Chapter 6. Analysis of Proposed Management Alternatives

Several proposed management alternatives for the white seabass fishery, along with a framework approach to management, were described in the previous chapter. As per CEQA guidelines and the MLMA, the effects of these alternatives on target and non-target species, the environment, and the socioeconomics of the fishery are evaluated in this chapter.

6.1 Alternative A - Status Quo

6.1.1 Effects on White Seabass

This alternative would continue existing white seabass regulations. The management of white seabass over the years has been complex, consisting of several different restrictions on commercial and recreational fisheries (see Section 4.2). Unlike earlier years, a number of recent laws and regulations pertaining to white seabass have resulted in reductions of commercial fishing effort and the take of sub-legal fish by recreational anglers. These regulations in combination with favorable oceanographic conditions and the recovery of several prey populations have probably contributed to increases in the white seabass stock. Currently, the white seabass resource appears to be recovering based on catch trends seen in the recreational and commercial fisheries as well as other factors (Section 2.10). The continued abundance of prey items such as sardines and squid, and the cessation of the El Niño/Southern Oscillation, should contribute to a stable ecosystem for white seabass along the California coast.

The selection of the status quo alternative, along with a framework approach to management, would meet some of the objectives of the WSFMP and MLMA. Under the FMP framework, management of the white seabass resource avoids being split between the Legislature and the Commission, which often resulted in allocation of the resource at the expense of the different fishery participants. This in turn lead to animosity and conflict between various user groups. In addition, framework management gives the Commission a strict set of procedures and management tools to use as needs arise. This will enable the Commission to act decisively and in a timely manner in response to changing biological, oceanographic, and socioeconomic conditions affecting the resource.

Another advantage of implementing this alternative is that short-term economic impacts are unlikely. However, if overfishing and collapse of the fishery occur, long-term impacts would be substantial.

The main disadvantage of this alternative is that is does not meet one of the principle objectives of developing a sustainable fishery. To adequately accomplish this objective, it is important to identify the level at which a population can be maintained while experiencing removals of a portion of the stock through natural and fishing mortality. Without identifying this level, resource managers will not have a starting point from which to gauge whether or not fluctuations in catch and abundance indices are of serious concern. Implementation of this alternative involves considerable uncertainty and risk since a harvest limit is not in place to prevent overfishing (see Section 6.5).

Wide fluctuations in the take of white seabass by commercial and recreational fisheries have occurred since the fishery began. Fishery landings appear cyclic in which a few years of high catches are followed by many years of much lower catches, and then catches return to high levels. Environmental changes and regulations are partly responsible for these fluctuations, but the magnitude of their effects on the white seabass stock are unknown. The cyclic nature of the fishery, without upper harvest limits in place, could put the white seabass resource at considerable risk since high take of white seabass followed by poor recruitment could lead to collapse of the fishery and a very long time for recovery, despite the return of favorable conditions.

This alternative also does not use the best available information to manage the fishery. Although it is acknowledged that there are gaps in our knowledge of white seabass, enough data exist to develop an estimate of population size which can be used as a starting point for further evaluation and refinement through monitoring and research (see Chapter 7).

6.1.2 Effects on Non-Target Species

The white seabass recreational and commercial fisheries, like most other fisheries, have some bycatch, which is either kept or returned to the marine environment. In large part, gear designs used by fishermen help to lessen the take of non-targeted species. Choices such as hook design and size, bait types, mesh sizes, and how and where these gears are used help to minimize the risk of catching juvenile or undersized fish as well as non-targeted species.

Much of the data on bycatch in the white seabass commercial fishery comes from a Department study in the 1980s and observations made by NMFS in the 1990s. The Department conducted an onboard observer program that covered the nearshore white seabass gill net fishery from 1983-1989 (Vojkovich et al. 1990). During this period, 818 sets of gill nets were observed on 250 days (approximately 3% coverage of the total logged fishing activity). As previously mentioned, the NMFS observer program does not cover the white seabass gill net fishery. However, some white seabass sets were observed incidentally on vessels primarily targeting halibut in the set net fishery in southern and central California. In southern California, a total of 521 sets was observed from 1990-1993 (Caretta pers. comm.). White seabass was the primary target of these sets, but a small fraction also targeted leopard sharks. In central California, a total of 52 sets targeting white seabass and soupfin shark was observed from 1990-1994 and 1999-2000 (Forney pers. comm.). The results of these studies are presented below (Sections 6.1.2.1 through 6.1.2.5). It should be noted, however, that implementation of Proposition 132 in 1994 has moved the white seabass gill net fishery farther from shore, so the composition of incidentally-taken species may be different from these studies.

6.1.2.1 Effects on Non-Target Finfish

<u>Recreational fishery interactions</u>

Recreational fishermen targeting white seabass catch undersized white seabass and other finfish. The MRFSS data shows that anglers targeting white seabass commonly returned undersized white seabass, barred sand bass (*Paralabrax nebulifer*), kelp bass (*P. clathratus)*, California halibut (*Paralichthys californicus)*, California barracuda (*Sphyraena argentea*), bat rays (*Myliobatis californica*), shovelnose guitarfish (*Rhinobatos productos*), Pacific mackerel (*Scomber japonicus)*, soupfin shark (*Galeorhinus zyopterus*), and other species of sharks. In addition to these species, sargo (*Anisotremus davidsonii*), yellowfin croaker *(Umbrina roncador*), and yellowtail (*Seriola lalandi*) are caught aboard CPFV's while fishing for white seabass (Conroy pers. comm.).

From 1993 to the present, an average of 66,000 white seabass were released after being caught. Unfortunately information is not available on the condition of the released white seabass, most of which are under the 28 inch (711 mm) size limit. Anecdotal information from recreational fishermen suggests that there are high levels of mortality due to damaged air bladders. Preliminary data suggest that hooking mortality of juvenile fish is around 10%, which is similar to the levels reported for red drum on the Atlantic coast (Crooke pers. comm.). Further investigation is needed to determine whether this type of interaction could affect the resource (see Chapter 7).

Finfish species, such as Pacific sardine, are occasionally used as bait for white seabass. However, the preferred bait is live squid, and impacts on finfish used as bait are not considered significant.

<u>Commercial fishery interactions</u>

A total of 85 finfish species, mostly those associated with kelp beds, were taken in the white seabass gill net fishery during the Department's onboard observer study. The most common species caught were Pacific sardine (*Sardinops sagax*), spiny dogfish (*Squalus acanthius*), Pacific mackerel, swell shark (*Cephaloscyllium ventriosum*), and white seabass (Table 6-1; Vojkovich et al. 1990). Fifty-two percent of the incidental species were released dead, 29% were kept for personal use or sale, and 19% were released alive. Over 75% of the incidentally-taken fish released alive were shark species while the discarded dead species consisted of Pacific sardine (60%), miscellaneous fish (22%), spiny dogfish (15%), and white seabass (3%).

Examination of current landing receipt data show that incidental species reported in the white seabass gill net fishery include Pacific mackerel, Pacific bonito (*Sarda chiliensis)*, California barracuda, California halibut and other flatfish (*Plueronectidae* and *Bothidae* sp.*)*, giant sea bass (*Stereolepis gigas*), soupfin shark, Pacific angel shark (*Squatina californica*), shortfin mako (*Isurus oxyrinchus*), common thresher (*Alopias vulpinus*), shovelnose guitarfish, and various skates (*Rajidae* sp.). These species were also taken during the Department's onboard observer program. Non-marketable species are not recorded on landing receipts, so some incidental take is not reported.

Since much of the commercial hook and line effort takes place in nearshore waters adjacent to and within kelp beds, there are some similarities in incidental catch with the Department's gill net study. Hook and line white seabass fishermen have reported incidental catches of several nearshore sharks and rays, including bat rays, leopard sharks (*Triakis semifasciata*), soupfin sharks, and swell sharks (*Cephaloscyllium ventrosium*). In addition, California halibut, Pacific sandab (*Citharichthys sordidus*), California barracuda, "red" rockfish; such as vermillion (*Sebastes miniatus*), and canary rockfish (*S. pinniger*), copper rockfish (*S. caurinus*), gopher rockfish (*S. carnatus*), blue rockfish (*S. mystinus*), ocean whitefish (*Caulolatilus princeps*), California sheephead (*Semicossyphus pulcher*), yellowtail, and giant sea bass have been noted as incidental catch.

Table 6-1. Observed incidental catch of finfish in the white seabass gill net fishery from 1983-1989 (Vojkovich et al. 1990)

High	Moderate	Low/Rare			
Pa. sardine	yellowtail	thornback	common thresher	vermillion rockfish	rubberlip surfperch
spiny dogfish	horn shark	jack mackerel	Ca. sheephead	barred sand bass	opaleye
Pa. mackerel	Ca. lizardfish	white croaker	bocaccio	shortfin mako	other rockfish
swell shark	soupfin shark	kelp bass	smooth hammerhead	Pa. sandab	other surfperch
white seabass	Ca. halibut	English sole	Pa. hagfish	N. anchovy	other flatfish
	leopard shark	blue shark	bigmouth sole	Ca. barracuda	ocean whitefish
	Pa. bonito	bat ray	hornyhead turbot	spotted sand bass	flying fish
	Pa. angel shark	Ca. scorpionfish	chilipepper	spotfin croaker	queenfish
	ratfish	Ca. skate	diamond turbot	Pa. electric ray	sevengill shark
	Pa. hake	shovelnose guitarfish	sixgill shark	sablefish	other skates
	brown smoothound	lingcod	grey smoothound	white shark	
		cabezon	giant seabass	petrale sole	
		fantail sole	copper rockfish	barred surfperch	

6.1.2.2 Effects on Invertebrates

Recreational fishery interactions

Market squid is the preferred bait for white seabass. Commercial and recreational white seabass fishermen obtain their squid either by purchasing it from a live bait retailer (i.e., bait receiver or barge) or by capturing squid on their own. There is no way at this time to quantify how much squid is purchased as live bait or taken by an individual for personal use. Currently, there are approximately 12 live bait vessels operating in California that seasonally fish for squid, anchovy, sardine, and mackerel. The amount of squid taken by live bait boats and by individual fishermen is likely to be insignificant in comparison to the commercial squid fishery for human consumption, which employs over 100 vessels and has a five-year average of 71,000 tons (63,000 metric tons) annually.

Commercial fishery interactions

A total of 1,331 invertebrates were taken in the white seabass gill net fishery during the Department's onboard observer study (Table 6-2; Vojkovich et al. 1990). Sixty-nine percent of the observed invertebrate catch consisted of crab species; over 50% of this catch consisted of spider crab (*Loxorhynchus* sp.), rock crab (*Cancer sp.*), and box crab (*Lopholithodes sp.*). The remainder consisted of various mollusks and other crustaceans. About 45% of invertebrates were returned dead, 39% were returned alive, and 15% were kept or sold.

Table 6-2. Observed incidental catch of invertebrates in the white seabass gill net fishery from 1983-1989 (Vojkovich et al. 1990)

Species	Total number	Number kept/sold	Returned alive	Returned dead
crab, box	189	28	39	122
crab, decorator	9	0	5	4
crab, hermit	2	0	2	0
crab, kelp	51	5	29	17
crab, marble	3	0	1	2
crab, pelagic red	5	0	1	4
crab, pointer	92	21	8	63
crab, rock	262	108	71	83
crab, sand	1	1	0	0
crab, spider	303	25	102	176
lobster, Ca. spiny	116	3	110	3
sea cucumber	94	0	69	26
sea star	35	2	31	3
sea urchin	53	5	33	15
shrimp	3	1	1	1
mollusk	2	0	0	2
snail	5	0	4	1
sea hare	3	0	3	0
octopus	3	0	3	0
squid, market	1	0	1	0
whelk	16	0	16	0
unspecified	81	0	1	80
TOTAL	1337	199	527	602

6.1.2.3 Effects on Seabirds

A number of marine bird species, including brown pelicans (*Pelecanus occidentalis californicus*), various tern species *(Sterna* spp.), cormorants (*Phalacorcorax* spp.), and bald eagles (*Haliaeetus leucocephalus*) occur in areas where white seabass fishing activities take place. Some of these species, such as the brown pelican and bald eagle, are federally protected.

The brown pelican, an endangered marine bird, may be indirectly affected by marine fishing activities (e.g., motor noise, boat whistles, etc.) near known rookeries. In order to prevent potential disturbances to the endangered brown pelican rookery and fledgling area at Anacapa Island, Ventura County, the Commission established a fishing closure within the boundary of Anacapa Island Ecological Reserve. The closure is from 01 January to 31 October each year, and encompasses an area 4,000 feet (1,219 m) long on the north side of west Anacapa Island, and extends offshore to a depth of approximately 120 feet (37 m).

The California least tern *(Sterna albifrons*), an endangered species, nests on a few beaches bordering the southern California coast and feeds on small live fish. Interactions between least terns and fishing activities are unlikely, since this species typically feeds in shallow water areas. However, other tern species are known to become entangled in fishing line after getting hooked while going after an angler's bait. Fishermen normally release the hooked tern by cutting the line. When hooked terns return to their nesting area, they can become entangled when the trailing fishing line snags on debris. In an attempt to free itself, a bird may thrash itself to death, and it may entangle other terns in the colony. Between the months of April and August, several species of terns breed at the Bolsa Chica Ecological Reserve (BCER) in Huntington Beach. In addition to a large (up to 2,000 pairs) colony of elegant terns (*S. elegans*), caspian terns (*S. caspia*), forster's terns (*S. forsteri*) and black skimmers (*Rynchops niger*), also nest at BCER (Collins pers. comm.; O'Reilly, pers. comm.). Annually, approximately 10 dead terns are found entangled in fishing line at the BCER seabird colony. Since terns feed primarily on small bait fish such as northern anchovy (*Engraulis mordax*), it is unlikely that interactions would occur with hook and line fishermen targeting while seabass because squid is the primary bait used.

Another protected bird found seasonally along the coast and the islands of California is the bald eagle (*Haliaeetus leucocephalus*). A recovery plan is currently in place that establishes geographical goals for population enhancement. More than 30 eagles have been released at Santa Catalina Island and some live on the mainland near Santa Barbara County. The eagles feed on live fish in the waters surrounding their habitat, so fishery interactions may be possible but are considered unlikely.

<u>Recreational fishery interactions</u>
Because of the fishing techniques employed in the white seabass recreational fishery, it is highly unlikely that there would be any interactions with surface foraging seabirds.

Baited fishing lines are weighted so they sink rapidly underwater where they are unavailable to birds such as the brown pelican, least tern, and bald eagle. However, these marine birds and cormorants often have interactions with anglers who fish for other species on the surface. The interactions take place when live bait (usually anchovy or sardine) is used as chum or for bait. When the bird goes after the bait, it can become caught on the hook or entangled in the fishing line. In most instances the bird is freed. No data exists to quantify these interactions, but the effect on the total population is not considered significant.

<u>Commercial fishery interactions</u>
Gill nets can capture surface foragers (e.g., gulls) as well as diving birds such as terns and cormorants. Seabird bycatch has been a problem in the nearshore gill net fisheries of central California, particularly for the marbled murrelet (*Brachyramphus marmoratus*), a threatened species, and the common murre (*Uria aalge*). The marbled murrelet is rare in southern California, and none have been reported killed in the gill net fisheries of this region (USFWS 1997). Therefore, the white seabass gill net fishery is not likely to impact this species since the majority of fishing occurs south of Point Conception. Common murres are winter visitors to southern California, so interactions are possible, but unlikely since the highest level of fishing effort occurs during the summer months. Eighty-two percent of white seabass landings using gill nets from 1995-2000 occurred from June through July, while only 11% of landings occurred from November through February.

During the Department's onboard observer study, a total of ten cormorants (*Phalacrocorax* sp.) died as a result of gear interactions. No other bird species suffered injuries or died. During the NMFS observer program, 14 cormorants died in the white seabass gill net fishery in southern California while 20 common murres were entangled in gill nets in central California.

Set longlines could potentially catch surface feeding birds if birds attempted to take the bait on the line, and be pulled under the water and drown. However, a commercial white seabass longliner reported having no seabird interactions (Athens pers. comm.). As in the sport fishery, commercial hook and line (other than longline) fishing interactions are unlikely, due to the techniques employed. However, current data are not available on seabird mortalities in the white seabass hook and line commercial fishery.

6.1.2.4 Effects on Marine Mammals

Interactions are possible with a number of marine mammal species, including California sea lions (*Zalophus californianus*), harbor seals (*Phoca vitulina*), northern elephant seals (*Mirounga angustirostris*), common dolphins (*Delphinus delphis*), and California gray whales (*Eschrichtius robustus*) since fishing for white seabass takes place primarily throughout the Southern California Bight (south of Point Conception). All marine mammals, especially threatened and endangered species, are fully protected by

Federal and State law, and special provisions have been established for those areas with highest interaction rates. Elephant seal, harbor seal, and sea lion rookeries are present on several of the Channel Islands in the Southern California Bight. Closures have been enacted by the Commission to keep fishing boats away from rookeries to minimize interactions and disturbances, particularly during pupping and breeding seasons [§630(b)(28), Title 14, CCR]. Elephant seals are also protected by another closure at Point Año Nuevo State Reserve in northern California [§29.05(b)(3), Title 14, CCR].

Recreational fishery interactions

California sea lions and harbor seals frequently follow sport fishing vessels to feed on bait used to chum for fish, and take hooked fish. There are many of these interactions and sea lions are occasionally hooked when they try to take catches (Hanan et al. 1989). Although legal in the past, all lethal methods to prevent depredation by marine mammals have been outlawed by the Federal government.

The MRFSS collected data on pinniped interactions with recreational anglers in California in 1999. Some data were available on interactions with anglers targeting white seabass (Table 6-3; RecFIN 2001). The data show variability in levels of interaction by season. Interactions tended to be lowest during winter, coinciding with a high availability of squid to marine mammals during this time. Higher interaction levels occurred during late spring and early summer when white seabass angling peaked, and throughout the summer months which coincides with the breeding season for California sea lions. Sea lion populations in southern California are highest at this time, when adults congregate at rookeries on offshore islands. In the fall, males migrate north and the population in southern California drops. Similar marine mammal interaction trends are seen in the overall survey data for recreational anglers in southern California.

Table 6-3. Pinniped interactions with recreational anglers targeting white seabass in 1999. Interviewed anglers reported pinnipeds within 100 yards of their fishing area (RecFIN 2001).

Months	Total number of interviews	Interviews reporting pinnipeds	Interviews where pinnipeds were reported when the animal approached angler's gear or catch	Interviews where pinnipeds were reported when physical contact was made with gear or catch
Jan-Feb	12	42%	20%	0%
Mar-April	48	54%	12%	4%
May-June	171	75%	40%	6%
July-Aug	60	33%	50%	25%
Sept-Oct.	53	43%	30%	26%
Nov.-Dec	97	53%	41%	12%
Annual	441	56%	37%	12%

Migrating gray whales (*Eschrichtius robustus*) often come very close to shore, and are frequently observed in kelp beds. Anglers fish for white seabass in the same areas during the early spring months. Although gray whales do not eat fish, they could be affected by the presence of recreational anglers. However, because the number of gray whales in an area at any one time is very small, the impact of recreational fishing for white seabass on these animals is probably not significant.

Commercial fishery interactions

The National Marine Fisheries Service (NMFS) considers the white seabass gill net fishery to be a Category I fishery, which is defined as a fishery in which it is highly likely that one marine mammal will be taken by a randomly selected vessel during a 20-day period. Currently, neither the Department nor NMFS has a marine mammal observer program for the white seabass gill net fishery. However, incidents of marine mammal deaths and injuries resulting from commercial fishing activities are reported by fishermen through the Marine Mammal Authorization Program (MMAP). Data on white seabass gill net interactions collected from this reporting system are combined with data on other gill net fisheries (angel shark, halibut, barracuda, leopard shark, perch and white croaker, rockfish, yellowtail, soupfin shark, and various other sharks excluding the swordfish/thresher shark fishery).

Reported marine mammal interactions for all of these fisheries combined consisted of one common dolphin; ten California sea lions and two harbor seals in 1996; three common dolphins and four California sea lions in 1997; and two common dolphins and two California sea lions in 1998. It is not clear how many of these interactions, if any, occurred in the white seabass gill net fishery because MMAP data is collected in aggregate for these fisheries. Marine mammal interactions are believed to be under-reported to the MMAP (Forney 2000).

During the Department's onboard observer study, six common dolphins, one Pacific white sided dolphin, and seven California sea lions died as a result of gear interaction. During the NMFS observer program, four California sea lions became entangled in white seabass gill nets in southern California while one harbor porpoise and two harbor seals were entangled in gill nets in central California.

Other marine mammals can become entangled in active gill net or surface longline fishing gear, and in fragments of gill net or monofilament line that have been lost or discarded. From 1990 through 1998, 37 gray whales were reported entangled in various fishing gears off the coast of California (Hill 1999). However, the entanglements could have occurred anywhere along the gray whale's migration route, which extends from Alaska to Baja California, Mexico. No gray whales have been observed entangled in active white seabass gill net gear.

No data are currently available on commercial white seabass hook and line interactions with marine mammals. Interactions with rod and reel are probably similar to those in the recreational fishery. Longlines employed in this fishery are set on the bottom, and are not likely to hook marine mammals swimming through the water column. A white seabass longliner reported having no marine mammal entanglements while fishing

(Athens pers. comm.).

6.1.2.5 Effects on Marine Turtles

Marine sea turtles, though uncommon, occur in California waters. Four species of federally protected sea turtles are found in California waters: green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), and olive ridley sea turtles (*Lepidochelys olivacea*). Stranding records indicate that the leatherback sea turtle is the most common in our waters. A relatively high level of leatherback sightings occurs off the Monterey area, peaking in August. Green sea turtles are thought to be the second most abundant species off California. A resident population of 50-60 adults lives in San Diego Bay, congregating in the warm water effluents of the local power plant. Loggerhead sea turtle sightings typically peak from July through September in the eastern Pacific. Olive Ridley sea turtles are highly pelagic and very rarely found off the California coast.

<u>Recreational fishery interactions</u>
Interactions of recreational hook and line fishing with sea turtles are possible, although highly unlikely. An MRFSS sampler observed a sea turtle become entangled in gear from a CPFV off Santa Catalina Island; the turtle was released unharmed (Horeczko pers. comm.). Sea turtles, however, are vulnerable to boat collisions. The NMFS Recovery Plan for the Eastern Pacific green sea turtle states that 80% of recent green sea turtle deaths in San Diego Bay and Mission Bay were associated with boat collisions.

<u>Commercial fishery interactions</u>
Observer programs conducted by NMFS (1990-2000) have documented all four species interacting with various commercial fishing gears including the halibut and angel shark set net fishery, the shark/swordfish drift gill net fishery, and the high seas longline fishery (NMFS 2000). The observed take for the halibut/angel shark fishery was five sea turtles from 1990-1994, with observer coverage ranging from 0% to 15.4%; four of these mortalities occurred off Ventura.

During the Department's onboard observer study, there were no sea turtle interactions with white seabass gill nets. The lack of interactions, in part, may be due to the differences in mesh size that exist between the white seabass fishery (6 to 7.5 inches) and the halibut (8.5 inches) and shark/swordfish (14 inches) fisheries. During the NMFS observer program, no sea turtle entanglements were observed in white seabass gill nets in southern California.

Marine turtles may be vulnerable to ingestion of marine debris. One adult green sea turtle was recently found dead in San Diego Bay with monofilament netting tightly packed in its esophagus.

6.1.2.6 Ecological interactions

Most of this document has focused on the direct effects of fishing activities on white seabass and other species. However, the removal of white seabass through fishing activities may also have indirect effects on the ecosystem. Unfortunately, our knowledge of white seabass and their relationships with other species in the ecosystem is limited.

White seabass are known to prey on squid, sardines, and other pelagic species, and in turn, are eaten by other fish and sea lions. However, it is not known how increased catches of white seabass would effect this food chain. There may also be competition between white seabass and other species since they are often caught with other migratory species, such as bonito and yellowtail, that have similar food habits. Again, we do not know the extent of these interactions and how the removal of white seabass from the ecosystem would affect this.

6.1.3 Habitat Impacts

6.1.3.1 Effects of Consumptive Use on Environment

Fishermen engaged in the take of white seabass may dispose of trash and other items while fishing. Evidence suggests that marine vessels and fishing activity are a primary source for anthropogenic debris in the Southern California Bight (Moore 1998). Lost gill nets can continue to capture marine animals. Lost or discarded monofilament fishing line can cause death or injury to marine animals if they become entangled (High 1984). Marine debris such as plastics and styrofoam can also cause death or injury to animals in the marine environment when it is ingested or entangles an animal (NOAA 1998).

Fishermen often target white seabass in and around kelp habitat. Boat traffic through kelp beds can damage or cut loose kelp fronds. However, this has no lasting effect on the kelp beds as a whole (Feder 1974). Giant kelp (*Macrocystis* spp.) comprises the bulk of the kelp beds in southern California, although forests of Elk kelp are present off San Diego County. Giant kelp can grow as much as two feet (0.6 meters) per day, and approximately 60,000 tons (54,432 metric tons) are commercially harvested each year throughout southern California. Due to the growth characteristics of giant kelp, the effects on kelp beds by fishing vessels are considered insignificant.

6.1.3.2 Effects of Non-consumptive Use on Environment

Non-consumptive users, such as underwater photographers and animal watchers, can have an impact on the environment. Divers entering the water from shore may trample organisms, or become entangled in kelp, causing temporary damage to kelp beds. Southern California intertidal populations susceptible to trampling include fleshy seaweeds, coralline algae, fragile tube-forming polychaetes, bivalves such as mussels, acorn barnacles, limpets, and grapsid crabs that seek refuge under loose rocks and seaweeds during low tide (Ghazanshahi 1983; Murray 1998).

The potential impacts and effects of scuba divers on white seabass habitats and breeding behavior have not been studied. However, the sensitivity of white seabass to noise suggests that scuba divers could cause some minor disturbances to their mating cycle. If a dive site is a potential spawning ground, and is used frequently by many divers, a possibility exists that fish would abandon that site for a less disturbed location.

Non-consumptive users may also dispose of trash in the marine environment, contributing to the problem of anthropogenic debris.

6.1.4 Economic Implications

Economic effects are not expected to be significant under this alternative. If it becomes necessary to modify current management measures, effects on the fishery-based economies would be addressed under the WSFMP framework process, in accordance with the MLMA.

6.1.5 Social Implications

Social effects are not expected to be significant under this alternative. If it becomes necessary to modify current management measures, effects on the fishery-based economies would be addressed under the WSFMP framework process, in accordance with the MLMA.

6.2 Alternative B - OY Proxies Based on National Standard Guidelines

6.2.1 Effects on White Seabass

This alternative estimates the white seabass population based on information about the virgin biomass (spawning stock) and estimates of natural mortality to obtain a proxy for MSY. An OY was obtained by multiplying MSY by 0.8125 (alternative B1) or 0.75 (alternative B2) as a precautionary adjustment (see Section 5.6.2).

The establishment of an OY through this alternative, along with the framework management approach, meets one of the principle objectives of developing a sustainable fishery. The OY places an upper harvest limit on the total take of white seabass to prevent overfishing while the framework management allows for regulations to be put in place quickly if harvest levels exceed OY. In addition, framework management can adjust OY or other control rule parameters, if needed, as more biological and socioeconomic data become available. This alternative would allow continued recovery of white seabass while important data were collected to yield a better defined MSY/OY control rule.

Unlike alternative A, this alternative provides a good starting point for sustainable fisheries management. However, as noted earlier due to data limitations (see Section

5.6), alternatives B, C, an D only address the upper harvest limit. Because of this, it is strongly recommended that the default control rule (Section 5.7) accompany all of these alternatives. An MSY/OY approach to management should be considered an interim solution when knowledge of a stock is data-poor, as is the case with white seabass. Therefore, this accentuates the need to do a stock assessment and develop a specific MSY/OY control rule for white seabass (see Section 7.4.1).

The MSY proxy of 1.6 million pounds for this alternative is very similar to sustained catch levels seen from the 1940s through the 1960s (with the exception of 1958-1959 (Table 3-1). This MSY proxy is almost identical to an MSY estimate produced in the lone stock assessment done for white seabass. For that assessment, MacCall et al. (1976) used catch-per-unit-effort (CPUE) data from United States-based commercial and recreational catches and calculated an MSY for white seabass of 1.65 million pounds. The similarity of the two MSY estimates calculated by different methods suggests that the MSY proxy has some value.

This alternative assumes that the existing biomass is close to or similar to pristine levels. This may not be the case and might lead to overfishing and cause the resource to become overfished. If this is allowed to continue for too long, the fishery could collapse. Implementation of this alternative involves some uncertainty and risk (see Section 6.5).

This alternative assumes that natural mortality approximates fishing mortality, which is most likely not the case based on recent catch trends. Another factor to consider is that there appears to be a shift in the catch and effort of the white seabass resource from the commercial to the recreational fishery. This may be important due to the large number of white seabass that are recreational-caught and released (see Section 3.6). Many of these fish may become injured or die, but the number of white seabass that suffer this fate is unknown and unaccounted for in estimating their total fishing mortality. In the red drum (*Sciaenops ocellatus*) fisheries, hooking mortality of released fish was important and managers considered this effect in their estimates of MSY (NCDMF 2000).

Alternatives B1 and B2 are similar, and differ only in the adjustments of MSY to yield OY. Since there are many uncertainties in the calculation of an MSY for white seabass based on our current knowledge, it is prudent to make precautionary adjustments. Technical guidelines (Restrepo et al. 1998) recommend that 75% of an MSY proxy in data-poor situations represent the upper harvest target, in the best of conditions (i.e., the current stock size is above the biomass level associated with MSY). Although there are several positive indicators that white seabass numbers are increasing, we feel it is prudent to adhere to the guidelines and be more conservative to help ensure the continued recovery of the white seabass resource. Therefore, we recommend alternative B2 over alternative B1.

6.2.2 Effects on Non-Target Species

6.2.2.1 Effects on Non-Target Finfish

Effects on non-target finfish are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.1).

6.2.2.2 Effects on Invertebrates

Effects on invertebrates are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.2).

6.2.2.3 Effects on Seabirds

Effects on seabirds are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.3)

6.2.2.4 Effects on Marine Mammals

Effects on marine mammals are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.4).

6.2.2.5 Effects on Marine Turtles

Effects on marine sea turtles are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.5).

6.2.2.6 Ecological Interactions

Ecological interactions are largely unknown, but effects on them are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.6).

6.2.3 Habitat Impacts

6.2.3.1 Effects of Consumptive Use on Environment

Effects of consumptive use on the environment are not expected to be significant and differ from effects under alternative A (see Section 6.1.3.1).

6.2.3.2 Effects of Non-consumptive Use on Environment

Effects of non-consumptive use on the environment are not expected to be significant and differ from effects under alternative A (see Section 6.1.3.2).

6.2.4 Economic Implications

Effects on the fishery-based economy are not expected to be significant and differ from effects under alternative A (see Section 6.1.4). However, if harvest limits are reached and fishing effort is reduced, there could be a negative impact.

6.2.5 Social Implications

Effects on the fishing community structure are not expected to be significant and differ from effects under alternative A (see Section 6.1.5).

6.3 Alternative C - OY Proxies Based on Recent Catch Levels

6.3.1 Effects on White Seabass

Since our knowledge of white seabass stocks is data-poor, this alternative uses a proxy for MSY based on recent catch, and adjusts it downward (multiplied by 0.75) as a precautionary approach to get an OY (see Section 5.6.3).

This alternative and the framework management approach, like alternative B, address one of the primary objectives of developing a sustainable fishery for white seabass by setting an upper harvest limit. This is the most conservative of all the alternatives and would impact the white seabass resource the least. This alternative, like alternative B would allow continued recovery of white seabass while important data were collected to yield a better defined MSY/OY control rule. Implementation of C1, C2, or C3 would have some uncertainty, but the risk of overfishing the stock to an overfished condition relative to the other alternatives is by far the least (see Section 6.5).

One of the difficulties with selection of this alternative is choosing an appropriate time period for the basis of MSY/OY. Indeed, the creation of three different time frames attests to this fact. Using recent catch for an MSY proxy has been suggested, with the stipulation that the time period be stable, especially showing no declines. Unfortunately, the white seabass commercial and recreational catches have been very unstable, thus recent catch as a proxy for MSY may be unsuitable.

Implementation of C1, C2, or C3 would require the development of additional regulations that would limit the take of seabass by each of the fishery components when the upper harvest limit was reached within a particular fishing year. Types of regulations or controls that could achieve this would be:

- Cessation of fishing when harvest target is reached;
- Elimination of catch during the spawning season;
- Elimination of fishing during the full moon phase in March, April, May and June;
- Increase of the size limit to 32 inches;
- Reduction of the recreational bag limit; and any
- Combinations of the above.

The amount of white seabass take that would be reduced by implementing one of these regulations can be calculated using data from MRFSS (RecFIN 2001) and the Department's market sampling program (Department unpubl. data). For example, an estimate of all fish taken under 32 inches can be obtained from these databases and subtracted from the total U.S. take of white seabass to yield a reduced estimate of total catch as a result of implementing a minimum size limit of 32 inches. This can be done similarly for the other potential regulations to see their effect on total catch. Based on total U.S. take in 2000 (928,950 lbs), these potential management tools would have to be used in combination to reduce take of white seabass to levels that do not exceed OY under this alternative (OY for C1=339,774 lbs; C2=247,702 lbs ; C3=212,985 lbs).

Table 6-4. Reduction estimates of white seabass catch and resulting take using various controls or regulations. Based on 2000 catch data.

Control or regulation	% reduction (recreational)	% reduction (commercial)	Estimated take (total)
Closed season from 3/15-6/15	46	1	540,022
No fishing during full moon from 3/15-6/15	43	27	563,526
Increased size limit to 32 inches	49	9	558,825
Reduced bag limit (2 fish only)*	4	not applicable	900,298

* Used 1999 estimates for bag limit reduction; 2000 effort data not available.

The selection of any of the options under alternative C would result in a reduction of take and a disruption of fishing activity as well as the implementation of further regulation and increased enforcement needs. Based on recent catches, this would occur in 2002.

Another issue that affects alternative C, as well as alternatives B and D, is the present inability to track recreational catch in a timely fashion. Unlike commercial fishing, there is limited collection of recreational harvest data other than the Commercial Passenger Fishing Vessel (CPFV) logbook data. This would be a particular problem for alternative C since these harvest limits would be reached much sooner than the others. One potential solution to tracking the amount of recreational catch in a timely fashion (less than 2 months lag time) would be to use CPFV logbook data and expand that data by the proportion of the previous years' private/rental boat and shore-based fishing from the MRFSS.

6.3.2 Effects on Non-Target Species

6.3.2.1 Effects on Non-Target Finfish

Effects on non-target finfish are not expected to be significant. Impacts (see Section 6.1.2.1) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases. However, a reduction in allowable take of white seabass as per alternatives C1, C2 , and C3 would probably cause fishing effort to shift to other finfish in the commercial and/or recreational fisheries.

6.3.2.2 Effects on Invertebrates

Effects on invertebrates are not expected to be significant. Impacts (see Section 6.1.2.2) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases.

6.3.2.3 Effects on Seabirds

Effects on seabirds are not expected to be significant. Impacts (see Section 6.1.2.3) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases.

6.3.2.4 Effects on Marine Mammals

Effects on marine mammals are not expected to be significant. Impacts (see Section 6.1.2.4) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases.

6.3.2.5 Effects on Marine Turtles

Effects on marine turtles are not expected to be significant. Impacts (see Section 6.1.2.5) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases.

6.3.2.6 Ecological Interactions

Ecological interactions are largely unknown, but effects on them are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.6).

6.3.3 Habitat Impacts

6.3.3.1 Effects of Consumptive Use on Environment

Effects of consumptive use on the environment are not expected to be significant. Impacts (see Section 6.1.2.3) may be greatly reduced if harvest limits are reached and fishing effort for white seabass decreases. However, a reduction in allowable take of white seabass would probably cause fishing effort to shift to other species in the commercial and/or recreational fisheries, producing an unknown effect.

6.3.3.2 Effects of Non-consumptive Use on Environment

Effects of non-consumptive use on the environment are not expected to be significant. Impacts (see Section 6.1.3.2) may increase if harvest limits result in greater availability of white seabass in the environment for photography and wildlife viewing. This could result in increased human pressure in white seabass habitat areas such as kelp beds and rocky reefs.

6.3.4 Economic Implications

This alternative may have a significant impact on the fishery-based economy, affecting both recreational and commercial industries. The proposed OY proxies under this alternative would have varying degrees of impacts, ranging from the least disruptive (C1) to the most disruptive (C3). Under the guidelines of C1, no more than 339,774 pounds (154,119 kg) could be harvested annually. This harvest level is 53% of the average annual harvest (646,459 lbs or 293,229 kg) for the years 1998-2000. Under C3 an annual harvest limit of 212,985 (96,608 kg) would be set, which is 33% of the 1998-2000 average annual harvest. These options could have a severe impact on revenues generated by recreational and commercial fishing.

Commercial ex-vessel revenues closely parallel landings, so a significant decrease in landings would be expected to have a severe impact on revenues for commercial fishermen targeting white seabass. Reductions of annual commercial harvests from alternatives C1 and C3 could result in a loss of ex-vessel revenues ranging from $212,000 to $132,000, based on 2000 revenues. However, many of these fishermen also participate in other fisheries, and could re-allocate their effort to target alternative species, offsetting this potential loss in income. Estimates of losses incurred to the commercial fishing industry (fish markets, grocery stores, restaurants, etc.) as a whole have not been estimated. Most fish businesses receiving white seabass are located in southern California; primarily in Orange, Los Angeles, Ventura, and Santa Barbara counties. Local economies in these counties would be hardest hit by revenue losses.

The extent of impact on the recreational fishery is difficult to predict, and is largely dependent on a recreational angler’s motivation for fishing. An angler who primarily targets white seabass may not reduce his fishing effort altogether, but may decide to target another species such as yellowtail or kelp bass if white seabass fishing was reduced to meet annual harvest levels. According to the MRFSS estimates, white seabass were named as the target species for less than 1% to nearly 5% of angler trips annually from 1980 to 2000 in southern California, with white seabass popularity peaking in 1999 and 2000 when availability to the California recreational fishery increased (Figure 3-2). If more conservative catch restrictions were imposed, it is likely that effort would shift to other species, minimizing economic impacts on the recreational fishery. If however, effort did not shift and reductions in take resulted in reductions in total fishing effort, a 53% to 33% decrease in white seabass angling expenditures could result. This amounts to a potential maximum estimated loss of $52 million to $32 million based on 2000 expenditure estimates, resulting in a 1% to 2% decrease in total marine angling expenditures for California (Section 3.3.1).

6.3.5 Social Implications

The proposed OY proxies under this alternative may have a significant impact on the fishing community structure by limiting harvest levels for commercial and recreational anglers, and therefore potentially limiting revenues generated by both fisheries. A drop in recreational fishing activity could cause a ripple effect for all industries that directly or indirectly serve white seabass fishermen. A drop in potential earnings for commercial operators targeting white seabass could result in these operators leaving the fishery altogether, or expending more effort targeting other commercial species. Dealers, markets, and restaurants handling white seabass may have to supplement business with other species or with white seabass from foreign markets in order to offset the effects of reduced availability of white seabass in California.

6.4 Alternative D - OY Proxy Based on 1947 to 1957 Catch Data

6.4.1 Effects on White Seabass

This alternative is similar to C, using catch data as a proxy for MSY and then reducing this number as a precautionary adjustment for OY (see Section 5.6.4).

This alternative and the framework management approach, like alternatives B and C, address one of the primary objectives of developing a sustainable fishery for white seabass by setting an upper harvest limit. This alternative is intermediate between the limits set in the other two alternatives. This alternative, like alternatives B and C, would allow continued recovery of white seabass while important data were collected to yield a better defined MSY/OY control rule. Implementation of alternative D would have some uncertainty and risk, similar to alternative B (see Section 6.5).

This alternative, unlike alternative C, does not use recent catch as a proxy for MSY, but instead uses catch data from many years ago. Using an earlier time period (1947-1957) when new white seabass regulations were not implemented and catches were fairly stable might provide a better estimate of MSY/OY. However, the use of an earlier time period may not be very reflective of current conditions, yielding an inaccurate MSY/OY value. This may be especially true for white seabass because there has been considerable loss and modifications of their habitat, particularly embayments, since 1947-1957.

6.4.2 Effects on Non-Target Species

6.4.2.1 Effects on Non-Target Finfish

Effects on non-target finfish are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.1). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.2.2 Effects on Invertebrates

Effects on invertebrates are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.2). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.2.3 Effects on Seabirds

Effects on seabirds are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.3). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.2.4 Effects on Marine Mammals

Effects on marine mammals are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.4). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.2.5 Effects on Marine Turtles

Effects on marine turtles are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.5). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.2.6 Ecological Interactions

Ecological interactions are largely unknown, but effects on them are not expected to be significant and differ from effects under alternative A (see Section 6.1.2.6).

6.4.3 Habitat Impacts

6.4.3.1 Effects of Consumptive Use on Environment

Effects of consumptive use on the environment are not expected to be significant and differ from effects under alternative A (see Section 6.1.4). Impacts may be reduced if harvest limits are reached and fishing effort is reduced.

6.4.3.2 Effects of Non-consumptive Use on Environment

Effects of non-consumptive use on the environment are not expected to be significant and differ from effects under alternative A (see Section 6.1.5).

6.4.4 Economic Implications

Effects on the fishery-based economy are not expected to be significant and differ from effects under alternative A (see Section 6.1.4). However, if harvest limits are reached and fishing effort is reduced, there could be a negative impact of unknown magnitude.

6.4.5 Social Implications

Effects on the fishing community structure are not expected to be significant and differ from effects under alternative A (see Section 6.1.5).

6.5 Risk Analysis of the Alternatives

Managing the white seabass fishery with an MSY/OY control rule when little stock information exists undoubtedly has considerable uncertainties and associated risks. Establishment of an OY that is too high (more aggressive take) for the current stock size can lead to overfishing. If this is allowed to continue for too long, the stock can become overfished and the fishery could collapse. On the other hand, if the OY is set too low (less aggressive take), the fishery could suffer substantial economic losses.

It is impossible to assess the absolute uncertainty and risk of managing under one of the proposed alternatives since we do not know the “true“ values for MSY and OY. However, it is possible to determine the relative risk of managing under one of the alternatives (more aggressive take) when one of the other alternatives (less aggressive take) would be more appropriate (i.e., the current stock size is smaller than predicted). Table 6-5 presents relative risk in number of years it would take for the white seabass resource to become overfished, if fishing continued at an OY that was more appropriate for a smaller stock size (i.e., overfishing was occurring). Alternative A was not evaluated in the analysis since it does not establish an OY, and therefore has the most risk of the alternatives. The assumptions and details of the models used in the analysis are discussed in Appendix D.

The results clearly indicate that the least risk is associated with alternative C, especially C3. Managing white seabass under any of the options under C would not cause the fishery to become overfished for many years. However, management under alternatives B or D could bring about an overfished condition in as few as 2 to 3 years.

The uncertainty and risk associated with these alternatives again emphasizes the need for more data to be collected so a better defined MSY/OY control rule can be developed.

Table 6-5. Number of years for the white seabass stock to become overfished when management is by one alternative (Y) while stock status suits another alternative (X). OK denotes no undue risk. The two numbers represent results from two different models.

	Y(management)					
X(actual stock status)	B1	B2	D	C1	C2	C3
B1	OK	OK	OK	OK	OK	OK
B2	65-73	OK	OK	OK	OK	OK
D	15-17	18-22	OK	OK	OK	OK
C1	3-4	4-4	6-7	OK	OK	OK
C2	2-3	3-3	4-4	19-23	OK	OK
C3	2-2	2-3	3-4	13-15	39-45	OK

6.6 Effects Found Not to be Significant

California Environmental Quality Act Guidelines (§15128, Title 14, CCR,) require that an environmental document include a brief statement indicating the reasons that various environmental issues were determined to be not significant and therefore not discussed in detail in the document. The following environmental factors were evaluated as having little relevance and insignificant effects on the white seabass resource: aesthetics, mineral resources, public services, utilities/service systems, agricultural resources, cultural resources, geology/soils, land use/planning, population/housing, and transportation/traffic; thus, they were not analyzed in this document.

6.7 Cumulative Effects

White seabass are affected by human generated activities other than fishing in State waters. The combination of effects from the proposed alternatives plus activities not regulated under the WSFMP are expressed cumulatively as declines in the health of the white seabass stock or the ecosystem upon which it depends. Other activities that influence the health and population structure of white seabass include: fishing outside state waters, illegal take, and coastal electric power generation operations. See Chapter 9 for other ecological concerns affecting the white seabass resource.

6.7.1 Take of White Seabass Outside California Waters

As mentioned in Section 2.5, the California fisheries for white seabass target the northern component of the resource, which ranges from Point Conception to Magdalena Bay, Baja California. The center of the population appears to be off central Baja California, Mexico, and could be greatly affected by the Mexican fishery. However, the present and historical size of the Mexican fishery for white seabass is unknown. MacCall et al. (1976) noted that approximately 70,000 pounds (31,752 kg) were commercially-caught annually during the 1960s. By the early 1970s, the catch had increased to 100,000 pounds (45,360 kg). Assuming an average weight of 25 pounds (11.3 kg) per fish, this would equate to an annual catch of 2,500 fish in the 1960s and 4,200 fish in the 1970s. This approximates the commercial harvest in California prior to implementation of Proposition 132. Recent landing figures are unavailable for the Mexican fishery; however, current Mexican regulations recommend that fishing effort not be increased for the artisan fishery, which takes white seabass and other croaker species.

The number of fish currently being taken by the recreational fishery in Mexico is unknown at this time, although anecdotal information indicates that white seabass less than 28 inches are being taken. There are no data to indicate whether the harvest in Mexico is affecting the white seabass population. The extent to which small fish are taken, along with the magnitude of the commercial and recreational Mexican fisheries, could have serious consequences for California's fishery.

6.7.2 Illegal Take of White Seabass

Some seabass are taken illegally by the recreational fishery either out of ignorance or as a calculated circumvention of the regulations. While there are no accurate estimates of the number taken illegally, Wine (1978;1979;1982) reported that in 1976-77,1977-78, and 1980, private boat fishermen landed nearly 2,400, 1,950, and 1,500 undersized white seabass, respectively. This illegal take by a portion of the angling public exceeded the legal take in the CPFV fishery in all three of these time periods. This trend continues today (RecFin 2001).

Poaching (taking fish illegally or during a closed season) and taking undersized white seabass also occurs in the commercial fishery. Few undersized white seabass are taken in the directed white seabass fishery. Vojkovich et al. (1990) found that less than 3% of the catch was less than 28 inches. However, the percentage of undersized white seabass reported in the halibut and white croaker fisheries totaled more than 50% of the incidental white seabass catch; and nearly all were discarded dead. The annual catch of undersized white seabass in these two fisheries was small (approximately 1,700 fish) but together they are similar to the annual catch of the CPFV anglers from 1970 through 1998 (see Figure 3-1). There is no longer a fishery for white croaker because of the health concerns associated with eating that fish. Movement of the halibut gill net fishery and white seabass directed fishery outside of State waters has probably reduced this take.

Although a serious issue, it is not possible at this time to determine whether the illegal take of white seabass poses a significant threat to the long-term survival of the species. Increased enforcement activity and greater public awareness in the past decade has contributed to lessening this problem.

6.7.3 Coastal Electric Power Generation Operations

Coastal electric power generation stations draw in large amounts of water, millions to billions of gallons per day, from nearshore waters for cooling purposes. Marine life can be either entrained or impinged by power plant operations. Entrained organisms are those not strong enough to swim against the current of the intake system. Impinged organisms are those that are collected on traveling screens designed to remove large debris (mostly kelp and trash) from the water entering the power plant. As part of normal operations to eliminate the growth of encrusting organisms growing on the inside of the intake pipes, heated water flows out through the intake pipes for an extended period of time, often several hours. Encrusting organisms such as mussels and barnacles, and fish living within the intake pipes are killed by this process.

Power plants kill billions of fish larvae and hundreds of thousands of juveniles and adults each year (Herbinson 1981). Clean Water Act studies have documented that more than 80% of the larval fish entrained are less than 10 days old (less than 6 mm long) indicating that potential local recruitment is being lost due to power plants; the studies assume that 100 percent of the organisms entrained are killed. In addition to fish, larval forms of invertebrates and adult zooplankton will be lost to the ecosystem.

There are several coastal power plants in southern California. These power plants often impinge juvenile white seabass. They also entrain and impinge potential prey items of white seabass, such as queenfish, white croaker, and northern anchovy, in large numbers. For example, the Huntington Beach Generating Station alone killed over 4 million of these three prey species combined from 1979-1998 (MBC Applied Environmental Sciences 2001). During this same period, over 2,400 juvenile white seabass were impinged. The number of white seabass eggs and larvae entrained, however, is unknown. These numbers could be substantial since white seabass young-of-the-year reside in shallow nearshore waters (Allen and Franklin 1992).

6.8 Summary Analysis of the Proposed Alternatives

Proposed alternatives for management of the white seabass fishery have been analyzed in this chapter. A comparison of these alternatives and their effects on the objectives for the WSFMP and the MLMA enables identification of which alternatives would best meet management needs. Although each one of the alternatives has some benefits for management, only alternatives B and D address most of the objectives of the WSFMP and MLMA (Table 6-6). Alternatives B and D, with similar risks of producing an overfished condition, would allow continued recovery of white seabass while important data were collected to yield a better defined MSY/OY control rule.

However, alternative B would have less economic impact on the recreational and commercial fisheries. The WSSCAP reached consensus that alternative B, with the inclusion of several trigger mechanisms aimed at minimizing the chance of overfishing the white seabass resource, was the preferred alternative.

Table 6-6. Summary of potential effects of proposed alternatives on white seabass fishery management plan (WSFMP) and Marine Life Management Act (MLMA) objectives.

WSFMP & MLMA objectives	Alternative A	Alternative B	Alternative C	Alternative D
Provide for sustainable uses	Does not provide long-term protection	Lessens likelihood of overfishing	Greatly reduces likelihood of overfishing	Lessens likelihood of overfishing
Use adaptive management	Yes	Yes	Yes	Yes
Minimize bycatch and waste	Yes	Yes	Potential to increase mortality of juvenile fish	Yes
Promote research for better management	Yes	Yes	Yes	Yes
Effective monitoring & enforcement	Yes	Yes	Creates enforcement problems	Yes
Restore & protect critical habitats	No effect	No effect	No effect	No effect
Economic effect on local communities	No effect	No effect or small negative effect	Significant effect	No effect or small-moderate effect
Base decisions on best available data	No	Yes	Maybe	Yes
Involve all parties	No effect	No effect	No effect	No effect

6.9 Mitigation

Fishing activities will result in the removal of individual white seabass from the population. However, specific safeguards included in the WSFMP such as management based on OY, regulation of seasons, bag and possession limits, size limits, and waters with restricted fishing and gear are designed to ensure that removal of those fish will not exceed sustainable levels. These provisions allow for both the conservation and maintenance of white seabass off California. Since no negative effect of this proposed project is expected on the white seabass population, mitigation measures have not been provided.

6.10 Consistency With Statewide/Regional Plans

The Department has concluded that the WSFMP is not inconsistent with air quality attainment or maintenance plans, area-wide waste treatment and water quality control plans, regional transportation plans, regional housing allocation plans, habitat conservation plans, natural community conservation plans, other regional land use plans, or any other terrestrial-based plans.