CHAPTER 5

ENVIRONMENTAL MANAGEMENT ISSUES

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5.1 INTRODUCTION

Alternatives defined in Chapter 2 were evaluated in the context of the affected environment (described in Chapter 3) to estimate and compare their potential direct, indirect and cumulative impacts (Chapter 4). Chapter 5 summarizes the major environmental issues that were identified through this analytical process and addresses them through a series of analyses that are required in an Environmental Impact Statement under National Environmental Policy Act and other federal regulations. They include analyses of short-term uses of resources versus the maintenance and enhancement of long-term productivity of the resources; irreversible and irretrievable commitments of resources; energy requirements and conservation potential of the alternatives; urban quality, historic resources and design of the built environment; cultural resources conservation potential of the alternatives; possible conflicts between the alternatives and other plans; and adverse effects that cannot be avoided. This chapter also includes a discussion of possible measures that could be used to mitigate unavoidable adverse effects.

5.2 SHORT-TERM USES VERSUS LONG-TERM PRODUCTIVITY

Short-term uses are generally those that determine the present quality of life for the public. The quality of life for future generations depends on *long-term productivity*; i.e., the capability of the environment to provide resources on a sustainable basis. It is known that fisheries have the potential to reduce long-term productivity of pelagic fish and non-fish resources if management standards are not met. Monitoring determines whether fishery control measures are effective and are being correctly applied to achieve management objectives. The framework procedure in the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (Pelagics FMP) allows for regulatory adjustments to be made in response to changing fisheries, resource conditions and environmental fluctuations.

None of the alternatives would be expected to cause long-term loss of productivity of fish resources (including sharks) harvested by Pelagics FMP-managed pelagic fisheries (Sections 4.1, 4.11.2). Despite the inclusion of measures that would reduce albatross interactions in the Hawai'i-based longline fishery, none of the alternatives are likely to prevent long-term loss of productivity of North Pacific seabird populations if interactions in other Pacific demersal and pelagic longline fisheries are not also reduced (Sections 4.6, 4.11.5). Small numbers of protected sea turtles, especially leatherbacks, loggerheads and olive ridleys,

would be expected to be killed in Hawai'i-based longline fishery interactions under all of the Alternatives, except Alternative 8. Even complete elimination of Hawai'i-based longline fishing mortality would not ensure sea turtle species' survival and recovery because other sources of human-induced mortality would remain (Sections 4.5, 4.11.4).

5.3 IRREVERSIBLE RESOURCE COMMITMENTS

Irreversible commitments of resources are actions which disturb either a non-renewable resource or a renewable resource to the point that it can only be renewed over a long period of time (decades). Loss of biodiversity may be an irreversible resource commitment. For example, extinction of an endangered species, such as the leatherback turtle, would constitute an irreversible loss.

Alternatives 3-8 and 10 include management measures intended to promote the recovery of endangered sea turtle populations. The cumulative effects of these alternatives on the status of threatened and endangered sea turtle species would not be expected to change significantly without a global conservation effort (Section 4.11.4). Relocation of longline fishing effort displaced from the Hawai'i-based longline fishery to areas with higher levels of sea turtle interaction (e.g., off Mexico, where there are important leatherback nesting beaches) has the potential to actually increase the mortality of some sea turtle species through indirect effects (Sections 4.11.7). It is reasonable to anticipate that markets previously supplied by Hawai'i longline products will replace much of the lost production with imports from international longline fisheries where the incidental take of sea turtles is several times greater than the impact of the Hawai'i-based longline fishery (4.11.9).

It is uncertain whether leatherback and loggerhead turtle populations can survive and recover after the high mortalities inflicted by the Asian high seas drift net fisheries during the 1980s. The effects of these fisheries on reproductive capacity are not fully known because juvenile turtles that survived during the 1980s may only now be reaching sexual maturity. Therefore, fishing mortality of even a small number of turtles from the pool of reproductive adults is considered a threat. Management of the Hawai'i-based longline fishery in isolation is not likely to eliminate this threat, especially if Hawai'i-based longline fishing effort in the central North Pacific is replaced by longline fishing effort from other sources (e.g., Japanese swordfish longline fleet).

5.4 IRRETRIEVABLE RESOURCE COMMITMENTS

An *irretrievable commitment* is the loss of opportunities for production or use of a renewable resource for a short to medium period of time (years). The alternatives considered in the EIS produce varying degrees of irretrievable resource commitments. These commitments parallel the environmental impacts evaluated for each resource in Chapter 4. The difference between resource levels under each alternative and potentially higher levels that otherwise could be produced also represents an irretrievable commitment of resources. The difference in output levels is the opportunity cost or lost production. The commitments are

not irreversible, however, because they could be reversed by changing management direction. (The Pelagics FMP includes an adaptive procedure to allow for changes in management direction. Regulatory adjustments can be made based on changing fisheries, resource conditions or environmental fluctuation).

5.5 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL OF THE ALTERNATIVES

The use of fossil fuels for fishing vessel operation and government surveillance and enforcement activities is an irreversible resource commitment. The EIS alternatives are expected to have direct impacts, as well as indirect impacts, on energy requirements.

Direct impacts on energy requirements

Alternatives allowing wider-ranging and greater fishing effort (Alternatives 1 and 2) or requiring higher levels of surveillance and enforcement (Alternatives 3-7 and 10) would be expected to cause higher consumption of fossil fuels. To the extent that the size of the fishing industry is reduced under Alternatives 3-7 or 10, those Alternatives would consume less energy than Alternative 1. Fossil fuels would also be directly conserved if longline fishing effort limitations in American Samoa result from Alternative 9. Alternative 8 has the potential for the greatest conservation of fossil fuels if domestic vessels prohibited from longline fishing do not convert to other fishing activities that consume the same amounts of fuel.

Indirect impacts on energy requirements

Alternatives 6, 7, 8 or 10 may indirectly provide an incentive for increased effort by commercial troll and handline fishers in Hawai‘i to provide fresh tuna and associated pelagic fish as a substitute for reduced domestic longline production. Higher prices for such products during time/area closures of the tuna sector of the Hawai‘i-based longline fishery could motivate small-boat fishers to increase fishing effort, with associated increases in fuel consumption by small vessels that are less fuel efficient than longline boats. Thus, the potential exists for a net increase in energy requirements under alternatives that restrict operations of the Hawai‘i-based tuna longline fishery.

Total ecological cost

Energy is not the only cost associated with fishing activities. All fishing has ecological costs, although these are often not recognized or acknowledged. Given alternative ways of harvesting a resource, ideally those with the lowest ecological costs could be chosen, providing they can be identified. The major obstacle is in defining, measuring and comparing the ecological costs of these alternatives. For example, one way of harvesting a resource may require greater amounts of energy but another, less energy-intensive way may cause some undesirable bycatches (Hall, 1998). These difficulties prevent a comparison of EIS alternatives in terms of their total ecological costs.

5.6 URBAN QUALITY, HISTORIC RESOURCES AND DESIGN OF THE BUILT ENVIRONMENT, INCLUDING RE-USE AND CONSERVATION POTENTIAL OF THE ALTERNATIVES

None of the alternatives would be expected to have appreciable effects on urban quality and the design of the built environment.

The reuse potential of the alternatives is related to the potential for re-direction of asset use. Vessels displaced from the swordfish sector in the Hawai'i-based longline fishery may not be adaptable to or economical for other fisheries. To the extent that vessels and gear become inappropriate and inefficient for other uses, Alternatives 3, 5-8 and 10 would have less reuse potential than Alternatives 1, 2 and 4. To the extent that Alternative 8 would displace existing longline fishing effort in American Samoa's longline fishery, these alternatives would re-direct use of tuna vessels and gear, possibly to developing pelagic longline fisheries in neighboring island states.

5.7 CULTURAL RESOURCES AND CONSERVATION POTENTIAL OF THE ALTERNATIVES

None of the alternatives have specific provisions that would encourage or discourage customary and traditional uses of pelagic resources by indigenous cultural practitioners in Hawai'i, Guam or the Commonwealth of Northern Mariana Islands (CNMI). Alternatives 2, 4-8 and 10 include measures intended to reduce Hawai'i-based longline fishing mortality of pelagic sharks, with potential for benefitting those Native Hawaiians who have a spiritual connection (*'aumakua*) to some shark species and individuals (Section 4.9).

Alternatives 2, 4-7, 9 and 10 would be expected to contribute to American Samoan cultural perpetuation (Section 4.9).

5.8 POSSIBLE CONFLICTS BETWEEN THE ALTERNATIVES AND OTHER PLANS

Alternatives 2-10 are not expected to conflict with any existing conservation plan for pelagic fish or non-fish resources. The no-action baseline (Alternative 1) would conflict with international and national plans for reducing the incidental catch of seabirds in longline fisheries and with the Shark Finning Prohibition Act. Option A (fishing experiment) has the most potential to contribute to a significant net long-term reduction in sea turtle mortality and ensure turtle species' survival and recovery. Through displacement of Hawai'i-based longline fishing effort to new fishing areas where there are higher rates of interaction with sea turtles and through market-driven transfer of takes to countries which are major exporters of fresh swordfish and tuna to the United States, some of the Alternatives (3, 5, 6, 7, 8 and 10) have the potential to increase net mortality. If this occurs, the latter alternatives are unlikely to achieve the conservation objectives of recovery plans for sea turtle species.

None of the Alternatives conflict with the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Under section 6(a) of the Coral Reserve Executive Order (EO), the boundary of the reserve extends seaward to 50 nm. This definition of the reserve area is the same as the "protected species zone" that was established through Pelagics FMP Amendment 3. Longline fishing is already prohibited in the protected species zone. The Pelagics FMP does not prohibit pelagic troll and handline fishing in the protected species zone, whereas the Coral Reserve EO allows commercial trolling for pelagic species only by vessels with National Marine Fisheries Service (NMFS) bottomfish limited access permits in certain areas and with certain (yet to be determined) limitations to be imposed on a by-owner basis.

None of the EIS Alternatives conflict with the access and use restrictions within National Wildlife Refuge (NWR) boundaries in the Northwestern Hawaiian Islands (NWHI), Midway, Johnston, Jarvis, Howland, Baker or Rose Atoll (American Samoa). New NWR have been established at Palmyra and Kingman Reef by Executive Orders that extend refuge boundaries seaward to 12 nm offshore. None of the EIS alternatives would prohibit commercial pelagic fishing within 12 nm of Palmyra or Kingman Reef. Alternatives 6 and 7 would establish seasonal closures for the entire Hawai'i-based longline fishery. Alternative 10 would establish a time/area closure for both the Hawai'i-based and other U.S. longline fisheries managed under the Pelagics FMP. However, none of the latter alternatives would prohibit longline fishing as comprehensively off Palmyra and Kingman Reef as the access and use restrictions of the NWR.

5.9 ADVERSE EFFECTS THAT CANNOT BE AVOIDED

Implementation of any of the alternatives would result in some unavoidable adverse environmental effects. The following adverse effects are inescapable under some or all of the alternatives.

5.9.1 Indirect Effects on Sea Turtle Mortality Associated with Relocation of Longline Fishing Effort

During late 2000, much of the Hawai'i-based swordfish longline fishing effort had been relocated to areas offshore of Mexico (Honolulu Fish. Co., Pacific American Fish Co. and Taiwan Fish Co., pers. comm., November 2000). Proximity to Mexico's leatherback turtle nesting beaches would be anticipated to increase the incidental longline take of this species compared to Hawai'i-based longline fishing. To varying degrees, this effort relocation occurs annually, but depending on the management regime imposed, some relocation may become permanent.

NMFS expects that the prohibition on swordfish-style longline methods included in the "reasonable and prudent alternative" (RPA) of the Biological Opinion on the Authorization of Pelagic Fisheries under the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region (Pelagics BO) (NMFS, 2001a) and incorporated in the Preferred

Alternative (Alternative 10) of the Final EIS will result in some shift of swordfish or mixed target longline fishing effort outside the jurisdiction of the Pelagics FMP. Approximately seven of the estimated 30 longline vessels currently fishing outside the Exclusive Economic Zone (EEZ) off California and making landings in California have de-registered their vessels from Hawai'i longline limited access permits (NMFS, 2001a). Additional vessels currently registered under Hawai'i-based longline limited access permits could de-register their permit and continue longline fishing for swordfish provided that no part of a fishing trip occurred inside the EEZ around Hawai'i. Such operations could land their catch in California or other eastern Pacific ports. This practice would avoid the prohibition on swordfish-style longline fishing included in the RPA and Preferred Alternative 10 of the EIS. NMFS would discourage this practice by restricting the flexibility of Hawai'i longline limited access permit holders to de-register and re-register vessels. NMFS believes this measure is necessary to insure that the impacts of the Hawai'i-based swordfish longline fishery are not shifted to the California longline fishery because such a transfer of effects would not increase the likelihood of survival or recovery of sea turtle species (NMFS, 2001a).

Regulation of the entire U.S. swordfish-style longline fishery may have the effect of encouraging these vessels to relocate outside of U.S. jurisdiction to foreign fisheries where there may be a lack of regulations, monitoring and trained scientific personnel. Scientists involved in conservation of dolphins in the eastern Pacific purse seine tuna fishery have observed that the strict environmental standards of some developed countries sometimes results in their fleets relocating to developing nations, where regulations are less strict. The impacts do not disappear; they are simply transferred to other areas (Hall, 1998).

For sea turtles, the indirect effect of the alternatives may encourage Hawai'i-based longline fishing effort to relocate to places where there are a lack of regulations, monitoring and trained personnel. There may also be higher levels of uncertainty about the impacts of fishing on sea turtle populations, with even less data available on population structure and abundance than what was generated by the Hawai'i-based longline fishery.

5.9.2 Market-driven Indirect Effects on Sea Turtle Takes and Mortalities Associated with Increased Imports of Fresh Tuna and Swordfish

The alternatives would apply standards for management to the Hawai'i-based longline fishery in isolation from the international supply and market systems for tuna and swordfish (Sections 4.8, 4.11.9). As the United States is a major consumer of these products, the narrow management focus could encourage expansion of fisheries operating outside of the EEZ. These fisheries are not subject to the management requirements and provisions for protected species that apply to the Hawai'i-based longline fishery. Products from these other fisheries could compete in the U.S. seafood market, replacing the reduction in fish products supplied by regulated U.S. pelagic fisheries. Levels of take and mortalities of sea turtles and other protected species in many of the areas from which substitute pelagic fish products could be imported are higher than those in the Hawai'i-based longline fishery (Section 4.11.10). Thus, market-driven transfer of sea turtle interactions resulting from

Alternatives 3-8 and 10 that are intended to reduce interactions in the Hawai'i-based longline fishery could produce greater adverse cumulative effects on depleted sea turtle populations in the Pacific and other oceans (Section 4.11.10).

5.9.3 Displacement of Pelagics FMP-managed Domestic Longline Fishing Vessels and Associated Pelagic Fish Marketing

Some or all of the vessels currently participating in the Hawai'i-based swordfish longline sector are likely to be displaced under Alternatives 3, 5-7 and 10. Alternatives 6-8 and 10 are likely to displace some or all of the vessels currently participating in the Hawai'i-based tuna longline sector and Alternative 8 would also displace vessels in American Samoa's tuna longline fishery (Sections 4.8, 4.11.8). Alternatives 1, 2 and 4 would not be expected to displace domestic longline fishing vessels from Hawai'i or American Samoa. Alternative 9 could lead to displacement of vessels that entered American Samoa's domestic longline fishery after July 15, 2000, if future action is taken by the Western Pacific Regional Fishery Management Council (Council) and NMFS to limit effort in this fishery.

Although Hawai'i vessels that are presently rigged for swordfish or mixed target longline fishing could be converted to target tuna, swordfish vessel operating costs and vessel debt payments for financed boats may be too high to be recovered by the revenue typically generated by targeting tuna (Section 4.8). Alternative fisheries and uses are fewer for swordfish vessels than for typically smaller tuna vessels. Vessels displaced from the swordfish sector in the Hawai'i-based longline fishery may not be readily adaptable to or economical for other fisheries (Section 4.8). To the extent that vessels and gear become inappropriate and inefficient for other uses, Alternatives 3, 5-8 and 10 would have greater adverse effects than Alternatives 1, 2 or 4. To the extent that Alternative 8 and, in the longer term, Alternative 9, would displace existing longline fishing effort in American Samoa's longline fishery, these alternatives would re-direct use of tuna vessels and gear, possibly to pelagic longline fisheries developing in other Pacific island states. Potential buyers for a limited number of tuna vessels displaced from the Hawai'i-based longline fishery might be found in a few island areas (e.g., Tonga, Fiji) where longline fisheries are expanding.

Alternatives 3, 5-8 and 10 would be expected to reduce the supply of fresh swordfish and tuna landed in Hawai'i for fresh marketing. To the edtent that such reductions would affect the scale and success of the operation of the Honolulu fish auction and seafood wholesalers, the new fish wholesale infrastructure planned for construction on State of Hawai'i's property at Pier 36 in Honolulu might need to be scaled down or even eliminated. The State of Hawai'i has already invested $12 million in dock and site improvements. Such an effect is unlikely to occur under Alternatives 1, 2, 4 and 9.

5.10 POSSIBLE MITIGATION MEASURES FOR UNAVOIDABLE ADVERSE EFFECTS

This section lists some of the possible ways in which unavoidable adverse effects of the alternatives might be mitigated. No attempt has made to define detailed programs for implementation of any of the possible mitigation measures.

5.10.1 Mitigation of Cumulative Effects Preventing Recovery of Protected Species

It is clear from Congressional discussion of the proposed Endangered Species Act (ESA) prior to its enactment in 1973 that the Congress intended that ESA-listed species be protected throughout the range of their critical habitat regardless of national boundaries. "The dominant theme pervading all Congressional discussion of the proposed ESA was the overriding need to devote whatever effort and resources were necessary to avoid further diminution of national and worldwide wildlife resources (emphasis added)...." (Coggins, 1975). International cooperation is a must to achieve conservation goals for protected species such as sea turtles that live in, and travel across, many national jurisdictions. That cooperation, however, requires a harmonization of objectives that has not yet often been achieved. Even though management needs to be international, each region presents different problems that need to be addressed. Both the global and local aspects of protected species conservation need to be considered.

If there is a solution to be found to reduce longline fishery interactions with sea turtles, it is likely to be developed with the assistance of the longline fishing industry. One model for this approach is the eastern Pacific purse seine industry that developed changes in fishing tactics that reduced fishery interactions with dolphins from hundreds of thousands of animals to a few thousand per year. These tactics were effectively exported to other fishing nations to reduce their kills of dolphins. A similar approach could be followed to reduce interactions with leatherback and other sea turtles in the Hawai'i-based and other longline fisheries.

The experience of the multi-national eastern Pacific purse seine tuna fishery in reducing the incidental capture of dolphins in fishing gear demonstrates that, under certain circumstances, incidental take of protected species problems can be addressed successfully but that a number of conditions are important for success. Many of these are of more general relevance for the recovery of other protected species (Hall, 1998):

- Recognition by nations and industries/fishing communities that a problem exists and a commitment to its solution (Hall, 1998). "Orders from 'on high' (either at the national or international levels) without involving the affected communities can often be counter-productive" (Hall, 1999).

- Continued and constructive interaction among fishing communities/industry, scientists, managers and environmentalists, based on the objective of finding a solution that achieves the desired conservation goals, while allowing the continuation

of the fishery. This implies that the demands of the extreme fractions of all sectors involved will, most likely, not be met (Hall, 1998).

- Protected species conservation may be impeded in an international context if politico-ethical considerations based solely on one country's perception of protected species are used as the overriding management objective. Not all nations, cultures or socio-economic classes value species or groups of species in the same way (Hall, 1998).

- The development of a scientific program to understand why the incidental catches happen, and the conditions that affect their level. A critical part of the program is the flow of information to the fishers concerning all factors affecting incidental mortality. It should also inform managers and the public of the full ecological consequences of any alternative proposal put forward to mitigate or eliminate the problem (Hall, 1998).

- The development of clear objectives with regards to the mitigation of impacts, with a schedule dictated by a realistic approach to the problem. Where appropriate, they should be defined within an international context and with the participation of all nations involved (Hall, 1998).

- All concerned should work towards the objectives in an iterative manner via realistic short-term goals that will encourage fishers to achieve them (Hall, 1998).

- The development of a system of incentives, from the level of the nation down to that of the individual fishers, with an emphasis on individual responsibility whenever possible. The system should serve as a selective force, encouraging the fishers to develop gear, techniques and decision-making skills that would allow them to continue using the resources while at the same time reducing the ecological impacts of their activity (Hall, 1998).

- The development of a fair system of regulations, based on scientific findings and statistical analyses. This should be done in close consultation with the fishers. The system should allow for creativity and experimentation and avoid micro management (Hall, 1998).

- The development of observer programs designed to determine the factors that cause, or increase, incidental mortality as well as the estimation of incidental catch numbers (Hall, 1998).

- Continued monitoring for unforeseen developments after an apparent solution has been found (Hall, 1998).

5.10.1.1 Mitigation of Cumulative Effects Preventing the Recovery of ESA-listed Sea Turtle Populations

Significant progress toward comprehensive conservation of threatened or endangered sea turtle species is not likely to occur without an international plan of action that integrates conservation of nesting habitat, nesting female turtles, and their eggs with efforts to globally reduce fisheries interactions with sea turtles.

Bi-lateral, multi-lateral and international programs to protect sea turtles

Potential multi-lateral actions ranging from sea turtle nesting habitat protection to turtle protection provisions in trade agreements might be considered and implemented through appropriate regional fisheries management organizations or commissions and under the bycatch provisions of the United Nations Fish Stocks Agreement (UNFSA) and the Food and Agricultural Organization (FAO) Code of Conduct for Responsible Fisheries.

Nesting and other critical habitat conservation

Bi-lateral programs to protect and restore sea turtle nesting habitats (e.g., NMFS-funded programs in Mexico, Costa Rica) have been established for eastern Pacific leatherback turtle populations but similar conservation programs are lacking in the western Pacific nesting habitats that have been linked to the majority of leatherback turtles taken in the Hawai'i-based longline fishery.

Reduction of sea turtle takes in fisheries worldwide

<u>Test and prove the effectiveness of longline gear and tactics modifications</u>

One of the conservation measures recommended in the Pelagics BO (NMFS, 2001a) is for NMFS to provide the technical and financial assistance necessary to export advances in knowledge of techniques and gear modifications that reduce sea turtle interactions and/or post-capture mortality. Broad exposure to such innovations could reduce fishery impacts to sea turtle populations worldwide.

Option A describes a fishing experiment to test methods of reducing sea turtle takes in the Hawai'i-based longline fishery. If modifications of longline gear and fishing tactics are demonstrated to be successful, they could be exported to international longline fisheries which account for virtually all of the sea turtle interactions with longline gear. There is a precedent for this type of mitigation in efforts to reduce sea turtle mortalities associated with shrimp harvested in trawls. Development of turtle exclusion devices (TED) to modify shrimp trawls made them less harmful to sea turtle populations. The international effort to spread this gear technology and concern for reducing sea turtle mortalities associated with trawl-caught shrimp is a good example of how important it is to develop appropriate fishing technology and to apply it to global efforts to reduce adverse impacts on protected species.

Potential market-driven mitigation measures by consumers and the market

Aside from any possible U.S. government initiatives, the market or the consumers themselves might take market-driven measures aimed at mitigating adverse effects on sea turtles and other protected species. These market-driven actions might include as a broad category of possibilities, eco-labeling initiatives and consumer boycotts. The role of the consumer could be focused on helping to resolve the problems of transferred adverse impacts on sea turtles and other protected species associated with importing seafood products into the U.S. market.

The consumer has been shown to be a formidable force in promoting tangible outcomes on protected species. Consider the issue of dolphin safe canned tuna. The threat of a consumer boycott drove the leading U.S. tuna canners to adopt "dolphin safe" labeling requirements. The same type of market-driven effort might prove equally successful in applying consumer pressure to encourage producers overseas and domestically to reduce adverse impacts on sea turtles, sea birds and sharks.

Reduce Hawai'i recreational shore fishery interactions with green sea turtles

The Pelagics BO (NMFS, 2001a) prescribes, as part of the reasonable and prudent alternative, a two-month (April-May) seasonal closure on longline fishing by U.S. vessels in areas between 15° N. latitude and the equator. The objective of this specific measure is to reduce the incidental take of leatherback and green turtles in the longline fishery. From observer data, and using a model-based predictor, McCracken (2000) estimated that between 37 and 45 green turtles (average 40) were taken each year by the Hawai'i-based longline fishery, and of these, an average of five were killed (given a 13 percent mortality rate).

The Hawai'i recreational shore fishery is another source of mortality specifically for green turtles. Of the 299 documented turtle strandings in the main Hawaiian Islands during 1999, 15 percent, or 43 animals, had recreational fishing hooks in them. The most serious aspect of green turtle interactions with recreational shore fishers is entanglement in monofilament fishing line. The line may get wrapped around the turtle's flipper and restrict its movements and ultimately may even sever the appendage. 20 of the 43 documented turtle strandings related to recreational fishing were dead when recovered. The remaining 23 turtles were entangled in monofilament line (NMFS, 2000a). Anecdotal information from recreational fishers suggests that the rate of interaction with shoreline fishing gear is much higher than the NMFS-documented strandings. Until this far greater source of mortality is mitigated, the green turtle population in Hawai'i is likely to remain threatened.

5.10.1.2 Mitigation of Cumulative Effects Preventing the Recovery of Albatross

Nesting and other critical habitat conservation

Japan's "Short-Tailed Albatross Conservation and Management Master Plan" identifies a possible long-term goal of establishing additional short-tailed albatross breeding grounds away from the primary nesting colony at Torishima once there are at least 1,000 short-tailed albatross on Torishima (cited in FWS, 2000). Midway Atoll National Wildlife Refuge has been identified as a possible site for establishing an additional breeding colony (FWS, 2000). The northwest Pacific coast of the United States is a historical foraging area for the short-tailed albatross (WPRFMC, 2001b). Until other safe breeding sites are established, short-tailed albatross survival will continue to be at risk due to the possibility of significant habitat loss and mortality from natural catastrophic volcanic eruptions and by land and mud slides caused by monsoon rains at the principal Torishima and Tsubamezaki nesting colonies in Japan (FWS, 2000).

Reduction of albatross takes in fisheries worldwide

An array of seabird mitigation methods have proven to be effective in significantly reducing the incidental take of albatross (WPRFMC, 2001b). More widespread use of such deterrents is expected as more countries adopt and implement national plans of action in conformance with the non-binding FAO International Plan of Action to reduce seabird bycatch in longline fisheries.

Technological innovation is likely to improve on currently available mitigation methods which are recommended by the Council (WPRFMC, 2001b) and by organizations such as FAO. It is important to continually evaluate new seabird mitigation methods and modifications of existing methods to improve their effectiveness and ease of use and to cope with possible habituation by seabirds to particular methods (WPRFMC, 2001b).

5.10.2 Mitigation of Cumulative Economic Effects on Hawai'i-based Longline Industry

5.10.2.1 Fishing experiments

A fishing experiment designed by NMFS is detailed in Option A (Chapter 2). The experiment would allow longline fishing in areas, at times and using methods not otherwise permitted under the Pelagics BO (NMFS, 2001a) and would result in short-term adverse effects on sea turtles that have not been analyzed in the Pelagics BO. Anticipated takes by such an experiment were not included in the draft incidental take statement. If NMFS authorizes such an experiment, it would probably be conducted under a permit issued under Section 10 of the Endangered Species Act. The Section 10 permit can be issued only after the

anticipated takes are analyzed in a separate Biological Opinion that specifically examines the impacts of the experiment.

Fishers themselves could conduct other experiments under the rules imposed by the BO (Preferred Alternative 10) to test the feasibility of fishing deep for swordfish in the convergence zone north of the Hawaiian Islands. This would essentially transfer the "mixed" fishing effort which will no longer be permitted under Preferred Alternative 10 to deeper depths. Such tests might evaluate bait type, time of day, most importantly, thermocline depth in relation to gear depth. No Section 10 permit would be required if longline fishing were conducted within the regulations on bait, lightsticks, gear and fishing depth that would be promulgated under the Preferred Alternative (Alternative 10).

Fishing experiments could encourage Hawai'i-based swordfish longline vessels to remain in Hawai'i rather than relocating to other fisheries that are unregulated with respect to sea turtle impacts, which may be several times greater than those in the Hawai'i-based longline fishery.

5.10.2.2 Longline gear, permit or vessel buyback

Programs for pelagic fishing vessel buyback and conversion were established by the governments of Japan, Korea and Taiwan after high-seas drift net fisheries conducted by these nations' fleets were terminated in 1992 in a response to a United Nations' resolution (Huppert and Mittleman, 1993). Permit and vessel buyback programs were established for U.S. fisheries in the Atlantic that were considered to be overcapitalized. It is unknown whether the U.S. government would establish a buyback program for Hawai'i-based longline vessel owners who would be displaced by implementation of certain of the alternatives. A similar mitigation measure would be compensation of discounted future earnings of the vessels for a fixed time period, assuming compensation was based on a fishery with no additional restrictions.

Some holders of a Hawai'i-based longline limited access permit, if displaced by implementation of any of the alternatives, might be willing to sell their permit or vessel to the federal government or a third party for the sole purpose of retiring the permit or vessel. Subject to the availability of funds for this purpose, the government might be willing to buy these permits or vessels to enable and encourage fishers who wish to pursue alternatives to longline fishing for swordfish in the Western Pacific Region. Any such buyout would require, at a minimum, a willing seller, a willing buyer and available funds.

No mitigation measures have been identified to subsidize the costs that would be incurred during the transition into new fisheries or new areas by Hawai'i-based longline fishers who would be displaced by implementation of certain of the alternatives.

5.10.3 Adaptive Resource Management

Most fishery management decisions are made with some degree of uncertainty because of incomplete information and marine resource unpredictability. These issues are magnified in the EIS because one of the management objectives is to reduce Hawai'i-based longline fishery interactions with ESA-listed sea turtles. Incidental capture of sea turtles by the Hawai'i-based longline fishery is a rare event. Estimating or predicting the number of sea turtles that may be taken by the Hawai'i-based longline fishery during any given year is hampered by lack of data. The number of interactions varies depending on the amount, type and distribution of longline fishing effort, natural variation in ocean conditions and sea turtle abundance. The available estimates do not include uncertainty associated with small sample size in the scientific studies or differences in handling of captured sea turtles between scientific studies or fishing operations. In addition, the sea turtle take estimates are based on fishing effort for a six-year period (1994-1999) of longline fishing during which the number of swordfish and mixed target trips has declined and the number of tuna trips and the number of hooks per set of tuna fishing has increased.

Court-ordered area closures (Alternative 3) implemented in mid-2000 have caused a redistribution of Hawai'i-based longline fishing effort to open areas where takes of sea turtles have been reported for the first time. In 2000, for example, the first takes of loggerhead turtles by deep-set tuna longline gear were reported. Information about the distribution of sea turtle takes will continue to change and should be evaluated before any particular time/area closure can be determined to achieve a target level reduction in sea turtle takes with a high level of probability. If interactions with sea turtles are random events that become more probable with increased fishing effort, time/area closures may concentrate longline fishing effort in open areas, thereby inadvertently increasing the probability of interactions. Adaptive management is the best strategy because it allows for learning and continual improvement of resource management strategy based on new information.