Bluefish Assessment Summary **ASMFC Bluefish SASC, July 2008**

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 2007 biomass estimate of 153,843 MT and *F*=0.15 from the ASAP model results. Fishing mortality rates (*F*) estimated in ASAP using state and federal indices show a low *F*, an increasing trend in population biomass, and an increasing trend in population numbers. January 1 population abundance estimates show a general increase in overall abundance since 1997. Abundance estimates peaked in 1982 at 163 million fish, declined to 58 million in the mid-1990s and have since increased to 103 million fish.

Forecast for 2009: Forecast yield in 2009 at status quo F (0.15) was 15,459 MT, which includes recreational discards with 15% mortality. The forecast is based on a 2007 yield of 15,568 MT.

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

Year	2001	2002	2003	2004	2005	2006	2007	Max	Min	Mean
USA Commercial landings[1]	3.9	3.1	3.4	3.6	3.2	2.9	3.3	7.5	0.8	3.7
USA Recreational landings[2]	6.0	5.2	6.0	7.2	8.2	7.7	9.6	37.7	3.7	14.9
USA Recreational discards[2]	1.9	1.5	1.3	1.8	1.9	1.9	2.7	2.3	0.6	1.3
Total Catch[3]	11.8	9.8	10.7	12.6	13.3	12.5	15.6	48.8	5.1	21.0

[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 2007, recreational anglers along the Atlantic Coast harvested nearly 9.6 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 2007 remained stable at 3,300 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). A 15% mortality rate was applied to recreational discards and no commercial discards were estimated for inclusion in this assessment.

Biological Reference Points: The current biological reference points for Atlantic coast bluefish in the FMP ($½B_{MSY}$ = 53,750 MT and F_{MSY} = 0.31) were based on a surplus production model that has since been rejected during the SAW 39 review. Biological reference points presented at SARC 41 were used in this assessment for comparison to current stock status ($½B_{MSY}$ = 73,526 MT; F_{MSY} = 0.19) (Table 2). The rebuilding deadline for bluefish is 2010, at which point the stock is expected to meet or exceed biomass at B_{MSY} (147,051 MT). The biomass estimate for 2007 (153,843 MT) exceeds that level and therefore can be considered rebuilt. The current *F* of 0.15 is below the SARC 41 approved F_{MSY} of 0.19 (note: the F_{MSY} estimate from the recent updated ASAP model is 0.18). Therefore, it is concluded that bluefish is not experiencing overfishing. The current estimate of biomass (153,843 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_{MULT} is the product of *F* at age and selectivity. The 2007 F_{MULT} value equals 0.15. Fishing mortality steadily declined from 0.36 in 1987 to 0.13 in 1999. Since 1999, fishing mortality has remained steady with average F=0.15.

Total Stock Biomass: Recent biomass estimates peaked in 1982 at 365.9 thousand MT, then declined to 89.8 thousand MT by 1996 before increasing to the 2007 level of 153.8 thousand MT.

Recruitment: Recruitment estimated in the ASAP model has remained relatively constant since 2000 around 25.2 million age-0 bluefish, with the exception of a large 2006 cohort estimated as 44.7 million fish. The 2007 recruitment estimate was to 21.7 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.

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 and lack of commercial discards also contribute to the uncertainty in the assessment results.

Sources of Information:

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Goodbred, C.O. and J.E. Graves. 1996. Genetic relationships among geographically isolated populations of bluefish (*Pomatomus saltatrix*). Marine and Freshwater Research 47:347-355.

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Lund, W.A. and G.C. Maltezos. 1970. Movements and migrations of the bluefish, *Pomatomus saltatrix*, tagged in waters of New York and Southern New England. Transactions of the American Fisheries Society 99:719-725.

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Northeast Fisheries Science Center. 2005. Report of the 41st Northeast Regional Stock Assessment Workshop (41st SAW): 41st SAW Assessment Report NEFSC CRD 05-14. September, 2005. 237 pp. 97-05.

Shepherd, G.R., J. Moser, D. Deuel, P. Carlson. 2006. The migration patterns of bluefish (*Pomatomus saltatrix*) along the Atlantic coast determined from tag recoveries. Fish. Bull. 104:559-570.

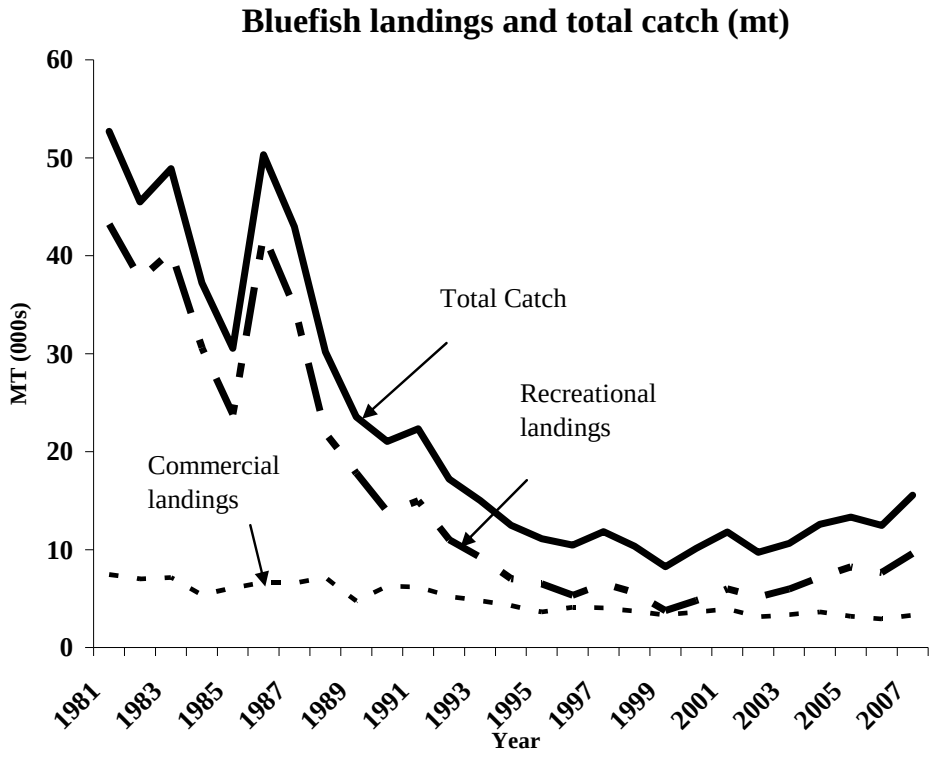

Figure 1. Total catch (landings plus recreational discards), recreational and commercial landings of bluefish, Maine to Florida, 1981-2007.

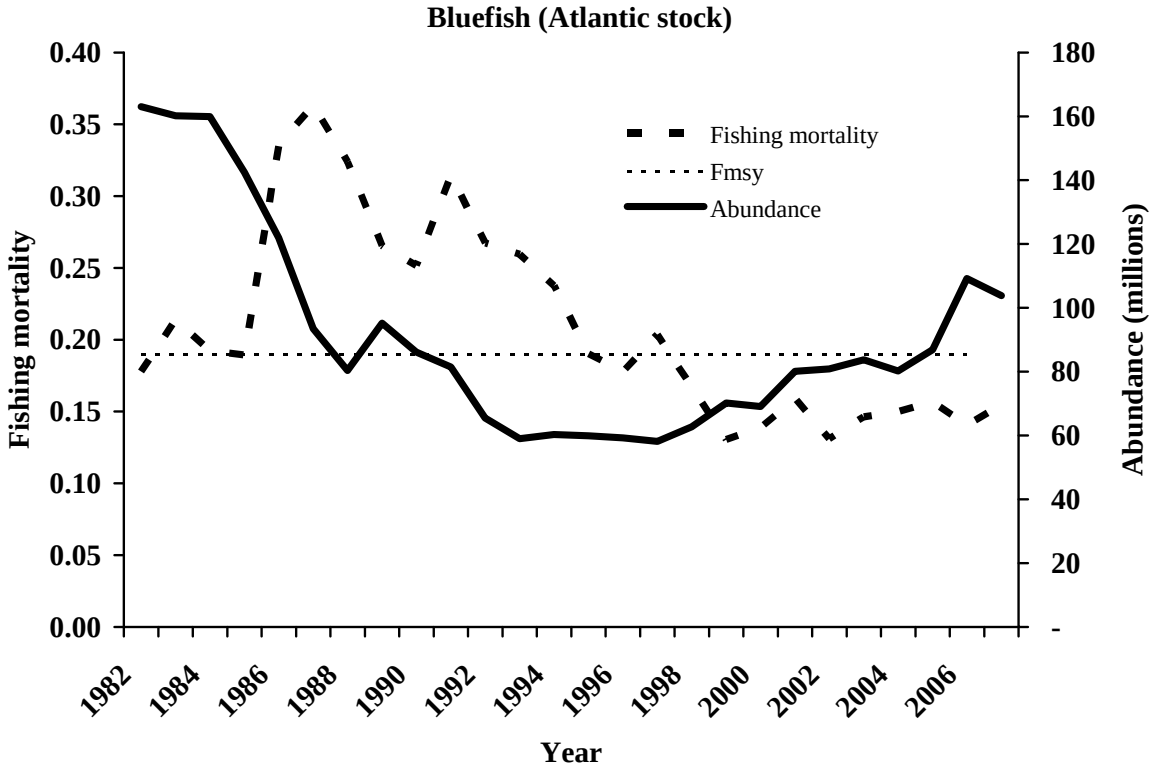

Figure 2. Fishing mortality and abundance estimates of bluefish along the Atlantic coast estimated from the ASAP model.

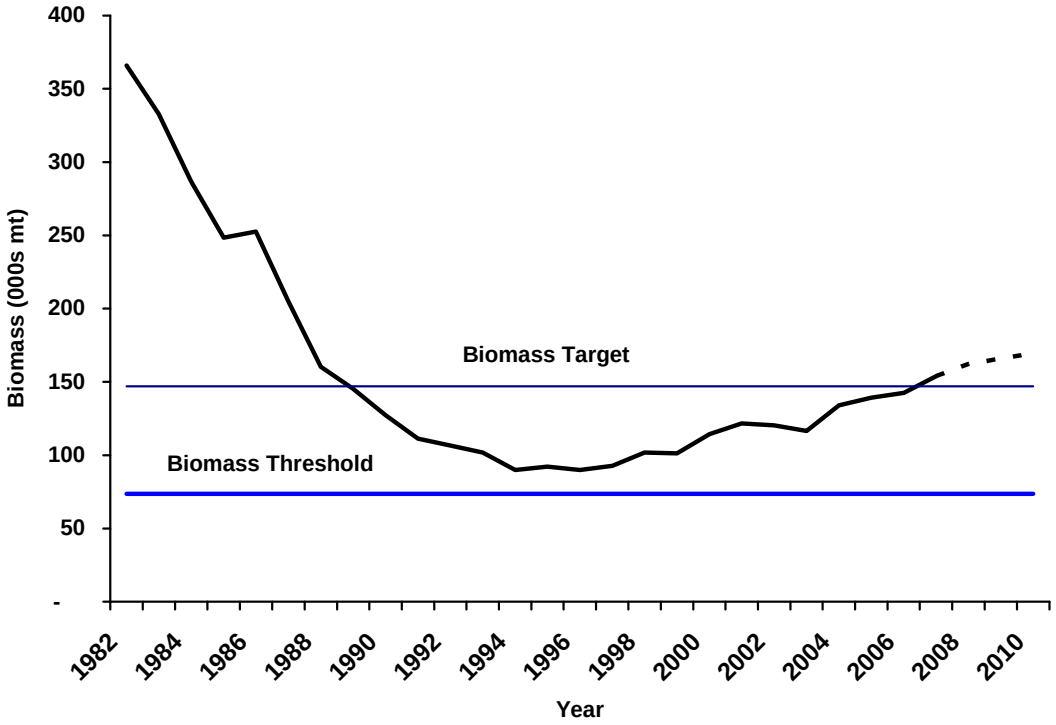

Figure 3. Atlantic coast bluefish biomass and biological reference points based on ASAP model results.

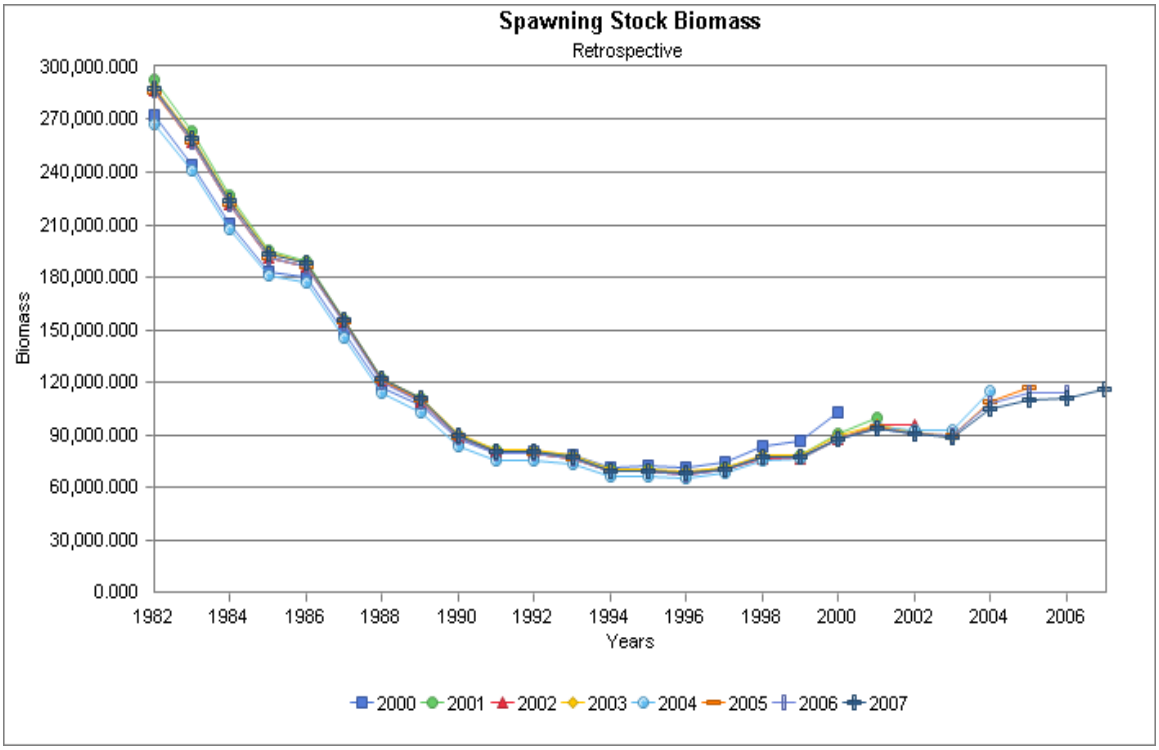

Figure 4. Retrospective pattern of spawning biomass from the ASAP model.

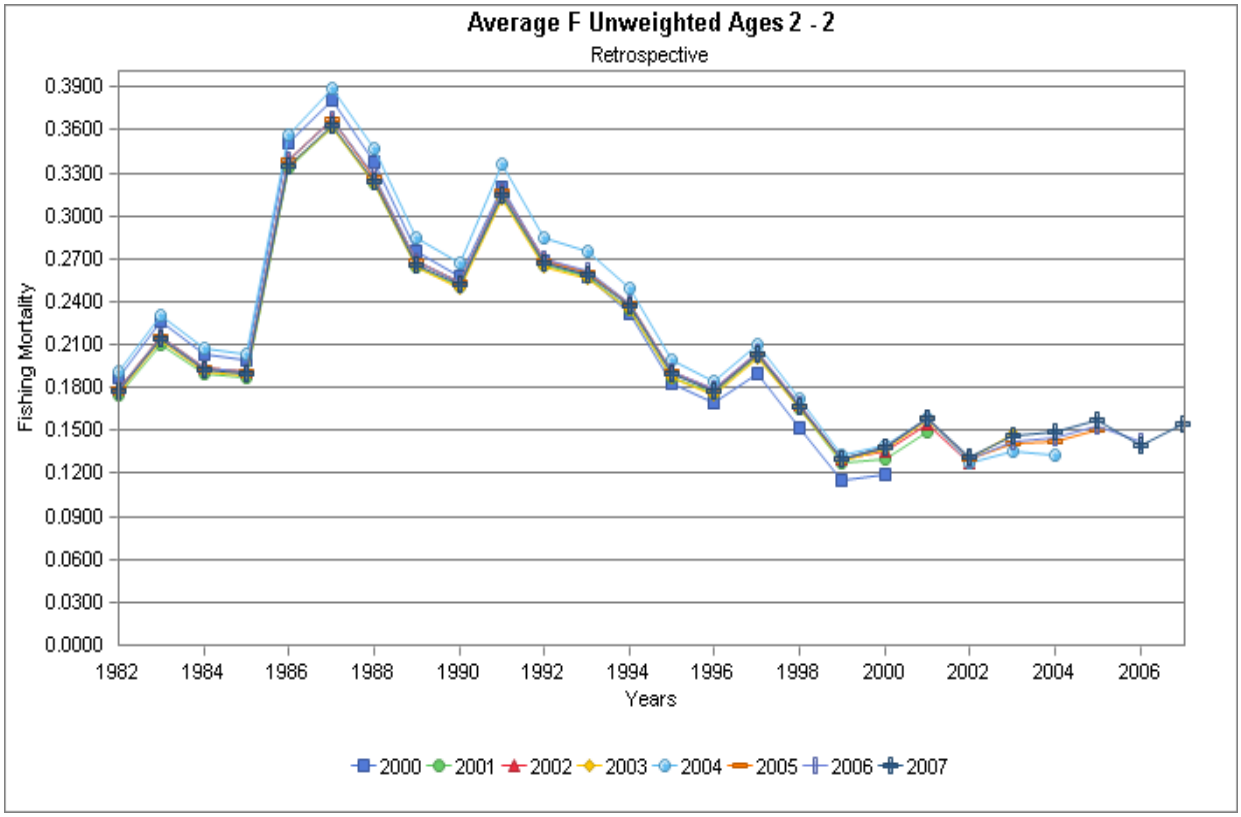

Figure 5. Retrospective pattern of Fmult (age 2) from the updated ASAP model.

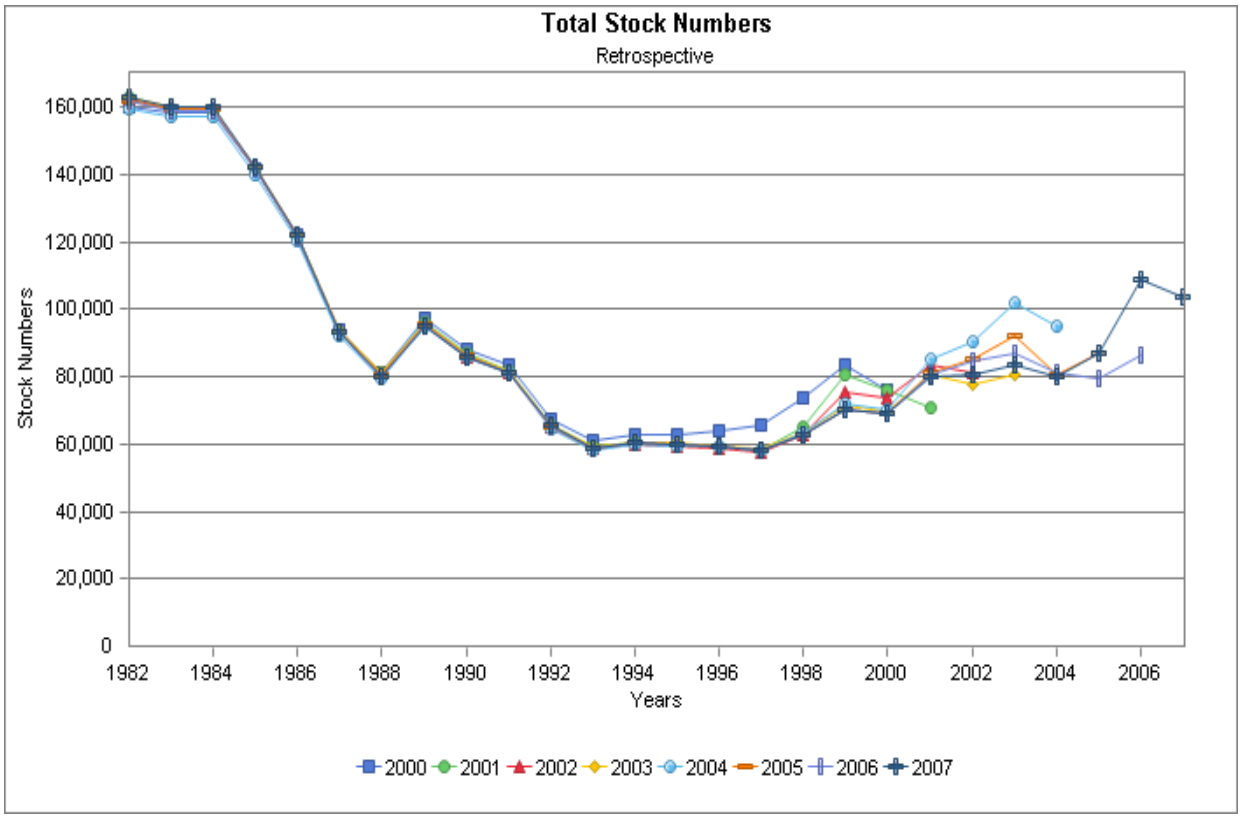

Figure 6. Retrospective pattern of N from updated ASAP model.

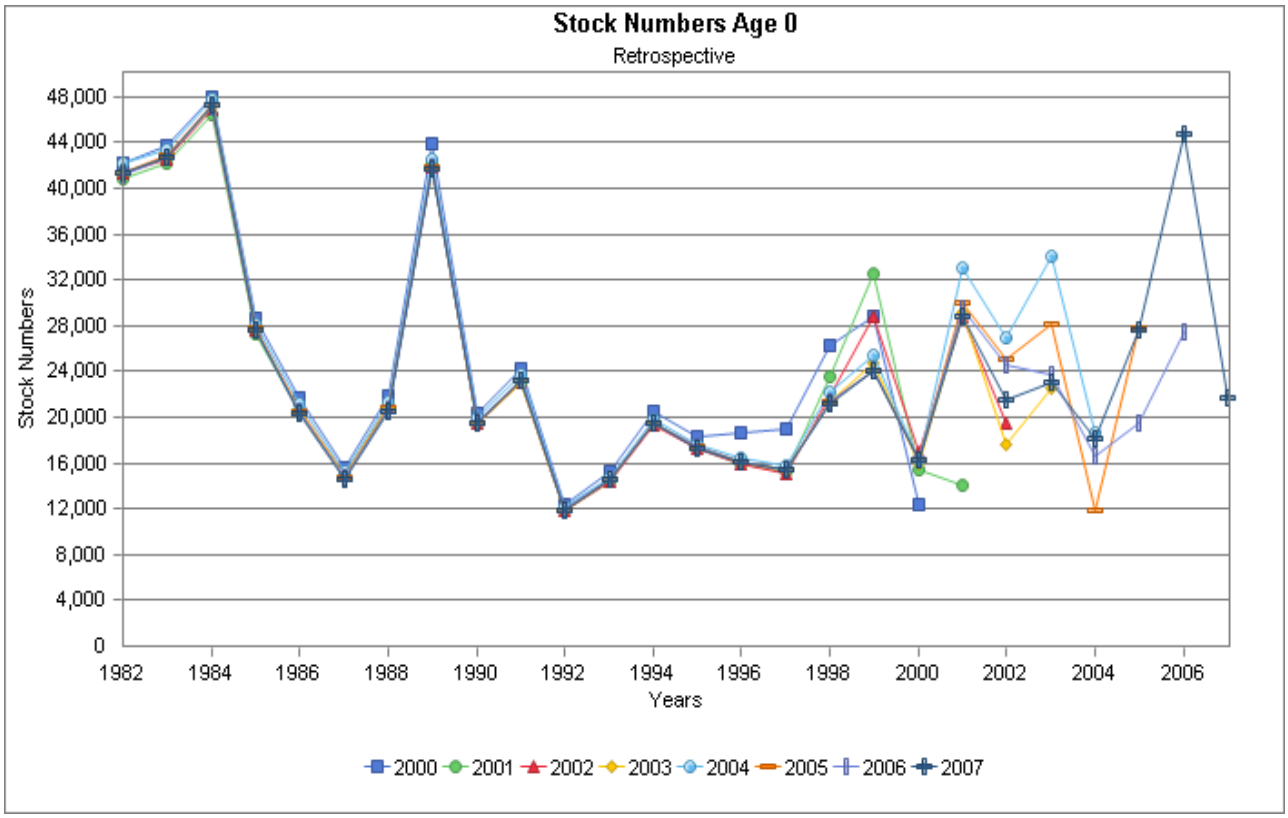

Figure 7. Retrospective pattern of recruits from updated ASAP model.

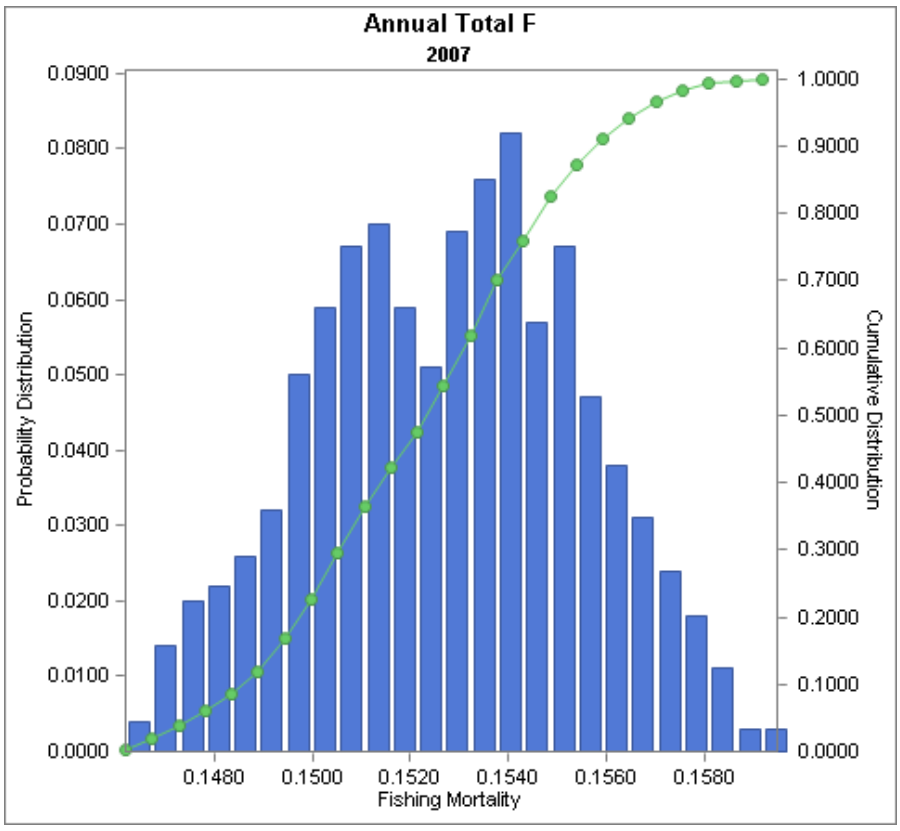

Figure 8. Variability in ASAP 2007 estimates of F based on MCMC results.

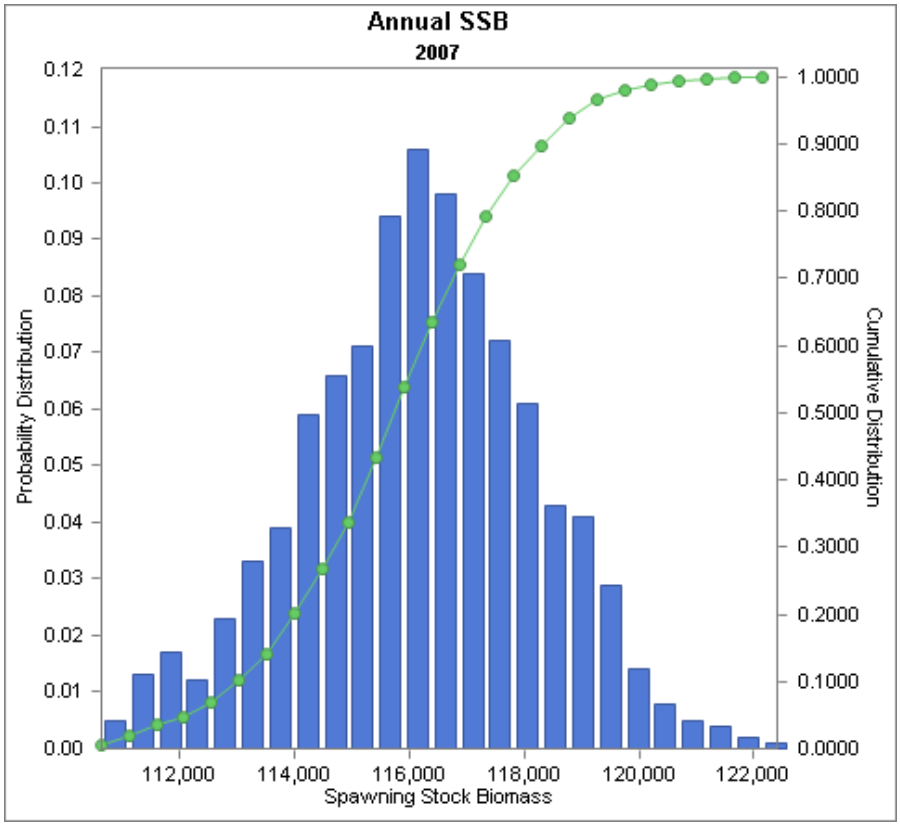

Figure 9. Variability in ASAP 2007 estimate of SSB from MCMC results.

Table 1. Atlantic coast landings and discards of bluefish, 1974-2007.

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*	50,687	52,688
1982	6,997	15,426	37,651	*832*	*38,483*	44,648	45,480
1983	7,166	15,798	40,425	*1,280*	*41,705*	47,591	48,871
1984	5,380	11,861	30,597	*1,260*	*31,857*	35,977	37,237
1985	6,122	13,497	23,821	*599*	*24,420*	29,943	30,542
1986	6,651	14,663	42,133	*1,544*	*43,677*	48,784	50,328
1987	6,578	14,502	34,769	*1,615*	*36,384*	41,347	42,962
1988	7,161	15,787	21,873	*1,146*	*23,019*	29,034	30,180
1989	4,740	10,450	17,808	*989*	*18,797*	22,548	23,537
1990	6,250	13,778	13,860	*929*	*14,789*	20,110	21,039
1991	6,160	13,580	14,967	*1,194*	*16,161*	21,127	22,320
1992	5,205	11,475	11,011	*979*	*11,990*	16,216	17,195
1993	4,808	10,600	9,204	*1,013*	*10,217*	14,012	15,025
1994	4,304	9,488	7,049	*1,128*	*8,177*	11,353	12,481
1995	3,628	7,998	6,489	*1,003*	*7,492*	10,117	11,120
1996	4,113	9,066	5,328	*1,010*	*6,338*	9,441	10,451
1997	4,064	8,960	6,487	*1,287*	*7,774*	10,551	11,838
1998	3,739	8,242	5,595	*999*	*6,594*	9,334	10,333
1999	3,330	7,341	3,744	*1,191*	*4,935*	7,074	8,264
2000	3,647	8,040	4,811	*1,675*	*6,486*	8,458	10,132
2001	3,945	8,697	6,001	*1,857*	*7,858*	9,946	11,803
2002	3,116	6,869	5,158	*1,448*	*6,606*	8,274	9,721
2003	3,358	7,403	5,958	*1,331*	*7,289*	9,316	10,647
2004	3,647	8,041	7,179	*1,761*	*8,940*	10,826	12,587
2005	3,187	7,026	8,225	*1,915*	*10,140*	11,412	13,327
2006	2,925	6,449	7,663	*1,860*	*9,523*	10,588	12,448
2007	3,315	7,309	9,599	*2,654*	*12,253*	12,914	15,568

Table 2. Bluefish biological reference points and current status.

Assessment year	catch year	F_{mult}	F_{msy}	1/2 B_{msy}	B_{msy}	2007 Biomass	2007 reported landings	MSY
2008	2007	0.15	0.19	73,526	147,052	153,843	15,568	15,565

Table 3. Fishing mortality at age from 2008 ASAP model.

F at age	0	1	2	3	4	5	6+	Fmult
1982	0.06	0.18	0.17	0.08	0.06	0.12	0.16	0.18
1983	0.07	0.21	0.20	0.10	0.07	0.15	0.20	0.21
1984	0.07	0.19	0.18	0.09	0.07	0.13	0.18	0.19
1985	0.06	0.19	0.18	0.09	0.06	0.13	0.17	0.19
1986	0.11	0.34	0.32	0.16	0.12	0.23	0.31	0.34
1987	0.12	0.36	0.34	0.17	0.12	0.25	0.33	0.36
1988	0.11	0.32	0.31	0.15	0.11	0.22	0.30	0.32
1989	0.09	0.27	0.25	0.13	0.09	0.18	0.24	0.27
1990	0.09	0.25	0.24	0.12	0.09	0.17	0.23	0.25
1991	0.11	0.31	0.30	0.15	0.11	0.22	0.29	0.31
1992	0.09	0.27	0.25	0.13	0.09	0.19	0.24	0.27
1993	0.09	0.26	0.24	0.12	0.09	0.18	0.24	0.26
1994	0.08	0.24	0.22	0.11	0.08	0.16	0.22	0.24
1995	0.06	0.19	0.18	0.09	0.07	0.13	0.17	0.19
1996	0.06	0.18	0.17	0.08	0.06	0.12	0.16	0.18
1997	0.07	0.20	0.19	0.10	0.07	0.14	0.19	0.20
1998	0.06	0.17	0.16	0.08	0.06	0.12	0.15	0.17
1999	0.04	0.13	0.12	0.06	0.04	0.09	0.12	0.13
2000	0.05	0.14	0.13	0.07	0.05	0.10	0.13	0.14
2001	0.05	0.16	0.15	0.08	0.05	0.11	0.15	0.16
2002	0.04	0.13	0.12	0.06	0.04	0.09	0.12	0.13
2003	0.05	0.15	0.14	0.07	0.05	0.10	0.13	0.15
2004	0.05	0.15	0.14	0.07	0.05	0.10	0.14	0.15
2005	0.05	0.16	0.15	0.07	0.05	0.11	0.14	0.16
2006	0.05	0.14	0.13	0.07	0.05	0.10	0.13	0.14
2007	0.05	0.15	0.15	0.07	0.05	0.11	0.14	0.15
selectivity	0.34	1.00	0.94	0.48	0.34	0.69	0.91	

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

		age						total
year	**0**	**1**	**2**	**3**	**4**	**5**	**6+**	000s
1982	41,440	32,524	15,077	9,229	7,873	6,866	50,040	163,049
1983	42,724	31,951	22,294	10,441	6,943	6,065	39,797	160,215
1984	47,289	32,540	21,121	14,921	7,721	5,283	31,076	159,950
1985	27,560	36,281	21,980	14,427	11,148	5,918	25,126	142,438
1986	20,272	21,166	24,581	15,057	10,794	8,553	21,552	121,974
1987	14,583	14,818	12,392	14,674	10,509	7,877	18,536	93,388
1988	20,552	10,559	8,434	7,203	10,105	7,595	15,896	80,343
1989	41,687	15,081	6,253	5,089	5,055	7,403	14,646	95,215
1990	19,512	31,201	9,469	3,987	3,672	3,778	14,449	86,068
1991	23,138	14,673	19,864	6,117	2,896	2,758	11,998	81,443
1992	11,922	17,034	8,773	12,095	4,312	2,129	9,185	65,449
1993	14,508	8,917	10,675	5,583	8,719	3,221	7,338	58,961
1994	19,452	10,881	5,632	6,844	4,040	6,531	6,942	60,322
1995	17,353	14,697	7,025	3,687	5,005	3,049	9,108	59,923
1996	16,106	13,323	9,949	4,808	2,757	3,839	8,455	59,238
1997	15,340	12,419	9,134	6,892	3,618	2,124	8,665	58,192
1998	21,241	11,725	8,296	6,174	5,122	2,762	7,401	62,721
1999	23,988	16,436	8,122	5,803	4,669	3,960	7,215	70,192
2000	16,230	18,792	11,811	5,881	4,465	3,655	8,205	69,039
2001	28,874	12,680	13,394	8,486	4,508	3,486	8,636	80,063
2002	21,551	22,403	8,855	9,441	6,441	3,495	8,670	80,856
2003	23,085	16,880	16,091	6,409	7,262	5,042	8,910	83,679
2004	18,134	17,989	11,941	11,479	4,894	5,655	10,112	80,204
2005	27,659	14,114	12,680	8,490	8,751	3,806	11,393	86,893
2006	44,741	21,476	9,878	8,955	6,451	6,790	10,877	109,167
2007	21,701	34,934	15,282	7,086	6,858	5,033	12,877	103,771

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

	age							
year	**0**	**1**	**2**	**3**	**4**	**5**	**6+**	total mt
1982	5,802	15,937	22,916	18,920	25,194	29,056	248,100	365,924
1983	4,272	13,419	22,071	22,449	21,941	26,788	221,950	332,890
1984	4,729	13,341	19,642	27,305	22,468	23,682	175,581	286,748
1985	2,756	14,512	21,321	27,844	31,436	23,618	126,963	248,449
1986	2,433	10,371	29,498	34,931	34,000	36,804	104,484	252,520
1987	1,750	4,446	14,622	29,642	31,105	30,933	92,382	204,880
1988	3,494	4,224	8,434	14,767	28,698	27,068	73,487	160,171
1989	5,419	4,524	6,628	10,790	18,400	30,398	69,129	145,288
1990	4,097	15,601	8,332	6,897	11,898	15,782	64,645	127,253
1991	3,239	4,842	13,905	10,582	8,137	10,930	59,570	111,205
1992	1,907	6,643	9,123	22,859	12,073	7,030	46,910	106,547
1993	2,611	5,261	10,141	13,735	23,803	10,426	35,808	101,786
1994	2,334	4,352	5,069	12,868	12,282	24,536	28,412	89,854
1995	2,950	6,467	6,884	6,378	14,263	12,373	42,773	92,088
1996	2,738	5,862	9,750	8,318	7,858	15,578	39,707	89,812
1997	1,994	6,334	9,500	15,300	11,071	8,730	39,858	92,786
1998	4,036	7,035	7,798	14,510	17,414	11,105	39,815	101,713
1999	3,358	8,711	7,473	12,128	16,013	16,235	37,301	101,219
2000	2,759	8,644	11,811	15,996	15,672	13,195	46,274	114,351
2001	4,620	5,579	12,189	21,385	17,444	13,525	46,893	121,634
2002	3,664	12,322	10,361	21,620	18,680	13,210	40,403	120,258
2003	2,770	9,453	16,091	13,907	19,173	18,454	36,621	116,468
2004	1,451	8,095	15,761	24,565	16,004	21,207	46,921	134,004
2005	2,213	6,351	16,737	18,168	28,617	14,274	52,863	139,223
2006	3,579	9,664	13,039	19,164	21,094	25,462	50,469	142,471
2007	1,736	15,720	20,172	15,165	22,427	18,875	59,749	153,843

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

	Age							
year	**0**	**1**	**2**	**3**	**4**	**5**	**6+**	total
1982	11164	9748	2851	2439	795	1214	3736	31,947
1983	4778	7667	8686	3022	971	1325	4778	31,228
1984	7121	6807	6719	2040	895	745	3177	27,503
1985	4677	6469	5773	2926	1328	520	2377	24,070
1986	5169	8071	8728	2802	1056	1703	4465	31,994
1987	3127	5419	5178	5757	2009	1083	3948	26,522
1988	1710	2084	2524	1589	1984	1599	2740	14,229
1989	3474	5673	3221	992	396	1168	2410	17,334
1990	2727	7186	1841	687	382	432	2479	15,732
1991	3695	5293	7392	1591	311	225	2136	20,642
1992	2131	9633	1710	2353	583	479	967	17,857
1993	1194	2082	1567	593	1041	669	1179	8,324
1994	1971	3144	1313	368	297	850	1073	9,016
1995	1823	3371	736	138	214	696	1058	8,035
1996	1701	2145	632	202	207	545	1412	6,844
1997	1636	4432	1528	571	210	96	1244	9,719
1998	665	2680	2711	838	254	300	447	7,895
1999	1570	1999	2107	614	191	385	481	7,347
2000	646	4256	2607	695	94	519	151	8,968
2001	1338	4227	3280	1090	188	575	230	10,929
2002	566	4959	1601	523	328	228	401	8,607
2003	816	2634	3957	771	376	318	641	9,514
2004	421	5149	2222	1226	425	461	644	10,547
2005	3263	2561	4179	1390	412	585	495	12,884
2006	2727	3499	2983	1092	302	284	665	11,553
2007	695	3067	5393	1549	854	583	759	12,900

Table 7. Yield at age (MT) estimated in ASAP model.

	Age							total	
Year	**0**	**1**	**2**	**3**	**4**	**5**	**6+**	predicted	reported
1982	1,563	4,776	4,333	5,001	2,545	5,136	18,525	41,878	45,480
1983	478	3,220	8,599	6,497	3,067	5,854	26,649	54,364	48,871
1984	712	2,791	6,248	3,733	2,605	3,339	17,948	37,376	37,237
1985	468	2,588	5,600	5,646	3,746	2,075	12,012	32,135	30,542
1986	620	3,955	10,474	6,500	3,328	7,328	21,646	53,851	50,328
1987	375	1,626	6,110	11,630	5,947	4,253	19,678	49,619	42,962
1988	291	833	2,524	3,257	5,635	5,697	12,669	30,906	30,180
1989	452	1,702	3,414	2,103	1,441	4,798	11,374	25,284	23,537
1990	573	3,593	1,620	1,189	1,237	1,803	11,089	21,103	21,039
1991	517	1,747	5,174	2,752	874	891	10,608	22,562	22,320
1992	341	3,757	1,778	4,447	1,634	1,583	4,940	18,479	17,195
1993	215	1,228	1,489	1,459	2,842	2,166	5,753	15,151	15,025
1994	236	1,258	1,182	692	902	3,192	4,392	11,854	12,481
1995	310	1,483	721	238	610	2,823	4,967	11,153	11,120
1996	289	944	619	350	591	2,211	6,630	11,633	10,451
1997	213	2,260	1,590	1,268	644	396	5,724	12,094	11,838
1998	126	1,608	2,549	1,970	864	1,205	2,402	10,724	10,333
1999	220	1,060	1,938	1,284	654	1,577	2,488	9,221	8,264
2000	110	1,958	2,607	1,890	329	1,873	851	9,618	10,132
2001	214	1,860	2,985	2,747	726	2,232	1,251	12,016	11,803
2002	96	2,728	1,874	1,198	951	863	1,868	9,577	9,721
2003	98	1,475	3,957	1,673	993	1,165	2,635	11,997	10,647
2004	34	2,317	2,933	2,623	1,391	1,728	2,988	14,013	12,587
2005	261	1,152	5,517	2,974	1,347	2,195	2,295	15,742	13,327
2006	218	1,574	3,938	2,338	989	1,065	3,084	13,206	12,448
2007	56	1,380	7,118	3,315	2,792	2,185	3,523	20,370	15,568

Table 8. Projections of abundance at age, biomass at age, catch at age and yield at age for 2008-2010 from ASAP model. Assumed constant F and weight at age equivalent to 2007. Yield includes recreational discards with 15% mortality.

Abundance (000s)

	0	1	2	3	4	5	6+	total
2008	23,517	16,860	24,496	10,812	5,389	5,324	12,851	99,250
2009	23,994	18,271	11,822	17,332	8,223	4,184	13,047	96,872
2010	24,311	18,642	12,812	8,365	13,181	6,384	12,347	96,041

Biomass (mt)

	0	1	2	3	4	5	6+	total
2008	1,881	7,587	32,334	23,138	17,623	19,967	59,629	162,160
2009	1,919	8,222	15,606	37,089	26,889	15,690	60,537	165,952
2010	1,945	8,389	16,911	17,900	43,101	23,939	57,291	169,477

Catch at age (000s)

	0	1	2	3	4	5	6+	total
2008	1,089	2,199	3,023	698	253	493	1,542	9,296
2009	1,111	2,383	1,459	1,118	386	387	1,565	8,410
2010	1,125	2,432	1,581	540	619	591	1,481	8,369

Yield at age (mt)

	0	1	2	3	4	5	6+	total
2008	87	990	3,990	1,493	828	1,849	7,154	16,390
2009	89	1,073	1,926	2,393	1,263	1,453	7,263	15,459
2010	90	1,094	2,087	1,155	2,024	2,216	6,874	15,540