CALCULATION OF SKIPJACK CATCH LIMIT FOR THE PERIOD 2018-2020 USING THE HARVEST CONTROL RULE ADOPTED IN RESOLUTION 16/02

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13 NOVEMBER 2017

PURPOSE

The application of the skipjack Harvest Control Rule to calculate the skipjack total annual catch limit for the period 2018-2020, using the parameters estimated at the 2017 skipjack stock assessment as defined in Resolution 16/02 *On Harvest Control Rules for Skipjack Tuna in the IOTC Area of Competence*.

The SC NOTED the Recommendation from TCMP01 which was, subsequently, ENDORSED by S21 IOTC Commission that "*when establishing a catch limit for skipjack tuna using the Harvest Control Rule (HCR) adopted in Resolution 16/02, the following procedure will be applied: after the review of the assessment of skipjack tuna by the SC, the result of the assessment will be used by the SC in the calculation of a catch limit using the adopted HCR. The Secretariat will then notify CPCs of the new catch limit for skipjack tuna that will apply for 2018*" (IOTC-2017-S21-R, Para. 56).

BACKGROUND

The Commission adopted Resolution 16/02 *On Harvest Control Rules for Skipjack in the IOTC Area of Competence* based upon simulation trials of a number of Harvest Control Rules conducted, reviewed and endorsed by WPM and the SC in 2015. As stated in the resolution, the first implementation of the HCR will be based upon the 2017 skipjack stock assessment agreed by the WPTT and then endorsed by SC.

The Resolution also requested a further review and possible modification of the HCR to be conducted after several iterations of applying the HCR, but no later than 2021.

CALCULATION OF THE SKIPJACK CATCH LIMIT FOR 2018-2020 USING THE ADOPTED SKJ HARVEST CONTROL RULE IN RESOLUTION 16/02

The SC NOTED that the Harvest Control Rule described in Resolution 16/02 requests that the skipjack tuna stock assessment is conducted every three (3) years, with the next stock assessment occurring in 2017.

The SC also NOTED that the application of the HCR shall recommend a total annual catch limit for 2018-2020 using the following three (3) values estimated from the skipjack stock assessment. For each value, the reported median from the reference case adopted by the Scientific Committee for advising the Commission shall be used:

a) The estimate of current spawning stock biomass (B_{curr});
b) The estimate of the unfished spawning stock biomass (B_0);
c) The estimate of the equilibrium exploitation rate (E_{targ}) associated with sustaining the stock at $B_{targ} = 40\% \ B_0$.

The SC also NOTED that the HCR has five control parameters as follows:
a) Threshold level (T), the percentage of B_0 below which reductions in fishing mortality are required, set at T = 40%. If biomass is estimated to be below the threshold level, then fishing mortality reductions, as output by the HCR, will occur.
b) Maximum fishing intensity (I_{max}), the percentage of E_{targ} that will be applied when the stock status is at, or above, the threshold level, set as Imax = 100%. When the stock is at or above the threshold level, then fishing intensity (I) = I_{max}

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c) Safety level (X), the percentage of B_0 below which non-subsistence catches are set to zero i.e. the non-subsistence fishery is closed, set as X = 10%. This level is below the LRP and is intended to prevent stock collapse should the biomass reach such levels.

d) Maximum catch limit (C_{max}), the maximum recommended catch limit, set at C_{max} = 900,000 t. To avoid the adverse effects of potentially inaccurate stock assessments, the HCR shall not recommend a catch limit greater than C_{max}.

e) Maximum change in catch limit (D_{max}), the maximum percentage change in the catch limit, set at D_{max} = 30%. To enhance the stability of management measures the HCR shall not recommend a catch limit that is 30% higher, or 30% lower, than the previous recommended catch limit.

The SC also NOTED that the recommended total annual catch limit shall be set as follows:

a) If the current spawning biomass (B_{curr}) is estimated to be at or above the threshold spawning biomass i.e., $B_{curr} >= 0.4B_0$, then the catch limit shall be set at $[I_{max}$ x E_{targ} x $B_{curr}]$

b) If the current spawning biomass (B_{curr}) is estimated to be below the threshold biomass i.e, $B_{curr} < 0.4B_0$, but greater than the safety level i.e., $B_{curr} > 0.1B_0$, then the catch limit shall be set at $[I$ x E_{targ} x $B_{curr}]$.

c) If the spawning biomass is estimated to be at, or below, the safety level, i.e. $B_{curr} <= 0.1B_0$ then the catch limit shall be at 0 for all fisheries other than subsistence fisheries.

d) In the case of (a) or (b), the recommended catch limit shall not exceed the maximum catch limit (C_{max}) and shall not increase by more than 30% or decrease by more than 30% from the previous catch limit.

e) In the case of (c) the recommended catch limit shall always be 0 regardless of the previous catch limit.

The HCR described in above produces a relationship between stock status (spawning biomass relative to unfished levels) and fishing intensity (exploitation rate relative to target exploitation rate) as shown below:
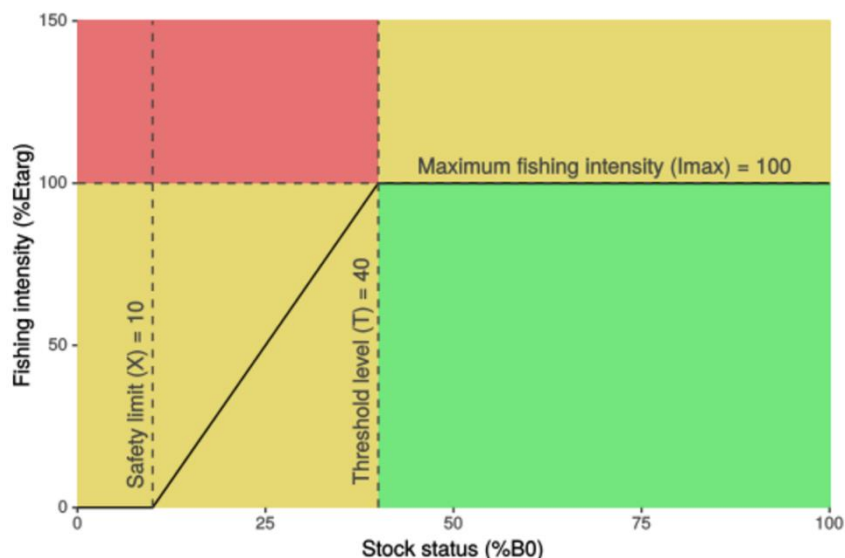
SKIPJACK STOCK ASSESSMENT IN 2017

The SC also NOTED that in the HCR established in Resolution 16/02 the estimates for the calculation of the catch limit should be taken from a model-based stock assessment that has been reviewed by the Working Party on Tropical Tunas and endorsed by the Scientific Committee via its advice to the Commission.

The SC NOTED that skipjack management advice was based on the range of results from the skipjack SS3 stock assessment model in 2017. The SC NOTED that the WPTT AGREED to use a model grid to characterize the uncertainy in the assessment related to growth, tag mixing period, tagging programs, natural mortality, steepness and tag-release mortality (for more details see IOTC-2017-WPTT19-Report). The SC also NOTED WPM's RECOMMENDATION that *the SC should apply the median value of the distribution of B_{curr}/B_0 outcomes from the stock assessment for specifying the*

I value for use in the catch limit calculation. Likewise, median values of estimates of B_{curr} and E_{targ} should also be used in calculations of the catch limit (i.e. $I \times E_{targ} \times B_{curr}$).

The SC NOTED the following key assessment results from the final grid (36 scenarios) of the SS3 (Median values with 80 % Confidence Interval in brackets):

Management Quantity	Indian Ocean
Catch in 2016	446,723 t
Average catch 2012–2016	407,456 t
$Yield_{40\%SSB}$ (1000 t) (80% CI)	510.1 (455.9–618.8)
$E_{2016}/E_{40\%SSB}$ (80% CI):	0.9259 (0.70–1.13)
$C_{2016}/C_{40\%SSB}$ (80% CI)	0.88 (0.72-0.98)
SB_0 (80% CI)	2,015.2 (1,651.2–2,296.1)
Total biomass B_{2016} (1000 t) (80% CI)	910.4 (873.6-1195)
$SB_{2016}/SB_{40\%SSB}$ (80% CI)	1.00 (0.88–1.17)
SB_{2016}/SB_0 (80% CI)	**0.40 (0.35–0.47)**
SB_{2016} (1000 t) (80% CI)	**796.66 (582.65-1059.4)**
$E_{target} = E_{40\%SSB}$ (80% CI)	**0.59 (0.53-0.65)**

Therefore, in relation to the application of the HCR, the SC NOTED:

a) The median of $SB_{2016}/SB_0 = 0.40$;
b) The estimate of the equilibrium exploitation rate associated with sustaining the stock at B_{targ} is $E_{targ} = 0.59$.
c) The current spawning biomass (B_{curr}) is estimated to be at or above the threshold spawning biomass i.e., $B_{curr} \geq 0.4B_0$, then the catch limit shall be set at $[I_{max} \times E_{targ} \times B_{curr}] = 100\% * 0.59 * 796,660$ t which results in a total annual catch limit of 470,029 t for the period 2018-2020.

RECOMMENDATION

That the Scientific Committee:

1) **NOTING** the Recommendation from TCMP01 ENDORSED by S21 IOTC Commission that "*when establishing a catch limit for skipjack tuna using the Harvest Control Rule (HCR) adopted in Resolution 16/02, the following procedure will be applied: after the review of the assessment of skipjack tuna by the SC, the result of the assessment will be used by the SC in the calculation of a catch limit using the adopted HCR. The Secretariat will then notify CPCs of the new catch limit for skipjack tuna that will apply for 2018*" (IOTC-2017-S21-R, Para. 56).
2) **RECOMMEND** that the Secretariat notify CPCs of the new total annual catch limit of 470,029 t for skipjack for the period 2018-2020.