

THE RELATIONSHIP BETWEEN $F_{0.1}$ AND F_{MSY} VALUES FOR THE NORTH ATLANTIC BLUEFIN ASSESSMENT AND ITS DEPENDENCE ON THE BEVERTON-HOLT STOCK RECRUITMENT STEEPNESS PARAMETER h

R.A. Rademeyer¹ and D.S. Butterworth¹

SUMMARY

Standard methods are used to determine how $F_{0.1}$ compares with F_{MSY} computed for various values for Beverton-Holt stock-recruitment steepness and selections of the demographic and fishery parameter values used for the baseline assessments western and East plus Mediterranean bluefin tuna.

RÉSUMÉ

Des méthodes standard sont utilisées pour déterminer comment comparer $F_{0.1}$ avec F_{PME} calculé pour différentes valeurs de steepness stock-recrutement de Beverton-Holt et des sélections des valeurs des paramètres démographiques et halieutiques utilisées pour les évaluations de référence du thon rouge de l'Atlantique Ouest et Est et de la Méditerranée.

RESUMEN

Los métodos estándar se utilizan para comparar $F_{0.1}$ con F_{RMS} para varios valores de inclinación stock-reclutamiento de Beverton-Holt y selecciones de valores demográficos y pesqueros utilizados para las evaluaciones de la línea de base del atún rojo del este y oeste más el atún rojo del Mediterráneo.

KEYWORDS

$F_{0.1}$, F_{MSY} , North Atlantic, bluefin, steepness

¹ Marine Resource Assessment and Management Group, University of Cape Town, South Africa, Rebecca.Rademeyer@gmail.com

Introduction

Values of the demographic and fishery parameters being used for projections for the current assessments of North Atlantic bluefin tuna were kindly provided Matt Lauretta (Western stock) and Tristan Rouyer and Rishi Sharma (Eastern stock), and are shown in **Table 1**. These values have been used in applying standard methods to compute $F_{0.1}$ for each set of values, together with F_{MSY} values as a function of the value of steepness h for a Beverton-Holt stock recruitment relationship. Note that the F values reported refer to apical F , i.e. the age at which selectivity is highest, being age 13 for the Western and age10+ for the Eastern stock.

Results

The results are shown in Table 2 and Figure 1. For high values of h , F_{MSY} exceeds $F_{0.1}$, but the reverse is true for low values. The values of h at which the two values are equal are 0.70 and 0.80 for the Western stock for the low and high maturity vectors respectively, and 0.68 for the Eastern stock.

Table 1. Values of the demographic and fishery parameters used for projections for the current assessments of North Atlantic bluefin tuna for the Western stock (courtesy Matt Lauretta) and the Eastern stock (courtesy Tristan Rouyer and Rishi Sharma).

Western stock																
Plus group age	16															
Age	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Selectivity-at-age	0.003	0.072	0.219	0.518	0.284	0.352	0.283	0.680	0.777	0.935	0.851	0.914	1.000	0.979	0.810	0.810
Weight-at-age (kg)	3.10	9.80	15.10	19.90	43.30	60.50	89.90	111.60	144.80	174.00	201.10	225.50	247.70	264.00	283.50	340.00
Maturity-at-age: low	0.00	0.00	0.25	0.50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
high	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.04	0.19	0.56	0.88	0.98	1.00	1.00	1.00	1.00
Natural mortality-at-age	0.38	0.30	0.24	0.20	0.18	0.16	0.14	0.13	0.12	0.12	0.11	0.11	0.11	0.10	0.10	0.10
Eastern stock																
Plus group age	10															
Age	1	2	3	4	5	6	7	8	9	10						
Selectivity-at-age	0.000	0.142	0.225	0.676	0.700	0.293	0.236	0.311	0.585	1.000						
Weight-at-age (kg)	3.03	9.94	19.51	33.88	48.97	66.33	90.82	113.78	137.72	202.52						
Maturity-at-age	0.00	0.00	0.25	0.50	1.00	1.00	1.00	1.00	1.00	1.00						
Natural mortality-at-age	0.38	0.30	0.24	0.20	0.18	0.16	0.14	0.13	0.12	0.10						

Table 2. $F_{0.1}$ and F_{MSY} , exploitable biomass-per-recruit (B^{exp}/R) and yield-per-recruit (Y/R) values for different steepness values for the Western stock (for the low and high maturity vectors) and for the Eastern stock (single maturity vector). The F values reported refer to apical F.

stock		West					East		
maturity	low			high					
F0.1	0.114				0.113				0.128
h	FMSY	B ^{exp} /R	Y/R	FMSY	B ^{exp} /R	Y/R	FMSY	B ^{exp} /R	Y/R
0.98	0.189	0.103	0.020	0.180	0.108	0.020	0.228	0.081	0.019
0.95	0.179	0.109	0.020	0.162	0.119	0.019	0.215	0.086	0.018
0.90	0.164	0.118	0.019	0.141	0.135	0.019	0.196	0.093	0.018
0.85	0.150	0.128	0.019	0.126	0.148	0.019	0.179	0.102	0.018
0.80	0.138	0.138	0.019	0.113	0.161	0.018	0.163	0.110	0.018
0.75	0.126	0.148	0.019	0.102	0.174	0.018	0.148	0.119	0.018
0.70	0.114	0.160	0.018	0.092	0.187	0.017	0.133	0.129	0.017
0.65	0.103	0.172	0.018	0.082	0.200	0.016	0.120	0.140	0.017
0.60	0.092	0.186	0.017	0.073	0.214	0.016	0.106	0.152	0.016
0.55	0.081	0.201	0.016	0.065	0.229	0.015	0.093	0.165	0.015
0.50	0.071	0.218	0.015	0.056	0.245	0.014	0.080	0.181	0.015
0.45	0.060	0.238	0.014	0.048	0.263	0.013	0.067	0.198	0.013
0.40	0.049	0.260	0.013	0.039	0.284	0.011	0.055	0.219	0.012
0.35	0.038	0.287	0.011	0.031	0.308	0.009	0.042	0.244	0.010
0.30	0.026	0.321	0.008	0.021	0.337	0.007	0.028	0.275	0.008

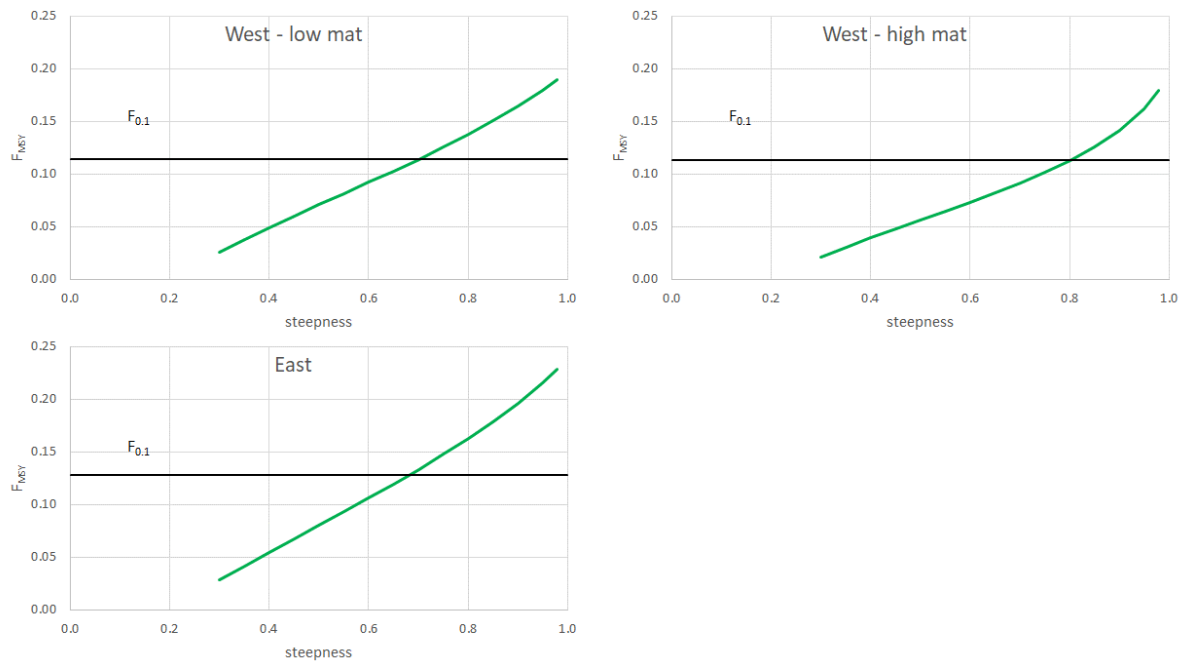


Figure 1. $F_{0.1}$ and F_{MSY} (green curve) values for different steepness h values for the Western stock (for the low and high maturity vectors) and for the Eastern stock (single maturity vector). The F values reported refer to apical F .