



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

### **1. Purpose and need**

The purpose for action by the Western Pacific Regional Fishery Management Council (Council) is that the National Marine Fisheries Service (NMFS) has made a determination that Western and Central North Pacific (WCNP) striped marlin is an overfished stock. NMFS informed the Council about this determination for WCNP striped marlin on December 5 2013, but the Federal Register announcement was not made until May 19, 2014. NMFS based its decision on the most recent stock assessment of, conducted in 2012 by the International Scientific Committee (ISC) (Lee et al. 2012). The results support a conclusion that the stock is subject to overfishing because the fishing mortality  $F/F_{MSY}$  is  $> 1.0$  (1.25) indicating the stock is subject to overfishing, and the spawning biomass (938 mt) is lower than the minimum stock size threshold (MSST) of 1,628

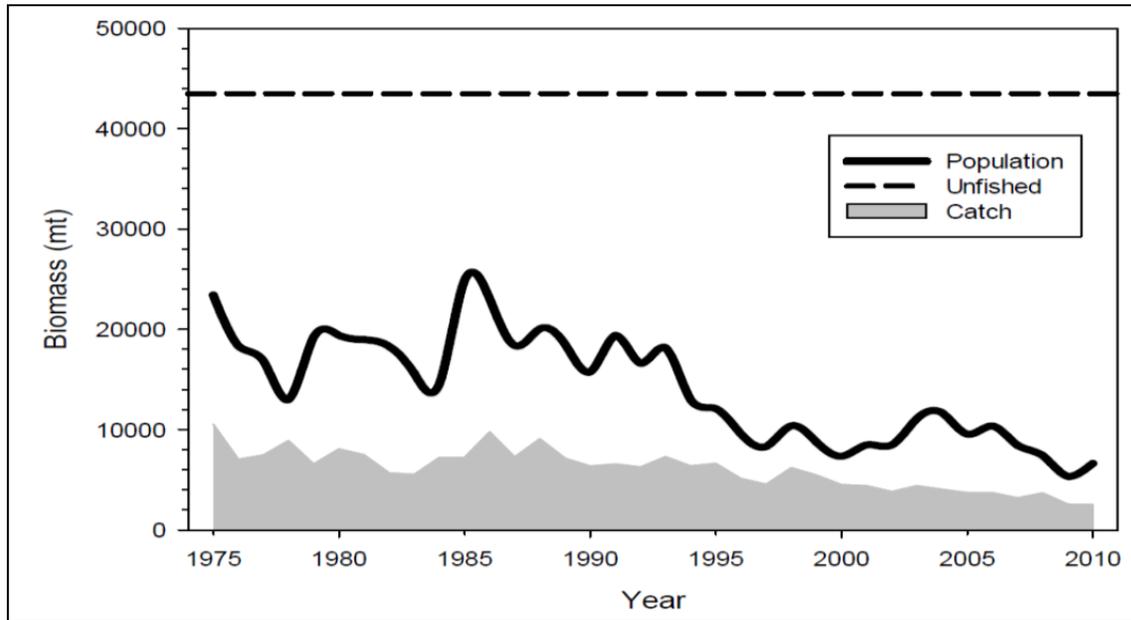
The need for Council action stems from National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which requires that 'conservation and management measures shall prevent overfishing while achieving optimum yield from each fishery for the United States fishing industry. Further, the evaluation of the overfished and overfishing condition of WCNP striped marlin stated that the Council is obliged to take action under sections 304(i) and 304(i)(2) of the Magnuson-Steven Act to address international and domestic impacts, respectively. The Council must develop domestic regulations to address the relative impact of the domestic fishing fleet on the stock, and develop recommendations to the Secretary of State and Congress for international actions to end overfishing and rebuild WCNP striped marlin.

### **2. Status of WCNP Striped Marlin**

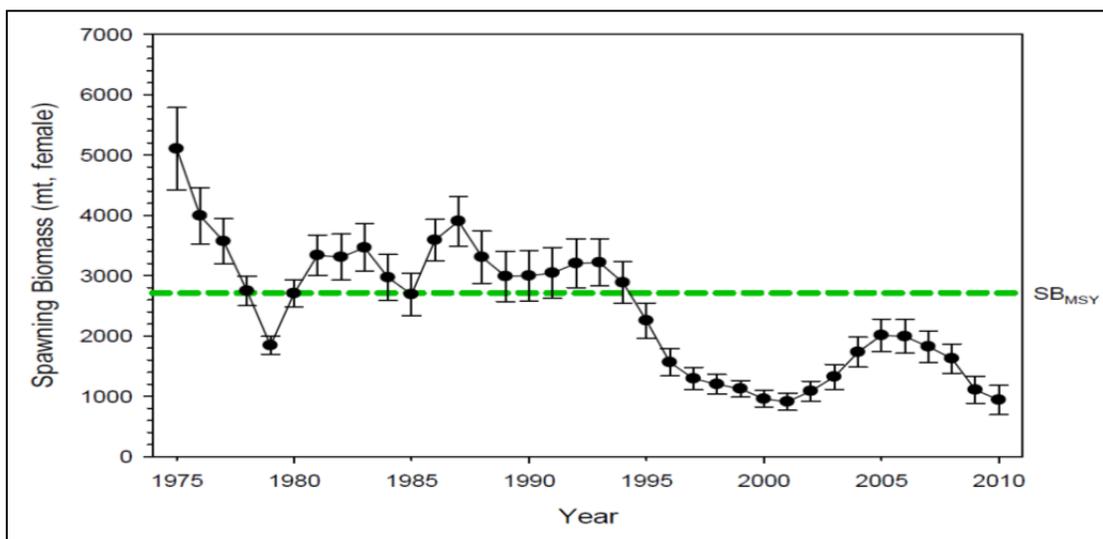
Catches of WCNP striped marlin have exhibited a long-term decline since the 1970s. Catches averaged roughly 8,100 metric ton (mt) per year during 1970-1979 and declined by roughly 50% to about 3,800 mt per year during 2000-2009. Lee et al. (2012) identified the stock is subject to overfishing and overfished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

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.

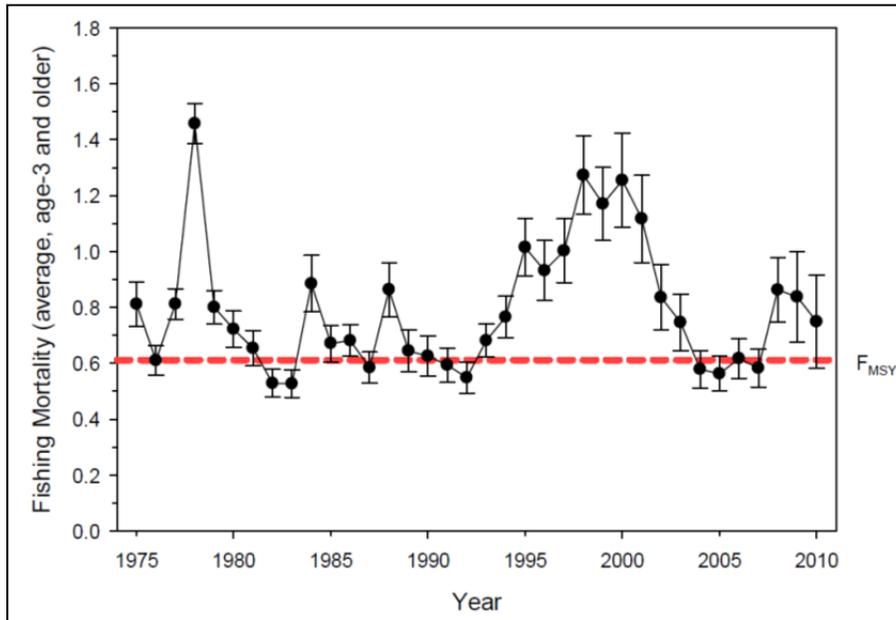


**Figure 1. Trends in population biomass and reported catch biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010. Source: Lee et al. (2012)**

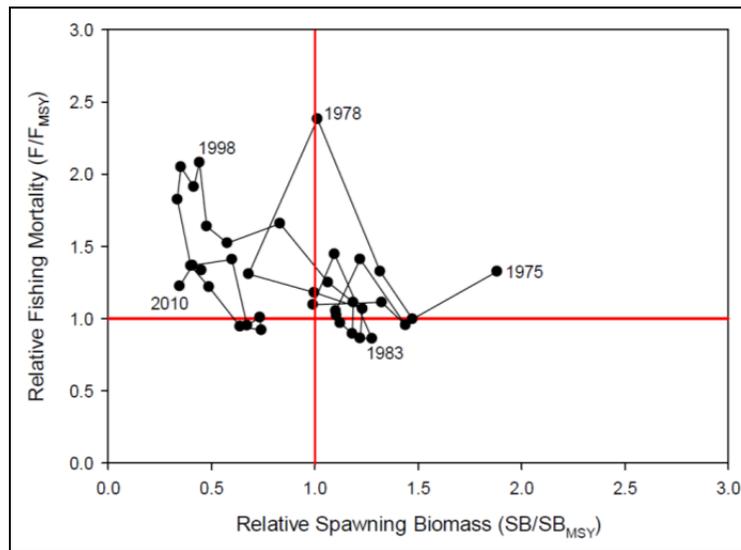


**Figure 2. Trends in estimates of spawning biomass of Western and Central North Pacific striped marlin (*Kajikia audax*) during 1975-2010 along with 80%  $SSB_{MSY}$**

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)

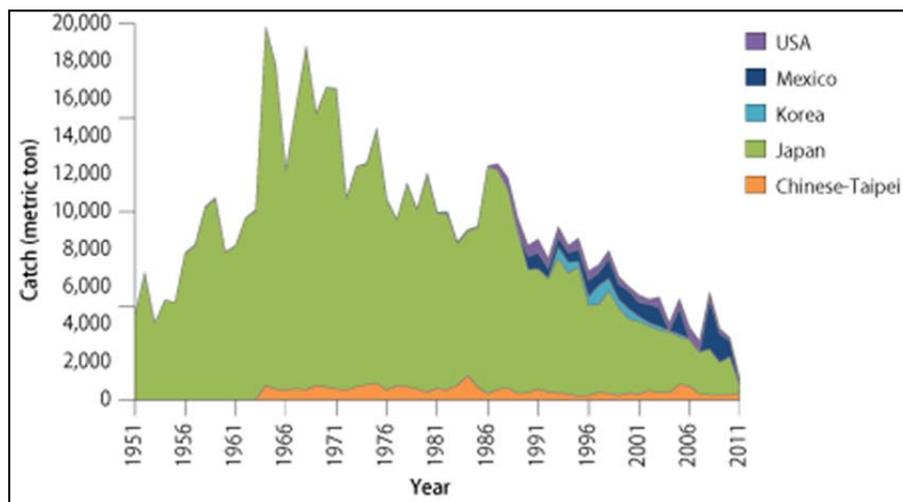
The ISC provided the following scientific information as conservation advice:

- 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 between 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: ISC web site,

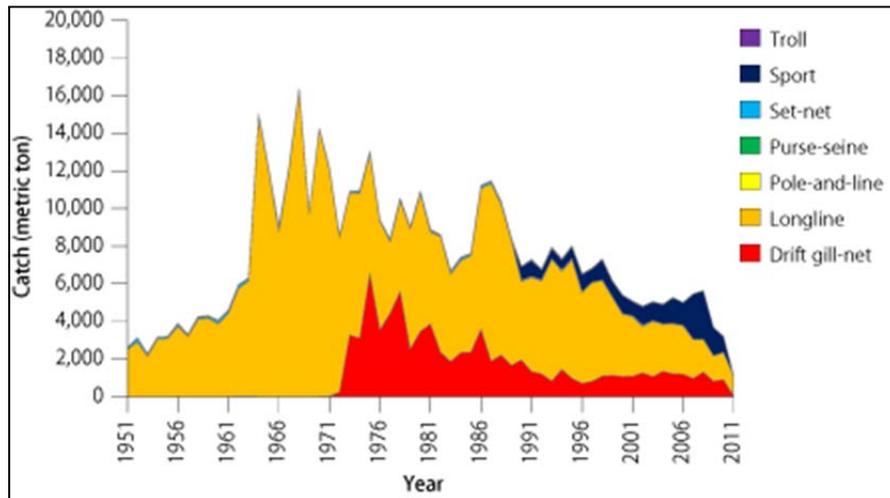
[http://isc.ac.affrc.go.jp/fisheries\\_statistics/index.html](http://isc.ac.affrc.go.jp/fisheries_statistics/index.html)

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)<sup>1</sup> 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<sup>2</sup>**

Year	Chinese Taipei	Japan	Korea	USA	Total	WCPFC area
2006	741	2,447	56	630	5,076	1,308
2007	301	2,220	47	567	5,540	1,083
2008	270	2,408	29	440	5,729	1,446
2009	262	1,719	22	270	3,788	974
2010	253	2,028	18	177	3,310	1,074



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

Source: ISC web site, [http://isc.ac.affrc.go.jp/fisheries\\_statistics/index.html](http://isc.ac.affrc.go.jp/fisheries_statistics/index.html)

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

<sup>1</sup> Data can be downloaded from [http://isc.ac.affrc.go.jp/fisheries\\_statistics/index.html](http://isc.ac.affrc.go.jp/fisheries_statistics/index.html)

<sup>2</sup> 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 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.

### **3. Hawaii longline fishery studies on WCNP Striped Marlin**

In 2012 the Council's 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.

NMFS Pacific Islands Fishery Science Center (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 (Bigelow 2011; 2012).

For the deep-set fishery, the percentage of live 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 live 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 150 cm EFL was considered as the minimum size for 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%).

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. 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. 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.

The Hawaii deep set longline fleet is now obliged to fish solely with circle hooks, using predominantly 15/0 sized hooks as a result of interactions with false killer whales. No economic analyses has been conducted on the impact of the hook change but it is thought that the universal use of circle hooks will lead to fewer striped marlins being caught.

A spatial and temporal analysis was conducted to investigate the existence of striped marlin catch rate (CPUE) hot spots. Striped marlin CPUE hot-spots exist in 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.

#### **4. WCPFC management measures for WCNP striped marlin**

The Seventh Meeting of the WCPFC adopted CMM 2010-01 that 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 ( $\approx 96-97\%$ ), and most of this longline striped marlin catch comes from WCPO ( $\approx 90\%$ ). 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 in Hawaii (longline plus troll/handline) was 573 mt, produces a catch limit of 458 mt. Total catches of striped marlin in Hawaii in 2012 and 2013 amounted to 293 mt and 401 mt respectively.

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

#### **5. Previous Council Action**

The Council considered the implications of the 2012 stock assessment at its 157<sup>th</sup> Meeting in June 2013, anticipating an overfished evaluation from NMFS. The Council made the following recommendation:

**Regarding a Potential New WCPFC Conservation and Management Measure for North Western and Central Pacific Striped Marlin, the Council recommended NMFS develop management measures that will end overfishing and lead to stock recovery, such as fishing at a constant catch of 3,600 mt as noted in the 2012 stock**

**assessment, and further advocate for measures that establish limits of not more than 500 mt for any CCMs with a history of catching less than 500 mt of striped marlin.**

The Council communicated this recommendation to NMFS in a letter dated July 8, 2013 and received a response dated July 24, 2013, which acknowledged that the Council recommendations were based on sound scientific advice.

## **6. Potential alternatives to reduce the impact of the Hawaii longline fisheries on WCNP striped marlin**

With respect to international fisheries, the Council reiterates its previous recommendation.

The following alternatives address the domestic actions that could be taken to reduce the impact of the Hawaii 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 regulatory burden on the fishery. 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 to 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 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.

### **2a. Prohibit retention of WCNP striped marlin by the Hawaii longline and troll fisheries when the WCPFC catch limit of 458 mt is reached**

**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 marlins 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.

## **2b. Prohibit retention of WCNPO striped marlin by the Hawaii longline when 95% WCPFC catch limit of 458 mt is reached**

Pros: The Hawaii longline fishery is an intensively monitored federally managed fishery and typically accounts for 96-97% of all the striped marlin landed in Hawaii. Thus as the cumulative total is approached in a given year then this fishery would be subject to non-retention of striped marlin until the following year. Troll vessels take between 2.4-4.2 % of the total striped marlin catch subjecting the longline fishery to a closure at 95% of the WCPFC limit (435 mt). This should leave sufficient margin for the troll fish catch without the danger of exceeding the 458 mt total

Further, nearly half of the troll landings are taken by charter vessels many of which practice a catch and release for marlins thus a potential source of mortality will be ameliorated by this catch and release ethic.

Cons: The application of the catch limit only to the longline fishery may be perceived to be inequitable. The longline fishermen may argue that they are being unfairly treated simply because their fishery is extremely well monitored in near real time and so it is easier to make them bear the brunt of management rather than extending the measure to all pelagic fisheries.

Upon hitting the limit it is recognized that a certain percentage of striped marlin may be subject to post hooking mortality and die even if alive on release. Discarding economically striped marlin impacts Hawaii's seafood consumers and fishing industry while likely having no impact on striped marlin stock status given that Japan catches about 80% of the WCNP landings. In addition, catch reporting by non CML troll fishers are believed to be poor and values uncertain.

## **7. Alternatives considered but no analyzed in detail**

Other alternatives were considered but not analyzed in detail, these include:

- Establishment of a trip limit for WCNP striped marlin
- Establishment of a minimum size for retention for WCNPO striped marlin

- Non-retention of all marlins
- Removal of two shallowest hooks nearest float in deep-set tuna fishery

Given that the total landings of striped marlin have consistently remained below the WCPFC limit, the Council sees no utility at this point in implementing additional measures which would add to the existing regulatory, administrative and enforcement burden on Hawaii's pelagic fisheries.

## References

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