State of Stock: Relative to the biological reference points proposed by the working group (WG) in the 2005 SARC, the bluefish stock is not overfished and overfishing is not occurring ($½B_{MSY}$ =73,526 mt; F_{MSY} = 0.19). This conclusion is based on a 2009 biomass estimate of 125,990 MT and *F*=0.18 from the ASAP model results. Estimates from ASAP using state and federal indices show a low fishing mortality rate (*F*) and an increasing trend in population biomass. January 1 population estimates show a general increase in abundance since 1997. Abundance estimates peaked in 1982 at 173 million fish, declined to 56 million in the mid-1990s and have since increased to 89 million fish in 2007. Abundance in 2009 declined to 71.3 million fish.

Forecast for 2010: Forecast yield in 2011 at status quo F (0.18) was 10,021 mt, which includes recreational discards with 15% mortality. The forecast is based on a 2010 yield of 10,272 mt.

Catch and Status Table (weights in '000 mt): Bluefish

Year	2003	2004	2005	2006	2007	2008	2009	Max	Min	Mean
USA Commercial landings[1]	3.4	3.6	3.2	2.9	3.3	2.6	3.2	7.5	0.8	3.7
USA Recreational landings[2]	6.0	7.2	8.2	7.7	9.6	8.6	6.2	37.7	3.7	15.7
USA Recreational discards[2]	1.3	1.8	1.9	1.9	2.7	2.4	1.0	2.6	0.6	1.4
Total Catch[3]	10.7	12.6	13.3	12.5	15.6	13.6	10.3	48.8	8.2	20.7

[1] Min, max and mean since 1950.
[2] Min, max and mean landings and discard mortalities since 1982.
[3] Min, max, and mean total catch since 1982.

Stock Distribution and Identification: Bluefish are highly migratory, pelagic species found along the U.S. Atlantic coast from Maine to Florida, but generally are found inshore north of the Carolinas only in warmer months (Beaumariage 1969; Lund and Maltezos 1970; Shepherd et al. 2006). Bluefish in the western North Atlantic are managed as a single stock (NEFSC 1997; Fahay et al. 1999). Genetic data support a unit stock hypothesis (Graves et al. 1992; Goodbred and Graves 1996; Davidson 2002). For management purposes, the ASMFC and MAFMC define the management unit as the portion of the stock occurring along the Atlantic Coast from Maine to the east coast of Florida.

Catches: Bluefish are one of the most sought after species by recreational anglers along the Atlantic Coast. In 2009, recreational anglers along the Atlantic Coast harvested nearly 6.2 thousand metric tons (mt) of bluefish (Figure 1, Table 1). Recreational landings have ranged from a low of 3,744 mt in 1999 to a high of 43,222 mt in 1981. Landings from the commercial bluefish fishery have been consistently lower than the recreational catch (Figure 1, Table 1). Regional variations in commercial fishing activity are linked to the seasonal migration of bluefish. Commercial landings decreased from 7,500 mt in 1981 to 3,300 mt in 1999. Commercial landings have been regulated by quota since the implementation of Amendment 1 in 2000. In 2000 and 2001, landings increased to approximately 3,600 mt and 3,900 mt, respectively, but declined in 2002 and 2003 to 3,100 mt and 3,400 mt, respectively. Landing estimates for 2009 increased to 3,151 mt (Figure 1, Table 1). Gill nets are the dominant commercial gear used to target bluefish and account for over 40% of the bluefish commercial landings from 1950 to 2003. Other commercial fishing gears including hook & line, pound nets, seines, and trawls, collectively account for approximately 50% of the commercial landings.

Data and Assessment: The ASMFC Bluefish Stock Assessment Sub-Committee compiled the commercial, recreational data, and ageing information for use in updating the assessment. The majority of commercial sampling since 1997 occurred in North Carolina and Virginia, where a large proportion of the landings are taken. Recreational landings data, length data, and discard estimates were collected from the

MRFSS survey. Age data were used from Virginia's cooperative ageing program and consisted of seasonal age data (spring and fall age keys). State agencies between Massachusetts and Florida conduct annual marine finfish surveys and the indices, partitioned by age, were used in a forward projecting catch at age model (ASAP). Indices included in the model were from the NMFS fall survey (ages 0-6+), CT trawl survey (ages 0-6+), NJ trawl survey (ages 0-2), DE trawl survey (ages 0-2), MRFSS recreational catch per angler (ages 0-6+), and SEAMAP survey (age-0). CT trawl survey indices were not estimated for 2008 but were included (ages 0-6+) for 2009. A 15% mortality rate was applied to recreational discards and no commercial discards were estimated for inclusion in this assessment update.

Biological Reference Points: The current biological reference points for Atlantic coast bluefish were developed for review at SARC 41 and are used in this assessment for comparison to current stock status ($½B_{MSY}$ = 73,526 mt; B_{MSY} = 147,051; F_{MSY} = 0.19) (Table 2). The current F of 0.18 is below the SARC 41 approved F_{MSY} of 0.19. Therefore, it is concluded that bluefish is not experiencing overfishing. The current estimate of biomass (126,121 mt) would not be considered overfished under the FMP definition or the B_{MSY} value approved by SARC 41.

Fishing Mortality: Fishing mortality estimates in ASAP are based on a separability assumption. F at age is the product of F_{MULT} and selectivity. Full selectivity prior to 1994 was achieved at age 1 while full selectivity since 1995 was estimated as age 2. The 2009 F_{mult} value equals 0.18. Fishing mortality steadily declined from 0.42 in 1987 to 0.21 in 2002. With the exception of 0.18 in 2009, fishing mortality has remained steady since 2000 with an average F=0.24.

Total Stock Biomass: Recent mean biomass estimates peaked in 1982 at 288.2 thousand MT, then declined to 79.5 thousand MT by 1994 before increasing to the 2009 level of 126.0 thousand MT.

Recruitment: Recruitment estimated in the ASAP model has remained relatively constant since 2000 around 25.0 million age-0 bluefish, with the exception of a relatively large 2006 cohort estimated as 32.3 million fish. The 2009 recruitment estimate was well below average at 10.8 million fish.

Modeling: The subcommittee updated the ASAP model that was approved in the 41st SAW peer-review. The bluefish data were truncated to an age-6+ category to reduce the influence of ageing error and to reduce the bimodal nature of the catch-at-age distributions. The ASAP model allows error in the catch-at-age as well as the assumption of separability into year and age components making it better at handling the selectivity patterns and catch data from the bluefish fishery. In the present configuration of ASAP, selectivity was estimated for two periods before and after 1994/1995.

Special Comments: The highly migratory nature of bluefish populations and the recruitment dynamics of the species create a unique modeling situation. Migration creates seasonal fisheries with unique selectivity patterns resulting in a bimodal partial recruitment pattern. This pattern has been identified in previous assessments as a source of uncertainty in the results and has been held constant in the model. The migratory pattern in bluefish also results in several recruitment events. A spring cohort, originating south of Cape Hatteras, NC during spring migrations, and a summer cohort originating in the offshore Mid-Atlantic Bight result in a bimodal age-0 size distribution. It has been hypothesized that the success of the spring cohort controls the abundance of adult bluefish. The variable intra-annual recruitment pattern, limited ageing data, recent changes in the NEFSC trawl survey and lack of commercial discards also contribute to the uncertainty in the assessment results.

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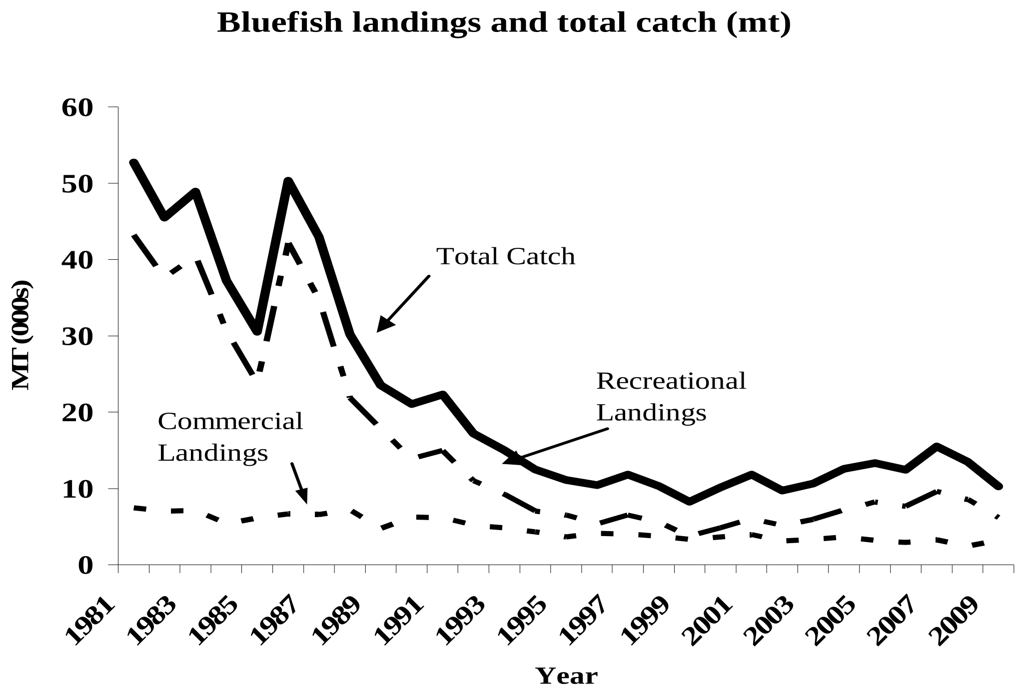

Figure 1. Total catch (landings plus recreational discards), recreational and commercial landings of bluefish, Maine to Florida, 1981-2009.

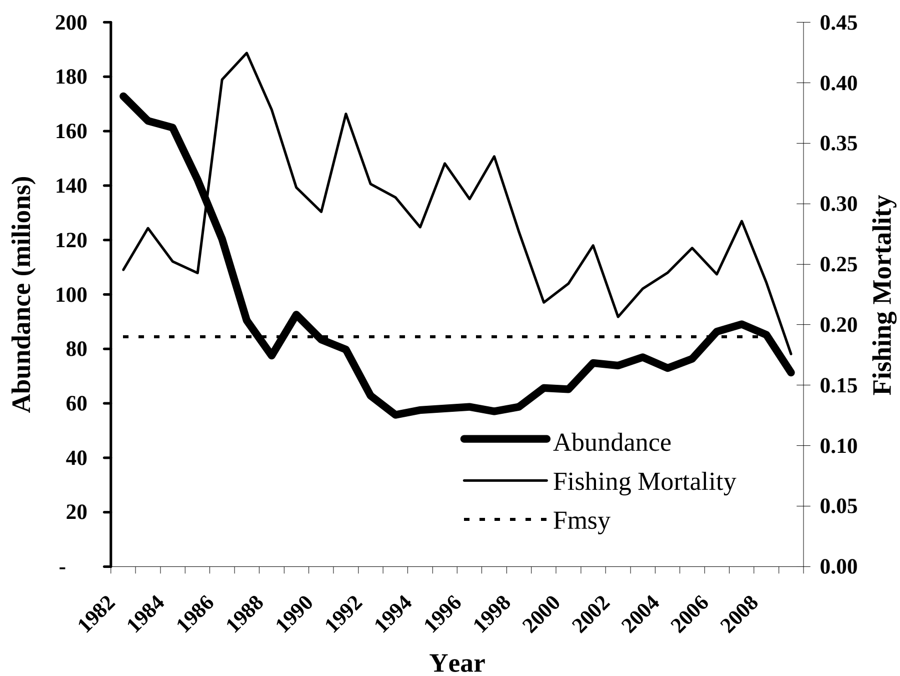

Figure 2. Fishing mortality and abundance estimates of bluefish along the Atlantic coast, 1982-2009, estimated from the ASAP model.

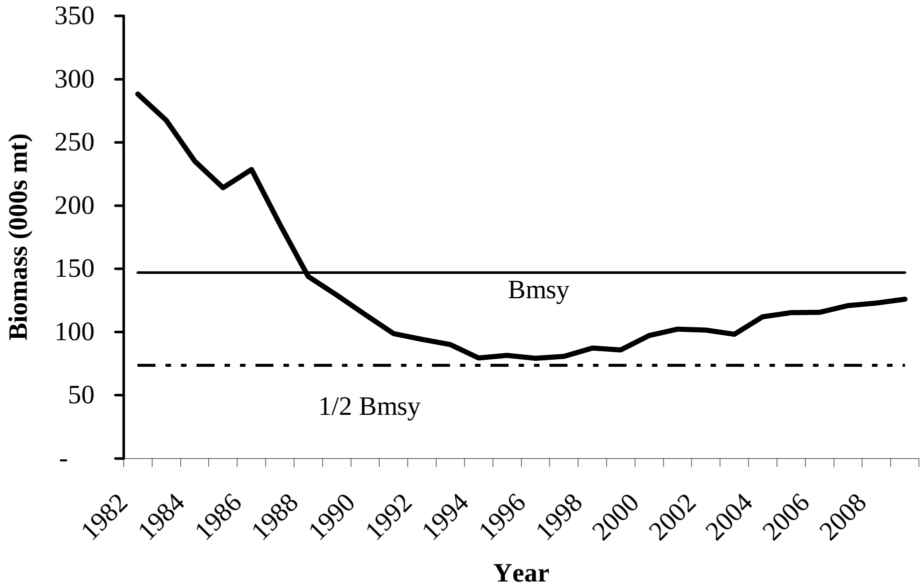

Figure 3. Atlantic coast bluefish biomass and biological reference points based on ASAP model results.

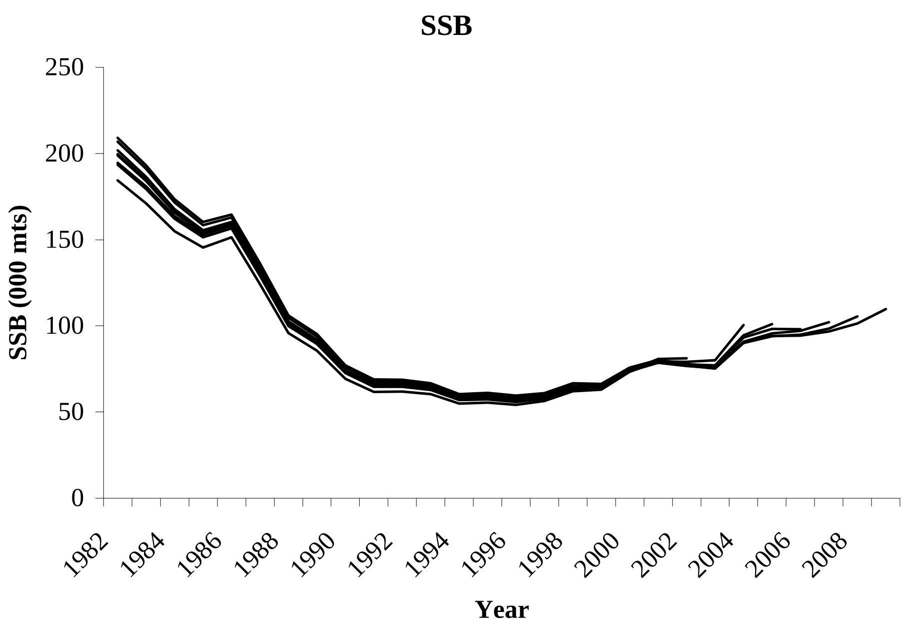

Figure 4. Retrospective pattern of spawning biomass from the ASAP model.

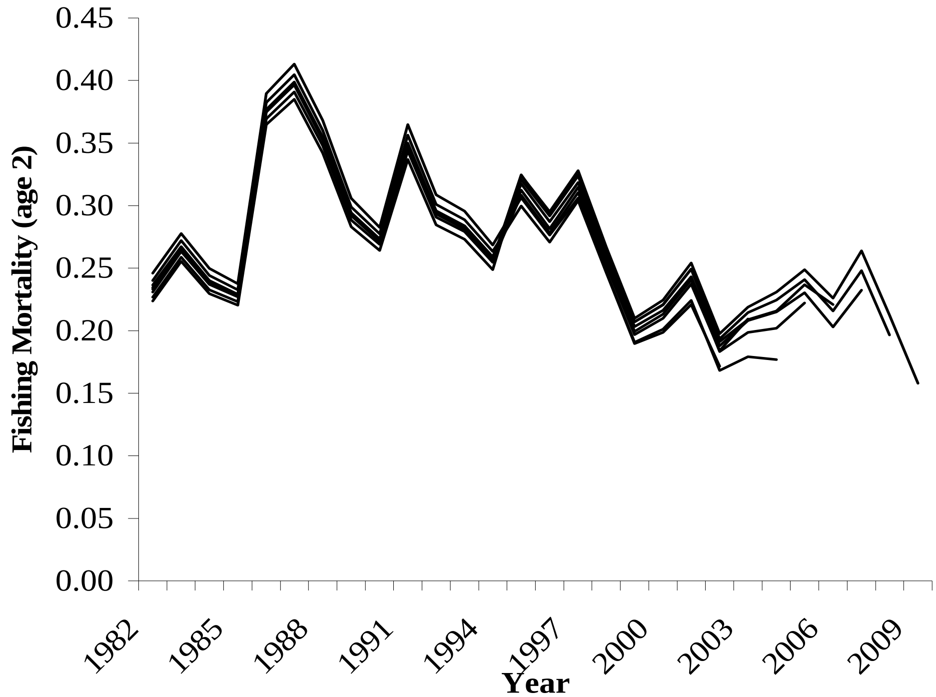

Figure 5. Retrospective pattern of Fmult (age 2) from the updated ASAP model.

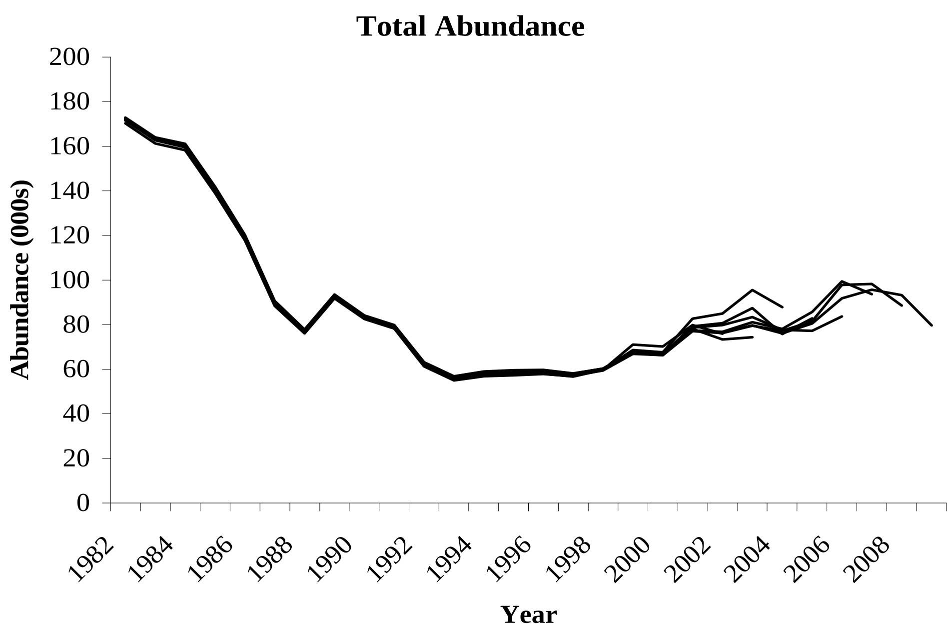

Figure 6. Retrospective pattern of total abundance from updated ASAP model.

Figure 7. Retrospective pattern of age 0 recruits from updated ASAP model.

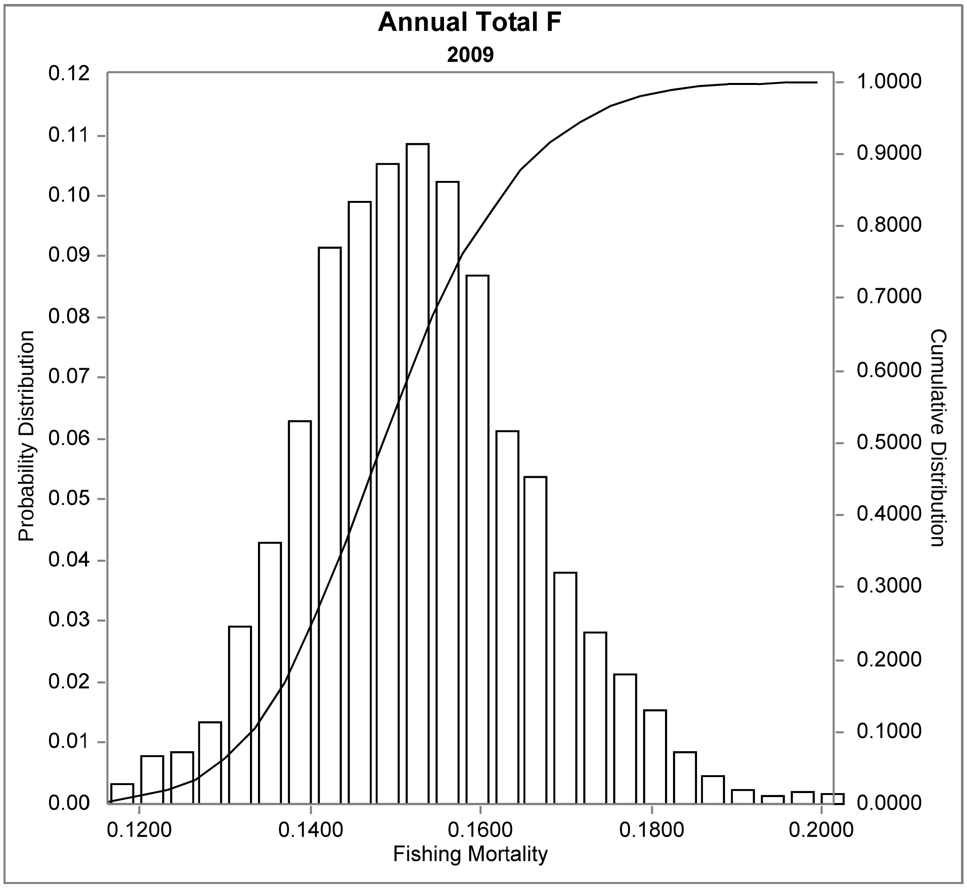

Figure 8. Variability in ASAP 2009 estimates of F based on MCMC results.

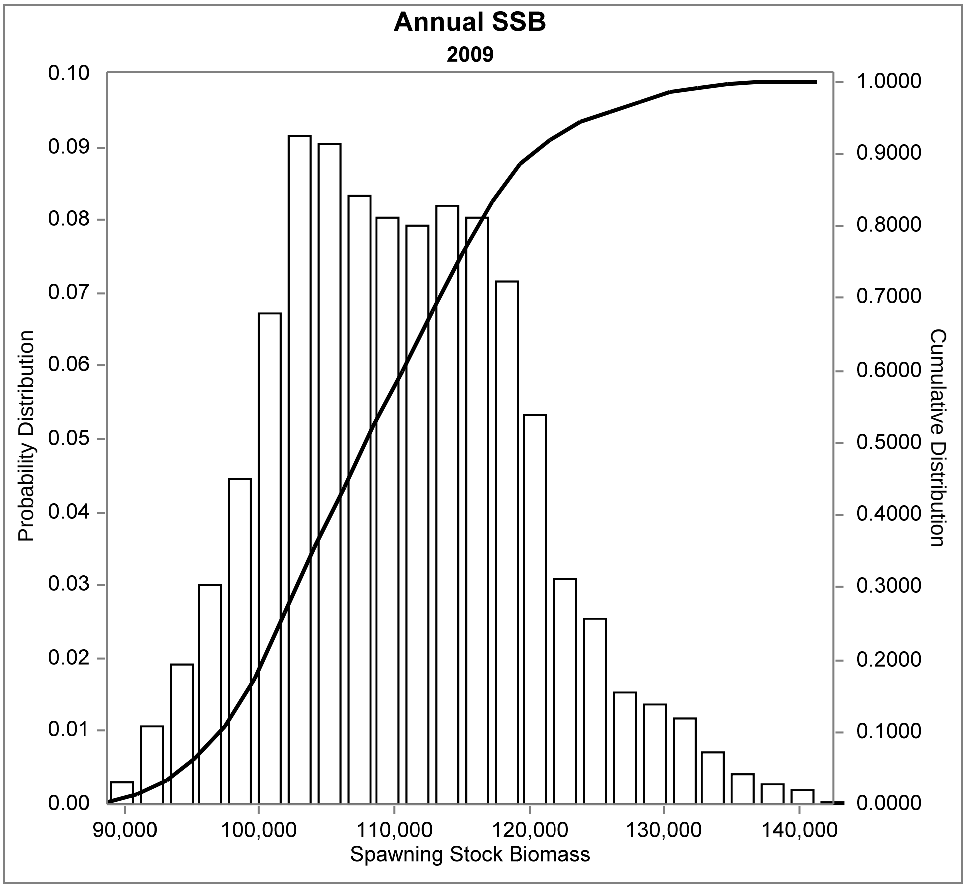

Figure 9. Variability in ASAP 2009 estimate of SSB from MCMC results.

Table 1. Atlantic coast landings and discards of bluefish, 1974-2009.

Year	Commercial Landings (mt)	Commercial Landings (000 lbs)	Recreational Landings (mt)	Recreational Discard (mt)	Recreational Catch (mt)	Total Landings (mt)	Total Catch (mt) (w/o commercial discards)
1974	4,538	10,005					
1975	4,402	9,705		**assumes same**			
1976	4,546	10,022		**mean wt**			
1977	4,802	10,587		**as landings**			
1978	4,986	10,992					
1979	5,693	12,551					
1980	6,857	15,117					
1981	7,465	16,457	43,222	*2,001*	*45,223*		52,688
1982	6,997	15,426	37,651	*832*	*38,483*	44,648	45480.5
1983	7,166	15,798	40,425	*1,280*	*41,705*	47,591	48871.3
1984	5,380	11,861	30,597	*1,260*	*31,857*	35,977	37237.1
1985	6,122	13,497	23,821	*599*	*24,420*	29,943	30542.3
1986	6,651	14,663	42,133	*1,544*	*43,677*	48,784	50327.6
1987	6,578	14,502	34,769	*1,615*	*36,384*	41,347	42962.1
1988	7,161	15,787	21,873	*1,146*	*23,019*	29,034	30180.1
1989	4,740	10,450	17,808	*989*	*18,797*	22,548	23537.4
1990	6,250	13,778	13,860	*929*	*14,789*	20,110	21039.0
1991	6,160	13,580	14,967	*1,194*	*16,161*	21,127	22320.5
1992	5,205	11,475	11,011	*979*	*11,990*	16,216	17195.1
1993	4,808	10,600	9,204	*1,013*	*10,217*	14,012	15025.1
1994	4,304	9,488	7,049	*1,128*	*8,177*	11,353	12480.7
1995	3,628	7,998	6,489	*1,003*	*7,492*	10,117	11119.9
1996	4,113	9,066	5,328	*1,010*	*6,338*	9,441	10450.8
1997	4,064	8,960	6,487	*1,287*	*7,774*	10,551	11838.5
1998	3,739	8,242	5,595	*999*	*6,594*	9,334	10332.5
1999	3,330	7,341	3,744	*1,191*	*4,935*	7,074	8264.4
2000	3,647	8,040	4,811	*1,675*	*6,486*	8,458	10132.5
2001	3,945	8,697	6,001	*1,857*	*7,858*	9,946	11803.4
2002	3,116	6,869	5,158	*1,448*	*6,606*	8,274	9721.4
2003	3,358	7,403	5,958	*1,331*	*7,289*	9,316	10647.0
2004	3,647	8,041	7,179	*1,761*	*8,940*	10,826	12586.9
2005	3,187	7,026	8,225	*1,915*	*10,140*	11,412	13327.3
2006	2,926	6,450	7,663	*1,860*	*9,523*	10,589	12449.0
2007	3,267	7,182	9,608	*2,653*	*12,261*	12,874	15527.3
2008	2,469	5,655	8,573	*2,443*	*11,016*	11,042	13485.3
2009	3,151	6,990	6,161	*960*	*7,121*	9,312	10272.7

Table 2. Bluefish biological reference points and current status.

Assessment year	Catch year	Fmult	Fmsy	1/2 Bmsy	Bmsy	2009 Biomass	2009 reported catch	MSY
2010	2009	0.18	0.19	73,526	147,052	125,990	10,273	15,644

Table 3. Fishing mortality at age from 2009 ASAP model.

	AGE						
	0	**1**	**2**	**3**	**4**	**5**	**6+**
1982	0.09	0.25	0.22	0.12	0.09	0.17	0.22
1983	0.11	0.28	0.25	0.13	0.10	0.19	0.25
1984	0.10	0.25	0.23	0.12	0.09	0.17	0.22
1985	0.09	0.24	0.22	0.12	0.08	0.16	0.21
1986	0.15	0.40	0.36	0.19	0.14	0.27	0.36
1987	0.16	0.42	0.38	0.20	0.15	0.29	0.38
1988	0.14	0.38	0.34	0.18	0.13	0.26	0.33
1989	0.12	0.31	0.28	0.15	0.11	0.21	0.28
1990	0.11	0.29	0.26	0.14	0.10	0.20	0.26
1991	0.14	0.37	0.34	0.18	0.13	0.25	0.33
1992	0.12	0.32	0.28	0.15	0.11	0.21	0.28
1993	0.12	0.31	0.27	0.15	0.11	0.21	0.27
1994	0.11	0.28	0.25	0.14	0.10	0.19	0.25
1995	0.09	0.30	0.33	0.19	0.12	0.19	0.12
1996	0.09	0.28	0.30	0.18	0.11	0.17	0.11
1997	0.10	0.31	0.34	0.20	0.13	0.19	0.12
1998	0.08	0.25	0.28	0.16	0.10	0.16	0.10
1999	0.06	0.20	0.22	0.13	0.08	0.13	0.08
2000	0.07	0.21	0.23	0.13	0.09	0.13	0.08
2001	0.08	0.24	0.27	0.15	0.10	0.15	0.09
2002	0.06	0.19	0.21	0.12	0.08	0.12	0.07
2003	0.07	0.21	0.23	0.13	0.08	0.13	0.08
2004	0.07	0.22	0.24	0.14	0.09	0.14	0.09
2005	0.07	0.24	0.26	0.15	0.10	0.15	0.09
2006	0.07	0.22	0.24	0.14	0.09	0.14	0.09
2007	0.08	0.26	0.29	0.16	0.11	0.16	0.10
2008	0.07	0.21	0.23	0.14	0.09	0.13	0.08
2009	0.05	0.16	0.18	0.10	0.06	0.10	0.06

Table 4. Population abundance (000s) at age from updated ASAP model.

	Jan 1 abundance 000s							
	0	**1**	**2**	**3**	**4**	**5**	**6+**	**total**
1982	57,024	45,924	13,671	7,132	6,808	12,416	29,841	172,815
1983	44,258	42,538	29,419	8,977	5,188	5,117	28,280	163,778
1984	51,783	32,586	26,326	18,729	6,423	3,853	21,546	161,246
1985	30,479	38,529	20,733	17,182	13,581	4,816	16,775	142,094
1986	22,054	22,758	24,744	13,645	12,515	10,216	14,427	120,359
1987	15,696	15,498	12,457	14,106	9,203	8,904	14,647	90,512
1988	21,688	10,938	8,298	6,962	9,413	6,498	13,710	77,508
1989	42,597	15,387	6,139	4,838	4,752	6,756	12,160	92,628
1990	20,492	30,967	9,209	3,792	3,406	3,488	12,023	83,378
1991	24,939	15,010	18,907	5,792	2,696	2,518	9,937	79,797
1992	12,224	17,715	8,452	11,056	3,960	1,937	7,444	62,788
1993	14,560	8,876	10,570	5,206	7,773	2,903	5,887	55,775
1994	19,992	10,617	5,356	6,577	3,680	5,721	5,614	57,557
1995	18,527	14,715	6,565	3,407	4,704	2,732	7,462	58,112
1996	19,134	13,795	8,906	3,851	2,302	3,405	7,273	58,668
1997	16,745	14,367	8,576	5,381	2,647	1,684	7,687	57,087
1998	20,370	12,448	8,652	5,003	3,624	1,912	6,714	58,722
1999	24,495	15,413	7,930	5,370	3,492	2,678	6,317	65,694
2000	17,487	18,845	10,352	5,218	3,876	2,637	6,719	65,135
2001	28,697	13,394	12,480	6,707	3,733	2,911	6,949	74,870
2002	20,921	21,784	8,621	7,835	4,712	2,771	7,223	73,867
2003	23,444	16,151	14,791	5,741	5,695	3,574	7,510	76,905
2004	17,958	17,979	10,738	9,625	4,117	4,283	8,232	72,932
2005	24,780	13,720	11,811	6,895	6,850	3,082	9,232	76,370
2006	32,288	18,823	8,849	7,432	4,851	5,089	9,052	86,384
2007	26,953	24,677	12,379	5,689	5,293	3,632	10,428	89,052
2008	23,493	20,344	15,595	7,617	3,951	3,900	10,236	85,134
2009	10,790	17,991	13,464	10,097	5,447	2,966	10,500	71,253

Table 5. Population biomass (MT) at age from updated ASAP model.

	biomass at age			mt				
	0	1	2	3	4	5	6+	total
1982	7,983	22,503	20,780	14,620	21,786	52,545	147,950	288,167
1983	4,426	17,866	29,125	19,301	16,396	22,602	157,718	267,433
1984	5,178	13,360	24,483	34,273	18,692	17,273	121,734	234,994
1985	3,048	15,411	20,111	33,161	38,297	19,222	84,765	214,015
1986	2,646	11,151	29,693	31,657	39,423	43,959	69,943	228,472
1987	1,883	4,650	14,700	28,495	27,242	34,967	72,999	184,935
1988	3,687	4,375	8,298	14,273	26,734	23,158	63,380	143,905
1989	5,538	4,616	6,507	10,257	17,299	27,740	57,394	129,350
1990	4,303	15,483	8,104	6,560	11,037	14,570	53,791	113,849
1991	3,491	4,953	13,235	10,020	7,575	9,978	49,335	98,587
1992	1,956	6,909	8,790	20,896	11,087	6,398	38,015	94,051
1993	2,621	5,237	10,041	12,808	21,219	9,398	28,731	90,054
1994	2,399	4,247	4,820	12,364	11,187	21,494	22,979	79,490
1995	3,150	6,475	6,434	5,894	13,407	11,087	35,040	81,486
1996	3,253	6,070	8,728	6,663	6,560	13,818	34,156	79,248
1997	2,177	7,327	8,919	11,946	8,099	6,923	35,359	80,750
1998	3,870	7,469	8,133	11,756	12,321	7,686	36,120	87,355
1999	3,429	8,169	7,295	11,223	11,976	10,981	32,656	85,731
2000	2,973	8,669	10,352	14,193	13,606	9,520	37,897	97,210
2001	4,592	5,893	11,357	16,901	14,446	11,294	37,736	102,219
2002	3,557	11,981	10,086	17,942	13,664	10,473	33,661	101,364
2003	2,813	9,044	14,791	12,458	15,034	13,082	30,867	98,089
2004	1,437	8,091	14,174	20,597	13,464	16,062	38,194	112,018
2005	1,982	6,174	15,590	14,756	22,400	11,556	42,836	115,295
2006	2,583	8,471	11,680	15,904	15,861	19,083	42,002	115,584
2007	2,156	11,105	16,341	12,175	17,309	13,620	48,384	121,089
2008	1,879	9,155	20,586	16,299	12,918	14,624	47,497	122,958
2009	863	8,096	17,772	21,607	17,811	11,122	48,720	125,990

Table 6. Catch at age (000s) for bluefish, Maine to Florida as used in the ASAP model.

	0	1	2	3	4	5	6+	total
1982	11164.1	9747.9	2850.8	2439.3	795.3	1213.5	3736.3	31,947
1983	4778.4	7666.7	8686.1	3022.0	970.6	1325.3	4778.4	31,228
1984	7121.3	6807.3	6718.5	2039.9	895.1	744.7	3176.7	27,503
1985	4676.7	6468.8	5773.3	2925.5	1328.5	520.0	2377.1	24,070
1986	5169.3	8070.7	8728.0	2801.7	1056.4	1703.1	4465.0	31,994
1987	3127.1	5419.5	5177.8	5757.4	2009.3	1083.0	3948.2	26,522
1988	1709.8	2083.6	2524.0	1588.6	1984.1	1598.6	2740.4	14,229
1989	3473.6	5672.6	3221.1	992.1	395.9	1168.5	2409.8	17,334
1990	2726.7	7185.8	1840.7	687.2	381.8	431.6	2478.6	15,732
1991	3694.6	5292.6	7391.9	1590.7	310.9	224.7	2136.5	20,642
1992	2131.3	9633.3	1709.8	2352.9	583.4	479.2	967.2	17,857
1993	1194.1	2081.6	1566.9	593.0	1040.8	669.0	1178.9	8,324
1994	1970.8	3144.3	1313.3	368.1	296.7	849.5	1073.1	9,016
1995	1822.8	3371.4	735.7	137.7	214.1	695.7	1057.8	8,035
1996	1701.5	2145.1	631.5	202.2	207.2	545.0	1411.8	6,844
1997	1634.1	4299.3	1496.2	510.5	196.6	93.4	1212.3	9,443
1998	683.5	2754.1	2786.1	861.3	261.0	308.0	458.8	8,113
1999	1638.5	1946.1	2096.7	572.8	174.7	352.5	482.8	7,264
2000	667.4	4396.5	2693.3	717.7	96.9	536.0	155.9	9,264
2001	1414.3	4466.7	3466.2	1151.9	198.3	608.0	243.5	11,549
2002	587.1	5145.6	1661.6	542.6	340.3	236.8	415.9	8,930
2003	819.3	2646.0	3975.0	774.6	377.9	319.8	644.0	9,557
2004	434.4	5270.8	2289.6	1265.2	435.4	473.5	662.8	10,832
2005	3262.8	2560.5	4179.2	1389.9	411.9	585.4	494.7	12,884
2006	2718.6	3489.6	2975.5	1090.2	301.9	283.5	662.6	11,522
2007	695.0	3065.0	5390.0	1548.2	852.7	582.7	1375.2	13,509
2008	893.1	3725.3	4011.6	463.1	615.1	239.1	396.3	10,344
2009	144.5	3083.9	2857.8	482.1	354.2	236.5	599.9	7,759

Table 7. Projections of abundance, biomass, SSB and yield for 2010-2012 using AGEPRO model. Assumed weight at age equivalent to 2009. Yield includes recreational discards with 15% mortality.

	F	1-Jan Abundance (000s)	Mean Biomass (000s mt)	SSB (000s mt)	Yield mt
2010	0.16	74,663	111.7	103.9	9,183
2011	0.16	78,265	114.2	105.2	9,057
2012	0.16	80,827	119.3	107.7	9,882

	F	1-Jan Abundance (000s)	Mean Biomass (000s mt)	SSB (000s mt)	Yield mt
2010	0.17	74,663	110.6	103.6	9,729
2011	0.17	77,970	112.7	104.4	9,543
2012	0.17	80,293	117.1	106.3	10,362

status quo	F	1-Jan Abundance (000s)	Mean Biomass (000s mt)	SSB (000s mt)	Yield mt
2010	0.18	74,663	111.1	103.3	10,272
2011	0.18	77,677	112.5	103.5	10,021
2012	0.18	79,766	116.3	104.9	10,828

Fmsy	F	1-Jan Abundance (000s)	Mean Biomass (000s mt)	SSB (000s mt)	Yield mt
2010	0.19	75,585	110.9	103.1	10,811
2011	0.19	77,385	111.6	102.7	10,490
2012	0.19	79,245	114.8	103.5	11,280

F0.1	F	1-Jan Abundance (000s)	Mean Biomass (000s mt)	SSB (000s mt)	Yield mt
2010	0.26	74,663	109.0	101.3	14,503
2011	0.26	75,402	105.8	97.3	13,549
2012	0.26	75,759	105.1	94.4	14,088