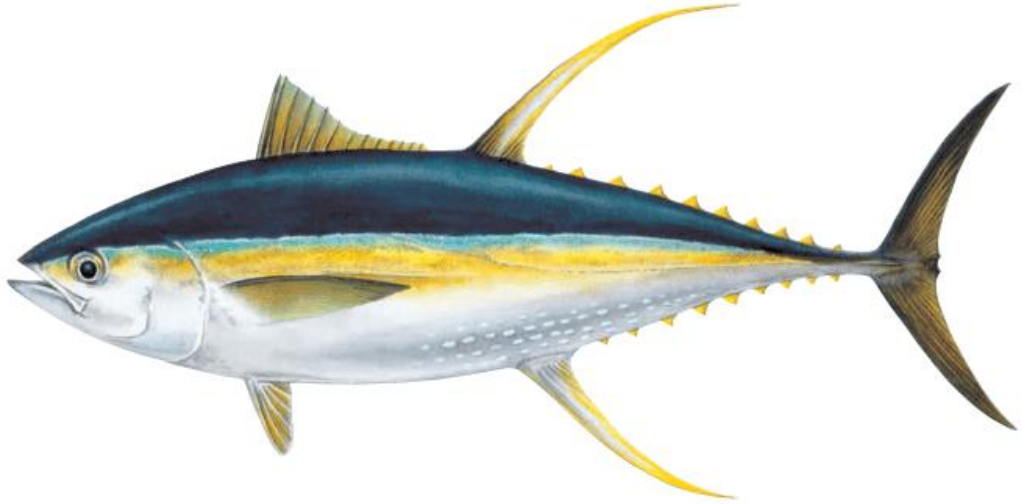
Yellowfin Tuna Assessment Review

Initial plan and discussion



Oceanic Fisheries Program, Pacific Community (SPC)

17 Dec 2021

Background

- 2020 yellowfin tuna assessments was presented with some cautionary caveats, and concerns that it presented an overly optimistic stock status

- Various issues were noted by the assessment team that could not be explored fully in the time available to deliver the assessment

- The SC16 recommended a peer review of the assessment be conducted

- Many of the concerns raised for the yellowfin tuna assessment are relevant to the bigeye tuna assessment, so the peer review will also have relevance to the bigeye assessment

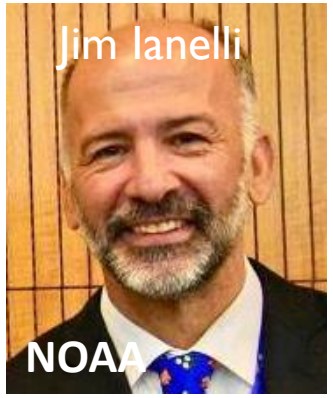
Timeline

2021

Yellowfin 2020 assessment follow-up work

Select a 3 person peer review panel – voted by CCMs, same panel as bigeye review

TOR for the peer review to SC17



2022

Model testing and analysis internally focussed on YFT

Expert review commencing early 2022, includes one week modelling workshop in Noumea, review panel reporting to SC18

2023

Incorporate recommendations in the next Yellowfin and Bigeye assessments, reported to SC19

Terms of Reference

Objectives

1. Undertake, in consultation with the stock assessment team (SPC), following the guidelines described in Process for the Independent Review of stock assessments (Attachment K), a peer review of the 2020 YFT stock assessment in the Western and Central Pacific Ocean (WCPO)

2. Based on the review work provide recommendations for improving the assessment, including data inputs, modelling approaches and treatment of uncertainty

3. In conjunction with the SPC assessment scientists, identify improvement options that are feasible for application to the 2023 YFT assessment

WCPFC Review Process

At the start of the review process, SPC-OFP will prepare a procedural plan including detailed schedules, activities, provision of assessment results (possibly including all the input data, modeling software, output of basic runs as well as all the sensitivity runs) and provide these to the panel for advanced reviewing.

Once the review process is finished, a draft review report will be provided to SPC-OFP for their review and response. If time permits, this step may be concluded towards the end of the peer review workshop.

The final panel report, incorporated with SPC-OFP's response(s) and the panel's feedback to SPC-OFP if needed, shall be submitted to the WCPFC Executive Director, in advance of the following Scientific Committee meeting as scheduled in the contract.

The Chair of the independent peer review panel will be expected to present the results of the review to the following Scientific Committee meeting.

Scope

1. Model inputs
2. Model configuration
3. Model diagnostics
4. Application of recent MULTIFAN-CL model developments
5. Future research areas, priorities to improve future assessments
6. Other aspects that come up

Work Plan

Activity	Output	Timeframe
Model development and experiments	Technical milestones posted to GitHub review site	Starting in December 2021, until 2023 assessment
Pre-workshop planning meeting (online)	Plan for the workshop developed	1 month prior to the 2022 review workshop
Review workshop at SPC, Noumea	Completion of 5 day + travel in-person modelling workshop in Noumea	Second half of 2022
Review outcomes of modelling workshop	Draft workshop report to SPC for review and response	2 weeks after 2022 review workshop
Finalise peer review report	Final report provided to SPC for addition of SPC responses	3 months after 2022 review workshop
Report finalised	Deliver report to WCPFC for posting	March 2023 SPC pre-assessment workshop

YFT 2020 Assessment Model

- 41 fisheries in 9 regions
- 11671 estimated parameters
- Grid of 72 models used to incorporate structural uncertainty (equal weights)
- Most important uncertainties influencing estimates of stock status were:
  - growth
  - tag mixing period
  - steepness

New Features in Multifan-CL

1. **Catch-conditioned method to estimate F**

   - Traditionally, MFCL uses a catch-errors method estimating a large number of parameters: effort and catchability deviates, average catchability, resulting in a total catch likelihood
   - Catch-conditioned method is an alternative approach, using Newton-Raphson to estimate F within each period, based on a regression of observed effort to F
   - Currently employs the Baranov catch equation, Pope's approximation not yet completed

2. **Orthogonal polynomial recruitment**

   - R[t,r,s] = P[t] + P[r] + P[s] + P[r,s] *Gram-Schmidt orthogonalization*

     time, region, season, plus a time-constant interaction

3. **Self-scaling multinomial likelihood for size comps**

   - Estimate effective sample sizes, instead of choosing an arbitrary value

Model quantity	catch_errs	ccond	ccond_orthp	%diff_ccond	%diff_ccond_orthp
MSY	8848	16270	15730	83.88	77.78
Ccurr.MSY	1.229	0.668	0.693	-45.66	-43.60
Fmsy	0.161	0.161	0.160	-0.50	-1.12
Fmult	1.165	3.962	3.801	240.09	226.27
Fcurr.Fmsy	0.858	0.252	0.263	-70.60	-69.35
B0	137300	261500	253200	90.46	84.41
Bmsy	54810	101300	98520	84.82	79.75
Bcurr	68907	224694	218852	226.08	217.61
SB0	77940	148900	144100	91.04	84.89
SBmsy	16670	31670	30870	89.98	85.18
SBcurr	23709	105041	100802	343.05	325.17
Bcurr.Bmsy	1.26	2.22	2.22	76.43	76.69
SBcurr.SBmsy	1.42	3.32	3.26	133.21	129.60
SBcurr.SBcurrF0	-	-	-	-	-
SBlatest.SBlatestF0	-	-	-	-	-
obj_bhsteep	11.7	10.1	5.3	-13.98	-54.73
obj_effdev	1101.1	-	-	-	-
obj_totcatch	3.5	-	-	-	-
obj_fmleffort	-	2792.1	2859.4	-	-
obj_lencomp	-16936.8	-16975.1	-16972.4	0.23	0.21
obj_wtcomp	-10361.3	-10349.1	-10340.3	-0.12	-0.20
obj_tagdata	-	-	-	-	-
obj_agelngdata	-	-	-	-	-
Obj	26060.4	24380.2	24312.1	-6.45	-6.71
No. parameters	2268	396	206	-82.54	-90.92
gradient	0.0000011	0.0000035	0.0000012	229.62	11.86

Pacific Community
Communauté du Pacifique

Test comparison based on Swordfish 2017

Massive reduction in number of estimated parameters

Initial Model development

1. Run last assessment with **original** executable
2. Run last assessment with **new** executable
3. Experiment with **catch-conditioned** method to estimate F
4. Experiment with **orthogonal polynomial** recruitment
5. Experiment with **self-scaling multinomial** likelihood for size comps

Will also work on a Data Overview, highlighting potential problems such as gaps in data, conflicting data, as well as data that the 2020 assessment model could not fit well

➡ Products will be uploaded to the review site https://github.com/PacificCommunity/ofp-sam-yft-review

Proposed Meeting Schedule

- Short chats (online): December - March - June - September
  - Quick look at results, set objectives for next 3 months

- Review workshop (Noumea): sometime after end of August 2022

Discussion Points

- Selection of Chair, one of the reviewers
- Weeks that could possibly work for the review workshop in Noumea
- What kind of output would you like to see from the different model runs, as a basis for your recommendations?
- Other topics