Black sea bass; Tables

Table 1. Black sea bass growth model results and calculated mean lengths at age.

	Caruso	Pemberton	Mercer	NMFS winter	NMFS spring	
L_{inf}	71.0	61.8	65.9	46.2	47.7	
K	0.20	0.21	0.16	0.36	0.35	
t_0	-0.2	0	0	0.40	0.04	
age	Mean lengh (cm)					avg (w/o Caruso)
1	15.14	**11.89**	**9.79**	**9.01**	**13.51**	11.05
2	25.26	**21.49**	**18.13**	**20.23**	**23.56**	20.85
3	33.55	**29.25**	**25.23**	**28.08**	**30.66**	28.30
4	40.34	**35.51**	**31.27**	**33.55**	**35.67**	34.00
5	45.89	**40.57**	**36.42**	**37.38**	**39.21**	38.39
6	50.44	**44.66**	**40.80**	**40.05**	**41.71**	41.80
7	54.17	**47.96**	**44.53**	**41.91**	**43.47**	44.47
8	57.22	**50.63**	**47.71**	**43.21**	**44.72**	46.57
9	59.71	**52.79**	**50.41**	**44.12**	**45.60**	48.23
10	61.76	**54.53**	**52.72**	**44.76**	**46.22**	49.56
11	63.43	**55.93**	**54.68**	**45.20**	**46.66**	50.62
12	64.80	**57.07**	**56.35**	**45.51**	**46.97**	51.47

Table 2. Commercial and recreational landings and discards (total) of black sea bass. Italicized landing estimated. Recreational discard losses estimated as 25% of total discards and commercial as 50% of totals presented in the table.

YEAR	Comm landings (mt)	Rec landings (mt)	Rec dicards (mt)	Comm discards (mt)	Total catch (mt)
1939	2,910	*727*			3,637
1940	3,097	*774*			3,871
1941	1,427	*357*			1,784
1942	1,129	*282*			1,411
1943	1,565	*391*			1,956
1944	3,307	*827*			4,133
1945	2,483	*621*			3,103
1946	2,232	*558*			2,790
1947	3,593	*898*			4,492
1948	6,832	*1,708*			8,540
1949	4,555	*1,139*			5,694
1950	5,736	*1,434*			7,170
1951	8,361	*2,090*			10,451
1952	9,883	*2,471*			12,354
1953	6,521	*1,630*			8,151
1954	5,141	*1,285*			6,426
1955	5,130	*1,283*			6,413
1956	5,247	*1,312*			6,559
1957	4,319	*1,080*			5,399
1958	5,241	*1,310*			6,551
1959	3,654	*914*			4,568
1960	3,101	*1,551*			4,652
1961	2,459	*1,230*			3,689
1962	3,554	*1,777*			5,331
1963	3,705	*1,853*			5,558
1964	3,143	*1,572*			4,715
1965	3,481	*1,741*			5,222
1966	1,537	*769*			2,306
1967	1,154	*577*			1,731
1968	1,079	*851*			1,930
1969	1,097	*772*			1,869
1970	970	*1,058*			2,028
1971	566	*540*			1,106
1972	727	*846*			1,573
1973	1,115	*1,145*			2,260
1974	1,023	*1,325*			2,348
1975	1,680	*1,791*			3,471

Black sea bass; Tables

Table 2 (cont'd). Commercial and recreational landings and discards (total) of black sea bass. Italicized landing estimated. Recreational discard losses estimated as 25% of total discards and commercial as 50% of totals presented in the table.

YEAR	Comm landings (mt)	Rec landings (mt)	Rec dicards (mt)	Comm discards (mt)	Total catch (mt)
1976	1,557	*1,895*			3,452
1977	1,985	*2,267*			4,252
1978	1,662	*1,697*			3,359
1979	1,241	*560*			1,801
1980	977	*1,002*			1,979
1981	1,129	546	65		1,740
1982	1,177	4,485	74		5,735
1983	1,513	1,839	137		3,489
1984	1,965	558	65		2,589
1985	1,551	945	90		2,587
1986	1,901	5,618	229		7,748
1987	1,890	870	79		2,839
1988	1,879	1,295	252		3,426
1989	1,324	1,488	94	217	3,122
1990	1,588	1,248	209	128	3,173
1991	1,272	1,875	247	28	3,421
1992	1,364	1,179	170	246	2,960
1993	1,433	2,189	136	505	4,263
1994	925	1,327	176	46	2,475
1995	935	2,809	373	77	4,194
1996	1,524	1,804	280	770	4,378
1997	1,186	1,926	296	56	3,464
1998	1,163	509	213	238	2,122
1999	1,315	726	393	84	2,517
2000	1,208	1,804	822	96	3,930
2001	1,296	1,545	739	246	3,826
2002	1,571	1,961	818	96	4,447
2003	1,361	1,481	507	139	3,489
2004	1,398	760	314	864	3,335
2005	1,290	846	475	165	2,776
2006	1,271	886	492	57	2,706
2007	1,016	1,026	601	169	2,811

Black sea bass; Tables

Table 3. Annualized fishing and natural mortality rates determined from tagging model.

	F	M
2002	*	*
2003	0.32	1.08
2004	0.39	1.08
2005	0.41	1.08
2006	0.38	1.08
2007	0.37	1.08

Table 4. Length measurements and landings (mt) from commercial fisheries 1984-2007.

Year	# lengths	Landings (mt)
1984	3841	1965
1985	2509	1551
1986	2922	1901
1987	1545	1890
1988	1376	1879
1989	883	1324
1990	1142	1588
1991	735	1272
1992	605	1364
1993	300	1412
1994	3166	896
1995	3233	925
1996	5295	1472
1997	4414	1186
1998	4171	1163
1999	4650	1315
2000	2196	1208
2001	2196	1296
2002	2196	1571
2003	3684	1361
2004	3684	1398
2005	5265	1290
2006	6000	1271
2007	7768	1016

min	300
avg	3074
max	7768

Table 5. Parameters of natural mortality models and associated objective function from SCALE model.

Base M	alpha	beta	Obj Function
0.40	Constant	Constant	253.14
0.50	Constant	Constant	247.75
0.60	Constant	Constant	243.51
0.40	7.5	-0.175	255.66
0.50	7.5	-0.175	250.40
0.60	7.5	-0.175	245.26
0.70	7.5	-0.175	241.27
0.80	7.5	-0.175	238.60
0.90	7.5	-0.175	237.02
0.60	7.0	-0.175	247.29
0.60	8.0	-0.175	243.92
0.60	7.5	-0.150	243.32
0.60	7.5	-0.200	249.22
0.60	7.0	-0.150	244.17
0.60	7.0	-0.200	252.07
0.60	8.0	-0.150	242.85
0.60	8.0	-0.200	246.71
0.90	7.0	-0.175	237.82
0.90	8.0	-0.175	236.80
0.90	7.5	-0.175	237.02
0.90	7.5	-0.150	236.97
0.90	7.5	-0.200	239.24
0.90	7.0	-0.150	242.36
0.90	7.0	-0.200	242.36
0.90	8.0	-0.150	237.06
0.90	8.0	-0.200	237.51

Black sea bass; Tables

Table 6. M values, Biological reference points and fishing mortality from SCALE and length-based yield per recruit models.

Base M	alpha	beta	F0.1	Fmax	F40%	YPR 40%	avg recruit	yield (mt)	F2007	F ratio
0.40	Constant	Constant	0.37	0.98	0.42	0.14	27,875,990	3,903	0.48	1.15
0.50	Constant	Constant	0.48	1.60	0.59	0.10	39,765,975	4,133	0.41	0.69
0.60	Constant	Constant	0.60	-	0.85	0.08	57,574,343	4,645	0.38	0.45
0.40	7.5	-0.175	0.15	0.27	0.17	0.19	25,052,388	4,770	0.73	4.30
0.50	7.5	-0.175	0.17	0.36	0.19	0.13	33,945,355	4,301	0.56	2.97
0.60	7.5	-0.175	0.19	0.93	0.22	0.09	47,261,598	4,090	0.47	2.16
0.70	7.5	-0.175	0.23	-	0.25	0.06	66,796,863	4,069	0.41	1.61
0.80	7.5	-0.175	0.28		0.31	0.04	95,096,515	4,240	0.37	1.18
0.90	7.5	-0.175	0.35	-	0.41	0.03	139,831,700	4,786	0.32	0.80
0.60	7.0	-0.175	0.16	0.31	0.11	0.11	43,255,263	4,546	0.52	4.74
0.60	8.0	-0.175	0.25	1.70	0.28	0.08	50,832,843	3,914	0.44	1.58
0.60	7.5	-0.150	0.37	-	0.41	0.08	53,187,988	4,095	0.42	1.03
0.60	7.5	-0.200	0.14	0.22	0.16	0.13	40,430,965	5,286	0.60	3.82
0.60	7.0	-0.150	0.28	1.61	0.31	0.08	50,266,135	3,968	0.44	1.43
0.60	7.0	-0.200	0.13	0.20	0.15	0.17	36,715,080	6,095	0.72	4.90
0.60	8.0	-0.150	0.45	-	0.53	0.08	55,381,775	4,319	0.42	0.79
0.60	8.0	-0.200	0.15	0.28	0.17	0.10	44,361,545	4,627	0.51	2.96
0.90	7.0	-0.175	0.22	-	0.26	0.04	116,861,675	4,410	0.36	1.39
0.90	8.0	-0.175	0.56	-	0.73	0.04	163,941,275	5,987	0.30	0.41
0.90	7.5	-0.175	0.35	-	0.41	0.03	139,831,700	4,786	0.32	0.80
0.90	7.5	-0.150	0.77	-	1.33	0.04	181,211,800	7,448	0.29	0.22
0.90	7.5	-0.200	0.16	0.35	0.19	0.05	101,782,075	4,768	0.39	2.11
0.90	7.0	-0.150	0.60	-	0.84	0.04	158,543,975	6,145	0.31	0.37
0.90	7.0	-0.200	0.14	0.23	0.16	0.06	84,365,165	5,445	0.46	2.86
0.90	8.0	-0.150	0.88	-	1.80	0.04	200,197,775	8,492	0.27	0.15
0.90	8.0	-0.200	0.20	-	0.24	0.04	122,250,403	4,439	0.35	1.47

Black sea bass; Tables

Table 7. Biological reference points and 2007 status for preferred option of constant M=0.4.

M=0.4 constant

	F	YPR	SSB/R	B/R
Fzero	0.000	0.000	1.124	1.177
F0.1	**0.368**	0.135	0.486	0.538
Fmax	0.975	0.152	0.268	0.319
F40%	**0.419**	0.140	0.450	0.501

	yield	SSB	Total Biomass
Fzero	-	31,341	32,816
F0.1	3,774	13,555	14,998
Fmax	4,248	7,472	8,882
F40%	3,903	12,537	13,977

2007 Total Biomass (mt)	12,892
2007 SSB (mt)	11,478
2007 SSB / SSB_{MSY}	92%
2007 F	0.48
2007 F / $F_{40\%}$	115%

Black sea bass; Tables