***Pacific Blue Marlin (Makaira nigricans)***

***Provision of scientific information***

ISC presented SC12-SA-WP-11. (Stock Assessment Update for Blue Marlin (*Makaira nigricans*) in the Pacific Ocean through 2014).

Status and trends

* SC12 noted the stock status for Pacific blue marlin provided by ISC in GN-IP-02 and SA-WP-12:

“Estimates of total BUM stock biomass show a long term decline. Population biomass (age-1 and older) averaged roughly 130,965 t in 1971-1975, the first 5 years of the assessment time frame, and has declined by approximately 40% to 78,082 t in 2014 (Figure 7-11). Female spawning biomass was estimated to be 24,809 t in 2014, or about 25% above SSBMSY (Table 7-3 and Table 7-4). Fishing mortality on the stock (average F, ages 2 and older) averaged roughly F = 0.28 during 2012-2014, or about 12% below FMSY. The estimated spawning potential ratio of the stock (SPR, the predicted spawning output at the current F as a fraction of unfished spawning output) is currently SPR2012-2014 = 21%. Annual recruitment averaged about 897,000 recruits during 2008-2014, and no long-term trend in recruitment was apparent. Overall, the time series of spawning stock biomass and recruitment estimates indicate a long-term decline in spawning stock biomass and suggest a fluctuating pattern without trend for recruitment (Figure 7-11).

**Table 7-3. Reported catch (t) used in the stock assessment along with annual estimates of population biomass (age-1 and older, t), female spawning biomass (t), relative female spawning biomass (SSB/SSBMSY), recruitment (thousands of age-0 fish), fishing mortality (average F, ages-2 and older), relative fishing mortality (F/FMSY), and spawning potential ratio of Pacific BUM.**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | Mean1 | Min1 | Max1 |
| Reported Catch | 17,828 | 18,282 | 20,086 | 18,165 | 19,407 | 20,727 | 20,356 | 18,232 | 9,160 | 25,589 |
| Population Biomass | 71,768 | 69,720 | 72,696 | 72,995 | 76,697 | 78,761 | 78,082 | 101,149 | 69,720 | 135,623 |
| Spawning Biomass | 22,706 | 23,065 | 22,392 | 23,182 | 23,432 | 24,771 | 24,809 | 41,717 | 20,972 | 71,807 |
| Relative Spawning Biomass | 1.14 | 1.16 | 1.13 | 1.17 | 1.18 | 1.25 | 1.25 | 2.10 | 1.06 | 3.62 |
| Recruitment (age 0) | 687 | 1031 | 702 | 1061 | 763 | 909 | 839 | 897 | 589 | 1181 |
| Fishing Mortality | 0.27 | 0.29 | 0.30 | 0.26 | 0.27 | 0.28 | 0.28 | 0.22 | 0.09 | 0.38 |
| Relative Fishing Mortality | 0.82 | 0.88 | 0.92 | 0.82 | 0.83 | 0.87 | 0.87 | 0.67 | 0.26 | 1.17 |
| 1 During 1971-2014 |  |  |  |  |  |  |  |  |  |  |

**Table 7-4 Estimates of biological reference points along with estimates of fishing mortality (F), female spawning stock biomass (SSB), recent average yield (C), and spawning potential ratio (SPR) of BUM, derived from the base case model assessment model, where “MSY” and “20%” indicate reference points based on maximum sustainable yield and a spawning potential ratio of 20%, respectively.**

|  |  |
| --- | --- |
| **Reference Point** | **Estimate** |
| FMSY (age 2+) | 0.32 |
| F20% (age 2+) | 0.30 |
| F2012-2014 (age 2+) | 0.28 |
| SSBMSY | 19,853 mt |
| SSB20% | 22,727 mt |
| SSB2014 | 24,809 mt |
| MSY | 19,901 mt |
| C2012-2014 | 20,163 mt |
| SPRMSY | 0.18 |
| SPR2012-2014 | 0.21 |

Note: SSB values represent female spawning biomass only.

The Kobe plot depicts the stock status relative to MSY-based reference points for the base case model (Figure 7-12) and shows that spawning stock biomass decreased to roughly the MSY level in the mid-2000s, and has increased slightly in recent years (Table 7-4 and Figure 7-11).

Based on the results of this 2016 stock assessment update, the Pacific blue marlin stock is not currently overfished and is not experiencing overfishing.Because Pacific blue marlin is mainly caught as bycatch, direct control of the annual catch amount through the setting of a total allowable catch may be difficult.”



**Figure 7-11. Time series of estimates of (a) population biomass (age 1+), (b) female spawning biomass, (c) recruitment (age-0 fish), and (d) instantaneous fishing mortality (average for age 2+, year-1) for BUM derived from the 2016 stock assessment update. The solid circles represents the maximum likelihood estimates by year for each quantity and the shadowed area represents the uncertainty of the estimates (± 1 standard deviation), except for the total biomass time series. The solid horizontal lines indicate the MSY- based reference points for spawning biomass and fishing mortality.**



**Figure 7-12. Kobe plot of the time series of estimates of relative fishing mortality (average of age 2+) and relative spawning stock biomass of BUM during 1971-2014. The dashed lines denote the 95% confidence intervals for the estimates in the year 2014.**

Management advice and implications

* SC12 noted the conservation advice for Pacific blue marlin provided by ISC in GN-IP-02 and SA-WP-12:

“Since the stock is nearly full exploited, the ISC recommends that fishing mortality remain at or below current levels (2012-2014).”