Feasibility of developing a stock assessment model for Main Hawaiian Islands Yellowfin Tuna Fishery

Part Deux

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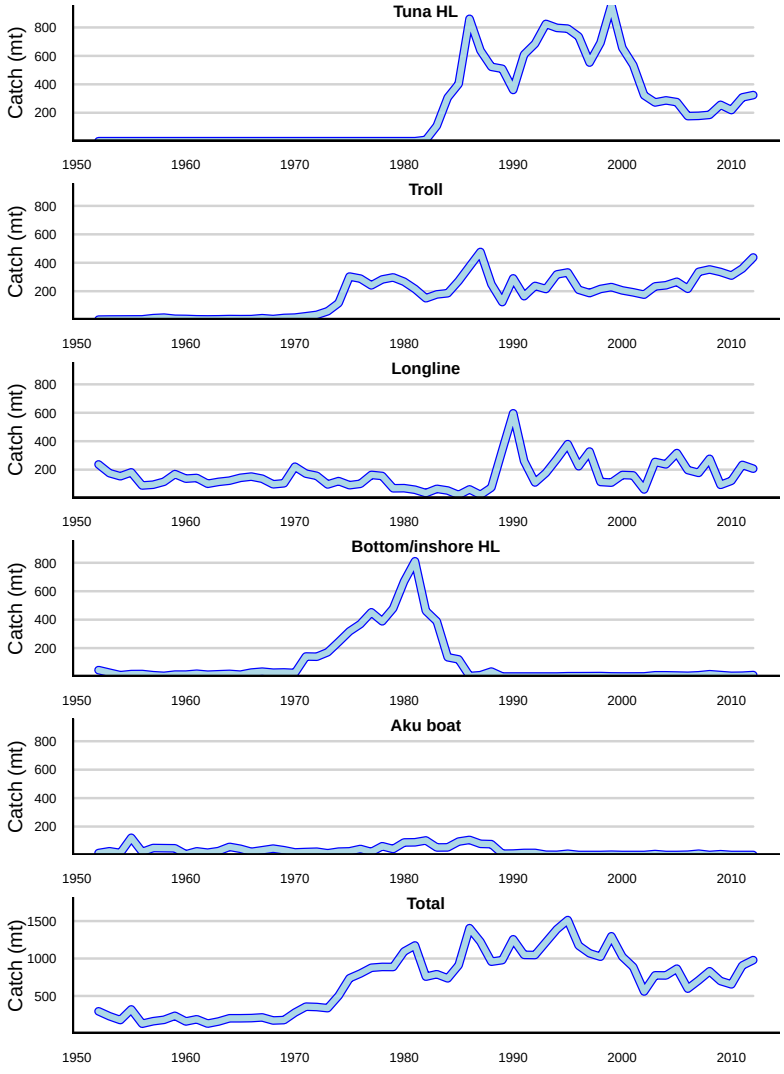
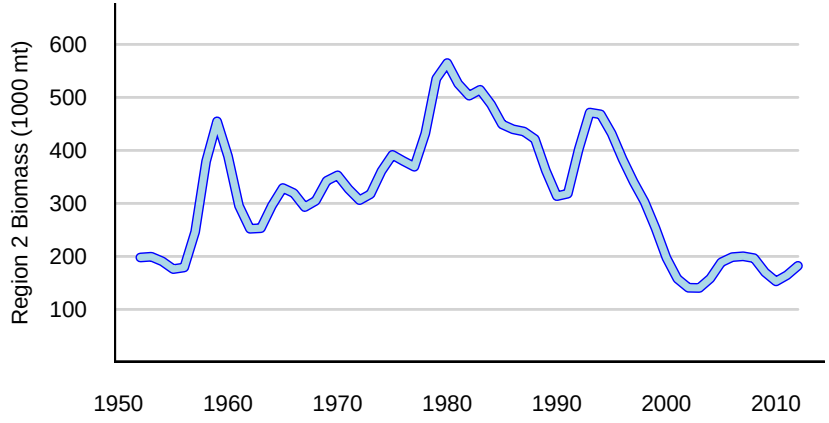
Combined HDAR and NOAA Catch Time Series

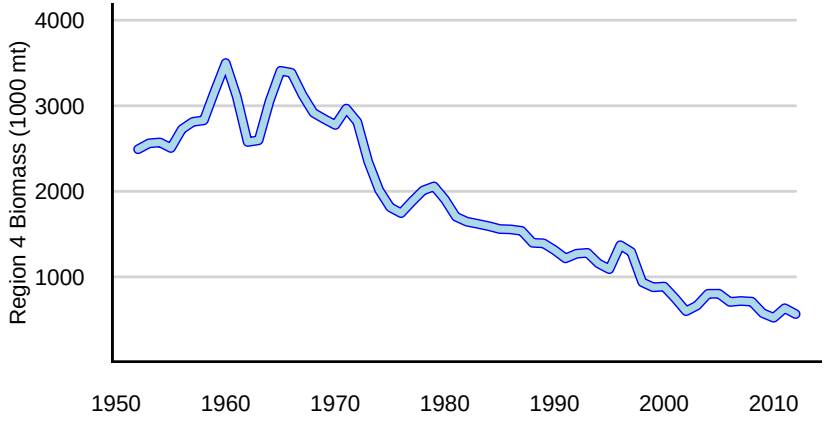


Biomass Estimates for MFCL Regions

Region 2



Region 4



Questions:

1. Can we contrive a simple model of the MHI YFT population and fishery?
2. Are the parameters of the model estimable from the data?
3. Are the data informative about the stock biomass?

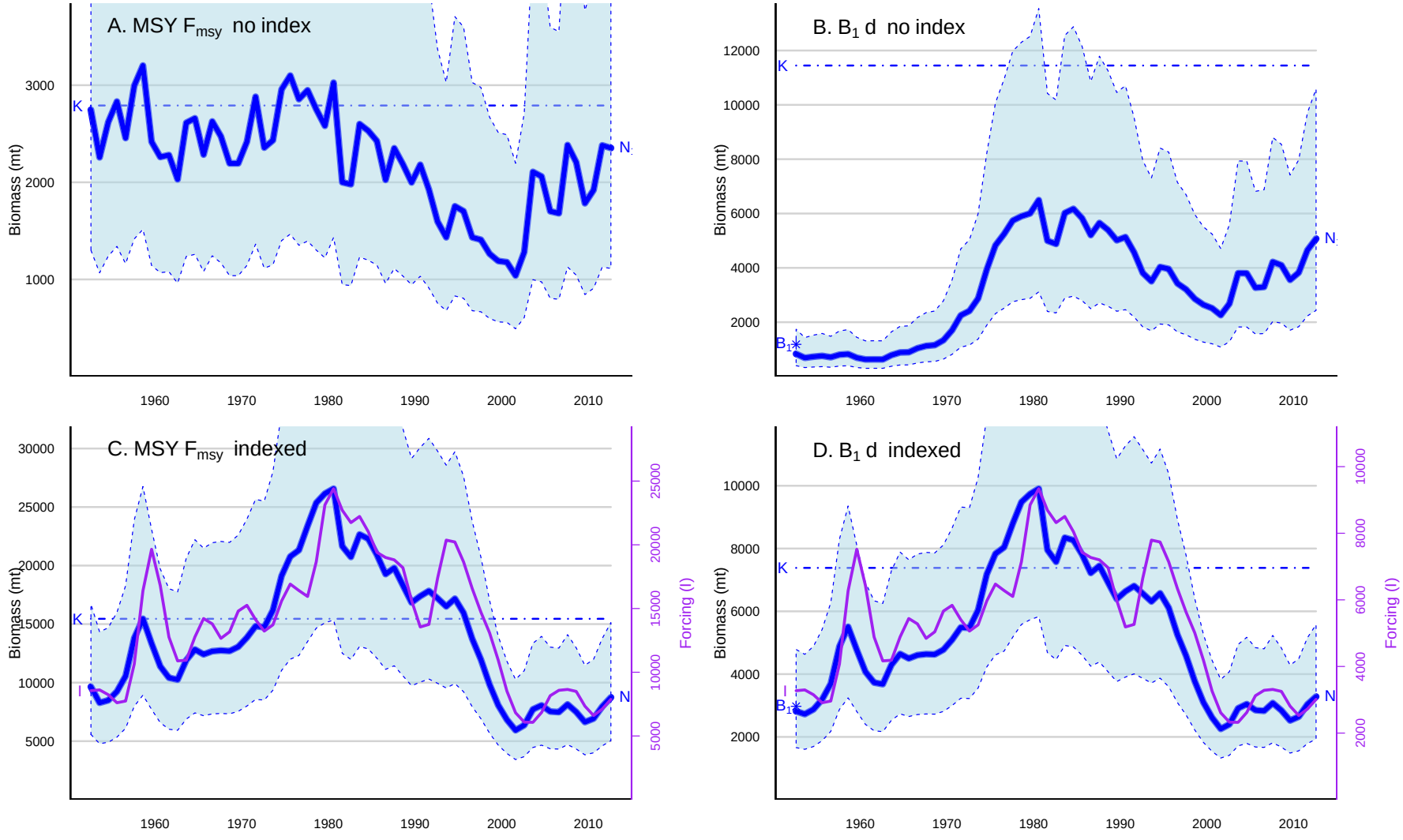
The principle model assumptions

1. The dynamics of the population of YFT in the MHI follows a simple Schaefer model.
2. Fishing mortality is represented by a random walk (Nielsen and Berg, 2014).
3. The local dynamics are forced by assuming that the local abundance is **approximately proportional** to some index population.
4. Annual catch by gear is the product of estimated fishing mortality of each gear and average biomass during a year.

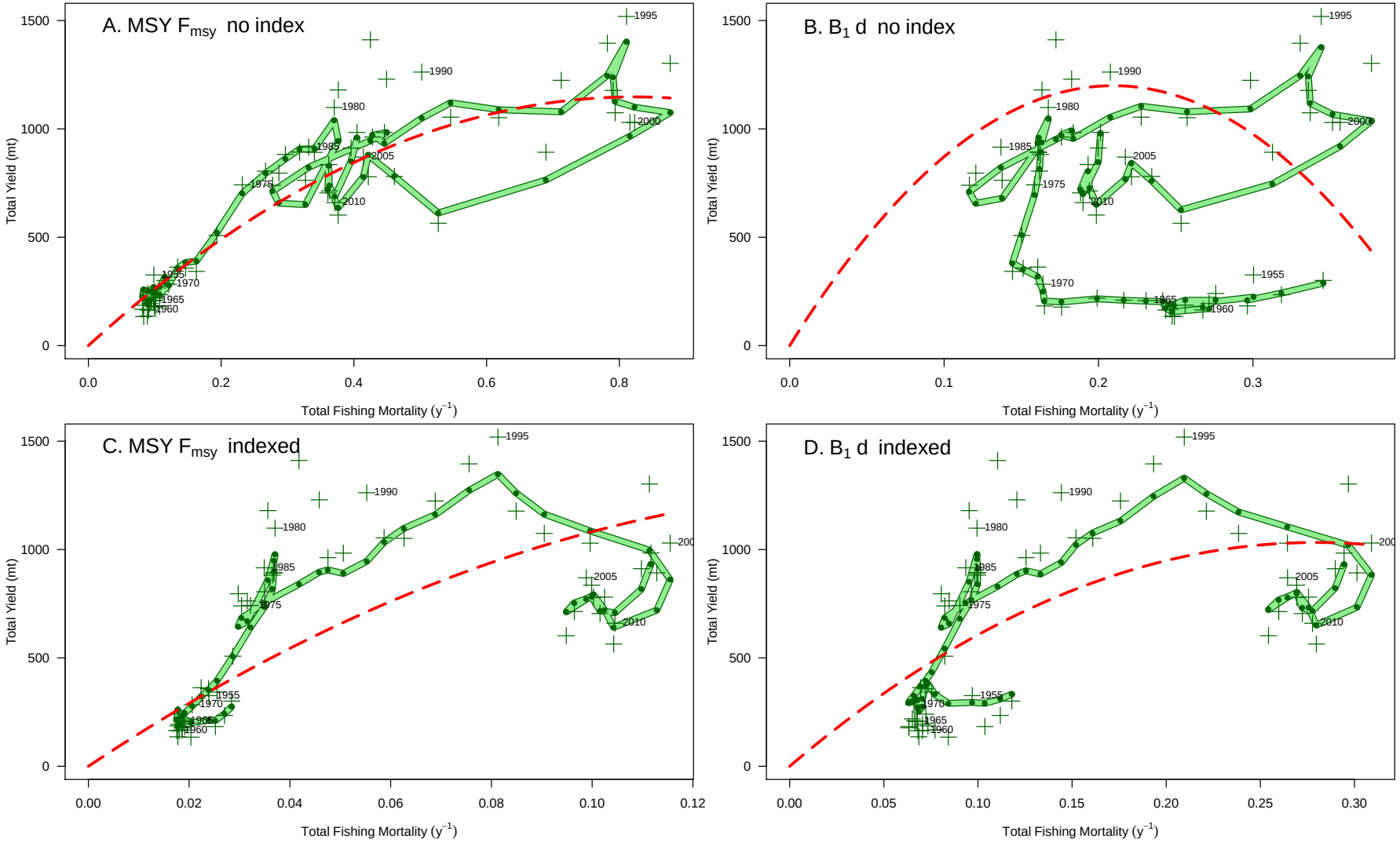
Estimabilty

Index		None		MFCL 2	
Parameterization		$\widetilde{Y}$ $F_{\widetilde{Y}}$	B_1 d	$\widetilde{Y}$ $F_{\widetilde{Y}}$	B_1 d
Designation		A	B	C	D
n		4	5	5	6
$-\log L$		-237.238	-237.968	-247.175	-243.343
$\|G\|_{max}$		0.0016409	33.1289	3.51082e-05	3.77653
B_1	Initial Biomass	—	1184.2	—	2802.3
d	$K = dB_1$	—	9.6674	—	2.6348
$\widetilde{Y}$	MSY	1147.5	1199.3	1288.7	1032.6
$F_{\widetilde{Y}}$	F at MSY	0.82239	0.20952	0.1668	0.2797
r	Growth Rate	1.6448	0.41904	0.3336	0.5594
K	Equilibrium Biomass	2790.8	11448	15452	7383.5
σ_P	Process Error	0.37416	0.36757	0.2743	0.2649
σ_Y	Observation Error	0.41693	0.43062	0.46924	0.47614
Q	Index Proportionality	—	—	0.04321	0.016535

Estimated Biomass Trends



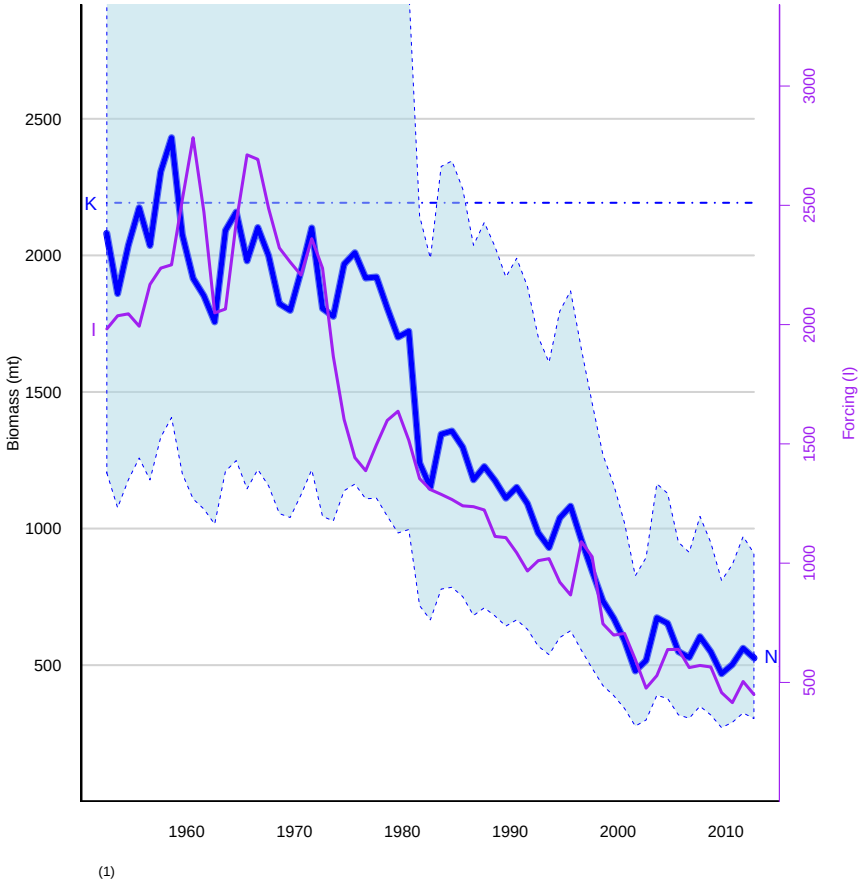
Production


A. MSY F_{msy} no index
B. B_1 d no index
C. MSY F_{msy} indexed
D. B_1 d indexed
Total Yield (mt)
Total Fishing Mortality (y^{-1})

Omitting r prior

Index	None		MFCL 2	
Parameterization	$\widetilde{Y}\ F_{\widetilde{Y}}$	$B_1\ d$	$\widetilde{Y}\ F_{\widetilde{Y}}$	$B_1\ d$
Designation	A	B	C	D
n	4	5	5	6
$-\log L$	-284.898	-236.212	-246.302	-242.176
$\|G\|_{max}$	2.45563	151.693	1.24795e-05	39.9125
B_1	—	1540.2	—	—
d	—	12.567	—	—
$\widetilde{Y}$	—	1274.9	1579.3	—
$F_{\widetilde{Y}}$	—	0.13174	0.1293	—
r	—	0.26347	0.25859	—
K	—	19355	24430	—
σ_P	—	0.35682	0.27044	—
σ_Y	—	0.43481	0.47162	—
Q	—	—	0.073752	—

Alternate forcing; MFCL Region 4



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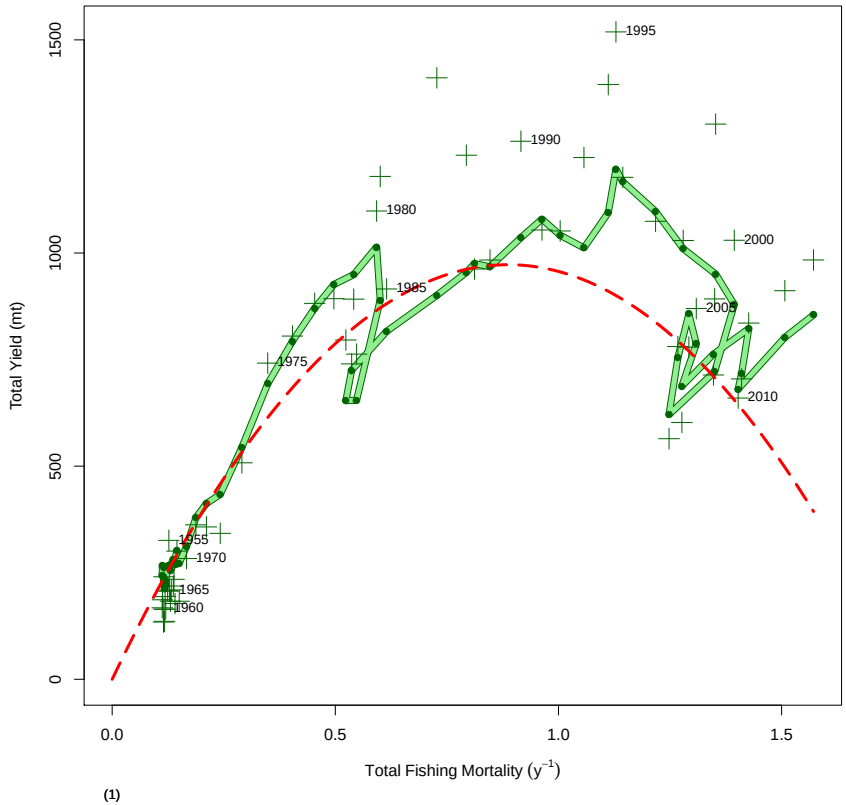

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