



**COMMISSION  
FIFTEENTH REGULAR SESSION**  
Honolulu, Hawaii, USA  
10 – 14 December 2018

---

**REFERENCE DOCUMENT FOR THE SCIENTIFIC INFORMATION AND DEVELOPMENT  
OF HARVEST STRATEGIES FOR NORTH PACIFIC STRIPED MARLIN (*Kajikia audax*)**

---

**WCPFC15-2018-18  
20 November 2018**

**Paper prepared by the Secretariat**

**A. Introduction**

1. The purpose of this paper is to provide a quick reference guide to the recommendations of the Scientific Committee (SC) and the Northern Committee (NC) of relevance to the discussions on the development of a harvest strategy for North Pacific striped marlin stock. It lists the recommendations drawn from the summary reports of SC14 and NC14.

**B. Scientific Committee Recommendations** (*Paragraphs 376 – 380, SC14 Summary Report*)

*Status and trends*

2. SC14 noted that no stock assessments were conducted for North Pacific striped marlin in 2018. Therefore, the stock status descriptions from SC11 are still current for North Pacific striped marlin. Updated information on catches was not compiled for and reviewed by SC14.

3. To emphasize the importance of developing a stock rebuilding plan for North Pacific striped marlin, SC14 reiterated the ISC15 stock status information, excerpted from SC11:

“Estimates of population biomass of the Western and Central North Pacific (WCNPO) striped marlin stock (*Kajikia audax*) exhibit a long-term decline (Table S1). Population biomass (age-1 and older) averaged roughly 20,513 mt, or 46% of unfished biomass during 1975-1979, the first 5 years of the assessment time frame, and declined to 6,819 mt, or 15% of unfished biomass in 2013. Spawning stock biomass is estimated to be 1,094 mt in 2013 (39% of  $SSB_{MSY}$ , the spawning stock biomass to produce MSY). Fishing mortality on the stock (average  $F$  on ages 3 and older) is currently high and averaged roughly  $F = 0.94$  during 2010-2012, or 49% 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  $SPR_{2010-2012} = 12\%$  which is 33% below the level of SPR required to produce MSY. Recruitment averaged about 308 thousand recruits during 1994-2011, which was 25% below the 1975-2013 average. No target or limit reference points have been established for the WCNPO striped marlin stock under the auspices of the WCPFC.

The WCNPO striped marlin stock is expected to be highly productive due to its rapid growth and high resilience to reductions in spawning potential. The status of the stock is highly dependent on the magnitude of recruitment, which has been below its long-term average since 2007, with the exception of 2010 (Table S1). Changes in recent size composition data in comparison to the previous assessment resulted in changes in fishery selectivity estimates and also affected recruitment estimates. This, in turn, affected the scaling of biomass and fishing mortality to reference levels.

Table S1: Reported annual values of catch (mt), population biomass (mt), spawning stock biomass (mt), relative spawning stock biomass  $SSB/SSB_{MSY}$ , recruitment (000s), fishing mortality, relative fishing mortality ( $F/F_{MSY}$ ), exploitation rate, and spawning potential ratio for the WCNPO striped marlin stock.

Year	2007	2008	2009	2010	2011	2012	2013	Mean <sup>1</sup>	Min <sup>1</sup>	Max <sup>1</sup>
Reported Catch	3084	3503	2468	2852	3125	3521	2984	5822	2468	10594
Population Biomass	6915	6773	6409	5156	7823	7349	6819	12758	5156	28440
Spawning Stock	1192	1171	970	984	873	1013	1094	2025	815	6946
Relative Spawning	0.42	0.42	0.34	0.35	0.31	0.36	0.39	0.75	0.29	2.46
Recruitment (age 0)	240	242	63	496	155	224	352	410	63	1369
Fishing Mortality	0.82	0.99	0.80	0.96	0.89	0.97	0.76	0.95	0.47	1.54
Relative Fishing	1.29	1.57	1.27	1.51	1.41	1.53	1.20	1.50	0.74	2.44
Exploitation Rate	45%	52%	39%	55%	40%	48%	44%	48%	32%	65%
Spawning Potential	15%	12%	16%	13%	12%	12%	14%	13%	7%	24%

<sup>1</sup> During 1975-2013

When the status of striped marlin is evaluated relative to MSY-based reference points, the 2013 spawning stock biomass is 61% below  $SSB_{MSY}$  (2819 t) and the 2010-2012 fishing mortality exceeds  $F_{MSY}$  by 49%. Therefore, overfishing is occurring relative to MSY-based reference points and the WCNPO striped marlin stock is overfished.”

### ***Management advice and implications***

4. SC14 noted that no management advice has been provided since SC11 for North Pacific striped marlin. Therefore, previous advice should be maintained, pending a new assessment or other new information.
5. To emphasize the importance of developing a stock rebuilding plan for North Pacific striped marlin, SC14 reiterated the following management advice and information, excerpted from SC11.

SC11 noted the following conservation advice from ISC:

The stock has been in an overfished condition since 1977, with the exception of 1982 and 1983, and fishing appears to be impeding rebuilding especially if recent low recruitment levels persist.

Projection results show that fishing at FMSY could lead to median spawning biomass increases of 25%, 55%, and 95% from 2015 to 2020 under the recent recruitment, medium-term recruitment, and stock recruitment-curve scenarios.

Fishing at a constant catch of 2,850 t could lead to potential increases in spawning biomass of 19% to over 191% by 2020, depending upon the recruitment scenario.

In comparison, fishing at the 2010-2012 fishing mortality rate, which is 49% above FMSY, could lead to changes in spawning stock biomass of -18% to +18% by 2020, while fishing at the average 2001-2003 fishing mortality rate ( $F_{2001-2003}=1.15$ ), which is 82% above FMSY, could lead to spawning stock biomass decreases of -32% to -9% by 2020, depending upon the recruitment scenario.

SC11 expressed concerns about the updated stock status of WCNPO striped marlin, noting that the stock was overfished (SSB<sub>2013</sub> at 61% below SSB<sub>FMSY</sub>) and that overfishing was occurring ( $F_{2010-2012}$  exceeds FMSY by 49%). Although a LRP for billfish species has not been adopted by the WCPFC, SC11 noted that  $SSB_{current}/SSB_{current,F=0}=0.12$  and is below the LRP adopted for tunas. SC11 also noted that projections indicate that  $Prob(SSB_{2020}>SSB_{2015})<50\%$  for all constant catch scenarios over 2,850 mt (under the three recruitment hypotheses modelled), which means that in order to allow the spawning biomass to rebuild then catches need to be reduced to less than 2,850mt. SC11 recommends that the Commission develop a rebuilding plan for North Pacific striped marlin with subsequent revision of CMM 2010-01 in order to improve stock status.

***Recommendations on the designation of North Pacific striped marlin as a Northern Stock***

6. Regarding the issue of the designation of North Pacific striped marlin as a Northern Stock (WCPFC14 Report, Para 378), SC14 provides the following recommendations:

- 1) SC14 recommends that the Commission clarify and quantify what is meant by “*mostly north of 20 degrees N*”.
- 2) In relation to paragraph 1, SC14 recommends that a check-list of benchmark scientific information for North Pacific striped marlin be developed to support the Commission’s deliberations in determining the designation of a northern stock. As such, the following table is forwarded for the Commission’s consideration.

No	Criteria	Response	Comments
1	What proportion of the total estimated stock biomass occurs on average north of 20N?	*Proportion of biomass above 20 °N is 2-4 times larger than the proportion of biomass south of 20 °N in the North Pacific	SC14-SA-IP-011 This value was estimated by stock assessment result in 2007.
2	Does all of the breeding/spawning area(s) occur north of 20 °N?	Unknown	
3	Does all of the nursery area(s) occur north of 20 °N?	Unknown	
4	Do any other important life history stages occur south of 20N?	Unknown	

5	What proportion of the total estimated catch occurs north of 20 °N?	**Range of annual percentages of 66%-96% above 20 °N. During the 2000s the average percentage was 73% above 20 °N	SC14-SA-IP-11 These values were estimated from stock assessment results in 2007, but were not endorsed by SC3.
6	Is fishery catch-per-unit-effort demonstrably higher north of 20 °N for comparable fisheries?	Unknown	
7	Is there sufficient information about fish movement between north and south of 20 °N?	No	

\*Proportion of biomass was calculated in 1964 and 1969 that is near the initial condition.

\*\*The average proportion of the total catch in numbers were calculated by decade (1950's-2000's).

### C. Northern Committee Recommendations (*Paragraphs 70 – 71, NC14 Summary Report*)

7. NC14 agreed to request ISC to conduct projections examining rebuilding scenarios for NP striped marlin that cover a range of rebuilding targets (20%SSB<sub>F=0</sub>, F<sub>MSY</sub>, and 0% to 50% reductions in increments of 10% from current catch limits), timelines (10, 15 and 20 years) and probabilities of each scenario to reach each target within different timelines. ISC should produce additional scenarios of catch reduction if the probability of reaching the rebuilding target in 10, 15, and 20 years is not at least 60%.

8. NC14 expressed concern over the status of NP striped marlin and urged the Commission to develop a rebuilding plan for the stock as a matter of priority. NC members are encouraged to submit a draft CMM, if possible.