Summary of results for LLSIm BUM by trip, with 5% observer coverage including observed catch in totals April 17 2022 for Blue marlin (Makaira nigricans),

2022-09-18

Table 1. Input data summary for each year. Columns are the observed bycatch, observed effort, observed sample units (trips), observed mean CPUE and standard error of CPUE, count of outliers defined as data points more than 8 SD from the mean, observed positive sample units, fraction positive, total trips from the logbooks, total effort, fraction of effort observed, fraction of sample units observed, and estimates of total bycatch and its standard error from a simple ratio estimator stratified only by year

Year	Eff	Units	OCat	OEff	OUnit	CPUE	CPse	Out	Pos	OCatS	OEffS	Cov	PFrac	EFrac	UFrac	Cat
1990	89813	3218	885	4057	164	0.23	0.03	0	88	11	37	221	0.54	0.05	0.05	19594
1991	93130	3224	1043	4375	156	0.26	0.04	0	90	12	39	346	0.58	0.05	0.05	22201
1992	84827	3148	1001	4306	148	0.23	0.03	0	86	12	43	392	0.58	0.05	0.05	19721
1993	112551	3237	1509	6147	168	0.25	0.03	0	115	19	55	721	0.68	0.05	0.05	27631
1994	105370	3374	1391	6407	181	0.22	0.03	0	108	16	50	612	0.60	0.06	0.05	22877
1995	109494	3471	984	6258	174	0.20	0.03	1	112	10	50	360	0.64	0.06	0.05	17216
1996	121937	4019	1132	6208	195	0.22	0.03	1	119	13	39	351	0.61	0.05	0.05	22235
1997	102645	3542	886	4658	165	0.20	0.02	0	105	11	36	306	0.64	0.05	0.05	19526
1998	112927	3658	830	4657	166	0.18	0.02	0	89	12	29	241	0.54	0.04	0.05	20126
1999	97008	3392	1032	4596	184	0.20	0.02	0	102	15	33	257	0.55	0.05	0.05	21785
2000	103886	3278	766	4843	148	0.19	0.02	0	90	11	35	179	0.61	0.05	0.05	16432
2001	90824	2939	914	5004	142	0.21	0.02	0	95	10	42	234	0.67	0.06	0.05	16590
2002	72489	2474	743	4235	136	0.17	0.02	0	86	11	41	344	0.63	0.06	0.05	12717
2003	88922	2777	579	4456	134	0.11	0.01	0	76	11	45	315	0.57	0.05	0.05	11554
2004	98444	2912	965	5803	156	0.14	0.02	0	100	12	43	359	0.64	0.06	0.05	16369
2005	88131	2735	606	4645	131	0.11	0.02	0	69	9	44	275	0.53	0.05	0.05	11497
2006	83396	2591	399	4635	143	0.08	0.01	0	70	6	36	121	0.49	0.06	0.06	7180
2007	78185	2416	203	4317	135	0.05	0.01	0	58	3	33	51	0.43	0.06	0.06	3676
2008	86300	2492	284	3948	130	0.07	0.01	0	64	5	31	53	0.49	0.05	0.05	6208
2009	70920	2213	322	3571	121	0.08	0.01	0	65	5	28	66	0.54	0.05	0.05	6394
2010	72313	2156	261	3401	107	0.05	0.01	0	42	9	40	171	0.39	0.05	0.05	5550
2011	64880	2073	239	3480	103	0.06	0.01	0	48	5	46	133	0.47	0.05	0.05	4455
2012	67809	2212	153	3544	118	0.04	0.01	1	52	2	37	31	0.44	0.05	0.05	2928
2013	58227	1988	121	2613	114	0.03	0.01	0	33	4	27	71	0.29	0.04	0.06	2696
2014	57166	1971	80	2698	92	0.02	0.00	0	24	2	33	45	0.26	0.05	0.05	1695
2015	46652	1683	59	2017	78	0.04	0.02	0	21	2	29	32	0.27	0.04	0.05	1365
2016	43522	1013	96	2176	49	0.06	0.02	0	30	3	30	22	0.61	0.05	0.05	1920
2017	46431	1041	98	2076	53	0.04	0.01	0	23	4	26	46	0.43	0.04	0.05	2192
2018	49482	1192	106	2210	57	0.04	0.01	0	36	3	33	90	0.63	0.04	0.05	2374

Table 2. Formula of BIC best model, along whether models were fit successfully. A dash (-) means the model converged. Failure to converge may be from data (not all years had a positive observation for delta models), fit (models did not converge) or CV (bycatch estimates had very large CVs). If cross-validation was done, mean RMSE and mean ME across folds is shown (near zero is better).

model	formula	Failure
TMBnbinom2	hbf + season + 1 + area + fleet + Year + offset(log(Effort))	-

Table 3. DHARMa residual tests, where significant P values may indicate poor model specification. Tests are a Kolmogorov-Smirnov(KS) test on whether the scaled residuals are uniform, a dispersion test based on comparing the ratio of the observed and simulated residuals (>1 is overdispersed), a zero inflation test based on the ratio of observed to expected zeros, and the number of outliers, defined as data points outside the range of the simulations

	TMBnbinom2
KS.D	0.01
KS.p	0.65
Dispersion.ratio	0.61
Dispersion.p	0.00
ZeroInf.ratio	1.03
ZeroInf.p	0.06
Outlier	39.00
Outlier.p	0.15

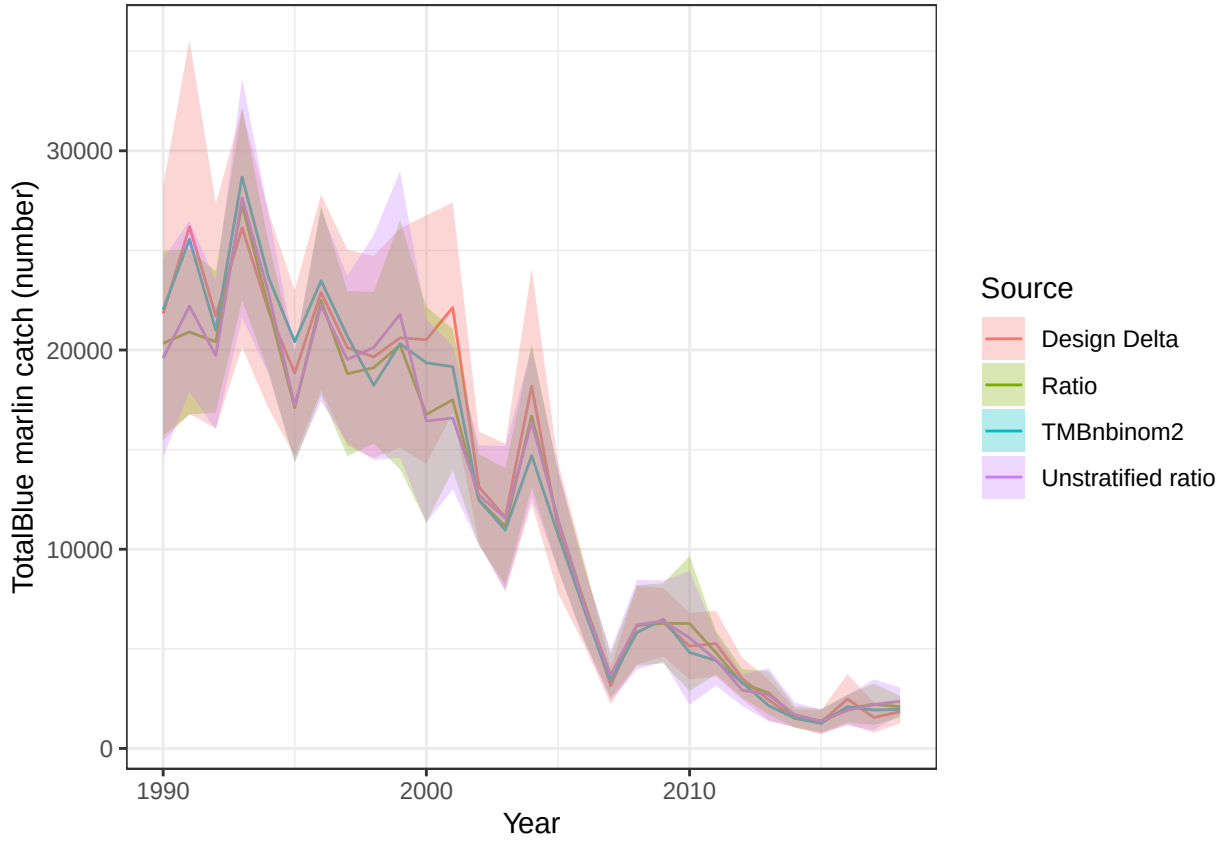

Figure 1. Total bycatch estimates for all valid models, including a simple unstratified ratio estimator, for Blue marlin. Catches are predicted for unobserved effort and added to the observed catches.

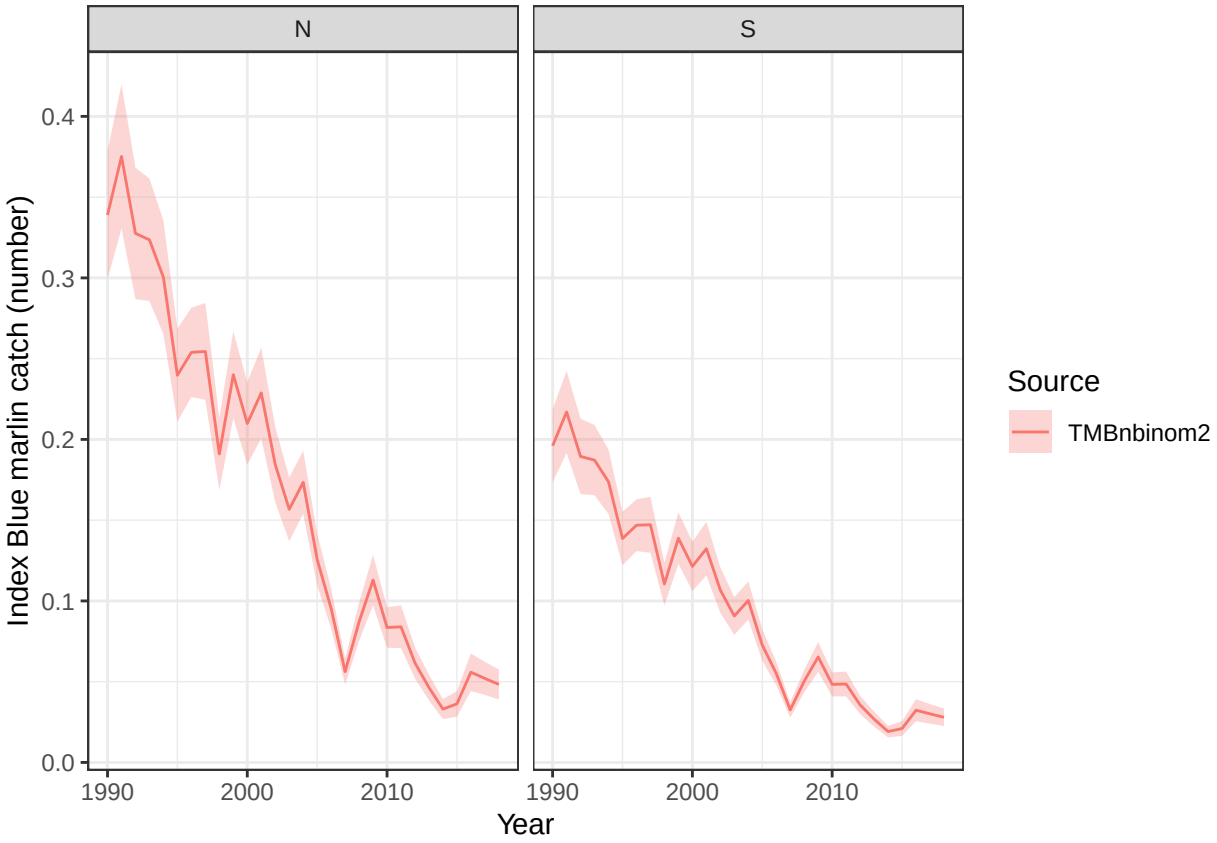

Figure 2. Abundance indices from all valid models for Blue marlin, plus and minus one standard error.

Table 4. Model selection table for TMBnbinom2. Weights are calculated based on BIC.

	cond..Int..	disp..Int..	cond.area.	cond.fleet.	cond.hbf.	cond.season.	cond.Year.	cond.offset.log.Effort...	AICc	AIC	BIC	df	logLik	selectCriteria	delta	weight
3	-1.3	+	+	+	0.01	+	+	+	14679.4	14678.6	14910.1	37	-7302.3	14910.1	0.0	0.99
2	-1.3	+	+	+	NA	+	+	+	14695.4	14694.7	14919.9	36	-7311.4	14919.9	9.8	0.01
1	-1.5	+	+	+	0.01	NA	+	+	14712.2	14711.5	14924.2	34	-7321.8	14924.2	14.1	0.00
0	-1.4	+	+	+	NA	NA	+	+	14732.0	14731.4	14937.9	33	-7332.7	14937.9	27.8	0.00

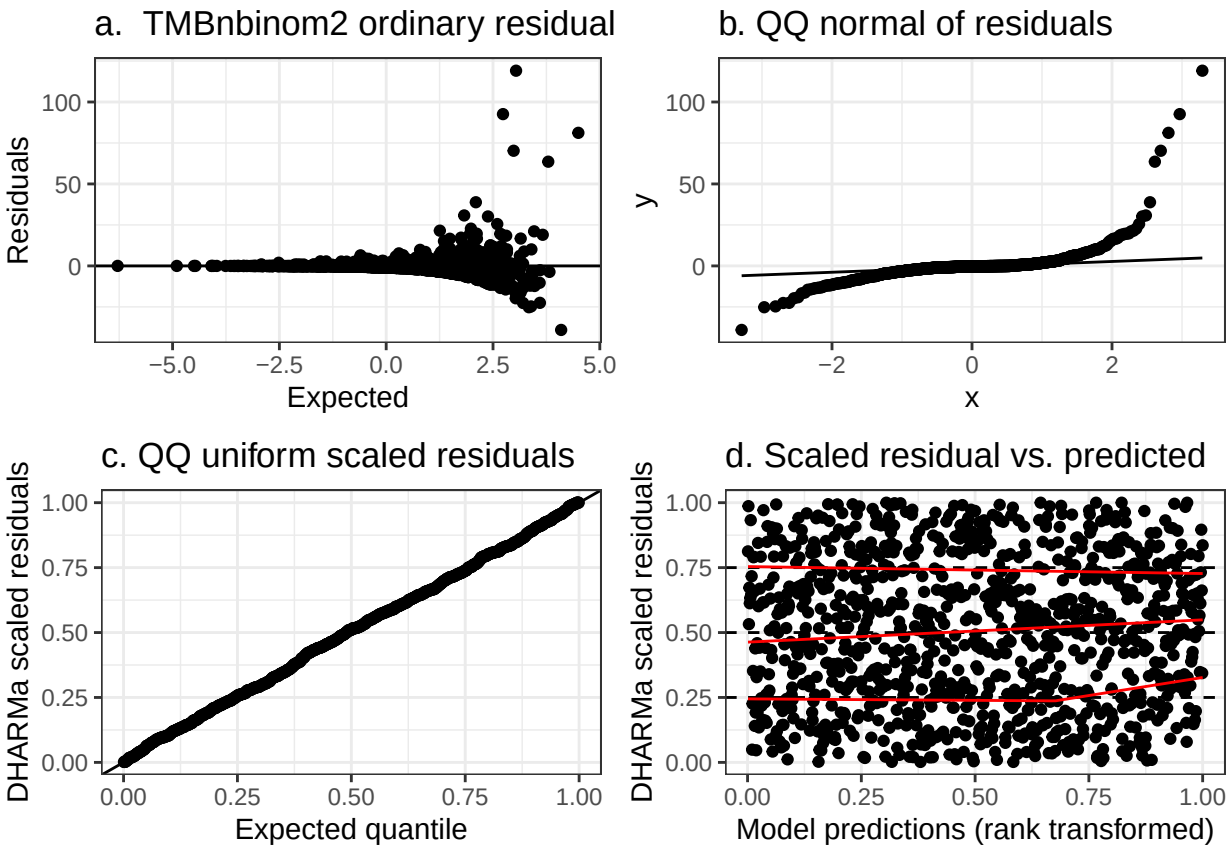

Figure 3. Residuals for the BIC best model for TMBnbinom2, showing the ordinary residuals (a,b) and DHARMa scaled residuals (c,d).

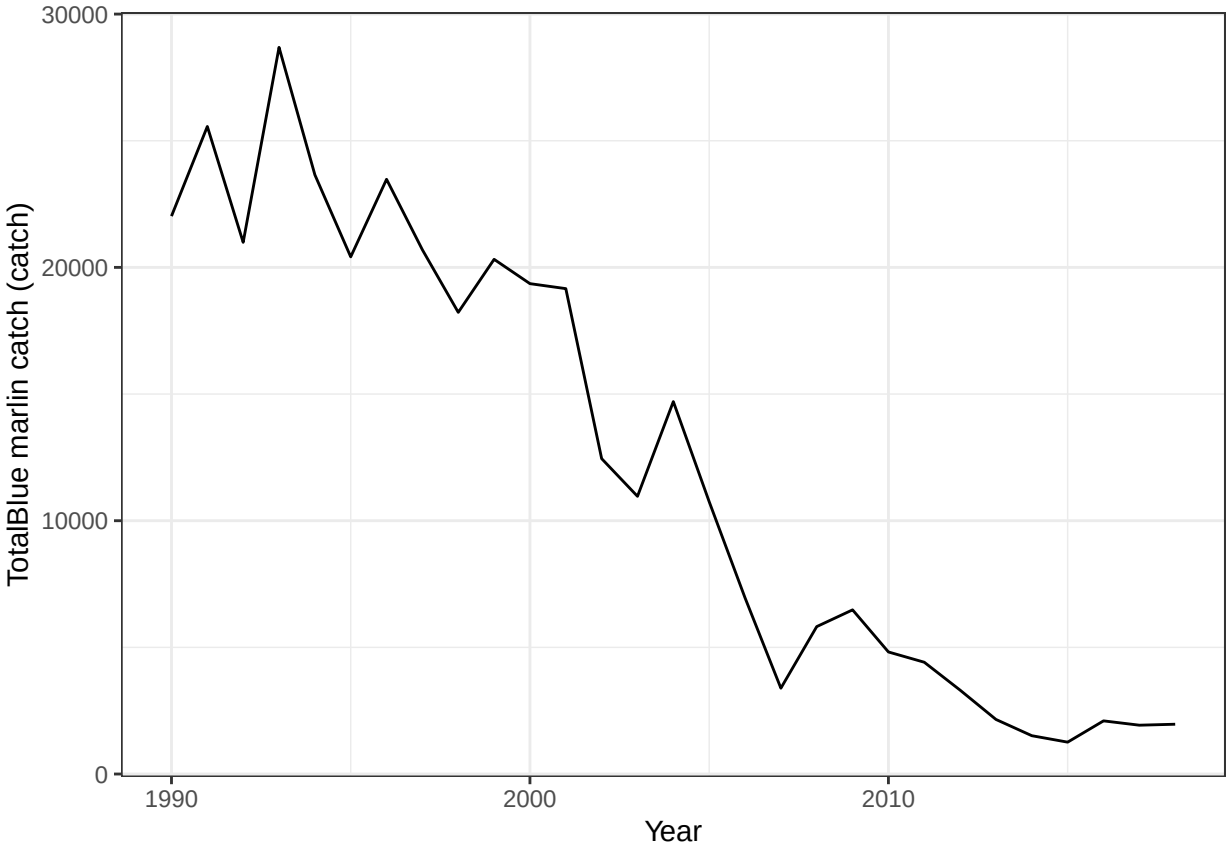

Figure 4. Estimated total bycatch from TMBnbinom2. Catches are predicted for unobserved effort and added to the observed catches.

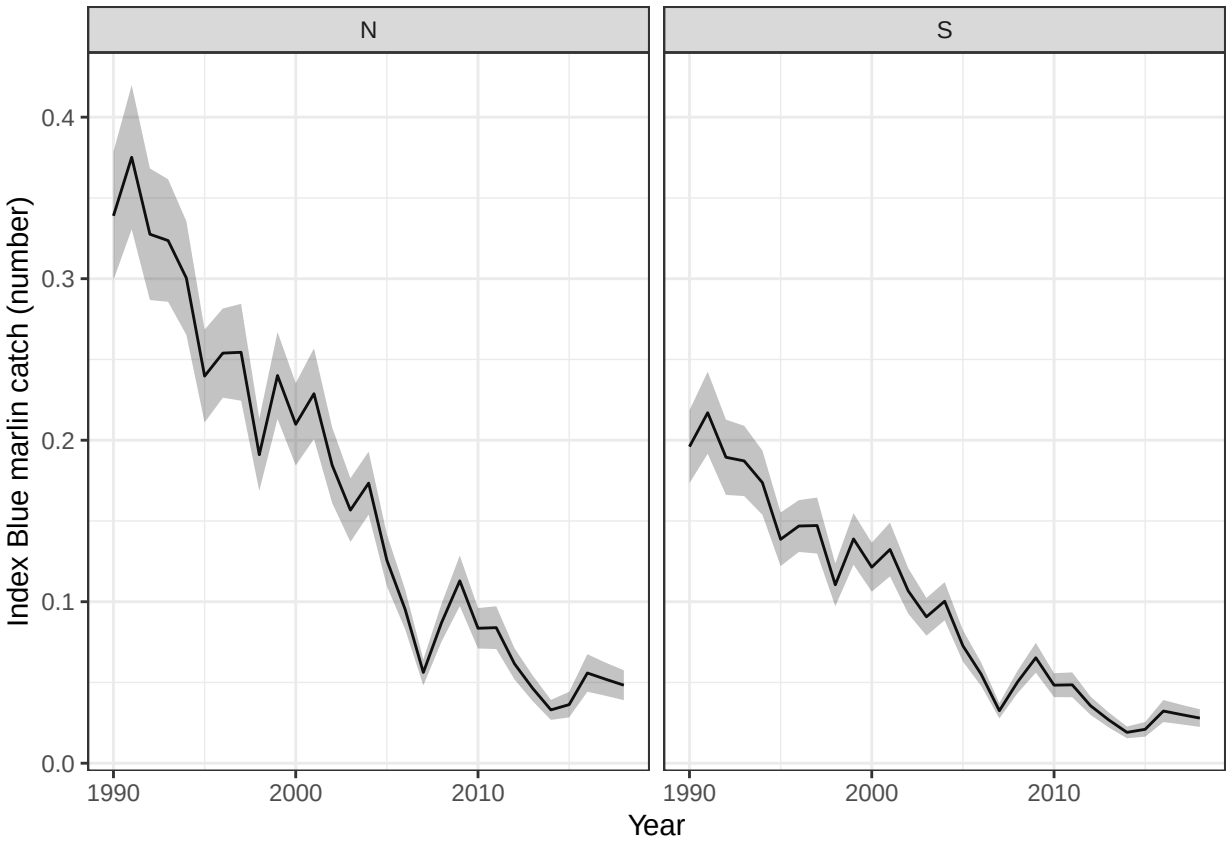

Figure 5. Estimated relative index from TMBnbinom2 plus and minus one standard error.