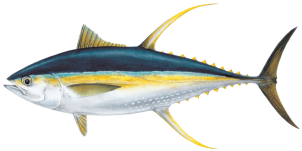
Yellowfin 2026 Assessment

Initial Discussion Topics



Arni Magnusson

SPC Pre-PAW Meeting
13 November 2025

Overview

Innovations in 2023 Assessment *simplified regional structure, Lorenzen M, catch-conditioned, estimation uncertainty*

Issues in 2023 Assessment *convergence/jittering, narrow confidence intervals, likelihood conflict between length and weight comps*

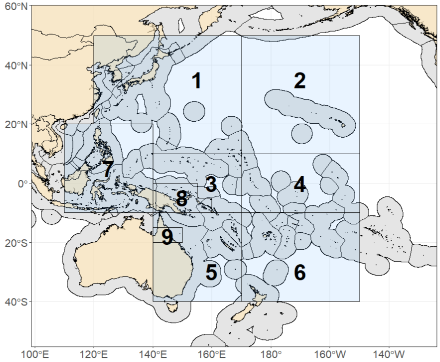
New Issues *uncertainty about Indonesian catches*

New Features in MULTIFAN-CL *length-based selectivity*

Things to Report to PAW *initial findings related to the above*

Innovations in 2023 Assessment

Simplified Regional Structure



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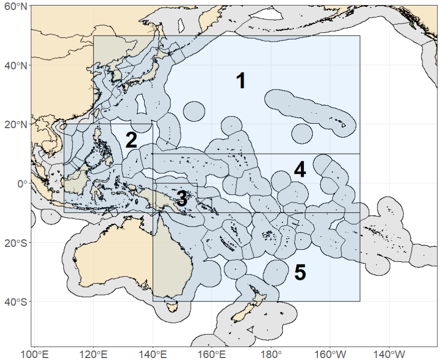
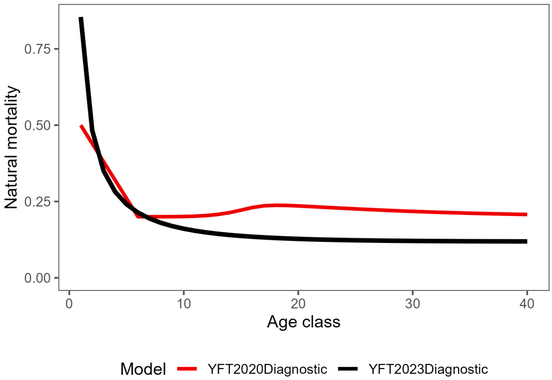


Lorenzen Natural Mortality



Catch-Conditioned Method

MULTIFAN-CL User Manual, section 4.5:

Essentially the catch-conditioned method for estimating fishing mortality, and hence catch, is that employed in most contemporary fish population models, such that the fishing mortalities are solved for conditional upon the observed catches. The formulation used in this method assumes that the Baranov catch equation held, and the Newton-Raphson (N-R) procedure was used to solve for the fishing mortality levels among the various fisheries for which there were incidents within a time period.

There is a fundamental difference in the dynamic model calculations when using the catch-conditioned method compared to the catch-errors method. With the latter, all the estimated parameters for calculating fishing mortality (catchability, effort deviates etc.) are available at the beginning of the model calculation period for all time periods; and therefore, the numbers-at-age calculation is a linear sequence starting from the first model year. In contrast, for the catch-conditioned method, in the first model time period none of the fishing mortalities are available, but rather, they are calculated sequentially for each fishing incident with each time period, starting in the first year.

Estimation Uncertainty

	Mean	Median	Min	10%ile	90%ile	Max	Diagnostic model
C_{latest}	751657	751856	750785	750860	752268	752337	751908
F_{MSY}	0.07	0.07	0.06	0.06	0.09	0.09	0.07
f_{mult}	1.96	2.00	1.47	1.64	2.38	2.50	1.89
$F_{\text{recent}}/F_{\text{MSY}}$	0.51	0.50	0.40	0.42	0.61	0.68	0.53
MSY	697874	700400	616800	644320	739560	771600	671600
SB_0	5761796	5729000	4455000	4817200	6640900	7279000	5216000
$SB_{F=0}$	5633743	5603267	4624645	4907798	6280841	6825888	5173954
SB_{latest}/SB_0	0.49	0.50	0.41	0.44	0.54	0.56	0.49
$SB_{\text{latest}}/SB_{F=0}$	0.50	0.50	0.41	0.45	0.55	0.58	0.49
$SB_{\text{latest}}/SB_{\text{MSY}}$	2.49	2.48	1.78	1.91	3.11	3.16	2.44
SB_{MSY}	1177733	1160500	740400	838260	1538200	1707000	1044000
SB_{MSY}/SB_0	0.20	0.20	0.17	0.17	0.23	0.24	0.20
$SB_{\text{MSY}}/SB_{F=0}$	0.21	0.21	0.16	0.17	0.24	0.25	0.20
$SB_{\text{recent}}/SB_{F=0}$	0.47	0.47	0.38	0.42	0.52	0.54	0.46
$SB_{\text{recent}}/SB_{\text{MSY}}$	2.31	2.30	1.68	1.77	2.89	2.94	2.27
$Y_{F_{\text{recent}}}$	157188	155300	141400	145150	172270	173300	152500
Including estimation uncertainty:							
	Mean	Median	Min	10%ile	90%ile	Max	
$SB_{\text{recent}}/SB_{F=0}$	0.47	0.47	0.36	0.42	0.52	0.59	
$F_{\text{recent}}/F_{\text{MSY}}$	0.51	0.50	0.26	0.41	0.62	0.78	
$SB_{\text{recent}}/SB_{\text{MSY}}$	2.31	2.28	0.93	1.73	2.95	3.59	

Issues in 2023 Assessment

Convergence and Jittering

Table 6: Overview of grid models. Each grid model was jittered 20 times and the model run that had the best objective function value was selected. The columns show the final gradient, final dynamic depletion, number of negative eigenvalues, and whether the Hessian was positive definite.

	Grid model	Njitters	ObjFun	Gradient	Depletion	Neigen	PDH
1	m1_s10_a050_h65	20	-838059.98	0.00229	0.431	3	
2	m1_s10_a050_h80	20	-838060.01	0.00018	0.468	3	
3	m1_s10_a050_h95	20	-838060.02	0.00414	0.492	2	
4	m1_s10_a075_h65	20	-837227.54	0.01139	0.430	4	
5	m1_s10_a075_h80	20	-837227.56	0.01899	0.467	4	
6	m1_s10_a075_h95	20	-837227.58	0.00139	0.491	4	
7	m1_s10_a100_h65	20	-836390.85	0.00095	0.440	0	Yes
8	m1_s10_a100_h80	20	-836390.87	0.00016	0.476	0	Yes
9	m1_s10_a100_h95	20	-836390.89	0.00637	0.500	0	Yes
10	m1_s20_a050_h65	20	-747997.99	0.00398	0.455	3	
...	...	...	...	...	...	...	...
54	m2_s40_a100_h95	20	-649867.30	0.00279	0.516	3	

Narrow Confidence Intervals

- Incorporating estimation uncertainty had no real effect on the overall uncertainty. For example, the confidence interval for $SB_{\mathrm{recent}}/SB_{F=0}$:

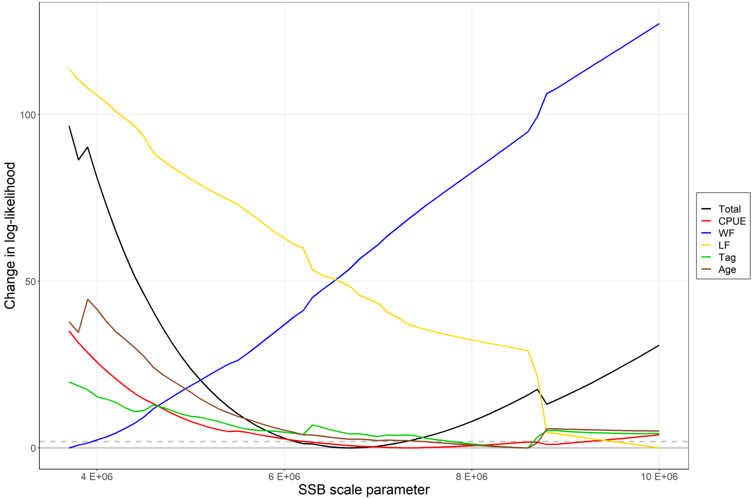
  0.42 − 0.52 without estimation uncertainty

  0.42 − 0.52 including estimation uncertainty

- Also, the confidence interval around the estimated M is quite narrow: 0.11 − 0.13

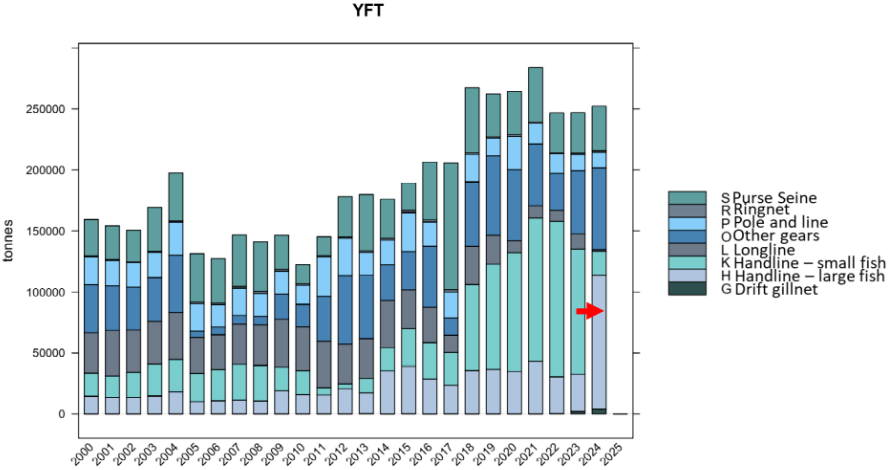
  The Lorenzen scale parameter that is estimated in the current diagnostic model determines M at the highest age in the model. This parameter is estimated by the diagnostic model as 0.119 per quarter, with 95% confidence limits at 0.113 and 0.126, based on the Hessian.

Likelihood Conflict Between Length and Weight Comps



New Issues

Uncertainty About Indonesian Catches



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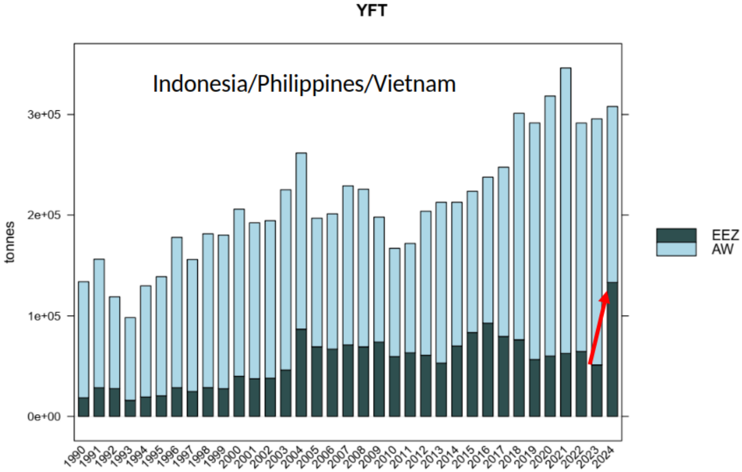

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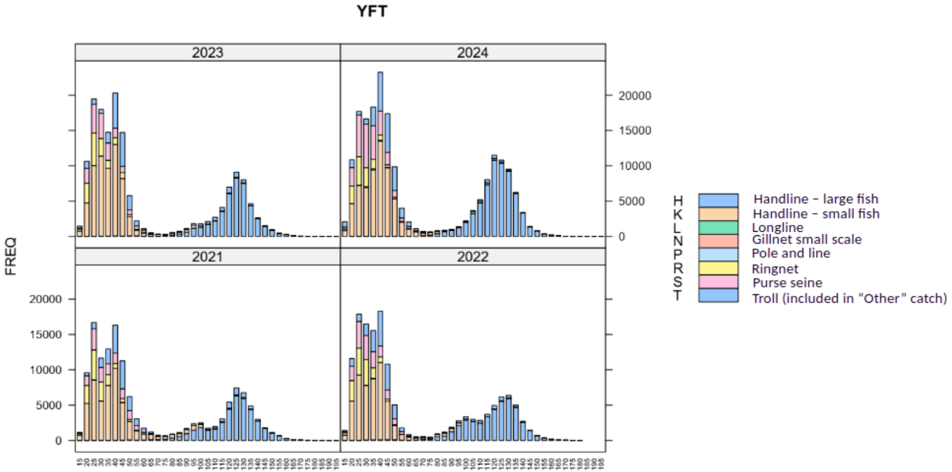

New Features in MULTIFAN-CL

Length-based selectivity

Email from Nick Davies yesterday:

> *Yes, the length-based selectivity feature as used for SKJ2025 can be applied to any stock assessment. Note that it differs fundamentally from that of SS3, in that it conserves the separability assumption for time-invariant selectivity-at-age for the fishing mortality calculations.*

Things to Report to PAW

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These slides:

https://github.com/PacificCommunity/ofp-sam-yft-2026-assessment