Southwest Region Current Bycatch Priorities and Implementation Plan

[NOTE: This is a public, working document that will be revised in the future as additional bycatch minimization opportunities occur.]

SOUTHWEST REGION
NATIONAL MARINE FISHERIES SERVICE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE WASHINGTON, D.C.

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I. INTRODUCTION

The National Bycatch Strategy

On March 11, 2003, the National Marine Fisheries Service (NMFS) initiated a six-part National Bycatch Strategy developed in response to a petition for rulemaking, in which the petitioner asserted that NMFS was not complying with its statutory obligations to monitor and minimize bycatch. The first component of the announced Strategy is a comprehensive review of the agencies progress toward meeting the National Bycatch Goal, which had been described in a 1998 report entitled *Managing the Nations Bycatch* (NMFS 1998). The second component of the Strategy is the development of a national approach to a standardized bycatch reporting methodology, as required by the Sustainable Fisheries Act. This approach is set out in *Evaluating Bycatch: a National Approach to Standardized Bycatch Monitoring Programs* (NMFS 2003), which concluded that at-sea observation (observers or digital observation) provides the best mechanism to obtain reliable and accurate bycatch estimates. The third component, to which the present document contributes, consists of implementing the national bycatch goal through regional implementation plans.

The National Goals for Regulating Bycatch

NMFS' responsibilities for reducing bycatch are mandated by the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and the Migratory Bird Treaty Act (MBTA). The National Bycatch Goal consists of the statutory requirements related to bycatch contained in these Acts. The National Bycatch Goal defines bycatch as the discarded catch of any living marine resource plus retained incidental catch and unobserved mortality due to a direct encounter with fishing gear (NMFS 1998). This definition is somewhat more expansive than that found in the MSA and is intended to allow consideration of the effects of all fishing related mortality associated with U.S. fisheries.

The MSA provides the following direction with respect to controlling the amount of fish that are discarded in the course of fishing operations in U.S. fisheries: 1) fishery management plans must establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery; 2) conservation and management measures shall, to the extent practicable, minimize bycatch and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch; and 3) fishery management plans must assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure survival of such fish.

The standard set by the MSA for bycatch reduction is "to the extent practicable". NMFS has suggested that "to the extent practicable" should be understood in terms of net benefits to the nation: "From a National perspective, there is too much bycatch mortality in a fishery if a reduction in bycatch mortality would increase the overall net benefit of that fishery to the Nation through alternative uses of the bycatch species. . . . In many cases, it may be possible but not practicable to eliminate all bycatch and bycatch mortality." The MSA, however, offers no such unusual definition of the word "practicable". The direction to minimize bycatch where practicable and minimize bycatch mortality where bycatch is unavoidable recognizes that bycatch can have significant negative impacts on marine ecosystems and that those effects must be limited to sustainable levels; but it also acknowledges that bycatch is unavoidable and must be tolerated to some extent if fishery resources are to exploited.

The ESA requires that the incidental take of species listed as threatened or endangered under the Act be limited to the extent that the take is not likely to jeopardize the continued existence of the species or result in the destruction or adverse modification of critical habitat. "Take" is defined broadly by the ESA to include harass, harm, pursue, hunt, shoot, wound, kill, trap. capture, or collect, or attempt to engage in any such conduct. If a threatened or endangered species occurs as bycatch in a fishery, then NMFS may issue an Incidental Take Statement that specifies the impact of any incidental taking, as well as Reasonable and Prudent measures, and terms and conditions to implement the measures, necessary to minimize the impacts.

The MMPA requires that commercial fisheries reduce incidental mortality and serious injury of marine mammals to insignificant levels approaching a zero mortality and serious injury rate. It further requires NMFS to develop and implement Take Reduction Plans to assist in the recovery or prevent the depletion of certain "strategic" stocks of marine mammals. The MMPA requires that NMFS classify each U.S. fishery according to whether there is a frequent (Category I), occasional (Category II), or remote (Category III) likelihood of incidental mortality and serious injury to marine mammals. Participants in Category I or II fisheries are required to register with NMFS, take on board an observer if requested by NMFS to do so, and to comply with all applicable Take Reduction Plan regulations.

The MBTA establishes a federal prohibition on the taking of certain migratory birds, unless permitted by regulations; NMFS monitors and reports the bycatch of these and other seabirds. Several seabird species, such as the marbled murrelet and short-tailed albatross, are also protected under the ESA. If listed seabirds are taken by federally regulated fisheries, NMFS must consult with the U.S. Fish and Wildlife Service, in order to obtain an Incidental Take Permit.

II. SOUTHWEST REGIONAL FISHERIES

This plan addresses bycatch associated with federally managed fisheries for which the Southwest Region has primary responsibility for developing regulatory measures under authority of the MSA, the MMPA or the ESA. Those fisheries are the Coastal Pelagic Species Fishery managed under the Coastal Pelagic Fishery Management Plan, the California and Oregon Drift Gillnet Fishery, managed under the ESA and MMPA, and the Large Vessel Tuna Purse Seine Fishery in the Eastern Tropical Pacific Ocean, managed under the MMPA[1].

A proposed FMP for U.S. West Coast Fisheries for Highly Migratory Species, developed by the Pacific Fishery

[1] Two other California fisheries are also not included in this plan because they are not actively regulated by NMFS. The angel shark/halibut set gillnet (>3.5 in. mesh) fishery, which operates off southern and central California, is a Category I fishery in the MMPA List of Fisheries because the average estimated mortality and serious injury of the Monterey Bay stock of harbor porpoise exceeds 50 percent of the PBR level. In September 2002, the California Department of Fish and Game issued permanent regulations prohibiting set gillnet fishing in ocean waters that are 60 fathoms or less in depth in central California, from Point Reyes to Point Arguello, citing concerns over the incidental take of seabirds and sea otters. California also prohibits this fishery from operating within 3 miles of land south of Pt. Conception. NMFS will continue to monitor this fishery, but also expects that this closure will result in a significant reduction in effort in this fishery off central California, and subsequently, in incidental mortality and serious injury or harbor porpoise. The yellowtail, barracuda, white seabass, and tuna drift gillnet fishery (mesh size >3.5 in and < 14 in.) was added to the 2003 MMPA List of Fisheries as a Category II fishery based on the fishery's similarity to other drift gillnet fisheries, and therefore, its potential to entangle marine mammals. California Department of Fish and Game logbook and landings data for 1991-2001 indicate that there are approximately 24 vessels that operate in this fishery. Vessels in this fishery set at the surface, using drift gillnets of up to 6,000 feet long. NMFS does not currently have observer data on the mortality or serious injury of marine mammals incidental to this fishery. However, in July 2002, NMFS began placing observers on some vessels in this fishery to better assess its potential to entangle marine mammals. Based on information collected by observers, NMFS will reassess the categorization of this fishery and evaluate whether incidental mortality and serious injury needs to be addressed through a Take Reduction Plan.

Management Council, is presently under NMFS review. The final FMP implemented by NMFS will comply fully with the various statutory mandates governing bycatch, as well as meet all of the agency goals with respect to reducing bycatch. Therefore, those fisheries covered by the draft FMP are not covered here, except for the two over which NMFS already exercises regulatory authority: the California and Oregon Drift Gillnet fishery and the large scale tuna purse seine fishery in the ETP. Other than a brief description of the draft FMP below, this plan does not cover the following west coast highly migratory species fisheries: recreational, pelagic longline, small vessel tuna purse seine, harpoon, and albacore troll.

NMFS has advised the Pacific Council that certain aspects of the draft FMP are not likely to be implemented because of concerns about the bycatch of sea turtles. In anticipation of the likely partial disapproval of the HMS FMP, NMFS is developing a companion rule under authority of the ESA to ensure that the west coast longline fishery is not likely to jeopardize the continued existence of sea turtles. NMFS expects to publish the two final rules simultaneously on or about February 19, 2004.

NMFS will conduct an ESA section 7 consultation on the effects of implementing the proposed FMP and a biological opinion resulting from that consultation will be issued prior to a decision to approve, disapprove, or partially approve the HMS FMP or to issue any other regulations to manage the West coast longline fishery under the ESA

Coastal Pelagic Species

The coastal pelagic species (CPS) fishery targets northern anchovy, jack mackerel, market squid, Pacific sardine, and Pacific mackerel. Two of the species, Pacific sardine and Pacific mackerel, are actively managed, that is, harvest guidelines are calculated based on current biomass estimates of each resource. Three species, northern anchovy, jack mackerel and market squid, are monitored only; no current biomass estimates are made. CPS finfish landed by the roundhaul fleet (fishing primarily with purse seine or lampara nets) are sold as relatively high volume, low value products (e.g., Pacific mackerel canned for pet food, Pacific sardine frozen and shipped to Australia to feed penned tuna, and Northern anchovy reduced to meal and oil). Other vessels target CPS finfish in small quantities, typically selling their landings to specialty markets for relatively high prices. These include live bait vessels in California, Oregon and Washington; roundhaul vessels that take Northern anchovy which are sold as dead bait to recreational anglers; and roundhaul and other mostly small vessels that target CPS finfish (particularly Pacific mackerel and Pacific sardine) for sale in local fresh fish markets or canneries. In addition to fishing for CPS, some vessels also fish for Pacific bonito, bluefin tuna, and Pacific herring.

Market squid frequently ranks as California's largest fishery both by tonnage and value. Management authority for the fishery rests with the State and a Market Squid Fishery Management Plan is currently under development by the State. Among the goals of the plan are to ensure proper utilization and the avoidance of bycatch in the market squid fishery as well as wastage of market squid in other fisheries.

California and Oregon Drift Gillnet Fishery

The California and Oregon Drift Gillnet (DGN) fishery targets swordfish and thresher shark. The fishery developed off southern California in the late 1970s as a shark fishery and expanded with the increased catch of swordfish. The fishery is regulated by the State of California under a limited entry system. It was classified by

NMFS as a Category I fishery under the MMPA as a result of interactions with marine mammals, some of which are listed under the ESA, and became the subject of a Take Reduction Plan in 1997. In 2000, NMFS, determined that the fishery was likely to jeopardize the continued existence of leatherback and loggerhead turtles in the Pacific. NMFS subsequently implemented fishery time-area closures under ESA regulations to reduce the takes of leatherback and loggerhead turtles. In 2003, NMFS re-classified this fishery as a Category II fishery based on reductions in takes of marine mammals.

Large Vessel Tuna Purse Seine Fishery

The eastern tropical Pacific (ETP) tuna fisheries, concentrated between 20° N and 20° S latitudes, are dominated by purse seiners targeting yellowfin and skipjack tuna; other gears include longline and pole-and-line. From 1970 to 1980, U.S. participation in the fishery expanded, but during the 1980s a progressive relocation of the U.S. fleet to the central western Pacific occurred. The purse-seine fishery operates year round, exhibiting little seasonality in catch. Large U.S. purse seine vessels (greater than 400 short tons carrying capacity) fish for tuna in the ETP under jurisdiction of the Inter-American Tropical Tuna Commission (IATTC) and are governed by the Agreement on the International Dolphin Conservation Program (AIDCP).

Proposed FMP for U.S. West Coast Fisheries for Highly Migratory Species

On June 18, 2003 the Pacific Fishery Management Council adopted a proposed Fishery Management Plan (FMP) for U.S. West Coast Fisheries for Highly Migratory Species. The proposed FMP covers a number of commercial and recreational fisheries for highly migratory species, including surface hook and line, drift gillnet, harpoon, pelagic longline, purse seine and recreational fisheries. The FMP was transmitted to NMFS on October 31, 2003, and NMFS is in the process of reviewing the plan to determine whether it is consistent with the requirements of the MSA, ESA, MMPA and other applicable law. A critical element of NMFS' review and approval of the proposed FMP will be a determination of whether it establishes a standardized reporting methodology to assess the amount and type of bycatch occurring in each fishery; and whether the conservation and management measures minimize bycatch, and, to the extent bycatch cannot be avoided, minimize the mortality of such bycatch. An ESA section 7 consultation on the effects of implementing the plan on listed species, such as sea turtles and albatross, is part of the review process.

The proposed FMP authorizes NMFS to require that vessels carry observers, and requires observer programs initially for the longline, surface hook-and-line, small purse seine, and commercial passenger fishing vessel fisheries. Initial observer sampling plans for these fisheries are to be completed by NMFS within 60 days of FMP implementation. The SWR, in co-ordination with F/ST-NOP, has identified the following amounts for FY04 observer coverage of three west coast HMS fisheries: California-based pelagic longline ($200,000); small purse seine targeting tunas and selected CPS ($75,000); and the hook-and-line albacore fishery ($100,000).

III. CRITERIA FOR IDENTIFYING VULNERABILITY OF DISCARD SPECIES TO ADVERSE IMPACTS

1. Quantitative assessment of bycatch mortality on the incidentally caught species Assessing the impact of fishing on species that are subject to bycatch or non-landed mortality, as a result of being discarded for regulatory or economic reasons, is in principle no different than assessing the affects of fishing on the target species. If sufficient information is available on fecundity, growth, age-specific rates of natural mortality, and mortality rates associated with discard in the fishery, an estimate of the mortality rate associated with

maximum sustained yield can be made and compared with that resulting from bycatch mortality. For many discarded species, however, such data are not available. In some cases there are insufficient data even to evaluate trends in abundance.

2. Status of the incidentally caught species In the absence of data that allow direct assessment of the effects of bycatch mortality on the reproductive potential of a population, other criteria must be used to determine the severity of the impacts on discarded species. If the species subject to discard mortality are classified as overfished under MSA, or listed as threatened or endangered under the ESA, or enjoys special protections under other statues, such as the MMPA or MBTA, then efforts to reduce bycatch mortality should receive a high priority.

3. High incidence of bycatch in a fishery Species that occur as bycatch as a large proportion of the catch in a fishery may be a management concern depending on the mortality rates associated with bycatch and the status of the incidentally caught species.

IV. Species of Concern in Southwest Regional Fisheries

The following marine resources have been identified as vulnerable as a result of their status or potentially vulnerable due to high rates of bycatch.

Sea Turtles All sea turtles that occur in U.S. Pacific waters are listed as either endangered or threatened under the ESA, and, with the exceptions of olive ridleys and Hawaiian green turtles, are in decline. Sea turtles are taken as bycatch in the large vessel tuna purse seine fishery and the DGN fishery. While the numbers of turtles that are taken in these fisheries are small, the precarious status of the populations, in particular leatherback and loggerhead turtles, makes the populations sensitive even to the small numbers of takes associated with Southwest Regional fisheries. These species have continued to decline in the Pacific basin; both populations have decreased by an order of magnitude over the last two decades. Thus, any fishery-associated mortality, no matter how low, will have negative impacts on the populations. Mitigation measures have been specified for sea turtles in the DGN fishery and the high seas pelagic longline fishery in the West Coast HMS FMP, now under NMFS review.

Dolphins, Whales and Other Marine Mammals Several species of dolphins are taken as bycatch in the large vessel tuna purse seine fishery, three of which are recognized as depleted under the MMPA: the northeastern offshore spotted dolphin, eastern spinner dolphin and the coastal spotted dolphin. The biological status of the coastal spotted dolphin is unclear and information to re-evaluate this stock is limited. The currently depleted populations of both northeastern offshore spotted dolphins and eastern spinner dolphins are not increasing at the rate expected based on the low rate of reported mortalities from the fishery since 1991. The DGN fishery takes Pacific white-sided dolphin, Risso's dolphin, long-beaked and short-beaked common dolphin, and northern right-whale dolphin, and has a history of interactions with fin whales, sperm whales, gray whales, and short-finned pilot whales.

Salmon Sixteen populations of west coast salmon are listed as threatened or endangered under the ESA. Many other populations, particularly those supported by hatchery production, are abundant and support substantial directed salmon fisheries, which are regulated to protect listed stocks. When the Coastal Pelagic Fishery for sardine began to develop off Oregon and Washington, concern was expressed regarding the

potential bycatch of salmon, especially in the fishery just off the mouth of the Columbia River. Pilot observer programs were initiated by the States of Washington and Oregon to document the level of salmon bycatch in their sardine fisheries.

Groundfish Nine groundfish species have been declared overfished by NMFS: bocaccio, canary rockfish, cowcod, darkblotched rockfish, lingcod, Pacific ocean perch, Pacific whiting, and yelloweye rockfish. Rockfish have been reported as bycatch in CPS fisheries and the DGN fishery.

Seabirds Seabirds occasionally interact with, and are taken by, the DGN and large vessel purse seine fisheries. No mitigation measures are presently in place for SWR fisheries, but have been specified for the high seas pelagic longline fishery in the West Coast HMS FMP, now under NMFS review.

Molas Common mola is the finfish most frequently discarded in the DGN fishery. In the calendar year 2001 fishery, 2,525 molas were observed discarded and 2,618 fish retained including 393 swordfish, 363 thresher shark and 1,279 tunas. Twenty-one percent of the 2001 effort was observed. The effect of these captures on the mola population is unknown; over 95% of molas observed captured in the DGN fishery are returned to the ocean alive. However additional research on the effects of capture on individuals and the population is appropriate given the apparently high rates of interaction with the fishery.

Blue and shortfin mako shark Blue shark is the second most common fin fish discarded in the DGN fishery. Unlike molas, most blue sharks are returned to the ocean dead. Relative abundance trends for common thresher, shortfin mako and blue shark in the DGN fishery have been investigated using data from fisher bridge logs, onboard observer records, and an NMFS fishery-independent relative abundance survey. Preliminary results indicate that local thresher shark stocks may be rebuilding after being overfished during the 1980s. Trends in relative abundance of shortfin mako and blue sharks show a slightly decreasing trend in abundance along with decreased fish size in the catch over the same period but the extent to which this has been influenced by shifts in environmental conditions and fish distributions is not known.

Invertebrates Large numbers of small pelagic invertebrates, such as salps, are captured and discarded by the DGN fishery. For example observer records suggest that during the 2001 fishery, as many as 100,000 pelagic tunicates were entangled. The effects of these removals, either on the invertebrate populations or on species which feed on gelatinous macro- plankton, such as sea turtles, is unknown.

V. IDENTIFICATION OF BYCATCH PROBLEMS

Coastal Pelagic Species

CPS vessels fish with encircling nets, targeting a specific school and the most common incidental catch in the CPS fishery is another CPS species. Few measures have been proposed to minimize bycatch (e.g. the use of grates to cover openings of holds through which fish are pumped). In California, limited amounts of information are available from at-sea observations. The bulk of bycatch data is derived from port sampling and suggests a very low incidence of bycatch (PFMC, 2003). When the sardine fishery was initiated off Washington and Oregon, the states implemented observer programs specifically to assess bycatch. The precision and accuracy of these data have not been assessed; however the reported levels of bycatch support the view that bycatch of vulnerable species is not significant. For example, the bycatch of salmon observed in the

Washington and Oregon sardine fishery in 2002 amounted to 1,800 fish, an insignificant amount compared to the landed catch of chinook and coho in the 2002 ocean salmon fisheries, which exceeded 400,000 fish off Washington and Oregon.

California and Oregon Drift Gillnet Fishery

Gillnets are efficient, non-selective gear and the bycatch of non-target species such as common mola, blue shark, skipjack tuna and mackerel in the DGN fishery is high. Between 1997 and 2001 observed landings of 5,300 swordfish were accompanied by the discard of 31,700 fish (excluding invertebrates), including 14,700 mola, 9,200 blue shark, 2,100 skipjack tuna, and 1,600 albacore tuna. Ninety-five percent of the molas were released alive and the majority of the tuna that was caught was landed. The fishery also takes marine mammals and sea turtles. Since 1980, with the exception of a few years, either the California Department of Fish and Game or NMFS have conducted an observer program to collect data on the bycatch of protected species. The DGN fishery is subject to the Pacific Offshore Cetacean Take Reduction Plan, implemented in 1997 to address incidental takes of beaked whales, pilot whales, pygmy sperm whales, sperm whales, and humpback whales. The Take Reduction Plan, which required the use of pingers, 36 feet net extenders, and mandatory skipper education workshops, reduced marine mammal entanglements by an order of magnitude in its first two years of implementation. The DGN fishery also takes Pacific white-sided dolphin, Risso's dolphin long-beaked and short-beaked common dolphin, and northern right-whale dolphin. The mortality rates of these species is less than 5% of the Potential Biological Removal (PBR) level, with the exception of northern right-whale dolphin, fin whales, and sperm whales for which the average mortality rates from 1998 to 2002 were 12%, 17.6% and 55.6% of PBRs, respectively.

In 2000, NMFS determined that the DGN fishery, operating under the Take Reduction Plan, will have a negligible impact on listed marine mammals. Takes of marine mammals in the DGN fishery have declined since implementation of the Take Reduction Plan, and as a result, in 2003, NMFS recategorized the DGN fishery from Category I to Category II on the MMPA List of Fisheries. The short-term goal of the Take Reduction Plan, to reduce mortality and serious injury of marine mammals to less than their PBR level, has been met for this fishery. NMFS is in the process of promulgating regulations that will provide guidelines about how to evaluate whether the long-term goal of a Take Reduction Plan, referred to as the Zero Mortality Rate Goal, has been met. Whether or not this fishery has met the goal will be assessed after a final decision is made.

In 2000, NMFS conducted an ESA section 7 consultation of the DGN fishery and evaluated the incidental take of listed sea turtles and marine mammals by the fishery. The opinion found that the operation of the fishery was likely to jeopardize the existence of leatherback and loggerhead sea turtle populations, and specified reasonable and prudent alternatives (RPAs) under which the fishery could operate. To comply with the RPAs, NMFS implemented time-area closures under the ESA for both species. To protect leatherback turtles, NMFS prohibited fishing with drift gillnets from August 15 through November 15 in U.S. waters in Monterey Bay, California and vicinity, north to the 45˚ N lat. intersection of the Oregon coast. To protect loggerhead turtles, NMFS prohibited fishing with drift gillnets from August 15-31 and January 1-31 in U.S. waters off southern California, south of Point Conception and west to the 120˚ W long., when the Assistant Administrator for Fisheries publishes a notice that El Niño conditions exist. NMFS is in the process of publishing a final rule that would change the loggerhead closure period from August 15-31 and January 1-31 to the months of June, July, and August during El Niño years. The take rates of leatherback turtles in the DGN fishery have been reduced, at least in part, due to the time-area closure. There has not been an El Niño year closure since implementation

of the loggerhead closure, so no data are currently available to evaluate whether that closure is effective at reducing loggerhead takes.

The bycatch of seabirds is well documented for the DGN fishery. Management measures in effect for the DGN fishery greatly reduce the likelihood of interactions with albatross, pelicans or other sea birds.

Large Vessel Tuna Purse Seine Fishery

The U.S. policy regarding the bycatch of marine mammals was in large part defined by the purse seine fishery for tuna in the ETP. In the 1960s the practice of setting nets around dolphins to harvest tuna swimming below was developed in the ETP. From 1970 to 1980 the purse seine fishery expanded, dominated by the United States. Annual dolphin mortality was listed at over 350,000. In 1972, Congress ratified the MMPA, primarily due to the public reaction to the high levels of dolphin mortality associated with the ETP tuna fishery. During the 1980s, a progressive relocation of the U.S. fleet to the Central Western Pacific occurred. In 1980, the U.S. fleet consisted of 126 seiners, 25 bait boats and 4 jig boats with a combined capacity of 118,000 mt. By 1994, only 4 U.S. flag seiners were active in the ETP with a combined carrying capacity of less than 6,000 mt.

Mexico and Ecuador are now the dominant participants in the fishery. A small number of large U.S. purse seine vessels continues to fish the ETP. Since 1998, U.S. flag vessels have accounted for less than 4% of the catch of tunas. In 2001, 5 large U.S. tuna purse seine vessels participated in the fishery out of a total of 140 vessels. The IATTC reports annual estimates of fin fish and dolphin mortality by species and stock, as well as standard errors associated with the estimates for all vessel classes. No U.S. vessels currently fish on dolphins. All large U.S. vessels carry observers while fishing and the accuracy and precision of bycatch estimates is accordingly high. Since 1986, the total mortality of dolphins in the large vessel tuna purse seine fishery has been reduced 98% from about 132,000 in 1986 to less than 2,000 in 2000. The U.S. fleet accounts for less than 4% of the current total effort in the fishery.

While U.S. participation in the fishery has declined significantly, the bycatch of dolphins in the ETP tuna fishery remains a controversial issue (e.g. the recent redefinition of the “Dolphin Safe” designation). NMFS continues its efforts, through its support of the IATTC and international agreements, to reduce bycatch by U.S. and foreign flag vessels.

Bycatch of sea turtles has been documented in the ETP large vessel purse seine fishery (NMFS 1999). NMFS has promulgated regulations dealing with bycatch reduction in the purse seine fisheries and conducted a Section 7 consultation on the regulations. They included provisions requiring immediate release of sea turtles entangled in purse seine gear and special handling and release techniques for sea turtles that are brought on board injured or comatose.

The IATTC defines bycatch as fish other than commercially-important tunas, which are discarded dead at sea while “discards” are defined as commercially important tunas which are discarded dead at sea. The discard rate of juvenile tuna has increased in the ETP fishery as a result of a shift in fishing strategies from dolphin sets to log and school fishing. The vast majority of bycatch and discards comes from sets on floating objects. The AIDCP identifies avoiding the bycatch and discard of juvenile tuna as a goal in ensuring the long-term sustainability of tuna stocks. In 2001, IATTC member nations initiated a full catch retention program to require all large purse-seine vessels to first retain on board and then land all bigeye, skipjack, and yellowfin tuna

caught, except fish considered unfit for human consumption for reasons other than size. The full catch retention program is intended to better document bycatch and act as an incentive for large vessels to avoid bycatch because of the economic penalty associated with having to land fish of little value. At the IATTC Working Group on Bycatch meeting in June 2002, there was a report that incomplete logbook reporting and dumping of fish, in spite of the resolution, were jeopardizing the program. The IATTC resolved in 2003 to continue with efforts to improve compliance and effectiveness in 2003 and 2004.

Parties to the IATTC have acknowledged that the current level of fishing capacity of 219,000 m^3 is in excess of the optimal level required to efficiently harvest tuna in the ETP, and have agreed to develop and implement a plan to achieve a target level of 158,000 m^3 of fishing capacity. If capacity reduction were realized and also resulted in reductions in fishing effort, associated bycatch levels would also be reduced.

VI. STRATEGIES FOR REDUCING IMPACTS

This section considers possible new bycatch management measures that should be considered on a fishery-by-fishery basis, including consideration of international and enforcement issues as necessary.

Coastal Pelagic Fishery

Amendment 9 of the CPS Fishery Management Plan recommended evaluation of the use of grates to cover openings of holds through which fish are pumped to allow release of larger fish. Oregon requires that a grate must be in place to sort out larger fish. The use of grates should also be evaluated for use in California and Washington and required if demonstrated to reduce the mortality resulting from bycatch. The cost of grates is minimal, approximately $100 per unit.

Drift Gillnet Fishery

NMFS has required a variety of modifications in the DGN fishery to reduce the bycatch rates of marine mammals, including the use of pingers, 36 feet net extenders, and mandatory skipper education workshops. In addition, NMFS has implemented significant time-area closures to reduce the bycatch of sea turtles. NMFS has determined that bycatch associated with the DGN fishery is consistent with the requirements of the ESA and MMPA. Gear modification measures were put in place as part of NMFS Take Reduction Team recommendations to reduce the take of marine mammals. Mesh sizes greater than 14 inches, 36 foot suspenders to sink the net, and pingers to drive off animals have shown good results in reducing the take of marine mammals. The gear modifications have also reduced the bycatch (discarded dead) of striped marlin, skipjack tuna, blue shark and common mola. However, they have increased the bycatch (discarded dead) of albacore. Tests for the statistical significance of these differences have not been conducted. Time/area closures have been developed for the DGN fishery by the states to protect juvenile and adult sharks, thus reducing the bycatch of these species by reducing economic discards. Time/area closures also exist to protect sea turtles and since the closures reduce effort, they tend to reduce the overall bycatch of other fish. Under state law in California, nets can only be set 2 hours before sunset and must be out of the water two hours after sunrise, to reduce the discard of striped marlin, which cannot be landed commercially.

Large Vessel Tuna Purse Seine Fishery in the Eastern Tropical Pacific

No new management measures or gear modification have been identified that would further reduce bycatch of juvenile tunas or protected species by large U.S. vessels fishing in the ETP purse seine tuna fishery. NMFS should continue its efforts, through its support of the IATTC and international agreements, to reduce the bycatch of protected species and juvenile tunas by U.S. and foreign flag vessels (see recommendations for research). NMFS should continue implementing the requirements of the 1999 biological opinion on the fishery as regulated by the MMPA.

VII. STANDARDIZATION AND ENHANCEMENT OF BYCATCH REPORTING METHODOLOGIES

Coastal Pelagic Species

In 1999, Amendment 8 to the Northern Anchovy Fishery Management Plan was partially approved by the Secretary of Commerce. The portions of Amendment 8 approved by the Secretary added four species to the plan, implemented limited entry to prevent overcapitalization, and changed the name of the plan to the Coastal Pelagic Species Fishery Management Plan. Other provisions were not approved, in part because they did not conform to National Standard 9 of the MSA. Specifically, Amendment 8 did not contain a standardized reporting methodology to assess the amount and type of bycatch in the CPS fishery and did not explain whether additional management measures to minimize bycatch and the mortality of unavoidable bycatch were practicable. Amendment 9 to the FMP was developed in response to NMFS' partial disapproval of Amendment 8.

Amendment 9 addressed NMFS' partial disapproval by recommending 1) that state agencies, federal agencies, and tribes develop an observer program for new fisheries for CPS north of Pigeon Point, California; 2) that state agencies, federal agencies, and tribes develop programs to monitor and record CPS bycatch at the docks; 3) evaluation of the use of grates to cover openings of holds through which fish are pumped to allow release of larger fish; and 4) that federal regulations implementing the FMP include authorization for placing observers on CPS fishing vessels. The first two recommendations described efforts already undertaken by state agencies.

Amendment 9 did not specify a standardized reporting methodology to assess the amount and type of bycatch in the CPS fishery. Rather, it recommended that state, federal, and tribal agencies develop programs (including at-sea observation) for monitoring and recording bycatch, and it summarized the state's approaches for monitoring bycatch and require that bycatch data derived from these efforts be reported in the annual Stock Assessment and Evaluation Report. NMFS approved Amendment 9 and implemented regulations providing NMFS with the authority to place NMFS certified observers aboard fishing vessels operating in the coastal pelagic species fishery in circumstances where other data collection methods were deemed insufficient for management of the fishery. Beginning in 2000, Oregon and Washington implemented observer programs for their emerging sardine fisheries. California has continued its port sampling program that assesses bycatch in CPS fisheries and requires logbooks for the squid fishery, but not for other CPS fisheries.

The available information on bycatch in the CPS fisheries, including observer and port sampling data, does not indicate that bycatch is a significant problem. Reported bycatch consists primarily of other CPS species (much of which is landed), salmon off Washington and Oregon but at very low levels relative to the catch in

salmon fisheries, and small numbers of barracuda, herring, blue shark, and thresher shark. By catch for the fishery is reported annually in the Stock Assessment and Evaluation Report, but reporting methodologies are not standardized among the three state agencies. This is not unexpected since the sardine fisheries off Washington and Oregon have only emerged in the past few years. In California, the port sampling program records observed bycatch as presence/absence evaluations; the actual amounts of bycatch are not quantified. Additional at-sea-observer data for California fisheries would be useful in quantifying and characterizing bycatch that may not be identified in the port sampling process, particularly in sectors of the fishery where sorting can occur at sea.

Recommendations: The CPS FMP should be amended to explicitly establish a standardized reporting methodology to assess the amount and type of bycatch occurring in all sectors of the fishery. The standardized methodology established by the FMP should be capable of reporting the precision and accuracy of bycatch estimates. A pilot at-sea-observer program in California to supplement and confirm the bycatch assessments derived from dock-side sampling conducted by the State of California should be a component of a standardized reporting methodology.

California/Oregon Drift Gillnet Fishery

The categorization of the DGN fishery under the MMPA provides NMFS with the authority to require participants to carry observers. The fishery was observed at relatively low rates, beginning in 1990. The 1997 Take Reduction Plan recommended an observer coverage rate of 20%, and since 1999, the fishery has been observed at a 20% rate or more, providing reliable estimates of bycatch of all vertebrate species. Reports of estimated marine mammal and sea turtle bycatch in this fishery are prepared annually by the Southwest Fisheries Science Center and reviewed by the Pacific Scientific Review Group, an external scientific peer-review panel convened in accordance with Section 117 of the MMPA. The reports currently contain estimates of precision associated with the estimates of marine mammal takes, but not for turtles or fish species. The Southwest Region produces annual summaries of observer data detailing landed and discarded catch in the fishery and makes them available on the internet. Protected Resources provides base marine mammal funding of $410,000 annually for observing the fishery.

The drift gillnet fishery for swordfish and sharks is one of the fisheries covered by the proposed FMP for West Coast Highly Migratory Species. In reviewing the proposed FMP, NMFS will determine the adequacy of the standardized reporting methodology to assess the amount and type of bycatch contained in the proposed FMP.

With the exception of green turtles and olive ridley turtles, sea turtle populations in the Pacific show no signs of recovering. NMFS should make every effort to ensure that the protective measures the agency requires are supported by the best information available. While the bycatch of species which are neither protected or commercially valuable is relatively high in the DGN fishery (e.g. common mola and blue shark) there is no evidence that the levels of bycatch are having a substantial negative effect on the populations. Estimates of precision are not available for measures of finfish and sea turtle bycatch in the fishery.

Recommendations: The Reasonable and Prudent Alternative of the current NMFS Biological Opinion on the DGN fishery should continue to be implemented, as well as the 1997 Take Reduction Plan. Observer coverage should be maintained at 20%. The SWFSC should prepare reports which include estimates of the total bycatch of finfish in the DGN fishery, as well as estimates of precision associated with measures of sea turtle and finfish

bycatch. The preferred alternative for DGN management measures proposed in the HMS FMP should be implemented. Specifically, close all EEZ waters off Washington to drift gillnet fishers to protect the common thresher shark, sea turtles and marine mammals. Fishing is currently allowed in waters off the Columbia River, if fish are landed in Oregon or California. Establish an inshore boundary offshore Oregon, defined by a series of waypoints (rather than the 100 fm curve or a mileage offshore as is currently used off Oregon), inshore of which, swordfish gillnetting would not be allowed, to reduce the take of reproductively valuable thresher sharks and other bycatch species. It is estimated that implementation of this action would reduce the take of thresher sharks in the DGN fishery off Oregon by 84%.

Large Vessel Tuna Purse Seine Fishery in the Eastern Tropical Pacific

A small number (5 in 2001) of large U.S. purse seine vessels continues to fish the ETP under jurisdiction of international agreements (IATTC and AIDCP). Since 1998, U.S. flag vessels have accounted for less than 4% of the catch of tunas by the fishery and no U.S. vessels currently fish on dolphins. The IATTC reports annual estimates of fin fish and dolphin mortality by species and stock, as well as standard errors associated with the estimates for all vessel classes. Bycatch associated with the operation of U.S. vessels is not reported independently; that data is presumably available on request form the IATTC. Because observer coverage of U.S. vessels is 100%, the accuracy and precision of bycatch estimates is high.

Recommendation: NMFS should continue its efforts, through its support of the IATTC and international agreements, to ensure that bycatch by U.S. and foreign flag vessels is accurately reported. NMFS should obtain and evaluate annual summaries of bycatch associated with U.S. vessels.

VIII. CURRENT BYCATCH RELATED RESEARCH

Efforts to Reduce Sea Turtle - Fishery Interactions

1. Between 2002 and 2003, SWFSC deployed 8 satellite transmitters on loggerhead turtles along the Pacific coast of the Baja California Peninsula. Understanding movements of loggerhead turtles near Baja will help determine their normal movement and habitat use patterns as well as those during anomalous SST conditions such as El Niño.

2. SWFSC has deployed SDR transmitters (location via satellite, dive depth, time at depth) on a total of 8 loggerhead turtles captured in the California-based longline fishery. These deployments will shed light on post-hooking mortality rates and identify patterns of movement subsequent to hooking.

3. SWFSC is currently satellite tracking 3 loggerhead turtles that were released off the coast of Peru in 2003. In addition to location, satellite tags were equipped with a depth monitor to collect information on dive depth and dive duration. Elucidating the dive patterns of loggerhead in more southern portions of the Eastern Pacific will contribute to our overall understanding of their dive patterns throughout the Pacific.

4. Between 2000 and 2003 SWFSC has had an ongoing leatherback research program designed to monitory leatherback movements and dive behavior via satellite telemetry. To date, 18 transmitters have been deployed on leatherbacks in Monterey Bay, California, and 30 deployed on leatherbacks at their nesting beaches located in the Western Pacific (Papua and Papua New Guinea).

5. Since 2002, SWFSC has worked closely with the Chilean government on a study investigating the effect of hook type on sea turtle bycatch rates (a study modeled after the circle hook experiment in the Northeast Distant Waters area, a statistical reporting zone in the Western Atlantic Ocean). SWFSC has provided funding and assistance with experimental design. We anticipate this research effort will continue through the 2004 longline season in Chile.

6. A study by NOAA / JIMAR researchers investigating sea turtle hearing has been ongoing at the Honolulu Laboratory since 2000. Preliminary results of this research indicate that green turtles have a very narrow hearing range (100-200Hz) that does not allow them to sense the sound emissions from pingers currently used on driftnets. Although these data are for green turtles, it is likely that similar narrow hearing ranges are possessed by loggerhead turtles as well as leatherback turtles.

7. Research defining core nursery areas for the common thresher shark, to avoid bycatch of juveniles, which are not in market demand because of their small size, in commercial fisheries. Also need to identify pupping and core nursery areas of thresher and mako sharks. Areas where pregnant females and newborns congregate may be vulnerable to fishing.

8. Telemetry studies of pelagic sharks to determine migratory routes, within-region habitat use, and vertical day-night swimming behavior for use in developing bycatch avoidance techniques.

9. Telemetry and archival studies of *Mola mola* utilizing temperature and depth-sensing acoustic transmitters to characterize diel patterns of movement, diving behavior and environmental and oceanographic preferences of this species (non-NOAA research). Such studies may be useful in devising measures to reduce bycatch of the ocean sunfish in drift gillnets.

IX. FUTURE RESEARCH RECOMMENDATIONS

1. Determine the effects of removals by U.S. fishing vessels of adult and sub-adult leatherback and loggerhead turtles on the reproductive capacity of the respective populations in the Pacific Ocean.

2. Explore whether there are frequencies or ranges of frequencies that are more effective in deterring marine mammal entanglement than that currently used in pingers. If so, the next step would be to encourage the incorporation of this acoustic characteristic into pingers that are purchased by the fleet as replacements for their current pingers.

3. Study post-hooking and post-entanglement mortality rates in loggerhead and leatherback turtles that were incidentally captured in longline and driftnet fisheries. This information can help determine acceptable turtle-fisheries interaction rates, and reveal spatial and temporal variation in survivorship among turtles.

4. Establish the degree of fisheries-related sea turtle mortality in coastal marine habitats of Latin and South America

5. Explore options for providing NMFS Enforcement with the means for unobtrusive monitoring of pinger compliance at sea e.g. hydrophones.

6. Characterize the migratory pathways of leatherback and loggerhead turtles in the Pacific Ocean, especially during El Niño years. Determination of these pathways could identify important opportunities for avoiding fishery interactions.

7. Determine the effects of mitigation measures, such as funding and support of conservation, education, and protection programs aimed at protecting nesting females, their eggs, and nesting beach habitat, relative to the effects of fishery removals of adults and sub-adults.

8. Continue research on the effects of purse seine encirclement on dolphin populations in the ETP.

9. Determine the effects of removals by U.S. fishing operations on Pacific populations of blue and short fin mako shark.

10. Determine post release mortality rates associated with gill net capture and the effects on west coast mola populations.

11. Develop technology, such as sorting grids, for releasing juvenile tunas in the purse seine fishery. Develop technologies and assess feasibility for the identification of species and size composition in schools of tuna prior to setting.

12. Conduct quantification and trend studies of finfish bycatch in the DGN fishery. Characterize size composition of fish bycatch species in DGN fishery; currently lengths are not taken of many species.

13. Review the efficiency of DGN sampling rate (observer coverage) for estimating DGN finfish and other non-turtle and marine mammal bycatch to determine whether enough samples being collected given the variability.

14. Characterize habitat and spatial and temporal dynamics of different life stages of various bycatch species, so avoidance techniques or possible area closures could be developed

15. Conduct a feasibility study on implementing Performance Standards. This system would reward fishers for decreasing their bycatch and/or bycatch mortality. Under a program using performance standards, goals could be set to reduce bycatch, (as an example 10% of the current bycatch of a particular species) and fishers who meet the goal would be rewarded with some incentive (an example might be additional time on the water). The same could apply for a reduction in bycatch mortality. Under such a program, incentives could be offered for both reducing bycatch and bycatch mortality. The system would require extensive study before being applied. The objectives and rewards for achieving goals would need to be identified, rules would have to be implemented by the Council, and observers would need to be employed to evaluate the success of the program as logbooks would not provide reliable data.

16. Conduct temporal and spatial gear restriction studies. Research into how the variables of setting time of day, area, or depth of gear affects various bycatch species, for use in development of bycatch avoidance techniques. Restricting the time that gear might be in the water could be used to prevent bycatch of many species.

17. In addition to conducting studies of the socio economic effects of effort reduction programs, the effects on bycatch should also be considered. Restricting effort in the fishery by its very nature serves to reduce overall bycatch. Effort reduction through limited entry and permit reduction already exist at the state level for the swordfish-shark DGN fishery. California and Oregon limit the number of permits. California also has a program to reduce permits through attrition. The Pacific Council is currently examining limited entry options for the California-based high seas longline fishery, which will soon come under federal/Council jurisdiction.

XVIII. EDUCATION AND OUTREACH EFFORTS

Current Efforts The SWR takes advantage of a variety of communication resources to inform and educate the public on fishery issues. The goal of the public outreach program in the SWR is to promote public acceptance of decisions made or supported by NOAA. Much of the effort of our Public Affairs Officer, Web Page Administrator and Public Outreach Committee is directed towards building our capacity to advance science and environmental literacy in partnership with public and private organizations. Current and past education and outreach activity by the SWR specifically directed at reducing bycatch include the following:

Drift Gillnet Fishery

The Pacific Offshore Cetacean Take Reduction Team meets annually to evaluate the effectiveness of marine mammal take reduction measures such as net depth requirements, pingers, issuance of new DGN permits, and skipper workshops. The Team makes annual recommendations to SWR regarding necessary changes to existing take reduction measures and additional management measures and research needs. Industry feedback on existing management measures is solicited through representatives on the Team and through skipper workshops. Since 1997, the Southwest Region has hosted 33 skipper workshops. The SWR website provides summaries of the annual total catch and final disposition, by species, of all fish, marine mammals, sea turtles, and seabirds observed caught in the DGN fishery since 1990.

Large Scale Tuna Purse Seine Fishery

The SWR works closely with industry and non-governmental organizations in the implementation of management measures for the large tuna purse seine fishery and is in regular communication these groups regarding bycatch issues. The SWR also discusses bycatch and other issues directly with fishermen at skipper workshops.

SWFSC Outreach Activities

SWFSC personnel have been involved with outreach through capacity building efforts outside of the United States at both the governmental and non-governmental organization level. A summary of the outreach activities undertaken in 2003 follows.

In January 2003, researchers worked with a Guatemalan non-governmental organization to develop a long-term study investigating the foraging ecology, population abundance, and habitat use of green turtles (*Chelonia mydas*) in coastal waters of Guatemala.

In February 2003, SWFSC worked with the Charles Darwin Research Station in the Galapagos Islands, Ecuador to develop a research program designed to study foraging behavior and population ecology of sea turtles in nearshore waters, and determine the post-nesting migratory pathways of green turtles as they depart this archipelago. This information will lead to a better understanding of the susceptibility of this population to interactions with pelagic fisheries.

In June 2003, SWFSC participated in a capacity building exercise with community leaders in Sonora, Mexico to develop a sea turtle monitoring program in the eastern Gulf of California, Mexico.

In September 2003, SWFSC partnered with the Peruvian Government to conduct observer training workshops at the port cities of Ilo, Moro Sama, and Lima. The particular fisheries targeted in this educational program included artisanal longline and driftnet fisheries as well as industrial purse seine fishery. A subsequent visit by SWFSC staff to Peru is planned for February 2005.

Currently SWFSC is drafting a formalized Letter of Agreement with the Instituto del Mar del Perú (Government fisheries agency) regarding marine turtles of the Pacific, and is also drafting a separate agreement with MINAE (Costa Rica's Minister of the Environment) regarding sea turtle nesting beach protection and fisheries bycatch reduction.

Recommendations for Future Education and Outreach Efforts Related to Reducing Bycatch

1. Increase efforts to educate the public about changes in the dolphin-safe designation for canned tuna, and NMFS' finding that the tuna purse seine industry practice of encircling dolphins to catch tuna has no significant adverse impact on dolphin populations in the ETP. The goal of the campaign would be 1) to improve public understanding of the multilateral tracking and verification system administered by NMFS to certify and verify tuna caught in the ETP consistent with the AIDCP and without mortality or serious injury to dolphins; and 2) promote public confidence that dolphins are being protected when Americans purchase tuna with the dolphin-safe label.

2. Support formation and activities of the newly proposed Scientific Advisory Board to the IATTC. The functions of the Board include modifying current purse-seine technology to make it less likely to cause dolphin mortality and seeking alternative means of capturing large yellowfin tuna. Other possible program of work for the Scientific Advisory Board proposed by IATTC are: the prevalence and significance of cow-calf separation; stress effects; review of currently available estimates of abundance for dolphin stocks; ecosystem effects; mortality estimates; life history studies; stock assessment of coastal spotted dolphins; population modeling; developments in gear technology and fishing techniques to improve dolphin release; capture of mature tunas not in association with dolphins; and any other research the Board believes is important to enhance the Agreement.

3. Continue skipper workshops for new entrants to the DGN fishery. Educational seminars should be developed that augment workshops to instruct fishers on how to further reduce certain finfish (non-protected species) bycatch or bycatch mortality. Currently the workshop focus is on avoiding interactions with marine mammals and sea turtles, although discussion of avoiding blue sharks does take place. Future workshops should be expanded to include more information on avoiding bycatch of various fishes and invertebrates and on decreasing bycatch mortality, if such information exists.

4. Continue skipper workshops for participants in the large vessel ETP purse seine fishery.

5. Develop and conduct skipper workshops as needed for west coast HMS fisheries; e.g. surface hook-and-line fishery and small purse seine fishery.

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