NMFS Report
Highly Migratory Species

I. Regulatory Activities

Tuna Bag Limits: The final rule establishing a daily bag limit for sport caught albacore and bluefin tuna in the Exclusive Economic Zone off California published in the Federal Register on October 15, 2007, with an effective date of November 15, 2007. The daily bag limit allows possession of 10 albacore per day south of Pt. Conception, 25 albacore per day north of Pt. Conception, and 10 bluefin tuna per day statewide.

II. Meeting Summaries

Pacific Leatherback Closure Area (PLCA): NMFS conducted an internal workshop on November 14, 2007 between NMFS fishery managers and scientists to evaluate existing information on leatherback distributions off the west coast to consider whether sufficient information had been generated since 2001 to justify reconfiguration of the PLCA. The group decided that there was insufficient information on leatherback distributions in the EEZ to justify any change to the PLCA at this time. Attachment 1 recounts that discussion that identifies NMFS' current position on reconfiguring the PLCA as well as provides a research agenda for future work.

General Advisory Committee (GAC) – IATTC: On February 20, 2008, the GAC to the U.S. Section to the Inter-American Tropical Tuna Commission (IATTC) met to receive and discuss information on: (1) 2007 and 2008 IATTC activities, (2) activities of the Commerce and State Departments and the Pacific Fishery Management Council and Western Pacific Fishery Management Council as they relate to the IATTC, including scientific developments, (3) upcoming meetings of the IATTC, including issues such as: conservation and management measures for yellowfin and bigeye tuna for 2008 and beyond, measures to be taken in the absence of conservation and management measures, management of fishing capacity, and other issues, (4) IATTC cooperation with other regional fishery management organizations, and (5) administrative matters pertaining to the GAC.

Summary – Western and Central Pacific Fisheries Commission (WCPFC) 2007:
The fourth annual session of the WCPFC was held in Tumon Bay, Guam, from December 3-7, 2007. The Commission was unable to agree on measures to strengthen the conservation and management of two of the regions most important fish stocks: yellowfin and bigeye tuna.

North Pacific Albacore Tuna. The seventh meeting (July 2007) of the International Scientific Committee (ISC) recommended that fishing mortality for North Pacific (NP) albacore be reduced. The Northern Committee (NC) (September 2007) noted that the NP albacore spawning stock biomass was at an historical levels. Therefore, the NC agreed to maintain the existing Conservation and Management Measure (CMM) that requires

Nations to not increase fishing effort for NP albacore. The fourth meeting of the WCPFC endorsed this recommendation.

Observer Program. Significant progress was made regarding monitoring, control, and surveillance of the WCPFC fisheries. Recommendations adopted were: an implementation schedule for the WCPFC Regional Observer Program, creating a record of vessels actively fishing on the high seas in the Convention area, improving the procedure for listing vessels found to have engaged in illegal, unreported, and unregulated fishing activities, and enhancing the implementation plan for the Commission's vessel monitoring system.

Seabirds. Technical specifications for gear used to mitigate longline interactions with seabirds were adopted for the most commonly used eight mitigation techniques approved in 2006. The techniques with technical specification are: tori lines, weighted branch lines, side setting, night setting, blue dyed bait, and offal discharge.

Sea Turtles. The United States presented a proposal outlining alternative gear options and fishing techniques to effectively reduce sea turtle bycatch but the proposal was not adopted. However, the U.S. kept its proposal on the table and plans to work inter-sessionally with key Nations to determine if and how a comprehensive CMM for sea turtles can be adopted in the future.

The Commission agreed that adopting new CMM's for bigeye and yellowfin tuna was its top priority for 2008. Other priorities for 2008 will include: developing a CMM to monitor and regulate transshipment activities, revising the Commission's procedures for evaluating cooperating non-member applications, and improving the consistency between CMMs for the high seas and the EEZ of member nations.

The Commission tasked the Northern Committee with convening a working group in order to begin the process of developing effective conservation measures for striped marlin in the North Pacific as a recent stock assessment indicates that the North Pacific stock is being fished unsustainably, and landings and stock biomass are low and will continue to decline if the current fishing mortality rate is maintained. The working group is tasked with completing its work in time for presentation at the 2008 Scientific Committee and NC annual meetings. NMFS has prepared a white paper on the striped marlin issue (Attachment 2).

More information regarding the WCPFC can be found at www.wcpfc.int.

III. Upcoming 2008 Meetings

Next Meeting of the IATTC: The 77th IATTC meeting was held March 5-7, 2008, in La, Jolla, California, to resolve the issue of tuna conservation for 2008 and beyond. A review of the 2007 fishery in the eastern Pacific Ocean and a status of the stocks will be presented at this meeting.

Five proposals are currently on the table from previous meetings: three (U.S., Spain/Ecuador, and Mexico) proposed at the IATTC June,2007 meeting, one proposed by Venezuela in October 2007, and one proposed from a five nation coalition consisting of Columbia, Guatemala, Nicaragua, Panama, and Peru at the October 2007 meeting. The IATTC Secretariat agreed to update the analysis of the five proposals with as much data from the 2007 fishery as possible in advance of the March 2008 meeting. This document (IATTC-77-04, *Proposal for Conservation of Yellowfin and Bigeye Tuna in the Eastern Pacific Ocean*), has been posted to the IATTC website www.iattc.org.

US-Canada Albacore Treaty: The default provision in the Treaty, which allows each Party to continue fishing for albacore tuna in each others waters at a level no more than 75 percent of the limit applicable during the last year of the regime (i.e., 94 vessels or 375 vessels months), was used for 2007. There have been preliminary discussions between both countries for meeting this spring in Victoria, British Columbia to perform the annual exchange of information and to discuss the future of the Treaty. There has been mixed support for continuing the Treaty and this will be one of the agenda items.

2008 Meeting Schedule

Dates	Meeting	Venue
2/20/2008	General Advisory Committee Meeting to the U.S. Section of the IATTC	(via teleconference)
2/28 - 3/6/2008	ISC ALB Working Group Workshop	La Jolla, CA
3/5-7/2008	77th Meeting of the IATTC	La Jolla, CA
05/12-16/2008	IATTC 9th Meeting of the Working Group on Stock Assessment	La Jolla, CA
TBD	U.S.-Canada Albacore Treaty Annual Meeting	Victoria, BC
5/28/2008	General Advisory Committee Meeting to the U.S. Section of the IATTC	San Diego, CA
06/16-27/2008	78th Meeting of the IATTC	Panama City, Panama
TBD	3rd IATTC/WCPFC Consultative Meeting	Panama City, Panama
07/16-17/2008	ISC ALB Working Group Workshop	TBA (Japan)
07/23-28/2008	Plenary Meeting of the ISC	TBA (Japan)
08/11-22/2008	4th Regular Session of the Scientific Committee Meeting of the WCPFC	Port Moresby, Papua New Guinea
09/09-11/2008	4th Regular Session of the WCPFC Northern Committee Meeting	Tokyo, Japan
09/25-30/2008	4th Regular Session of the WCPFC Technical and Compliance Committee	Pohnpei, Federated States of Micronesia
12/08-12/2008	5th Meeting of the WCPFC	Busan, Republic of Korea
12/09-16/2008	ISC ALB Working Group Workshop	
	Acronym Key	
AIDCP	Agreement on the International Dolphin Conservation Program	
ALB	Albacore	

IATTC	Inter-American Tropical Tuna Commission	
ISC	Interim Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean	
WCPFC	Western and Central Pacific Fisheries Commission	

Attachment I

Status of the Pacific Leatherback Conservation Area

NOAA's National Marine Fisheries Service
Southwest Region and Southwest Fisheries Science Center

Background

Swordfish is a popular seafood choice for U.S. consumers due to its firm, moist and mild flavor. Between 1989 and 2005, U.S. annual swordfish demand averaged 16,556 metric tons (mt) with U.S. landings averaging 6,444 mt (about 39 percent of demand) and imports totaled 10,111 mt (61 percent). Domestic landings of swordfish gradually declined beginning in the early 1990s through early 2000s with demand supplemented by imports ranging from 35 percent (1993) to 77 percent (2005). From 1989 through 2005, imports increased from rough parity with U.S. landings to over three times domestic landings in recent years. In 2005, U.S. imports of swordfish were 10,187 mt, valued at about $77 million. Singapore, Panama, Canada, and Chile were the dominant suppliers of imports.

In the Eastern Pacific Ocean (EPO), U.S. fishermen use two primary methods to harvest swordfish in commercial quantities: longlines and drift gillnets (DGN). Longline fishing is the method utilized by the swordfish fishery based in Hawaii while DGNs is the primary method used on the U.S. West Coast. There is also a small harpoon fishery that operates out of southern California, but the fishery only successfully operates during periods of calm seas when swordfish "fin" in surface waters, thus harpooning is not considered a commercially viable fishery for most of the West Coast.

While the status of the EPO swordfish stock appears to be relatively healthy, access to this stock is limited in both Hawaii and West Coast fisheries due to Endangered Species Act (ESA) protections, specifically, sea turtle interactions. Hawaii longline swordfish fishermen are required to use specific gear and bait, and effort is limited by fishing permits, set certificates, and the number of annual sea turtle interactions. On the West Coast, the DGN fishery is managed by limiting permits as well as a seasonal implementation of the Pacific Leatherback Closure Area (PLCA) that annually closes the waters north of Point Conception to the mid-Oregon coast and seaward beyond the

Exclusive Economic Zone (EEZ) to 129° West longitude to DGN gear from August 15 – November 15.

The PLCA was developed using the information available at the time as an avoidance strategy established specifically to address anticipated leatherback turtle takes in the DGN fishery and was required under the biological opinion written for this fishery in 2000. NMFS identified an area known to be utilized by leatherback turtles at certain times of the year based upon observed takes in the DGN fishery and established this particular time/area closure to minimize leatherback interactions with DGN gear. At the time of its implementation in 2001, it was not possible to rigorously define the geographic area where interactions with endangered leatherback sea turtles were most likely to occur, necessitating the implementation of a relatively large area closure. Since 2001, much has been learned about the distribution and abundance of leatherbacks within the West Coast EEZ. This information was shared with DGN fishermen. Due to a substantial decline in participation, landings and exvessel revenue in the DGN fishery since implementation of the PLCA, DGN fishermen applied for an exempted fishing permit (EFP) that, if approved by NMFS, would have allowed participating vessels to fish in the PLCA under rigid restrictions that would have limited impacts to sea turtles and other species.

In June 2007, NMFS wrote the Pacific Fishery Management Council and stated that it would not approve the EFP based on concerns for potential mortalities of protected species with DGN gear. By taking this action, NMFS essentially precluded using fishery-dependent methods as a means to potentially modify the configuration of the PLCA. However, NMFS did not rule out the use of fishery-independent information to reconsider the dimensions and timing of the PLCA seasonal closure.

To that end, NMFS conducted an internal workshop on November 14, 2007 between NMFS fishery managers and scientists to evaluate existing information on leatherback distributions off the west coast and determine whether sufficient information had been generated since 2001 to justify consideration of reconfiguring the PLCA. The participants agreed that that there was insufficient information on leatherback distributions in the EEZ to justify any change to the PLCA at this time. This paper recounts that discussion and identifies NMFS' current position on reconfiguring the PLCA as well as provides a research agenda for future work.

Current Knowledge of Leatherback Sea Turtles off West Coast

Leatherback nesting populations in the Pacific can essentially be grouped into two distinct genetic stocks, those that nest on beaches in the Eastern Pacific, and those nesting in the Western Pacific. All populations migrate to foraging areas and the leatherback sea turtles found off the West Coast of the USA utilize this area as foraging habitat. These leatherbacks originate from the Western Pacific metapopulation but represent a portion of that population. Tracks of leatherback turtles with satellite-linked transmitters indicate that these turtles nest in Indonesia where there are a number of threats including nest erosion, pig predation, deforestation, and a concern about low

hatchling production on some beaches. Despite these threats, the Western Pacific population is considered much healthier and robust than the Eastern Pacific population.

Satellite-linked telemetry studies of post-nesting females from Indonesia, Papua New Guinea, and the Solomon Islands, undertaken by NMFS Southwest Fishery Science Center (SWFSC) scientists, indicate that leatherbacks originating from these beaches have multiple destinations following nesting including the west coast of North America, the North Pacific Transition Zone, the equatorial Pacific, the South China Sea and southern hemisphere waters. This finding is supported by genetics work also being done by the SWFSC.

The presence of leatherbacks off the U.S. West Coast is related to the distribution and abundance of jellyfish. The Western Pacific population of leatherbacks forage on jellyfish and are known to primarily consume *Chrysaora fuscescens* (brown sea nettle) found in neritic waters between Point Arena and Point Sur. They also consume *Aurelia labiata*. (moon jelly), *Phacellophora camtschatica* (egg yolk jelly), and *Chrysaora colorata* (purple stripe jelly). Due to the low nutrient value of jellyfish prey, leatherbacks must seek large aggregations of prey when foraging.

Satellite-linked telemetry has shown differences in feeding strategies and movements among populations of Pacific leatherbacks. Most leatherbacks tagged off central California have subsequently moved into waters adjacent to the North Equatorial Current and then returned to California coast. NMFS scientists are not clear if this remigration to California is a function of habitat condition, fidelity to foraging sites, or an artifact of tagging, however, the data indicate that these turtles may imprint on the foraging grounds, suggesting that the same animals may return to the West Coast year after year. Unlike the Western Pacific leatherbacks which travel across the entire Pacific to forage, the Eastern Pacific population, which nest in southern Mexico and Costa Rica, have been tracked by satellite-linked transmitters to the southeast Pacific (generally south of the equator and thus not affected by actions within the West Coast EEZ).

The greatest density of leatherbacks off the West Coast has been observed at coastal retention areas during August and September, the usual timing of upwelling relaxation, but they are also seen in lesser numbers during October and November. Because there has been little to no survey effort during April through July, and December, it is not clear if leatherbacks occur at highest densities in August and September, or if this is the result of sampling bias.

NMFS scientists are in the process of expanding their research efforts from monitoring hatchling success rates on Western Pacific nesting beaches and related activities to include a more focused effort on understanding the movements and distribution of leatherbacks off the US West Coast. Part of this effort focuses on understanding the importance of offshore areas to leatherbacks as all of the survey work done thus far in the EEZ has focused on the waters within 30 miles of shore and it is currently unknown whether offshore areas form important primary or secondary foraging habitats relative to nearshore areas. The SWFSC marine turtle research program scientists are also working

with their colleagues at NMFS' Pacific Fisheries Environmental Laboratory in Pacific Grove, California to identify oceanographic seasonal predictors of jellyfish abundance in the fall months as a way to understand the linkage between prey availability and leatherback distributions.

Reconfiguration of PLCA

Based on what is currently known about the coastal abundance of leatherback sea turtles off the West Coast relative to large-scale oceanographic events, NMFS recognizes that insufficient information exists to attempt any reconfiguration of the PCLA with any reasonable degree of confidence at this time. Rather, more research efforts that include the collection of oceanographic data from NOAA ships during simultaneous overflights to record leatherback sea turtle distributions will need to be undertaken to provide the needed information. It is also recognized that there needs to be a greater integration of understanding the relationship between swordfish and leatherback turtle distributions. One source of information missing from current research efforts is the knowledge of commercial fishermen from their fishing experiences with various fishing gears at sea and the sighting of leatherbacks. Participants in the workshop did agree that a collaborative effort with industry and turtle experts is needed to better understand the relationship between the swordfish fishery and sea turtle distributions. NMFS is exploring options for conducting such an information-sharing workshop that will bring together industry experts and scientists and serve as the initial effort to develop a working collaboration. The workshop is in the planning stages with a tentative 2-3 day meeting scheduled to be held in the spring at Scripps Institute of Oceanography in La Jolla, California. The overarching goal of the workshop will be to understand the key life history and ecological traits influencing the distribution and abundance of swordfish and leatherback sea turtles in the California Current. An important objective will be to bring together scientists and fisheries managers conducting research and monitoring projects on these species as well as knowledgeable fishermen who have a history of participation in west coast swordfish fisheries. A major outcome of the workshop will be to highlight areas where further research and monitoring efforts, with emphasis on collaborative projects, would assist in providing sustainable fishing opportunities while minimizing interactions with protected sea turtles.

Finally the collaboration between NMFS biologists and oceanographers may provide NMFS the opportunity to revise its current management strategy of the PCLA for the DGN fishery from a static to a more dynamic one by using oceanographic processes to predict when and where leatherback turtle distributions are likely to occur during the fishing season. This collaboration of various scientific disciplines offers NMFS great potential for adaptively managing the swordfish fishery to minimize sea turtle interactions.

Research Needs

It was also recognized that a more concerted research effort needs to be undertaken to accelerate NMFS' understanding of the presence of leatherback turtle off the West Coast

to mange the swordfish fisheries adaptively. To this end, SWFSC turtle experts have developed the following research priorities that require funding to carry out effectively:

1) Expand the research and monitoring of leatherback turtles from central California neritic waters to offshore and Oregon/Washington waters. Previous ecosystem studies of leatherback turtle foraging habitat off California have been confined to shelf waters (<90m depth) within 30 miles of the coast, therefore, data are needed to investigate the presence of leatherback turtles in offshore and Oregon/Washington waters, evaluate the importance of these areas to leatherbacks, and determine how interaction with the proposed fisheries can be reduced or avoided. The initial objective of the Leatherback Use of Temperate Habitat (LUTH) study will be to examine and characterize the abiotic and biotic conditions that create and define leatherback foraging habitat within the offshore fishery area, approximately 40-150 miles off the coasts of California and Oregon. The collaborative effort would be a 'process-oriented' ecosystem investigation involving oceanographic and prey sampling from a NOAA ship and aerial surveys of leatherback turtle distribution from a NOAA Twin Otter aircraft during August-September 2008. Telemetry studies of leatherback turtles have suggested they associate with dynamic oceanographic features (e.g. fronts) within the traditional drift gillnet fishing area. Because the spatial and temporal components of frontal habitat is affected by physical forcing, the precise location of the effort will be determined real-time, with input from ERD collaborators, by identifying frontal features and physical mechanisms (i.e. surface currents) that might aggregate jellyfish prey, via evaluation of remotely sensed and in-situ oceanographic data. The results of this study will improve NMFS' ability to asses presence of leatherback turtles in the proposed fishing areas by identifying likely foraging areas via remote sensing techniques, thereby mitigating potential interactions. The secondary objective is to obtain abundance estimates and knowledge of seasonal distribution of leatherbacks utilizing foraging areas off the coasts or Oregon and Washington from aerial surveys. Previous telemetry data and antecdotal information indicate that Oregon/Washington waters support a foraging population of leatherback turtles, however, it is unknown how many turtles use this area or if they are the same individuals that use California waters. If predictable aggregations of leatherbacks can be identified, telemetry studies would be initiated to examine foraging site fidelity along the North American coast.
2) Develop methods to reduce leatherback bycatch in swordfish longline and driftnet fisheries by identifying areas of distributional and habitat overlap. The objectives of this study are to use satellite-linked telemetry of swordfish and leatherbacks to answer the following questions: a) What is the habitat use of both swordfish and leatherbacks off Central California? b) Is habitat separation apparent and if so when and where? c) How does any observed separation vary temporally and spatially and in the face of changing environmental conditions? d) How can fishing methods be modified to take advantage of any habitat separation (vertically or horizontally) to reduce leatherback bycatch in US West Coast longline and driftnet fisheries?

3) Convene an agency-wide workshop to compile knowledge of predictive modeling of fishery interactions with protected species among science centers and management offices, including experts in environmental modeling, oceanography, and resource management. This proposal assists the decision making process for fishery management and evaluates existing data and future sampling design necessary for such decision making processes. The objectives of this effort are to: a) compile and build analytical approaches for predicting fishery by-catch of protected species based on environmental data, b) test the performance of these models, c) provide recommendations for applications of predictive models, and d) provide recommendations for the future data collection and sampling considerations.

Attachment 2

Striped Marlin Briefing
NOAA National Marine Fisheries Service
Southwest Region and Southwest Fisheries Science Center

Background

The most recent stock assessment for striped marlin indicates that the North Pacific stock is being fished unsustainably, and landings and stock biomass are low and will continue to decline if the current fishing mortality rate is maintained. This stock assessment has raised concern with NMFS scientists and managers. The purpose of this briefing is to draw attention to this issue and provide a basic summary of the relevant information needed for management decisions. This briefing summarizes what is known about the natural history and stock assessment of striped marlin, fisheries that have recorded landings of striped marlin, and some recommendations for what could be done on the national and international scale in order to allow the stock to recover.

Natural History

The striped marlin (*Tetrapturus audax*) is a large, oceanic fish with a long and tall dorsal fin which decreases in height ending just before the second dorsal fin. Striped marlin reach a maximum length of about 12 feet, weighing over 450 pounds. In contrast to the blue marlin, there is no significant sexual size dimorphism in this species. Females are reported to reach first maturity at 50-80 lb; it is not possible to determine onset of sexual maturity in males because change in the size of testes is slight. The species is found throughout the tropical, subtropical, and temperate waters of the Pacific and Indian Oceans. The stock structure of striped marlin in the Pacific has not been well defined. The two most frequently considered hypotheses are: 1) a single-unit stock in the Pacific, which is supported by the continuous "horseshoe-shaped" distribution of striped marlin across the central north, and central south Pacific, with a continuous distribution along the west coast of Central America; or 2) a two-stock structure, with the stocks separated roughly at the Equator, albeit with some intermixing in the eastern Pacific Ocean (EPO). The species seems to be more abundant in the eastern and north central Pacific than elsewhere, and occur between 45° N. and 45° S. latitude.

Movements tend to be diffusive as striped marlin do not tend to form dense schools but occur singularly or in small groups, usually segregated by size[1]. Distribution of eggs is unknown. Larvae are reportedly found in the North Pacific west of 180° W. longitude between 10° N. to 30° N. latitude, and in the central South Pacific west of 130° W. longitude between 10° S. to 30° S. latitude[2]. They are most abundant in the respective local early summers, with peak occurrences during May through June in the western North Pacific, and in November and December in the central South Pacific. The seasonal occurrence of mature females coincides with that of the larvae. While the distribution of larvae east of 120° W. longitude is not well known, mature fish are reported to occur there between 5° and 20° N. latitude, largely in May and June[3].

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[1] Southwest Fisheries Science Center striped marlin research; posted on the website: http://swfsc.noaa.gov/textblock.aspx?Division=FRD&ParentMenuId=141&id=1126

[2] Food and Agriculture Organization of the United Nations Fisheries and Aquaculture Department, Species Fact Sheet for Tetrapturus audax: http://www.fao.org/fishery/species/2501.

[3] Food and Agriculture Organization of the United Nations Fisheries and Aquaculture Department, Species Fact Sheet for Tetrapturus audax: http://www.fao.org/fishery/species/2501.

Squire and Suzuki (1990) argued that striped marlin make long-term migrations between spawning and feeding areas. Young fish migrate eastward to feeding areas off the Central American coast and subsequently return westward as adults. Similarly, according to the Southwest Fisheries Science Center, tag recapture data also indicate movement from southern California to Baja California Sur, but show little or no movement in the reverse direction[4]. Tag recapture data further reveal movement from off the coasts of Mexico and southern California to waters near Hawaii, Peru, and the Marquises Islands.

Striped marlin are epipelagic, preferring water temperatures between 20 to 25 degrees Centigrade during all stages of their life cycle. Acoustic telemetry studies indicate they spend 86 percent of their time in the surface layer above the thermocline. Some researchers have argued that depth preference is governed by temperature stratification; the fish they tracked spent the vast majority of time in waters within 2 degrees Centrigrade of the mixed layer temperature and never ventured into waters 8 degrees Centrigrade colder than the mixed layer temperature (Brill, *et al*. 1993; Holts and Bedford 1990).

Striped marlin are opportunistic feeders on epipelagic fishes including mackerel, sardine, and anchovy, and will take invertebrates including squid and red crab when available. Off southern California, striped marlin are often seen feeding at the surface on these small coastal fish. Predation on adult marlin has not been documented but may occur from large pelagic sharks or toothed whales.

The Billfish Working Group of the ISC has noted that the basic biology of striped marlin needs additional research, with an emphasis on stock structure, life history parameters, and movement (ISC 2007). The Pacific Fisheries Management Council 2007 Stock Assessment and Fishery Evaluation document also reports the need for more age and growth data from locally caught fish, research on the stock structure differences between populations to south and west of the U.S. Exclusive Economic Zone, and research on seasonal migration differences relative to the size, age, and sex of striped marlin (PFMC 2007).

Stock Assessment

Stock status of striped marlin in the EPO has been assessed regularly by the Inter-American Tropical Tuna Commission (IATTC) and the International Scientific Committee for Tuna and Tuna-Like Species in the North Pacific (ISC). The most recent stock assessment of striped marlin in the EPO was conducted by IATTC in 2003. The most recent stock assessment of striped marlin in the North Pacific Ocean was conducted by the Marlin Working Group of ISC in 2007.

ISC and NMFS consider there to be a single stock of striped marlin in the North Pacific; however, IATTC considers there to be multiple stocks. IATTC assumes that there is a single stock of striped marlin in the EPO, based on the analysis of trends in catch per unit of effort (CPUE) in several sub areas, and genetic studies that have suggested that there are separate populations in the eastern and western South Pacific and there may be a separate population with centers of distribution in the regions proximate to Hawaii in the north-central Pacific and to Ecuador and Mexico in the EPO (IATTC 2007). However, the IATTC report notes that because data on daily activities of striped marlin have been obtained by electronic tags that have not provided

[4] Southwest Fisheries Science Center striped marlin research; posted on the website: http://swfsc.noaa.gov/textblock.aspx?Division=FRD&ParentMenuId=141&id=1126

information on movements over long time periods, the conclusions reached for an EPO stock model should be considered tentative.

For the IATTC assessment, standardized catch rates were obtained from a general linear model and from a statistical habitat-based standardization method (IATTC 2007). Analyses of stock status were made using two production models, taking into account the time period when billfish were targeted by longline fishing in the EPO, that were considered the most plausible. A Pella-Tomlinson model yielded estimates of the AMSY in the range of 3,700–4,100 metric tons (mt) with a current biomass being about 47 percent of the unfished biomass. The current biomass is estimated to be greater than the biomass that would produce the AMSY. An analysis, using the Deriso-Schnute delay-difference model, yielded estimates of AMSY in the range of 8,700–9,200 mt, with the current biomass greater than that needed to produce the AMSY, and about 70 percent of the size of the unexploited biomass.

The most recent stock assessment conducted by ISC in 2007 assumed a single Pacific-wide stock of striped marlin (ISC 2007). According to the ISC Billfish Working Group, the stock status is difficult to determine due to a range of uncertainties in the fishery data as well as biological uncertainties (*e.g.* maturity schedule, growth rates, stock structure, the movement of striped marlin between temperate and sub-tropical areas throughout its range, etc.). It is therefore difficult to describe the biomass distribution for this stock throughout its range. Two assessment model scenarios were developed to address the uncertainty in the steepness of the stock recruitment relationship: 1) the maternal effect scenario in which recruitment is estimated by a Beverton-Holt stock recruitment curve; and 2) the environmentally driven recruitment scenario in which recruitment varies about its mean.

The ISC report indicates that spawning biomass has declined from around 40,000 mt in the early 1970s to about 5,000 mt in the early 2000s[5]. Spawning biomass in 2003 was estimated to be 14 to 15 percent of the 1970 level, depending upon model scenario. Recruitment estimates also exhibited a long-term decline since the 1970s, and recent recruitment (1996-2003) is roughly one-half of the long-term average (1965-2003) under both model scenarios. In addition, both model scenarios indicated that landings and spawning biomass will continue to decline if the current fishing mortality rate is maintained. Fishing mortality in the early 2000s has increased to more than three times the amount in the early 1970s. There appears to be some inconsistency in the indices developed for the western Pacific and the eastern Pacific, and in the future modeling efforts will include spatial segregation. The ISC Plenary recognized that current levels of fishing mortality across the North Pacific are not likely to be sustainable, and recommended that the fishing mortality rate of striped marlin (which can be converted into effort or catch in management) should be reduced from the current level (2003 or before), taking into consideration various factors associated with this species and its fishery. The ISC Plenary also recommended that until appropriate measures in this regard are taken, the fishing mortality rate should not be increased.

Regional Fisheries Management Organizations

IATTC has not acted on the most recent ISC recommendations that were released in July 2007. The IATTC annual meeting took place in June 2007, before ISC had finalized its most recent assessment and recommendations. It is expected that the ISC stock assessment and recommendations will be addressed in the upcoming IATTC annual meeting in May 2008.

[5] Summary presentation given by Gary Sakagawa to the WCPFC Northern Committee at their annual meeting September 11-13, 2007 in Tokyo, Japan. Summary report available: http://www.wcpfc.int/.

The Western and Central Pacific Fisheries Commission (WCPFC) Scientific Committee reviewed the ISC report in August 2007 at their annual meeting. For the northern stock of striped marlin the scientific committee acknowledged the work of ISC in their 2007 stock assessment and did not modify ISC management recommendations; however, the inclusion of North Pacific striped marlin as a northern stock was not recommended based on limited information on the spatial distribution of biomass. Under provisions of the Convention, a northern stock must lie mostly north of 20° N. latitude. ISC did not address the spatial distribution of biomass, thus the Scientific Committee could not determine if the stock biomass is mostly north of 20° N. latitude.

The WCPFC Northern Committee (NC) also reviewed the ISC stock assessment in September 2007 at their annual meeting. The NC recognized that striped marlin has neither been designated a northern stock, nor been assigned to the NC for developing management recommendations; however, noting the result of the ISC report, the NC considered it appropriate to provide comments in relation to striped marlin to the Commission at the annual meeting in December 2007. The NC noted that striped marlin are an important resource in the northern portion of the Convention Area as the stock is caught primarily in the northern fisheries that NC members have a special interest in. The NC considered appropriate management strategies for striped marlin and acknowledged that because the species is mostly taken incidentally, strategies aimed at reducing catches of striped marlin (in fisheries directed at other species) may be appropriate. The NC advised its members to make every effort, on a voluntary basis, not to increase their respective current fishing mortality rates (*i.e.* catch or effort) on striped marlin in the North Pacific, and to reduce them to the extent practicable. In addition, the NC recommended that the Commission task the NC with convening a working group that includes fisheries managers, gear technology experts, fishermen, and scientists in order to begin the process of developing effective Conservation Management Measures for striped marlin in the North Pacifc. The working group is tasked with completing its work in time for presentation at the 2008 Scientific Committee and NC annual meetings. The report summaries of the Commission's December 2007 meeting have not been released.

Fisheries Information & Landings

North Pacific

Striped marlin support important commercial and recreational fisheries in the North Pacific. Although directly targeted in the past, currently most are taken as incidental catch in tuna longline fisheries. Pacific-wide landings have been less than 10,000 metric tons per year since 1989, and have averaged approximately 5,215 metric tons per year for the years 1995 to 2005[6]. Striped marlin are caught mostly by longline fisheries; lesser amounts are caught by recreational, gillnet, and other fisheries (see figure 2). During recent years the greatest catches in the North Pacific have been taken by the

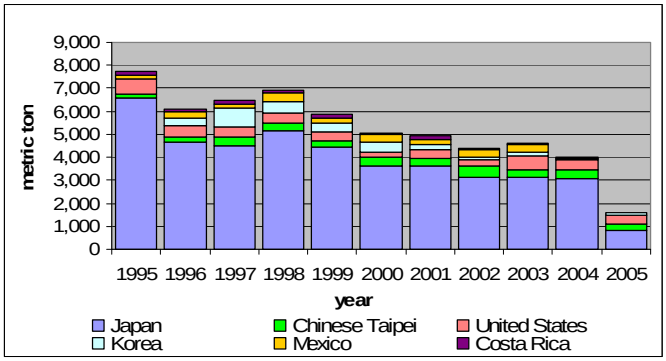

Figure 1. Striped marlin catches in the North Pacific by country, 1995-2005. Data are from the Marlin Working Group catch tables as of February 1, 2007 and may differ from official statistics.

[6] Data are from the Marlin Working Group catch tables as of February 1, 2007 and may differ from official statistics.

fisheries of Japan, Chinese Taipei, the United States, Mexico and the Republic of Korea (see figure 1).

EPO

The catches and standardized fishing effort for striped marlin has decreased markedly in the EPO since about 1998 (see figure 3). According to the IATTC, the stockwide catch of striped marlin in the EPO from 2001-2005 ranged from 1,500-2,200 mt (round weight)[7] (PFMC 2007). During recent years the greatest catches in the EPO have been taken by fisheries of Japan, the Republic of Korea, and Costa Rica (IATTC 2007).

U.S. West Coast

The HMS FMP prohibits commercial take of striped marlin; however, there is a small seasonal recreational fishery for striped marlin in the Southern California Bight in the late summer months. The average catch of striped marlin from 2001-2005 by U.S. West Coast fisheries constitutes about one percent of the EPO catch (PFMC 2007). The majority of the U.S. West Coast incidental catch by commercial fisheries was less than 10 mt[8], and the U.S. West Coast recreational catch was approximately 20 mt, or 300 fish per year, based on club records and commercial passenger fishing vessels logbook recorded catches (PFMC 2007). The California billfish angler survey (1969 to 2005) indicates that the catch rate of billfish (the catch is comprised primarily of striped marlin) in California has remained relatively constant and low since 1969, at about a rate of 0.10 billfish per anger-fishing-day (one fish for every 10 days of fishing)[9]. The total number of billfish caught as reported by the survey ranged from 46 (1973) to 993 (1985); however, catch and release of striped marlin is a trend that seems to be increasing in popularity. Most striped marlin caught in the southern California sport fishery are three to six years old and weigh 120 to 200 pounds.

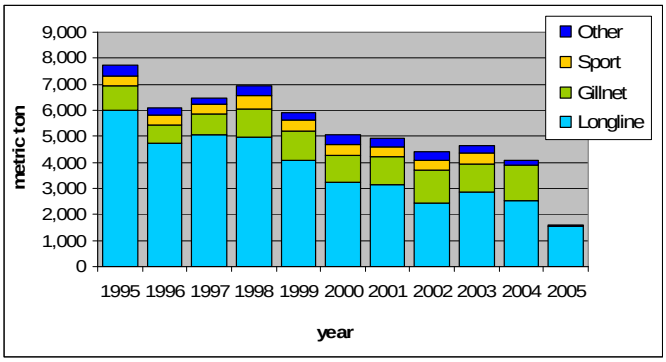

Figure 2. Striped marlin catches in the North Pacific by gear type (1995-2005). Data are from the Marlin Working Group catch tables as of February 1, 2007 and may differ from official statistics.

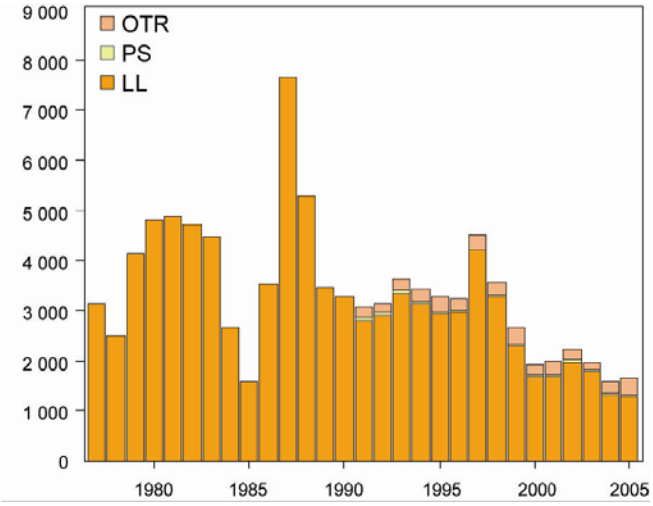

Figure 3. Retained catches of striped marlin in the EPO, 1977-2005, by gear type (in metric tons). Source: Document IATTC-75-06, 2007.

Recreational and commercial fishing for striped marlin began off southern California in the early 1900s using hand-held harpoons and rod-and-reel. The California State legislature banned the use of harpoons to take striped marlin in

[7] IATTC catch tables extracted 9/3/07.

[8] Striped marlin commercial catch includes estimates from the drift gillnet observed catch.

[9] National Marine Fisheries Service Pacific Billfish Database: http://www.recfin.org/billfish/.

1935 and further curtailed the sale and import of striped marlin in 1937, thus preserving the southern California fishery entirely for recreational anglers. California has a recreational daily possession limit of one striped marlin.

Generally, fish begin arriving in the coastal and insular waters off southern California in June and remain until at least October. The number of fish moving into the Southern California Bight during any particular year is associated with water temperatures. The colder water north of Point Conception usually limits their northward distribution; although, during El Niño years they intermittently range north to about San Francisco. According to the National Marine Fisheries Service Pacific Billfish Database, the estimated aggregate cost for billfish trips in California was about $488,000 in 2005, which is a significant component of the recreational fishing industry in southern California[10]

Recommendations

Despite the fact that the U.S. West Coast catch of striped marlin does not constitute a significant portion of the catch of striped marlin in the North Pacific or the EPO, additional conservation measures would be desirable. Because the species is mostly taken incidentally, strategies aimed at reducing catches of striped marlin (in fisheries directed at other species) would probably be the easiest to implement. There should be an effort to not increase the current fishing mortality rates (*i.e.* catch or effort) on striped marlin in the North Pacific, and to reduce them to the extent practicable, even if only on a voluntary basis. Measures such as these are necessary to avoid the experience of the white marlin fisheries in the Atlantic Ocean. NMFS received a petition to list Atlantic white marlin as an endangered or threatened species in 2001; subsequently, two comprehensive reviews (2002 and 2007), of the stock status of the species were conducted, and NMFS eventually determined that an ESA listing for white marlin was not warranted.

The United States should consider the following:

- The possibility of the WCPFC establishing measures to limit the catch of striped marlin in the western Pacific Ocean, which would likely compel vessels to shift their fishing effort to the EPO, unless conservation measures were already put in place by the IATTC to restrict the catch of striped marlin in the EPO.

- Advocating the catch and release of striped marlin in recreational fisheries in the EPO, since recreational fishing constitutes an important component of the striped marlin catch from the United States, Mexico, and Costa Rica.

- Forming a bilateral agreement with Mexico, since striped marlin is an important recreational fishery for both countries.

- Encouraging the use of circle hooks in recreational fishing in order to decrease the mortality of striped marlin once released. The Southwest Fisheries Science Center advocates in its 2006 Billfish Newsletter the use of circle hooks when releasing billfish because it reduces deep or foul hooking when bait fishing or trolling[11].

[10] National Marine Fisheries Service Pacific Billfish Database: http://www.recfin.org/billfish/.

[11] The Southwest Fisheries Science Center 2006 Billfish Newsletter: http://swfsc.noaa.gov/textblock.aspx?Division=FRD&id=1199&ParentMenuId=3

- Encouraging the use of circle hooks in longline fisheries that are still using traditional "J" hooks.

- Encouraging and creating incentives for the development of innovative gear types and methods for decreasing the number of interactions of striped marlin with longline gear, and/or decreasing the post-hooking mortality of striped mortality.

- Funding scientific research to address some of the data limitations that have been discussed by the ISC, WCPFC, IATTC, and PFMC.

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