

# **Black Sea Bass Assessment Summary for 2010**

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## BLACK SEA BASS ASSESSMENT SUMMARY FOR 2009

**State of Stock:** The black sea bass stock is not overfished and overfishing is not occurring relative to the biological reference points recommended by the 2008 Northeast Data Poor Stocks Working Group (DPSWG) Peer Review Panel (NEFSC 2009a; Figure 1). Fishing mortality varied between  $F = 0.20$  and  $F = 0.74$  during the 1960s and 1970s. Fishing mortality increased steadily during the 1980s and early 1990s, peaking at  $F = 1.26$  in 1986. Fishing mortality remained high until after 2001 ( $F=1.17$ ), falling steadily to  $F = 0.29$  in 2009 (Figure 2). Spawning stock biomass (SSB) decreased from about 12,160 mt in 1975 to about 8,275 mt in 1979, then increased to about 11,600 mt during the mid 1980s. SSB declined through the 1980s and early 1990s to only 6,600 mt in 1996. With improved recruitment and declining fishing mortality rates since 2001, SSB has steadily increased to about 12,978 mt in 2009 (Figure 3). Recruitment averaged 26.4 million fish during 1968-1999 but increased to 56 million in 2000 followed by recruitment of 40 million fish in 2002. Although 2004 recruitment was the lowest in the time series, recent years have been near average (Figure 4). The black sea bass model average retrospective pattern suggests that  $F$  is under-estimated and recruitment and total biomass are over-estimated in the terminal year (Table 1).

**Projections for 2009-2010:** If landings in 2010 are 1,723 mt (3.8million lbs) and discards are 501 mt (1.1 million lbs), the projected estimate of  $F$  in 2010 = 0.26 with Jan 1, 2011 total biomass of 16,000 mt, which is above the biomass target of  $B_{MSY} = 12,537$  mt (Figure 1). Fishing at  $F_{MSY} = F_{40\%} = 0.42$  in 2011 results in projected total catch of 3,465 mt (7.6 million lbs) with landings of 2,772 mt (6.1 million lbs) assuming discards equal the 2000-2009 average proportion. Fishing at  $F_{2009} = 0.29$  in 2011 results in projected catch of 2,467 mt (5.4 million lbs) with landings of 1,974 mt (4.4 million lbs) while a 2011 fishing mortality of 0.315, which is 75% of  $F_{MSY}$ , results in projected total catch of 2,707 mt (6.0 million lbs) and landings of 2,166 mt (4.8 millions lbs). In all three scenarios, total biomass and spawning stock biomass would remain above  $B_{MSY}$ .

### Projection Table

2010-2012 recruitment average of 1968-2009 estimates. Landings, Discards, and Spawning Stock Biomass (SSB) are given in metric tons.

#### 2011

	F	Landings (mt)	Discards (mt)	SSB (mt)
$F_{2011}=F_{msy}$	0.42	2,772	693	13,872
$F_{2011} = 75\% F_{msy}$	0.32	2,166	542	14,636
$F_{2011}=F_{2009}$	0.29	1,974	493	14,677
<b>Quota=status quo</b> (catch = 4.5 million lbs)	0.23	1,633	408	15,335

**Catch and Status Table (weights in 000s mt, recruitment in millions, arithmetic means)**

<b>Year</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>	<b>Max<sup>1</sup></b>	<b>Min<sup>1</sup></b>	<b>Mean<sup>1</sup></b>
Commercial landings	1.4	1.4	1.3	1.3	1.0	0.9	0.5	2.0	0.5	1.3
Commercial discards	<0.1	0.4	<0.1	<0.1	<0.1	0.2	0.1	0.4	<0.1	0.1
Recreational landings	1.5	0.8	0.9	0.9	1.0	0.7	1.0	5.6	0.5	1.6
Recreational discards	0.5	0.3	0.2	0.3	0.3	0.4	0.4	0.8	0.1	0.3
Catch used in assessment	3.4	2.9	2.5	2.5	2.5	2.1	2.1	7.8	1.8	3.3
Commercial quota	1.4	1.7	1.8	1.7	1.1	0.9	0.5	1.8	0.5	1.3
Recreational harvest limit	1.6	1.8	1.9	1.8	1.1	1.0	0.5	1.9	0.5	1.4
Spawning stock biomass <sup>1,2</sup>	12.6	12.5	12.2	12.0	11.8	12.1	13.0	13.0	6.0	9.0
Recruitment (age 1)	26.4	20.1	23.9	23.2	28.2	26.2	27.4	56.4	20.0	28.0
F (ages 2-7+)	0.84	0.66	0.45	0.44	0.43	0.35	0.29	1.26	0.26	0.74

1: Over the period 1981-2009

2: Jan 1 estimate

**Stock Distribution and Identification:** The Mid-Atlantic Fishery Management Council (MAFMC) and Atlantic States Marine Fisheries Commission (ASMFC) Fishery Management Plan for black sea bass defines the management unit as all black sea bass from Cape Hatteras, North Carolina northeast to the US-Canada border (MAFMC 1999).

**Catch:** The principal gears used in commercial fishing for black sea bass are fish pots, otter trawl and handline. After peaking at 9,900 mt in 1952, commercial landings markedly decreased during the 1960s, and have since ranged between about 600 and 2,000 mt. Commercial landings averaged 1,300 mt annually during 1988-1997. Commercial fishery quotas were implemented in 1998, and landings then ranged between 1,300 mt and 1,600 mt during 1998-2009. The recreational rod-and-reel fishery for black sea bass harvests a significant proportion of the total catch. After peaking at 5,600 mt in 1986, recreational landings averaged 1,700 mt annually during 1988-1997. Recreational fishery harvest limits were implemented in 1998, and landings then ranged between 500 mt and 2,000 mt during 1998-2009. Commercial fishery discards, although poorly estimated, appear to be a minor part of the total fishery removals from the stock, generally less than 200 mt per year. Recreational discards are somewhat higher ranging from 100 to 800 mt per year.

**Data and Assessment:** The assessment model for black sea bass changed in 2008 from a simple index-based model to a complex statistical catch at length model (SCALE; NFT 2008a) incorporating a broad range of fishery and survey data (NEFSC 2009b). Biological reference points have also been revised. The fishery catch is modeled as a single fleet with indices of stock abundance from NEFSC winter, spring, and autumn surveys. A model averaging approach was adopted using the average of results from ten candidate models. There appears to be some consistent retrospective bias in F and SSB estimates but less so in recruitment.

**Biological Reference Points (BRP):** The 2008 DPSWG Peer Review Panel (NEFSC 2009a) recommended that  $F_{40\%}$  be used as the fishing mortality threshold reference point and spawning

stock biomass at  $F_{40\%}$  ( $SSB_{40\%}$ ) be used as the stock biomass target reference point. The reference points are  $F_{MSY} = F_{40\%} = 0.42$  and  $SSB_{MSY} = SSB_{40\%} = 12,537$  mt = 27.6 million lbs (Figure 1). The stock biomass threshold of  $\frac{1}{2} SSB_{MSY} = \frac{1}{2} SSB_{40\%} = 6,269$  mt = 13.8 million lbs. The biological reference points for black sea bass were calculated using yield and SSB per recruit in the NOAA NFT framework (NFT 2008b, 2008c).

**Fishing Mortality:** Fishing mortality varied between  $F = 0.20$  and  $F = 0.72$  during the 1960s and 1970s. Fishing mortality increased steadily during the 1980s and early 1990s, peaking at  $F = 1.26$  in 1986. Fishing mortality remained high until 2002, decreasing from 1.17 in 2001 to  $F=0.29$  in 2009 (Figure 2). The average mortality decreased in the most recent years and has remained below  $F_{MSY}$  since 2008.

**Recruitment:** Recruitment at age 1 averaged 26.4 million fish during 1968-1999 and in 2000, peaked at 56.0 million fish. The 2000 and 2002 year classes are estimated to be the largest of the time series, at 56.0 and 39.8 million age 1 fish (Figures 3-4).

**Spawning Stock Biomass:** Spawning stock biomass (SSB) increased from about 5,700 mt in 1968 to about 12,200 mt in 1975, then decreased to about 6,000 mt by 1998. With improved recruitment and declining fishing mortality rates since 2001, SSB has steadily increased since to about 13,000 mt in 2009 (Figure 3). The inter-model variation bounds the biological reference point and suggests that black sea bass has reached or exceeded  $SSB_{MSY}$ .

**Special Comment:** The 2008 DPSWG Peer Review Panel (NEFSC 2009a) recommended - "These new reference points and stock status determinations should be used with caution due to the uncertainty in the natural mortality estimate, the model input parameters, residuals patterns in model fit, and significant uncertainty associated with managing a protogynous species (i.e. individuals change sex from female to male)."

### Sources of Information

Mid-Atlantic Fishery Management Council. (MAFMC). 1999. Amendment 12 to the Summer flounder, scup and black sea bass fishery management plan. Dover, DE. 398 p + appendix.

Northeast Fisheries Science Center (NEFSC) 2009a. Report by the Peer Review Panel for the Northeast Data Poor Stocks Working Group, 20 January 2009. 34 p.

Northeast Fisheries Science Center (NEFSC) 2009b. The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting. Part A. Skate species complex, Deep sea red crab, Atlantic wolfish, BLACK SEA BASS, and Black sea bass. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-02; 496 p.

NOAA Fisheries Toolbox (NFT). 2009. Statistical Catch-at-Length Model (SCALE), vers. 1.03. (Internet address: <http://nft.nefsc.noaa.gov>).

Figure 1. Spawning stock biomass (SSB; 000s metric tons), fishing mortality, and biological reference points for black sea bass.

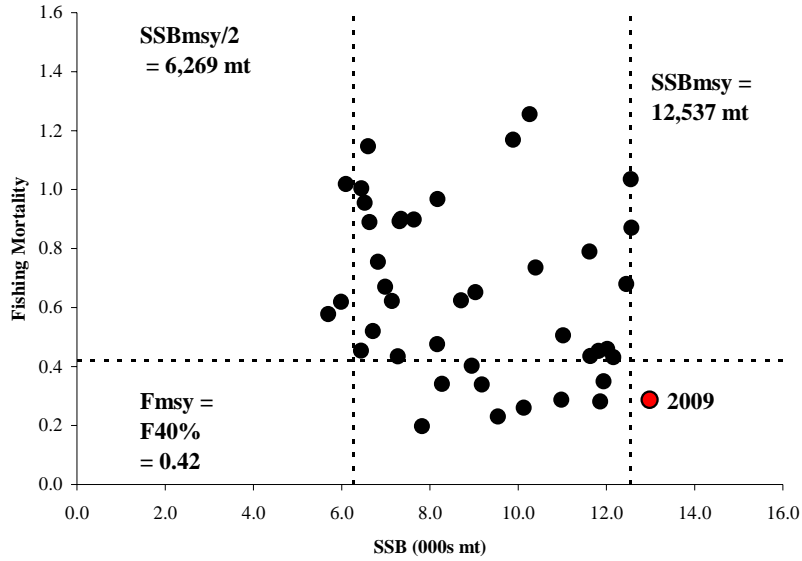


Figure 2. Total catch (landings and discards, metric tons) and fishing mortality rate (F) for black sea bass

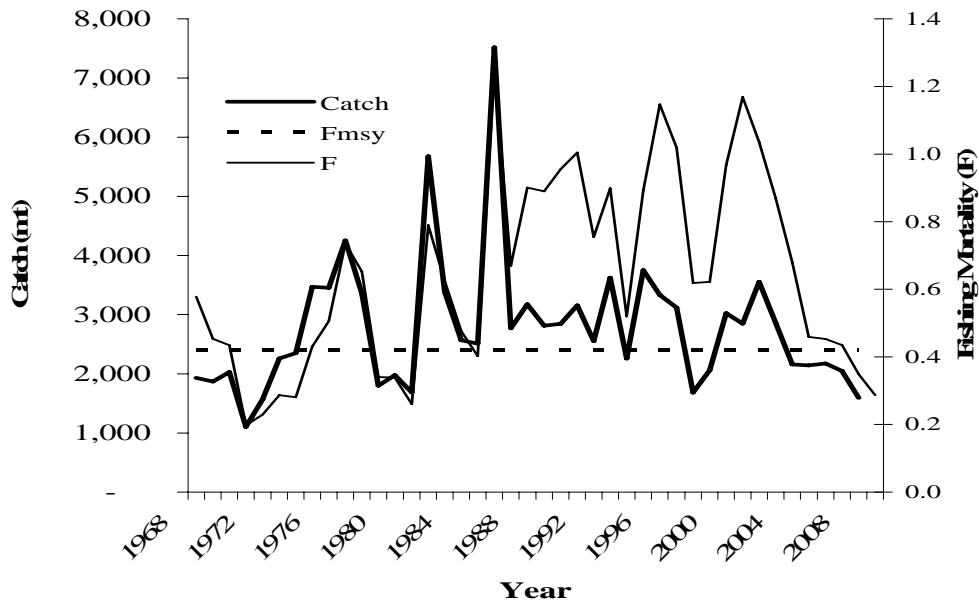


Figure 3. Spawning stock biomass (SSB, metric tons) and recruitment (age 1, millions) for black sea bass.

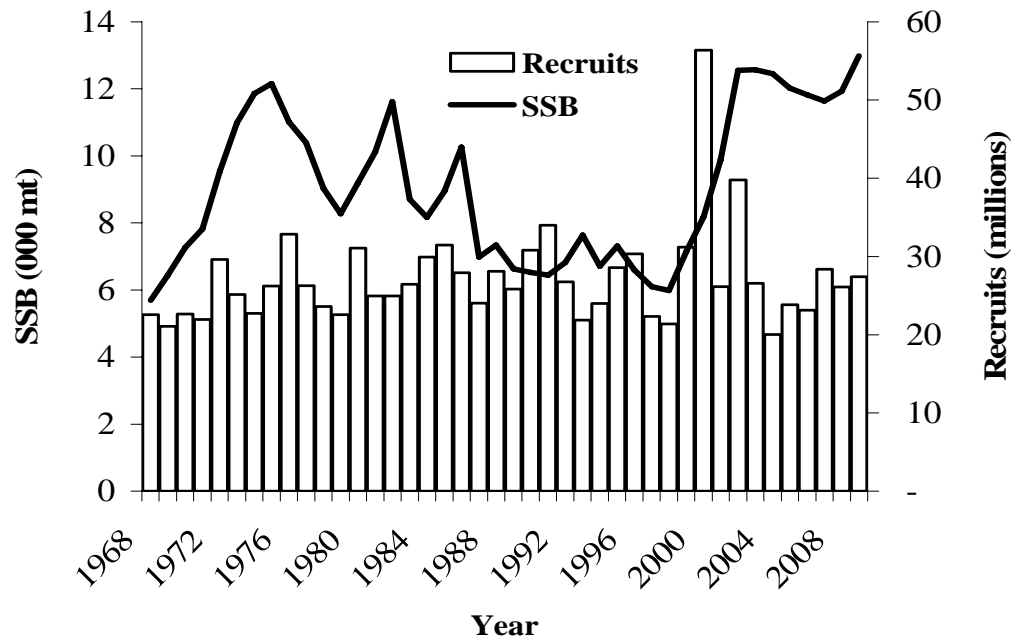


Figure 4. Spawning stock biomass (SSB, metric tons) and recruitment (age 1, millions) scatterplot for black sea bass.

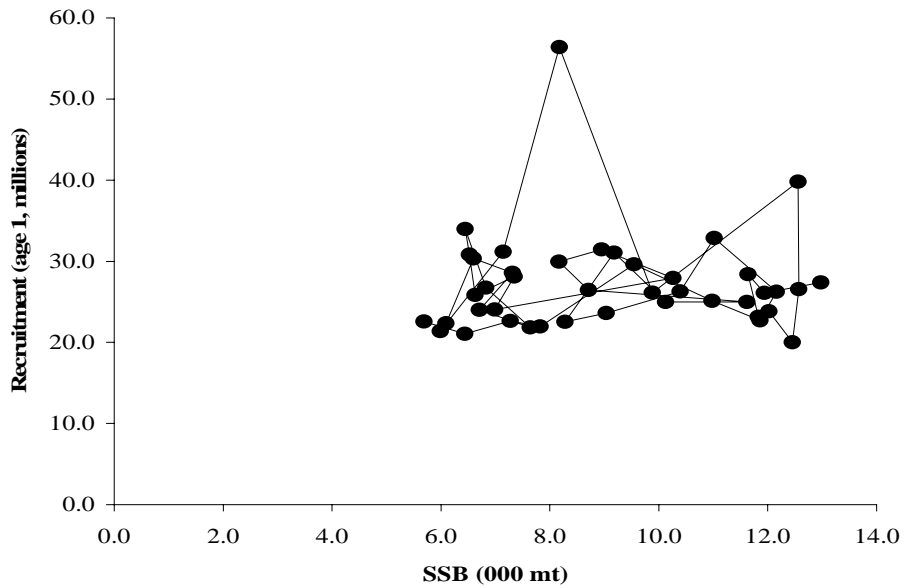


Table 1. Summary of Mohn's rho values for each run and average.

<b>run</b>	<b>F</b>	<b>SSB</b>	<b>R</b>
1	-0.34	0.28	0.27
2	-0.34	0.27	0.27
3	-0.39	0.23	0.30
4	-0.39	0.22	0.29
7	-0.26	0.28	0.25
8	-0.24	0.23	0.23
9	-0.20	0.23	0.22
10	-0.19	0.22	0.21
11	-0.20	0.28	0.21
12	-0.34	0.28	0.28
avg rho	-0.29	0.25	0.25