested north of a line drawn due west magnetic from the center of the mouth of San Francisco Bay. No commercial harvest is permitted. Fishermen wishing to collect abalone are required to purchase and report their catch on an abalone report card. Catches must be reported for every fishing day as well as the general location from which they were harvested. CDFG summarizes annual catch and effort data from returned cards (CDFG 2007a).

Important abalone sites within the study region include Point Arena Lighthouse, Arena Cove, Sea Ranch, Fisk Mill Cove, Slat Point, Ocean Cove, Timber Cove, Fort Ross, Reef Camp, Tomales Point. However, during abalone season nearly every accessible cove in Sonoma and Mendocino counties, where effort is greatest, may experience harvesting (CDFG 2007a).

CDFG abalone creel and index sites exist throughout the north central coast study region. These index sites provide important catch and effort data through angler contact during creel surveys. Additionally, periodic subtidal scuba assessments by CDFG divers provide population trend information and density data in these areas. The creel survey sites exist in high use areas for red abalone harvesting, thereby providing indices for assessing the status of stocks. Information collected from index sites may be used to adjust the annual total allowable catch for the recreational abalone harvest based on evidence of recruitment and density conditions at abalone index sites. Five of the eight abalone index sites along the northern coast of California are within the study

region at the following locations (relative level of effort is indicated in parenthesis) (CDFG 2007a):

- Arena Cove (high use)
- Salt Point (high use)
- Timber Cove (moderate use)
- Ocean Cove (moderate use)
- Fort Ross (high use)

Poke-Poling

This mode of fishing is usually done in rocky intertidal areas and jetties at lower ocean tides. Target species include monkey-face prickleback, rock prickleback, lingcod, cabezon, nearshore rockfish and sculpins (CDFG 2007a).

Clamming

Clamming involves anglers digging into mud or sand flats with rakes, shovels, or trowels to harvest clams out of the substrata. Target species of clam include common littleneck, Washington, gaper, and occasionally geoduck at extreme negative ocean tides. Recreational clamming effort in the north central coast study region is mostly concentrated within and around Bodega Bay and Tomales Bay. Other areas include Doran Beach, Clam Island, and Seal Island near the mouth of Tomales Bay (CDFG 2007a).

Spearfishing

Information on spearfishing in the north central coast study region is sparse. Central California spearfishing competitions have been sampled sporadically by CDFG biologists over the years. Historically some of these locations included Anchor Bay, Ocean Cove, Salt Point, Timber Cove, Fort Ross, and Sharp Park. Target species for this recreational fishing mode include cabezon, nearshore rockfish, kelp and rock greenling, lingcod, monkey-face prickleback, and California halibut (CDFG 2007a).

4.2.2.1. Recreationally Harvested Species

According to data provided by the Pacific States Marine Fisheries Commission, more than 109 species of finfishes were caught by recreational anglers from 2004 to 2006 within the north central coast study region, although many of these were seen infrequently in sampled catches. The recreational salmon fishery is important to many anglers utilizing boat-based modes of fishing throughout the study region. Other important fisheries associated with both boat-based and shore-based modes are

rockfish, lingcod, cabezon, greenling, and California halibut and surfperches. Also important to the recreational fishery in the study region is the harvest of invertebrates such as Dungeness crab, red abalone, and various species of clams (CDFG 2007a).

Recreational fisheries within the north central coast study region which have the greatest potential to be impacted by implementation of new or expanded MPAs are those which target primarily resident, non-migratory species. These include nearshore and shelf rockfishes, lingcod, cabezon, kelp greenling, California halibut, jacksmelt, surfperches, Dungeness crab, red abalone and clams (CDFG 2007a).

Recreational fishery profiles including estimated number of fishing trips and estimated catch by target species within the study region can be found in Appendix IV of the Regional *Profile of the North Central Coast Study Region* (CDFG 2007a).

Recreational Kelp Harvest

There is a small but unknown amount of kelp harvest occurring within the study region by licensed recreational fishermen. There is no closed season, closed hours, or minimum size limit, and the daily bag limit on all marine aquatic plants is 10 pounds wet weight. No eel grass (*Zostera* sp.), surf grass (*Phyllospadix* sp.), or sea palm (*Postelsia* sp.) may be cut or disturbed recreationally.

4.2.2.2. Recreational Fishing Industry Trends

In January 2004, California began an integrated recreational fishery sampling and assessment program called the California Recreational Fisheries Survey (CRFS). The CRFS is a collaborative effort between CDFG and the Pacific States Marine Fisheries Commission with funding from state and federal sources. This program incorporates and updates the comprehensive sampling methodologies for California, of the former national Marine Recreational Fisheries Statistics Survey (MRFSS) and CDFG's Ocean Salmon Project (CDFG 2007a).

Modes of fishing that are not fully captured by the CRFS program are consumptive diving (including dive charters and private shore-based or skiff diving), and kayak angling. Fisheries not fully captured by the CRFS program include Dungeness crab, and the abalone and clams. Although the CRFS program does provide some information on recreational consumptive diving and kayak angling, it is limited by sampling frequency and whether or not these activities occur at sites that are sampled. The recreational take of Dungeness crab is partially captured by the CRFS program; however, CPFV logbook data provides the best measure of that fishery. The CRFS program does not collect data on recreational catch of abalone by shore-pickers or free-divers, nor does it collect data on the recreational take of clams (CDFG 2007a).

Recreational fishing effort (expressed as angler days) in the north central coast study region differs by fishing mode (Table 4-1). In 2006 shore-based angling, fishing from man-made structures and beach and bank, accounted for 64% of the fishing effort

sampled by the CRFS program in the study region. Fishing from CPFVs or private and rental boats accounted for 36% of all fishing effort. Within each of those modes, man-made structures accounted for 47% of all fishing while fishing from CPFVs only comprised 11% of all fishing (CDFG 2007a). It is worth noting that the effort estimates for the beach and bank mode are derived from telephone surveys of licensed anglers.

Table 4-1. 2006 Estimated Angler Days by Fishing Mode

| Fishing Mode | Effort (angler days) |
|---------------------------------------|----------------------|
| CPFVs ¹ | 66,584 |
| Private and Rental Boats ¹ | 151,805 |
| Beach and Bank ¹ | 100,815 |
| Man-made structures ² | 280,917 |

¹ Estimate derived from CRFS database for all of San Francisco and Wine districts for ocean only trips.

² Estimate derived from CRFS database and includes only ocean sites and only sites in Mendocino County within the study region, does not include Tomales Bay.

Source: CDFG 2007a.

Statewide trends in recreational fishing license sales and boat registrations for CPFVs have not mirrored the trend of California's increasing population. Recreational resident fishing license sales for all waters (inland and ocean) declined steadily from approximately 2.25 million in 1980 to approximately 1.27 million 2000. This represents a 44% decrease in a 20-year period. However, a small but sharp increase occurred from 2003 to 2004 (Chart 4-3). In the past three years, sales have remained fairly stable (CDFG 2007a).

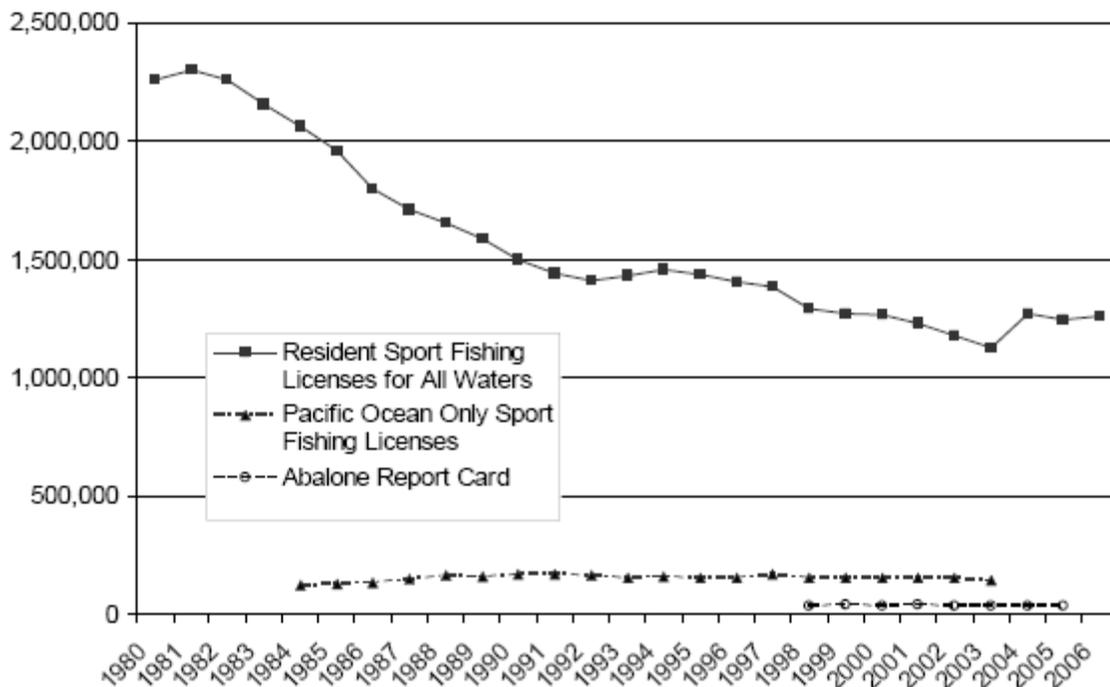
The trend in the sale of Pacific Ocean-only sport fishing licenses is quite different (Chart 4-3). CDFG issued this type of license from 1984 to 2003. From 1984 to 1991 license sales increased by 37%, then gradually declined by 16% during the next 12 years to a level higher than that in 1984. The sharp rise in resident sport fishing licenses for all waters in 2004 is likely due to the halt of sales of Pacific Ocean-only licenses after 2003 (CDFG 2007a).

CDFG began selling abalone report cards in 1998. Abalone report card sales from 1998 to 2005 have remained fairly stable, ranging from 35,180 to 40,841, respectively (Chart 4-3). The proportion of all sport fishing license buyers who also purchased abalone stamps ranged from 28% to 33% between 1998 and 2005 (CDFG 2007a).

Data are not available for the number of CPFV registrations in the north central coast study. However, as a proxy, data are available which show the number of registered CPFVs in the north central coast study region which have submitted logbooks; this is representative of the active CPFVs in the region. The number of CPFVs in the study region that submitted logbooks annually from 2004 to 2006 was

106, 100, and 78, respectively. These represent 24%, 22%, and 18% of the logbooks submitted for the entire state for those years (CDFG 2007a).

Chart 4-3. Resident Sport Fishing Licenses for All Waters; Pacific Ocean-Only Sport fishing Licenses; and Abalone Stamps (1980-2006)



Source: CDFG 2007a.

4.2.3. Species Harvested Jointly by Commercial and Recreational Fisheries

Table 4-2 lists the species/species groups occurring within the north central coast study region that experienced harvest by both commercial and recreational fishing in 2005 and 2006. Dover sole, grenadier, sablefish, and thornyheads had no recorded recreational landings in 2005 or 2006, and so are not included (CDFG 2007a).

Table 4-2. Average Annual Landings for Commercial and Recreational Fisheries within the North Central Coast Study Region (2005-2006)

| Market Category | Commercial ¹ | | Recreational ² | |
|-------------------------------|--------------------------------------|------------|--------------------------------------|------------|
| | Average 2005 and 2006 Landings (lbs) | % of Total | Average 2005 and 2006 Landings (lbs) | % of Total |
| Nearshore Rockfish | 37,821 | 5.4 | 664,655 | 94.6 |
| Shelf Rockfish | 45,699 | 56.0 | 35,910 | 44.0 |
| Flatfish Other | 568,317 | 99.9 | 209 | 0.1 |
| Cabezon | 8,015 | 13.2 | 52,872 | 86.8 |
| California Halibut | 517,260 | 85.4 | 88,707 | 14.6 |
| Coastal Pelagics ³ | 364,684 | 91.7 | 10,937 | 2.9 |
| Lingcod | 27,018 | 6.1 | 412,463 | 93.9 |
| Greenling (Rock and Kelp) | 425 | 0.3 | 120,956 | 99.7 |
| Chinook Salmon ⁴ | 108,850 | 64.1 | 61,050 | 35.9 |
| Sanddabs | 131,677 | 94.1 | 8,319 | 5.9 |
| Tuna | 23,217 | No data | No data | No data |
| Surfperch | 10,008 | 15.2 | 55,799 | 84.8 |
| Sharks, Skates, and Rays | 35,757 | 50.6 | 34,954 | 49.4 |
| Croaker | 12,069 | 43.7 | 15,568 | 56.3 |
| Dungeness Crab ⁵ | 5,194,651 | | 1,774 | |
| Smelt | 5418 | 72.0 | 2,106 | 28.0 |

¹ Commercial fishery information is from the CFIS database (extraction date: March 14, 2007) estimates include landings from Point Arena and Anchor Bay

ports, Bodega Bay port complex and San Francisco Bay port complex and includes both state and federal waters.

² Estimates derived from Recreation Fisheries Information Network database, includes all ocean waters in the San Francisco and Wine districts except for waters of the San Francisco Bay. The Wine district includes Sonoma and Mendocino counties with portions of Mendocino outside the study region (these are draft and will be updated to include only those portions with-in the study region when available).

³ Coastal pelagics include Pacific sardines, Pacific anchovy and Jack mackerel.

⁴ Salmon reported in numbers of fish not pounds.

⁵ Recreational Dungeness crab landings are reported in numbers not pounds.

Source: CDFG 2007a.

CDFG's Ocean Salmon Project has surveyed the commercial salmon landings since 1952 and recreational salmon landings since 1962. From 1989 to 2006, the number of commercial salmon vessel permits issued by CDFG decreased from 5,429 to 1,554. Although the data do not show a steady increase in the proportion of salmon

harvested by the recreational sector during this period, 2006 had the highest recreational proportion of harvest during the 18-year period, and 1986-90 had the lowest. In general, the proportion of harvest by the recreational sector is increasing in the north central coast study region. The average measurable harvest of Chinook salmon between 1986-1990 and 1991-2006 is described in Table 4-3 (CDFG 2007a).

Table 4-3. Estimated Average Chinook Salmon Harvest in the North Central Coast Study Region (1986 to 2006)

| Year | Commercial | | Recreational | | Total (1000s of Fish) | Number of Commercial Permits |
|-----------|----------------|------------|----------------|------------|--------------------------|------------------------------------|
| | 1000's of Fish | % of Total | 1000's of Fish | % of Total | | |
| 1986-1990 | 1,775,600 | 94.7% | 98,300 | 5.3% | 1,853,900 | 5,429 (1989) |
| 1991-2006 | 192,500 | 69.6% | 81,800 | 30.4% | 274,300 | 2,432.4 |

Source: CDFG 2007a.

4.2.4. Existing Fishing Closure Zones

Several areas in the north central coast study region and adjacent offshore waters are closed to certain types of fishing by other regulations. These are important considerations when establishing MPAs and are summarized below (CDFG 2007a).

Year-round closures for commercial and recreational fishing by all gear types include (CDFG 2007a):

- Waters of Cordell Bank less than 100 fathoms (fms) in depth—no retention of groundfish except for “other flatfishes”² with specified hook and line gear (50 CFR Part 660, subpart G).
- Waters off the Farallon Islands less than 10 fms in depth—no retention of groundfish except “other flatfish” with specified hook and line gear.

Year-round closures to specified commercial gear types include (CDFG 2007a):

- All waters within 3 miles of shore are closed to use of trawl gear.
- Within the Rockfish Conservation Area³ (RCA), take and possession of federal groundfish species and ocean whitefish is prohibited with the following

² “Other flatfish” is defined in federal regulations at 50 CFR Part 660 as butter sole, curlfin sole, flathead sole, Pacific sanddab, rex sole, rock sole, and sand sole

³ *The RCA, defined by coordinates approximating depth zones, is different for trawl and non-trawl fisheries and may change within a year. For trawl fisheries, the RCA is 100-150 fm within the north central coast study region. In latitudes between 40°10' N and 38°N the RCA is 100-200 fm January, February, November, and December, and 100-150 fm the rest of the year. For non-trawl fisheries, the portion of the RCA that is closed year round lies between 30 and 150 fm. In the north central coast study region the

gear types: trawl nets, traps, hook and line gear (including longline gear), set gill and trammel nets, and spear. Exceptions to this prohibition apply to vessels participating in the primary whiting fishery, vessels fishing with demersal seine gear shoreward of the 100 fm boundary line, and vessels fishing for “other flatfish” with specified hook and line gear.

- In waters shoreward of the RCA but outside 3 miles from shore, small footrope gear is required on trawl nets.
- Within state waters, the use of gill nets and trammel nets to take rockfish is prohibited.
- Gill nets and trammel nets may not be used within 3 miles of the mainland shore.
- Groundfish Essential Fish Habitat Closures: Recently established Groundfish Essential Fish Habitat Conservation Areas are spatial closures for specific gear types implemented by the National Marine Fisheries Service. Though these areas primarily exist outside of state waters (for example, no bottom contact shallower than 50 fathoms is allowed at Cordell Bank), Groundfish Essential Fish Habitat Conservation Areas do exist within state waters in the vicinity of the Farallon Islands.

Year-round closures to recreational fishing for groundfish species within the north central coast study region (includes rockfish, lingcod, cabezon, and kelp greenling) at the time of publication of this document include (CDFG 2007a):

- Waters within the recreational RCA in depths greater than 30 fms.
- Waters less than 10 fms around the Farallon Islands and Noonday Rock closed to fishing for groundfish, except for “other flatfish” with specified hook and line gear.

In addition to the above year-round closures, seasonal closures exist for recreational fisheries within the study region. For rockfish, lingcod, cabezon, and kelp greenling, this includes the area from the shoreline to the offshore boundary of state waters from January to May and in December, and from 30 fms to the offshore boundary of state waters from June to November. The closed area may change within the year.

RCA effectively only covers depths between 30-69 fm (69 fm is the greatest depth within the north central coast study region). Therefore, the RCA depth zone accounts for approximately 31.5% of the study region area.

While these seasonal closures provide benefits by helping to sustain individual fisheries, unlike year-round closures that would be in effect within SMRs, they do not allow populations of fished species to achieve maximum size and age structure (CDFG 2007a).

The maximum depth in the north central coast study region is only 60-69 fms. Therefore, the study region only contains portions of depth-related regional fishery closures (such as the RCA), as opposed to entire depth zones (CDFG 2007a).

4.3. Socioeconomic Effects of Proposed MPAs

The implementation of an MPA network component alters the economic and social dynamics of consumptive uses of the fishery resources. In general, fishing reduces species abundance, alters size and age composition of fished populations, alters species diversity, changes biological interactions among species, and sometimes alters habitats. More importantly to CEQA, a new MPA network component may change physical resource of the species, population, community and meta-population dynamics in and around the zones of no or limited take.

4.3.1. Microeconomic Considerations

Commercial extractive uses of the marine system are a major source of revenue for the American economy. Nationally in 2000, commercial fisheries alone added approximately \$27 billion per year to U.S. gross domestic product (NOAA 2000). Some or all forms of commercial fishing would be displaced activities in many of the MPAs in the proposed network component; therefore, these user groups could be expected to suffer losses and increased costs to conduct their business to the extent they cannot efficiently redirect their activities. The displacement effort⁴ both across fishing grounds and into other fisheries has been argued as the fundamental driver to determine the type and magnitude of the benefits and costs from the implementation of MPAs (Sanchirico et al. 2002). Sanchirico and Wilen (2001) discuss the ecological/biological and socioeconomic conditions under which commercial fisheries might suffer short- or long-term costs. These include:

- lost harvest revenue and income to fishermen;
- secondary losses in output/sales, income, jobs and tax revenue in local economies;
- no loss in harvest but increased cost of harvesting due to increased travel-related cost, resulting in lower net income to fishermen (displacement effort);

⁴ *Displacement effort* is the additional effort or cost to do business beyond that which would normally occur as a result of some action or change affecting the business.

- losses in consumer's surplus to consumers of commercial seafood products (if prices rise for fishery products due to reductions in harvests);
- overcrowding, user conflicts, possible localized overfishing, depletion or habitat destruction in remaining open areas due to displacement (this could raise costs or lower harvests);
- loss of fishermen's local area knowledge (as a result of displacement) that may support sustainable fishing practices; and
- social disruptions from losses in incomes and jobs.

The potential that any of these effects will actually occur, and the relative intensity of these potential effects is speculative because actual costs depends greatly on the offsite considerations, such as habitat degradation and reduction of fishable waters (Sanchirico 2000), fishery management regulations, and the economic conditions and behavioral responses of the fishing industry (CDFG 2002a), as well as behavioral responses of individual fishing operations, associated secondary industries (i.e., processing, distribution), and consumers.

These potential losses could be offset by increased biomass and aggregate harvests within fishing locations outside of the MPAs, caused by the spillover effect.⁵ Within the estimated timeframes necessary for habitats and fish stocks to improve (i.e., on the order of 5 yrs or more), expected long-term benefits to commercial fishing could include:

- Long-term increases in harvest revenue and income to fishermen;
- Long-term increases in secondary output/sales, income jobs and tax revenues in local economies;
- Long-term increases in consumer's surplus to consumers of commercial fishing products (if prices to consumers decline with increased harvest); and
- Long-term increases in economic rents⁶ (may or may not exist in open access fisheries).

Some of the literature has shown that it is possible for no short- or long-term losses to occur (Leeworthy and Wiley 2001). Consequently, as the datasets improve and adaptive management provides real world examples and data feedback (Murray et

⁵ *Spillover effect* is defined as follows: as the number and biomass of individuals increase within reserves, many species will move out of reserves into fishing grounds, enhancing stocks in fished areas through spillover.

⁶ *Economic rent* is a return on an investment over and above a normal rate of return on investment.

al. 1999), economic theories need to be applied to this specific case and all of its associated permutations.

4.3.2. Macroeconomic Considerations

Many fishermen, especially commercial fishermen, have expressed concerns about external and internal factors that they believe are affecting their ability to maintain sustainable fisheries. These influences were identified in the ethnographic data survey conducted for the Channel Islands National Marine Sanctuary (Kronman et al. 2000) and are summarized below:

4.3.2.1. External Factors

- Affect of poor Asian economy on overseas fish sales.
- Elasticity of global and local consumption of fishing commodities and sensitivity of commodity pricing.
- Variable exchange rate of U.S. dollar.
- Effect of international competition on domestic markets during closed seasons.
- Increased cost of living in coastal areas.
- El Niño events (i.e., natural oceanic fluctuations) that decrease catch and income.
- Effects of pollution and habitat destruction from coastal development.
- Conflicts over environmental allocations and ecological interactions (i.e., sea otters, seals and sea lions, birds).
- Potential conflicts among user groups resulting from new regulations.

4.3.2.2. Internal Factors

- Attrition of existing workforce and limited numbers of new participants into the fisheries.
- Effects of marketing structure on ability to stabilize pricing.
- History of open access and overcapitalization causing biological or economic overfishing that has led to economically unsustainable fisheries.

4.3.3. Fishery Displacement and Congestion

The primary potential impact to commercial and recreational fishing is the displacement of fishing activity resulting from the implementation of proposed MPAs, particularly the SMRs, which prohibit all harvest, and SMCAs that prohibit the take of more sedentary bottom fishes and invertebrates. Depending on the level of harvest restriction and applicable species, each fishery participant who currently fishes within a proposed MPA will face a varying degree of pressure to redirect effort outside the MPAs. This could result in a secondary pressure to fishing operators to increase congestion and competition at particular fishing hotspots or along the immediate boundary of the new MPAs. Primary effects are addressed below. Secondary effects resulting from behavioral responses (e.g., effects relating to ancillary business—fishing supplies, fuel, boat repairs, etc.) are too speculative to be adequately determined.

Displacement may impact both commercial and recreational fisheries. Although the fisheries may extend beyond the study region, the analysis of aerial extent presented below is limited to boundaries of the north central coast study region. The displacement discussion below is based on the Ecotrust draft *Summary of Potential Impacts of the Integrated Preferred Alternative and the North Central Coast Regional Stakeholder Group MPA Proposals on Commercial and Recreational Fisheries in the MLPA North Central Coast Study Area* (Scholz et al. 2008). For a more detailed assessment of socioeconomic impacts, the reader is referred to the Ecotrust Report.

4.3.3.1. Commercial Fisheries Displacement

Data layers characterizing the spatial extent and relative stated importance of fishing grounds for eight commercial fisheries (California halibut, coastal pelagics, market squid, deeper nearshore rockfish, nearshore rockfish, urchin, Dungeness crab, and salmon) were used to approximately assess the percentage area of commercial fishing grounds affected by the Proposed Project and Alternatives 1, 2, and 3 (Table 4-4). The Ecotrust analysis represents a worst case scenario as it assumed that all commercial fishing in areas affected by MPAs would be lost completely, when in it is more likely that fishing effort would be redirected to areas outside of the MPAs.

Table 4-4. Percentage area of commercial fishing grounds within the north central coast study region affected by the Proposed Project and Alternatives 1, 2, and 3 by landing port

| | Fisheries | Proposed Project | Alternative 1 | Alternative 2 | Alternative 3 |
|----------------------|---------------------------|------------------|---------------|---------------|---------------|
| Point Arena | California Halibut | --- | --- | --- | --- |
| | Coastal Pelagics | --- | --- | --- | --- |
| | Market Squid | --- | --- | --- | --- |
| | Deeper Nearshore Rockfish | 30.1 | 32.0 | 16.8 | 33.9 |
| | Nearshore Rockfish | 26.9 | 28.4 | 17.6 | 30.4 |
| | Urchin | 23.6 | 19.1 | 16.1 | 26.6 |
| | Dungeness Crab | 14.0 | 13.5 | 11.1 | 19.2 |
| | Salmon | 12.5 | 11.9 | 9.3 | 12.8 |
| Bodega Bay | California Halibut | 19.3 | 17.7 | 19.2 | 27.7 |
| | Coastal Pelagics | --- | --- | --- | --- |
| | Market Squid | --- | --- | --- | --- |
| | Deeper Nearshore Rockfish | 23.7 | 22.8 | 19.5 | 26.0 |
| | Nearshore Rockfish | 27.7 | 25.9 | 14.2 | 30.9 |
| | Urchin | 23.1 | 18.8 | 16.9 | 26.4 |
| | Dungeness Crab | 16.4 | 16.3 | 13.7 | 21.7 |
| | Salmon | 12.0 | 11.8 | 9.3 | 14.4 |
| Bolinas | California Halibut | 19.8 | 18.2 | 19.7 | 28.1 |
| | Coastal Pelagics | --- | --- | --- | --- |
| | Market Squid | --- | --- | --- | --- |
| | Deeper Nearshore Rockfish | 26.5 | 31.2 | 26.5 | 33.5 |
| | Nearshore Rockfish | --- | --- | --- | --- |
| | Urchin | --- | --- | --- | --- |
| | Dungeness Crab | 1.1 | 0.1 | 1.1 | 7.3 |
| | Salmon | 11.2 | 11.6 | 11.2 | 10.7 |
| San Francisco | California Halibut | 9.4 | 8.8 | 9.3 | 14.5 |
| | Coastal Pelagics | --- | --- | --- | --- |
| | Market Squid | --- | --- | --- | --- |
| | Deeper Nearshore Rockfish | 14.7 | 18.3 | 13.5 | 23.8 |
| | Nearshore Rockfish | 14.3 | 17.8 | 12.2 | 25.3 |
| | Urchin | 30.1 | 21.5 | 16.2 | 30.4 |

| | Fisheries | Proposed Project | Alternative 1 | Alternative 2 | Alternative 3 |
|---------------|---------------------------|------------------|---------------|---------------|---------------|
| | Dungeness Crab | 15.7 | 15.6 | 13.2 | 21.3 |
| | Salmon | 12.0 | 11.8 | 9.3 | 14.4 |
| Half Moon Bay | California Halibut | 6.8 | 6.2 | 7.2 | 19.7 |
| | Coastal Pelagics | 9.1 | 9.9 | 6.2 | 9.8 |
| | Market Squid | 2.5 | 3.3 | 2.5 | 20.5 |
| | Deeper Nearshore Rockfish | 10.2 | 15.1 | 10.8 | 26.8 |
| | Nearshore Rockfish | 9.3 | 9.5 | 9.5 | 9.5 |
| | Urchin | --- | --- | --- | --- |
| | Dungeness Crab | 15.9 | 15.8 | 13.3 | 21.6 |
| | Salmon | 12.0 | 11.8 | 9.3 | 14.4 |

Source: Scholz et al. 2008

As indicated by the data, anticipated maximum potential displacement of important commercial fisheries for the Proposed Project would vary from 30.1% (for both the deeper nearshore rockfish fishery in the Point Arena area and the urchin fishery in the San Francisco area) to 1.1% (for the Dungeness crab fishery in the Bolinas area). Displacement associated with Alternative 1 would vary between 0.1% (for the Dungeness crab fishery in the Bolinas area) and 32.0% (for the deeper nearshore rockfish fishery in the Point Arena area). Displacement associated with Alternative 2 would vary between 1.1% (for the Dungeness crab fishery in the Bolinas area) and 26.5% (for the deeper nearshore rockfish fishery in the Bolinas area). Displacement associated with Alternative 3 would vary between 7.3% (for the Dungeness crab fishery in the Bolinas area) and 33.9% (for the deeper nearshore rockfish fishery in the Point Arena area). When comparing median displacement values as averaged across all commercial fisheries and landing ports, the Proposed Project would potentially affect 16.4% of the important fishing grounds in the north central coast study region, Alternative 1—16.2%, Alternative 2—13.0%, and Alternative 3—21.6%.

4.3.3.2. Recreational Fisheries Displacement

Data layers characterizing the spatial extent and relative stated importance of fishing grounds for four recreational fisheries (California halibut, Dungeness crab, salmon, and rockfish/lingcod complex) were used to approximately assess the percentage area of recreational fishing grounds affected by the Proposed Project and Alternatives 1, 2, and 3 (Table 4-5). Recreational fishermen are also broken out by user group in Table 4-5 (i.e., commercial passenger fishing vessels, private vessels, kayak based, and pier/shore based), and by subregion (i.e., Region 1—Ocean Beach in San Francisco County, Region 2—San Francisco Bay access points to Point Reyes, Region 3—Point Reyes north to Alder Creek). The Ecotrust Report represents a worst case scenario as it assumed that all recreational fishing in an area affected by a MPA would

be lost completely, when in it is more likely that fishing effort would shift to areas outside of the MPA.

Table 4-5. Percentage area of recreational fishing grounds within the north central coast study region affected by the Proposed Project and Alternatives 1, 2, and 3 by subregion

| | | Fisheries | Proposed Project | Alternative 1 | Alternative 2 | Alternative 3 |
|--------------------------------------|----------|--------------------|------------------|---------------|---------------|---------------|
| Commercial Passenger Fishing Vessels | Region 3 | California Halibut | 4.6 | 6.3 | 4.6 | 6.7 |
| | | Dungeness Crab | 8.7 | 12.6 | 8.7 | 19.4 |
| | | Rockfish | 11.7 | 14.2 | 15.3 | 16.4 |
| | | Salmon | 6.5 | 7.8 | 6.5 | 6.7 |
| | Region 2 | California Halibut | 12.5 | 11.9 | 12.3 | 22.6 |
| | | Dungeness Crab | 4.7 | 6.6 | 5.5 | 9.7 |
| | | Rockfish | 10.3 | 22.7 | 10.3 | 26.9 |
| | | Salmon | 10.1 | 11.1 | 10.7 | 13.8 |
| | Region 1 | California Halibut | 2.6 | 0.9 | 2.1 | 18.3 |
| | | Dungeness Crab | 13.6 | 21.5 | 19.1 | 21.9 |
| | | Rockfish | 20.4 | 24.9 | 19.8 | 32.5 |
| | | Salmon | 10.6 | 11.7 | 11.2 | 14.4 |
| Private Vessels | Region 3 | California Halibut | 7.8 | 8.2 | 8.1 | 14.2 |
| | | Dungeness Crab | 7.3 | 8.7 | 7.5 | 16.5 |
| | | Rockfish | 18.8 | 23.4 | 20.6 | 27.2 |
| | | Salmon | 9.2 | 11.8 | 11.8 | 12.4 |
| | Region 2 | California Halibut | 5.4 | 4.9 | 5.4 | 8.8 |
| | | Dungeness Crab | 9.1 | 10.0 | 9.5 | 16.6 |
| | | Rockfish | 17.4 | 20.1 | 17.4 | 24.7 |
| | | Salmon | 9.6 | 11.0 | 10.1 | 12.6 |
| | Region 1 | California Halibut | 10.4 | 7.3 | 9.7 | 22.5 |
| | | Dungeness Crab | 6.8 | 10.4 | 8.5 | 9.5 |
| | | Rockfish | 19.1 | 24.6 | 18.7 | 32.3 |
| | | Salmon | 8.8 | 9.9 | 9.4 | 13.5 |
| Kayak Anglers | Region 3 | California Halibut | 0.0 | 0.0 | 0.0 | 0.3 |
| | | Dungeness Crab | 0.0 | 0.0 | 0.0 | 0.2 |
| | | Rockfish | 7.4 | 6.5 | 10.8 | 10.3 |
| | | Salmon | 4.2 | 3.9 | 4.7 | 8.7 |
| | Region 2 | California Halibut | 0.0 | 0.1 | 0.0 | 0.0 |
| | | Dungeness Crab | --- | --- | --- | --- |

| | | Fisheries | Proposed Project | Alternative 1 | Alternative 2 | Alternative 3 |
|------------|----------|--------------------|------------------|---------------|---------------|---------------|
| | | Rockfish | 12.1 | 21.8 | 12.1 | 23.9 |
| | | Salmon | 10.1 | 15.4 | 12.9 | 17.9 |
| | Region 1 | California Halibut | 3.0 | 0.3 | 2.9 | 11.4 |
| | | Dungeness Crab | 6.7 | 10.9 | 10.0 | 10.8 |
| | | Rockfish | 12.1 | 12.1 | 12.3 | 14.3 |
| | | Salmon | 3.1 | 3.6 | 3.3 | 3.6 |
| Pier/Shore | Region 3 | California Halibut | --- | --- | --- | --- |
| | | Dungeness Crab | --- | --- | --- | --- |
| | | Rockfish | 0.3 | 4.9 | 11.5 | 15.5 |
| | | Salmon | --- | --- | --- | --- |
| | | Striped Bass | 16.9 | 17.7 | 16.9 | 34.3 |
| | Region 2 | California Halibut | 0.0 | 0.0 | 0.0 | 0.0 |
| | | Dungeness Crab | 0.0 | 0.0 | 0.0 | 0.0 |
| | | Rockfish | 11.7 | 18.1 | 13.3 | 21.6 |
| | | Salmon | --- | --- | --- | --- |
| | | Striped Bass | 13.9 | 13.9 | 13.9 | 24.7 |
| | Region 1 | California Halibut | 4.0 | 4.0 | 3.3 | 12.7 |
| | | Dungeness Crab | 12.9 | 21.0 | 17.2 | 18.6 |
| | | Rockfish | 5.3 | 10.3 | 5.3 | 21.3 |
| | | Salmon | 0.0 | 0.0 | 0.0 | 0.0 |
| | | Striped Bass | 6.2 | 10.9 | 5.3 | 19.3 |

Source: Scholz et al. 2008

As indicated by the data, anticipated maximum potential displacement of important recreational fisheries for the Proposed Project would vary from 20.4% (CPFV: region 1 rockfish) to 0.3% (Pier/Shore: region 3 rockfish). Displacement associated with Alternative 1 would vary between 0.1% (Kayak Anglers: region 2 California halibut) and 24.9% (CPFV: region 1 rockfish). Displacement associated with Alternative 2 would vary between 2.1% (CPFV: region 1 California halibut) and 20.6% (Private Vessels: region 3 rockfish). Displacement associated with Alternative 3 would vary between 0.2% (Kayak Anglers: region 3 Dungeness crab) and 34.3% (Pier/Shore: region 3 striped bass). When comparing median displacement values as averaged across all recreational types and fisheries, the Proposed Project would potentially affect 24.7% of the important recreational fishing grounds in the north central coast study region, Alternative 1—31.5%, Alternative 2—28.1%, and Alternative 3—46.2%.

4.4. CEQA-Related Environmental Effects

Given the above analysis, it is apparent that to varying degrees across all four alternatives displacement may occur to some level for both commercial and recreational fishing activities. Alternative 3 would result in the greatest amount of potential displacement to commercial and recreational fisheries from proposed MPAs.

Displacement can have several consequences as outlined in sections 4.3.1 and 4.3.2. In summary, fishing effort within the north central coast may be redirected to different locations outside of MPAs, including areas along the periphery of new MPAs, locations beyond state waters, and locations within state waters but outside the study region, or may target different species than those previously fished within MPAs. Fishing effort within the north central coast also could become lower as a result of individual fishermen's decisions to fish less often because of the effort involved, to relocate out of the state, or to leave the fishery because of increased business costs. This could have some detrimental effect on local economies (Pendleton and Rooke 2006), although such effects are anticipated to be limited and of short duration as fisheries recover. Networks of MPAs are promising management tools partially because of their ability to benefit exploited populations and fisheries (Murray et al. 1999), by providing periodic recruitment to recharge nearby populations of adults, juveniles, and/or larvae of fished species. These would benefit both commercial and recreational fishing activities in the long run.

Displacement of fishing effort outside of MPAs could also lead to an increase in nonconsumptive recreational uses (e.g., marine wildlife viewing, scuba diving, kayaking) inside MPAs, as these locations would provide an opportunity for such activities without conflicting with fishing activities. This would benefit local economies as demand for recreation-related businesses increased.

Ultimately, the choices individual fishermen will make following the implementation of an MPA network component along the north central coast cannot be predetermined. However, the range of potential displacement-related indirect effects on the physical environment requiring consideration under CEQA can be estimated. These are identified below.

4.4.1. Air Quality

The potential exists for increased air emissions as a result of increased transit times by displaced fishing vessels traveling to locations outside of designated MPAs. A discussion of the potential displacement-related effects regarding air quality can be found in Chapter 5 of this EIR.

4.4.2. Biological Resources

The possibility exists that establishment of MPAs will displace and concentrate existing fishing effort into other state waters or areas outside state waters along the

north central California coast. Alternately, fishing effort may be attracted to the edges of established MPAs to benefit from potential increases in catch or catch per unit effort. It is suggested that either of these types of congestion could lead to marine species population decline and habitat degradation impacts outside MPA boundaries. A discussion of the potential displacement-related effects to biological resources can be found in Chapter 6 of this EIR.

4.4.3. Cultural Resources

The potential for substantial loss of maritime-related historic resources resulting from displacement-related economic losses is discussed in Chapter 7 of this EIR.

4.4.4. Population and Employment

Displacement of fishing effort could cause economic hardship for a number of individual fishermen resulting in economic effects in local communities. A discussion of the potential for economic blight in association with displacement of fishing effort can be found in Chapter 7 of this EIR.

4.4.5. Public Services and Utilities

Illegal fishing within MPAs could result from displacement of fishing effort, necessitating an increase in demand for enforcement services. A discussion of the potential displacement-related effects to public services and utilities can be found in Chapter 7 of this EIR.

4.4.6. Recreational Nonconsumptive Uses

As noted above, displacement of fishing effort to locations outside of MPAs could lead to an increase in recreational nonconsumptive use of MPAs themselves. A discussion of the potential displacement-related effects to recreational nonconsumptive uses can be found in Chapter 7 of this EIR.

4.4.7. Vessel Traffic

Displacement of fishing effort to locations outside of MPAs could lead to increased vessel congestion in those areas. A discussion of the potential displacement-related effects to vessel traffic can be found in Chapter 7 of this EIR.

4.4.8. Water Quality

Displacement of fishing effort could cause economic hardship for a number of individual fishermen and result in vessel abandonment. A discussion of the potential displacement-related effects to water quality resulting from vessel abandonment can be found in Chapter 5 of this EIR.

