WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

Council action regarding the overfishing and overfished conditions of Western and Central North Pacific striped marlin

Purpose and need

The **purpose** for action by the Western Pacific Regional Fishery Management Council (Council) is that the most recent stock assessment of Western and Central North Pacific (WCNP) striped marlin, conducted in 2012 by the International Scientific Committee for tuna and tuna-like species of the North Pacific Ocean (ISC) indicates that this stock is subject to overfishing and is overfished (Lee et al.. 2012). Under the Council's National Standard 1 control rule, the WCPNO striped marlin would be considered to be overfished. It's likely that NMFS will make an official determination regarding its status in the near future.

The **need** for Council action stems from National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which requires that 'conservation and management measures shall prevent overfishing while achieving optimum yield from each fishery for the United States fishing industry. Moreover, the need also stems from MSA section 304(e) once NMFS notifies the Council of the status determination. Further, the pelagic fisheries in Hawaii have been operating under a Western and Central Pacific Fishery Commission (WCPFC) Conservation and Management Measure (CMM 2010-01) to reduce fishing mortality on the stock, and which may be revised at the forthcoming 10th Meeting of the WCPFC in December 2013.

Status of Striped Marlin

Catches of WCNP striped marlin have exhibited a long-term decline since the 1970s. Catches averaged roughly 8,100 metric ton (mt) per year during 1970-1979 and declined by roughly 50% to about 3,800 mt per year during 2000-2009. As stated above, although an official status determination from NMFS is pending, Lee et al. (2012) identified the stock is subject to overfishing and is overfished.

Estimates of population biomass of the WCNP striped marlin stock exhibit a long-term decline (Figure 1). Population biomass (age-1 and older) averaged roughly 18,200 mt, or 42% of unfished biomass during 1975-1979, the first 5 years of the assessment time frame, and declined to 6,625 mt, or 15% of unfished biomass in 2010. Spawning stock biomass (SSB) is estimated to be 938 mt in 2010 (35% of SSB_{MSY}, the spawning biomass to produce MSY (Figure 2). Fishing mortality on the stock (average F on ages 3 and older) is currently high (Figure 3) and averaged roughly F = 0.76 during 2007-2009, or 24% above F_{MSY}. The predicted value of the spawning potential ratio (SPR, the predicted spawning output at current F as a fraction of unfished spawning output) is currently $SPR_{2007-2009}$ = 14% which is 19% below the level of SPR required to produce MSY. Recruitment averaged about 328 thousand recruits during 1994-2008, which

was roughly 30% below the 1975-2010 average. No target or limit reference points have been established for the WCNP striped marlin stock under the auspices of the WCPFC. Compared to MSY-based reference points (see Figure 4), the current (2010) spawning biomass is 65% below SSB_{MSY} and the current fishing mortality (average F for 2007-2009) exceeds F_{MSY} by 24% (Figure 4). Therefore, overfishing is currently occurring relative to MSY and the stock is in an overfished state.

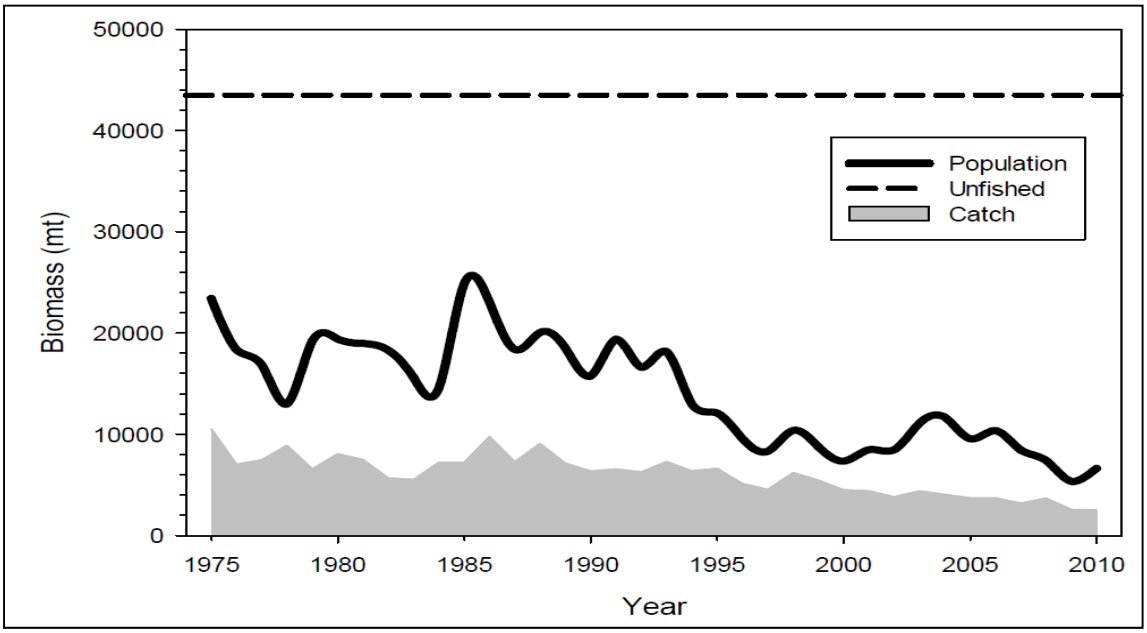

Figure 1. Trends in population biomass and reported catch biomass ofWestern and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010. Source: Lee et al. (2012)

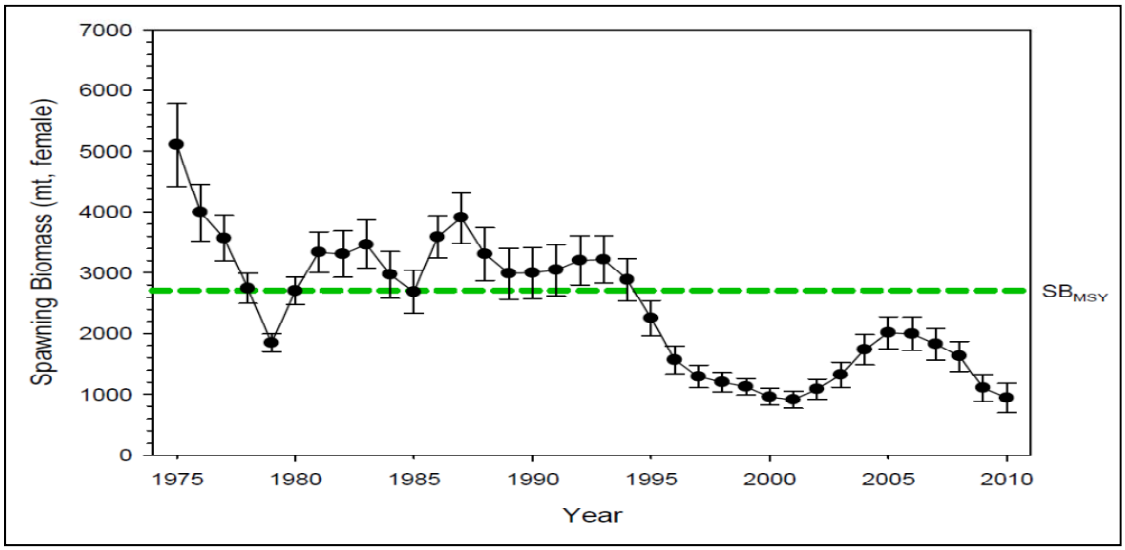

Figure 2. Trends in estimates of spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals. Source: Lee et al. (2012)

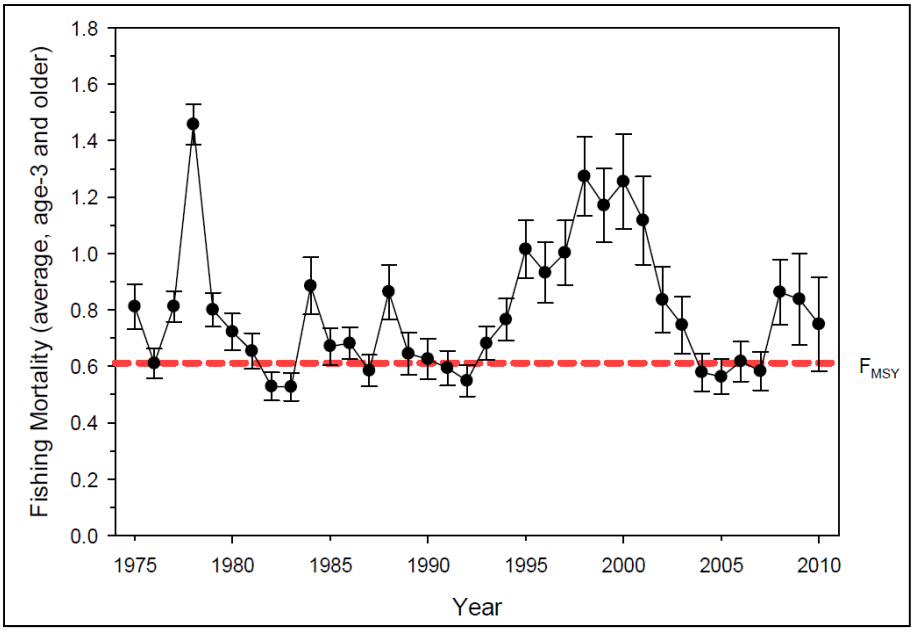

Figure 3. Trends in estimates of fishing mortality of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010 along with 80% confidence intervals.
Source: Lee et al. (2012)

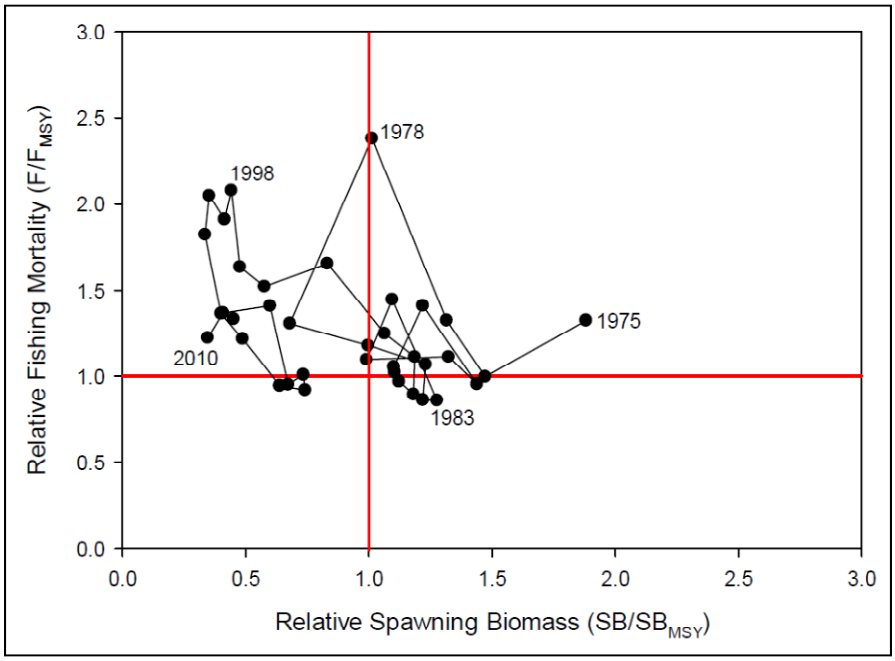

Figure 4. Kobe plot of the trends in estimates of relative fishing mortality and relative spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010.
Source: Lee et al. (2012)

The ISC provided the following scientific information as conservation advice:

- Fishing at FMSY would lead to spawning biomass increases of roughly 45% to 72% from 2012 to 2017.

- Fishing at a constant catch of 2,500 mt would lead to potential increases in spawning biomass of 133% to 223% by 2017.

- Fishing at a constant catch of 3,600 mt would lead to potential increases in spawning biomass of 48% and 120% by 2017.

By comparison:

- Fishing at the current fishing mortality rate would lead to spawning biomass increases of 14% to 29% by 2017.

- Fishing at the average 2001-2003 fishing mortality rate would lead to a spawning biomass decrease of 2% under recent recruitment to an increase of 6% under the stock-recruitment curve assumption by 2017.

Catches of striped marlin by Japanese fleets exceed those taken by fleets from all other nations fishing in the North Pacific (Figure 5). For example, the 1984 catch by Chinese-Taipei and the 1994 and 1997 catches by South Korea were the only national annual totals other than Japan above 1000 mt since the start of the data series. In contrast, three Japanese fleets (distant-water and offshore longline; coastal longline; large-mesh gill net) each caught more than 1,000 mt in several different years.

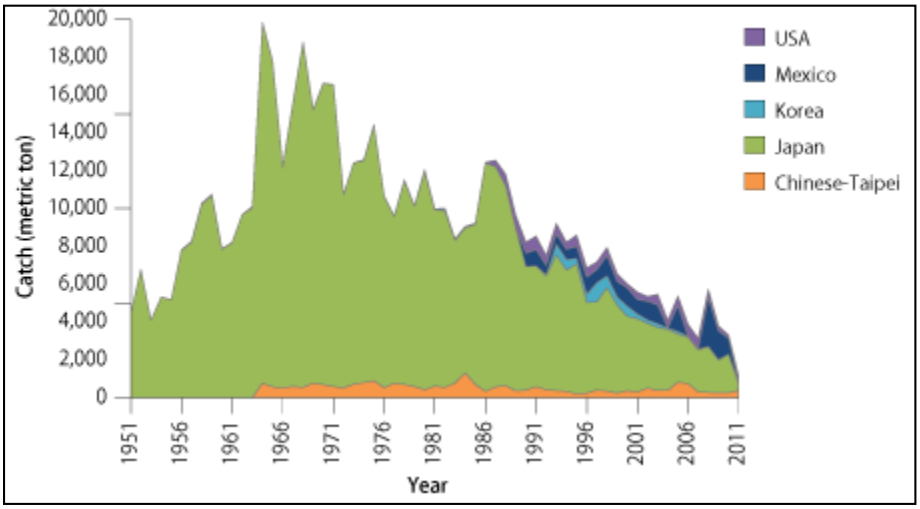

Figure 5. Annual landings of striped marlin reported by ISC members in the North Pacific Ocean.
Source:

The national annual catch totals from the USA and Chinese-Taipei are similar in magnitude at several hundred metric tons. Recent figures from the ISC (Table 1)[1] indicate that Japanese catches of North Pacific striped marlin averaged about 74% of the total catch between 2006-2010, evenly split by longline and drift gillnet (Figure 6). US catches over this period averaged about 14% of the total. Future Japanese fishing mortality on the WCNP stock of striped marlin will depend greatly on how quickly and to what extent coastal drift gillnet and longline fisheries rebuild after the 2011 Tōhoku earthquake and tsunami.

Table 1. Recent catches of striped marlin by country in the North Pacific[2]

Year	Chinese Taipei	Japan	Korea	USA	Total
2006	741	2,447	56	630	5,076
2007	301	2,220	47	567	5,540
2008	270	2,408	29	440	5,729
2009	262	1,719	22	270	3,788
2010	253	2,028	18	177	3,310

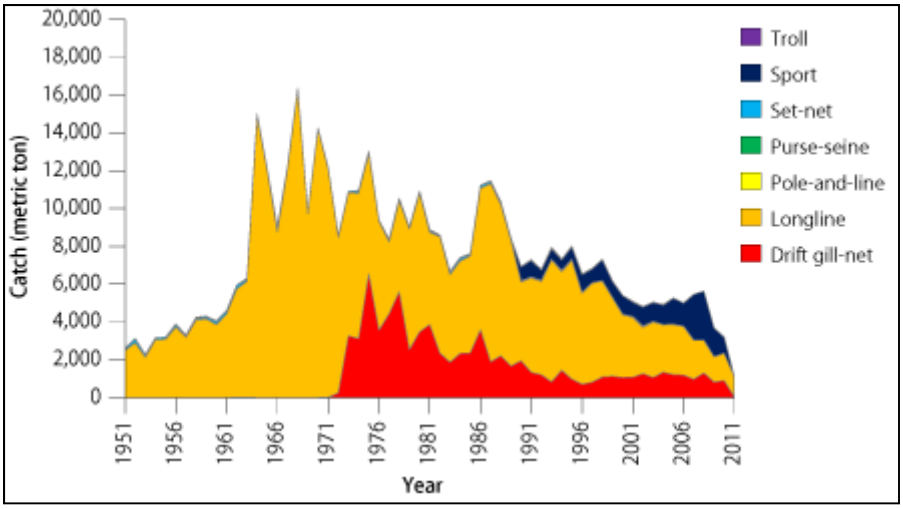

Figure 6. Annual landings of striped marlin by main fishing gears in the North Pacific Ocean.
Source:

[1] Data can be downloaded from http://isc.ac.affrc.go.jp/fisheries_statistics/index.html
[2] Data for Mexico's sports fisheries omitted from table since this fishery catches exclusively EPO striped marlin which are not overfished or subject to overfishing.

In the Eastern North Pacific Ocean (ENPO) the most recent stock assessment was conducted by Maunder and Hinton (2010) using data from 1975-2009. The results of the assessment indicate that the striped marlin stock in the ENPO is not subject to overfishing or overfished. Stock biomass has increased from a low of about 2,600 metric tons (t) in 2003, and was estimated to be about 5,100 t in 2009. There has been an increasing trend in the estimated ratio of the observed annual spawning biomasses to the spawning biomass (S) in the unexploited stock, which has doubled from about 0.19 in 2003 to about 0.38 in 2009. The estimated ratio of spawning biomass in 2009 to that expected to provide catch at the level of maximum sustained yield (MSY), $S_{(2009)}/S_{MSY}$, was about 1.5, which indicates that the spawning biomass was above the level expected to support MSY. The estimated recent levels of fishing effort (average 2007-2009) were below those expected at MSY (F_{mult} = 13.3). Recent annual dead discards and catches have been estimated to be about 1,300 t, or about 50 percent of MSY (2,596 t). If removals continue at this level, then it is expected that the biomass of the stock will continue to increase over the near term.

WCPFC management measures for WCNP striped marlin

The Seventh Meeting of the WCPFC adopted CMM 2010-01 required CCMs to reduce total catches of North Pacific Striped Marlin in a phased reduction that by January 1, 2013, the catch would be at 80% of the levels caught in 2000 to 2003. The CMM covered all fisheries, not just longliners. Most striped marlin in Hawaii is landed by the longline fishery (≈93%), and most of this longline striped marlin catch comes from WCPO (≈90%). US historical longline catches of striped marlin in the NP WCPO have ranged between 200-700 mt. Applying CMM 2010-01 to the period 2000-2003, where the maximum catch was 573 mt, produces a 2013 catch limit of 458 mt. Total catches of striped marlin in 2010 and 2011 amounted to 185 mt and 413 mt respectively.

No management measures have been adopted for ENPO striped marlin stock which as noted above is not overfished or subject to overfishing.

Hawaii longline fishery studies

In 2012 the Pelagics Plan Team recommended several studies to examine potential ways to manage striped marlin catch in the Hawaii longline fisheries based on the preliminary stock assessment and the forthcoming stock status determination of overfishing and overfished by Lee, et al.

The PIFSC conducted two studies to examine catch retention, condition of catch (live vs. dead), size frequency, and size by condition upon longline retrieval and disposition (see PIFSC IR-11-025). For the deep-set fishery, the percentage of alive striped marlin was ~49% from 2004–2011 with relatively small (46–53%) annual variation. In both longline fisheries at least 89% or more of the striped marlin caught is retained and sold. The percentage of alive striped marlin was higher in the shallow-set fishery (~76%) and also had relatively small (74–79%) annual variation from 2005 to 2011 (2004 has a small sample size). The percentages of striped marlin categorized as ‘alive’ are probably biased upwards by an unknown amount because observer protocols specify that any responsiveness calls for a designation as ‘alive’. The

percentage of alive striped marlin increased with size in both fisheries. In the deep-set fishery, the percentage alive was ~30% for striped marlin of 75–100 cm EFL and increased to ~68% for 175–200 cm EFL. In the shallow-set fishery, the percentage alive was ~69% for striped marlin of 100–125 cm EFL and increases to ~77% for 175–200 cm EFL. Hypothetically, if a size limit of <150 cm EFL was considered to be released from the longline fisheries , then the observed size categories from 2004 to 2010 would indicate that this would comprise 71% in number and 54% in weight for the deep-set fishery and 35% in number and 24% in weight for the shallow-set fishery.

PIFSC also examined the economic impact on Hawaii-based longline fisheries if size-limit categories for striped and blue marlin were established (IR-12-007). The economic loss associated with establishing a striped marlin minimum size limit of 150 cm (eye fork length, EFL) averaged $350,981 annually or a market reduction of 29.2%. The relationship between size limit and economic loss increases rapidly to a size of 175 cm EFL where the loss averaged $957,963 annually (84.1%). The economic loss associated with establishing a blue marlin minimum size limit of 150 cm EFL averaged $27,222 annually or a market reduction of 3.8%. The relationship increases rapidly to a size of 175 cm EFL where the loss averaged $368,161 annually (50.4%).

Given the high estimated fishing mortality Bigelow and Mourato (2010), conducted an analyses of potential longline catch reductions of North Pacific striped marlin while maintaining target bigeye tuna catches. Longline mitigation was based on modification of longline gear and spatially closed areas. Aspects of gear mitigation considered in the study were the efficacy of removing shallow hooks adjacent to longline floats and conversion of terminal gear from Japanese style tuna hooks to 18/0 circle hooks. A spatial and temporal analysis was conducted to investigate the existence of striped marlin catch rate (CPUE) hot spots. Analyses of the effects on removing shallow hooks and changing from tuna to circle hooks both demonstrated moderate striped marlin CPUE reductions with minimal or no reductions on target bigeye CPUE. Striped marlin CPUE hot-spots exist in the Baja California in the eastern Pacific, near New Zealand and in the northwest Pacific; however there were no hot-spots identified that were spatially persistent in the area fished by the Hawaii-based tuna fishery. Using large (18/0) circle hooks had a larger effect on CPUE (42% reduction) than removing shallow hooks. Reduced catchability occurred for most species on large circle hooks and they contend that these reductions are a function of 18/0 circle hook morphology.

Potential alternatives to reduce the impact of the Hawaii longline fisheries on WCNP striped marlin

The following alternatives address the actions that could be taken to reduce the impact of the Hawaii longline fisheries on WCNP striped marlin.

1. No action

Under this alternative, the Council would take no action to minimize impacts of fishing mortality on WCNP striped marlin and would continue to comply with any regional management measures for WCNP striped marlin as agreed to by the WCPFC.

Pros: The no action alternative imposes no additional administrative burden on the fishery, or on the Council and NMFS. Under the no action alternative Hawaii's pelagic fisheries catching striped marlin would likely continue to maintain catches beneath the current WCPFC specification or conform with any new measure that is agreed to by the WCPFC.

The no action alternative recognizes that action by the United States alone has no potential to reduce fishing mortality on the stock, and that the prime responsibility for reducing fishing mortality is primarily the function of the size of Japan's fisheries catching striped marlin.

Further, the current management measure applies to all fisheries catching striped marlin which includes the Hawaii troll/charter fishery. The troll fishery accounts for only 3.5% of the Hawaii striped marlin catch, while the charter fishery striped marlin catch accounts for 40% of the total troll catch. The no action alternative would mean that these small fisheries which catch only a tiny fraction of the Hawaii striped marlin catch would not be burdened with measures that may be ineffective to end overfishing and rebuild the stock..

Cons: Taking no action may be contrary to the provisions of the MSA, since under the no action alternative Hawaii's pelagic fisheries would continue to catch striped marlin without domestic management measures that reduce fishing mortality.

2. Prohibit retention of WCNPO striped marlin by the Hawaii longline and troll fisheries

Pros: Taking action to require non-retention by Hawaii's pelagic fisheries would be consistent with the MSA to develop domestic regulations to address the relative impact of domestic fisheries on WCNPO striped marlin.

Cons: A total ban on retaining striped marlin is unlikely to be implemented by those nations landing most of the catch, nor by the WCPFC. Thus US fishermen would be disproportionately burdened with a measure that may be ineffective to end overfishing and rebuild the stock. Striped marlin comprise about 3% of the landed volume and 1.3% of total landed value of pelagic fish in Hawaii. While minor in comparison to other pelagic landings, such a ban would have disproportionate effects in small vessel fisheries, especially the charter fisheries, which take about 40% of the troll catch. Striped marlin is popular with consumers in Hawaii so striped marlin would likely continue to be imported to Hawaii from those countries making greater contributions to striped marlin overfishing.

3. Establish a trip limit for WCNP striped marlin

Pros: Taking action to set a trip limit would be consistent with the MSA to develop domestic regulations to address the relative impact of domestic fisheries on WCNP striped marlin. A trip limit for striped marlin imposes less of an economic burden on the fishery than a retention ban. Moreover, a trip limit is more likely to be compatible with any measures implemented by the WCPFC and IATTC which are unlikely to impose non-retention for all fisheries.

Cons: Implementation of a trip limit may impose a significant regulatory burden on the Hawaii

longline fisheries, Council and NMFS that is greatly disproportionate to the impact of the measure on stock fishing mortlaity. Striped marlin is popular with consumers in Hawaii so striped marlin would likely continue to be imported to Hawaii from those countries making greater contributions to the overfishing/overfished status of striped marlin. A trip limit for striped marlin in the Hawaii longline fisheries may be ineffective to end overfishing and rebuild the stock.

4. Establish a minimum size for retention for WCNPO striped marlin.

Under this alternative, a minimum size of 150 cm would be established as the minimum size for retention of striped marlin, which is close to the 50% length at sexual maturity (Bigelow 2011, 2012).

Pros: This measure would still permit catch and retention of striped marlin, albeit that fish smaller than 150 cm would have to be released. Released fish would be subject to some post release mortality but survivors would have a chance to grow to become sexually mature and contribute to further recruitment.

Cons: Implementation of a size limit may impose a significant regulatory burden on the Hawaii longline fishery, troll fishery, Council, NMFS and State of Hawaii that is greatly disproportionate to the impact of the measure on the fishing mortality of the stock. About 50% of the fish caught by the deep set longline fishery are reported as dead on longline hauls, thus the impact of a minimum size may be very limited in terms of conservation gains. Although the troll fishery is currently only 3.8% of total striped marlin landings, a minimum size for retention would disproportionately affect the charter vessel fishery which in 2011 landed 54% of the striped marlin (WPRFMC 2013).

Council Action

The SSC and Council may wish to select a preliminary preferred alternative or develop and alternative not considered here to address the overfishing of the WCNPO striped marlin stock. The SSC and Council may also wish to recommend whether a new WCPFC CMM is needed or if the current CMM should remain in effect.

References

Lee, H-H, K.R. Piner, R. Humphreys and J. Brodziak. 2012. Stock assessment of striped marlin in the Western and Central North Pacific Ocean in 2011. Billfish Working Group, International Scientific Committee for Tuna and Tuna-like Species in the North Pacific Ocean, Sapporo, Japan. 117 pp. (http://isc.ac.affrc.go.jp/latest_stock_assessments.html)

Maunder, M.N. & M.G. Hinton.2010. Status and trends of striped marlin in the Northeast Pacific Ocean in 2009. Inter-American Tropical Tuna Commission, 1st Scientific Advisory Committee Meeting, August 31-3 September, 2010, La Jolla, 218 pp. (http://iattc.org/StockAssessmentReports/StockAssessmentReport11ENG.htm)

WPRFMC. 2013. Pelagic fisheries of the Western Pacific Region, Annual Report 2011. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, 340 pp. (http://wpcouncil.org/managed-fishery-ecosystems/pacific-pelagic/data-collection-and-annual-reports-pelagics/)