

(EXAMPLE) ASSESSMENT SUMMARY REPORT

SEDAR XX. Example Species

(NOTE: Text, Figures, and Tables are created from simulated data or extracted from various sources for illustration only. This report does not represent conditions from any one assessment)

This Summary Report provides a broad but concise view of the salient aspects of the stock assessment. It recapitulates: (a) the information available to and prepared by the Data Workshop; (b) the application of those data, development and execution of one or more assessment models, and identification of the most reliable model configuration as the base run by the Assessment Workshop (AW); and (c) the findings and advice determined during the Review Workshop. All contents of the Summary Report are available and addressed in detail in the Stock Assessment Report (SAR).

Stock Status and Determination Criteria

The stock is overfished but overfishing is not occurring. The current index of spawning stock biomass is low; the 2001 spawning stock size is estimated at about 43% of SSB_{msy} and 55% of MSST. The 2001 fishing mortality rate is estimated at about 45% of F_{msy}. Recruitment estimates trend downward between 1972 and 2001. Stock age structure appears reduced by an extended period of high fishing mortality between 1972 and 1998.

Stock Status Summary Table

Criteria	Recommended Values	
	Definition	Value
MSST (Pounds SSB)	$(1-M)SS_{MSY}$	509 mt
MFMT (Full F)	F _{MSY}	0.21
MSY (gutted weight)	Yield at F _{MSY}	7.72 mp
F _{MSY}	F _{MSY}	0.21
OY (gutted weight)	Yield at 0.75*F _{MSY}	7.6 mp
F _{OY}	0.75*F _{MSY}	0.16
M (base)	--	0.14
Biomass Status	SSB/MSST	0.87
Exploitation Status	F/MFMT	0.85

Stock Identification and Management Unit:

The stock evaluated by this assessments includes all fish covered by the management unit. The management unit includes fish under the jurisdiction of the South Atlantic Council, which includes U.S. Atlantic waters of North Carolina (NC), South Carolina (SC), Georgia (GA), and the east coast of Florida (FL) including the Atlantic side of the Florida Keys (Monroe County).

Species Distribution:

Example Snapper have an extensive range in warm waters of the Atlantic Ocean and adjacent seas. Within the management unit addressed by this assessment, example are most abundant in NC and SC waters. Tagging studies show neither long-range migrations nor extensive local movements of adults and there is no circumstantial or anecdotal information to suggest such movements.

Life History:

Example snapper are a hermaphroditic species that may reach a maximum age of 25 years and a length of 50cm. Individuals are born as females and then switch to males sometime after age 3. Natural mortality is estimated at 0.14 overall, with age-specific estimates incorporated in the assessment as described in Section II.2.3 of the SAR. Females mature around age 3.

Life History Characteristics at age

Age	Length		Whole Weight		Female %		Natural Mortality
	mm	inch	kg	pound	Mature	at age	
1	228.3	9	0.15	0.33	0.00	1.00	0.23
2	259.7	10.2	0.22	0.48	0.80	1.00	0.21
3	287.6	11.3	0.29	0.65	1.00	0.75	0.19
4	312.3	12.3	0.37	0.83	1.00	0.50	0.18
5	334.2	13.2	0.46	1.01	1.00	0.25	0.17
6	353.6	13.9	0.54	1.19	1.00	0.10	0.16
7	370.8	14.6	0.62	1.36	1.00	0.05	0.15
8	386.1	15.2	0.69	1.53	1.00	0	0.15
9	399.7	15.7	0.77	1.69	1.00	0	0.14
10	411.7	16.2	0.84	1.85	1.00	0	0.14
11	422.4	16.6	0.9	1.99	1.00	0	0.14
12	431.8	17	0.96	2.12	1.00	0	0.13

Assessment Methods:

Three modeling approaches are considered in this assessment: a surplus production model (ASPIC), a forward projection age-structured model (ASAP), and a stochastic stock reduction analysis (SRA). A Virtual Population Analysis (VPA) was consulted to evaluate assumptions and configuration options regarding changes and catchability and selectivity for the age structured model and catch curve analyses were used to evaluate total mortality trends in the independent survey data.

The forward projection catch-age model was chosen for evaluating stock status and providing management advice. The recommended configuration includes catch series for all fisheries starting in 1958, time-varying catchability, age-based natural mortality scaling, and incorporation of the fishery-dependent headboat CPUE and fishery-independent MARMAP longline and trap CPUEs.

Assessment Data:

The assessment model incorporated catch data by gear and fishery sectors for 1958-2007, with the initial year of data availability varying by fishery and gear as shown in the table below. Biological samples become available later in the time series, with lengths available by fishery between the late 1970's and early 1980's and ages available starting in 1975 for the headboat fishery and 1990 for the commercial hook and line fishery.

Fishery-based CPUE indices evaluated in the base and sensitivity runs of the model include those from the commercial hook and line, MRFSS, and headboat fisheries. Fishery dependent CPUEs are provided by the MarMap Trap and longline components and the SEAMAP trawl.

Fishery-Dependent Data Overview:

Element	Landings	Discards	Effort	Lengths	Ages
Commercial H&L	1958-2007	1995-2007	1993-2007	1983-2007	1990-2007
Commercial Trawl	1961-1978	--	--	--	--
MRFSS	1981-2007	1981-2007	1976-2007	1981-2007	--
Headboat Survey	1972-2007	2004-2007	1972-2007	1975-2007	1975-2007

Fishery-Independent and Survey Data Overview:

Element	CPUE	Ages	Area
MARMAP Trap	1983-2007	1983-2007	NC - N. FL
MARMAP Longline	1995-2007	1995-2007	NC - N. FL
SEAMAP Trawl	1981-2007	--	NC - GA

Release Mortality:

Mortality of released fish is estimated by fishery sector and gear where feasible. Commercial hook and line fishery discard mortality is estimated at 30%, while that for the commercial trawl fishery is 90%. Discard mortality for both recreational components is estimated at 40%.

Catch Trends:

Three major fisheries catch this stock: commercial, recreational, and headboat. The most common commercial gear has been hook and line, with occasional commercial landings also from trawls and traps. Trawling has been banned since January 12, 1989. Total landings increased during the 1970s and early 1980s as the commercial fishery expanded, rising from about 335 mt in 1972 to over 900 mt in 1982. Except for a brief spike in 1988-1990, landings declined steadily from the 1982 peak to the low of under 30 mt in 2000.

The headboat fishery was predominant, 1972-1977, accounting for 64% on average of landings in weight. From 1978, onward the commercial fishery predominated, representing 53-82% of annual landings. Recreational fisheries seldom landed more than 10% of the total until 1999-2001, when they represented 34% of total weight landed. Commercial landings increased during the 1970s, from 47 mt in 1972 to 729 mt in 1982.

Fishing Mortality Trends:

Annual estimates of instantaneous fishing mortality (F) reported for each fishery, including those for both discard and directed components, are apical or peak values observed across all ages for the given fishery and year. This is analogous to 'fully recruited' fishing mortality.

Total apical fishing mortality for all directed fleets combined is estimated at $F=0.18$ in 1986 at the start of the analytical period. Fishing mortality increases steadily in the early portion of the series, reaching a peak of $F=0.30$ in 1993 before falling steadily to $F=0.15$ in 1998. Fishing mortality increases slightly in 1999 to around $F=0.2$, although a downward trend since 2000 ends with a terminal estimate of $F=0.15$ for 2005.

Stock Abundance and Biomass Trends

Total stock abundance averages 27.6 million fish and varies with little trend between 1986 and 1999. However, abundance jumps sharply in 2000 to 40.5 million fish as the strong 1999 year class enters the estimated population at age 1. Total abundance tapers off gradually thereafter to the terminal estimate of 31.7 million fish for 2005.

Spawning stock is measured as total female gonad weight. Estimated spawning stock gradually improves over the assessment period, from just below 500 metric tons (mt) of eggs in late 1980's to over 700 mt in the last few years which include the observed high of 752 mt of eggs in 2005.

Estimated recruitment at age 1 exhibits two notably strong year classes (1996 and 1999) but little overall trend otherwise. Recruitment over the assessment period averages 9.6 million fish, with peak values of 13 million in 1997 and 22 million in 2000.

Projections:

There is considerable uncertainty in future rates of recovery due to: uncertainty about the biology of the species, model uncertainty, and quality of the data available.

Projections simulating current fishing mortality show less than 50% probability of achieving SSB_{msy} in 2016 which is the last year of the Council's 18 year rebuilding program. The projections show a 50% probability of exceeding the MSST in 2011. Projections simulating no directed fishing or by-catch ($F = 0$) would achieve SSB_{msy} in 2009 but the mortality from discards would increase.

Scientific Uncertainty:

Example snapper switch sex from females to males. The analytical tools and biological reference points do not take this into consideration. Implications of this are unknown and could have important affects on reference points and estimates of recovery.

Concern was expressed that important information on the status of larger fish derived from deeper waters was not available as a separate index for inclusion in the assessment. It is recommended that further consideration be given to developing such indices from commercial and fishery independent data.

Effective monitoring of stock recovery, especially under further fishing mortality reductions, will require improved information on discards, especially the size of fish that are discarded and further research into discard mortality rates.

Addenda and Report Modifications:

The Review Panel recommended an alternative model configuration, incorporating the MARMAP longline index and modifying the approach for estimating the size of discarded fish in the recreational fishery, for development of advice. Full results of this configuration are provided in addendum 1 to the Stock Assessment Report and summarized in this report.

Source:

The contents of this document are taken from the SEDAR XY Stock Assessment Report for Example (SEDAR XY-SAR1). Copies are available on the SEDAR website (www.sefsc.gov/sedar) or through the SEDAR program office at the South Atlantic Fishery Management Council (4055 Faber Place Drive, Suite 201, North Charleston, SC 29405).

Readers are advised that the Council or Commission receiving a SEDAR assessment may request additional sensitivity analyses or projection scenarios following receipt of this report and that the results of such further analyses are not included in the SEDAR report and not reflected in this summary.

Table 1. Total landings and discards in pounds, whole weight, by fishery and sector, 1958-2007.

Year	Landings in Pounds (whole weight)					Discards in Pounds (whole weight)				
	Recreational		Commercial			Commercial	Recreational		TOTAL	Total Removals
	Headboat	MRFSS	Handline	Trawl	Other	Handline	Headboat	MRFSS		
1958			194	0	0		1,550	4,770	6,320	12,834
1959			1,262	0	0		1,740	5,090	6,830	14,922
1960			1,747	0	0		1,930	5,410	7,340	16,427
1961			19,317	24,025	0		2,130	5,710	7,840	59,021
1962			10,822	42,582	0		2,330	5,990	8,320	70,045
1963			20,967	0	0		2,500	6,240	8,730	38,437
1964			6,792	0	0		2,620	6,410	9,030	24,852
1965			21,913	96	0		2,670	6,560	9,240	40,479
1966			3,397	0	0		2,650	6,660	9,310	22,017
1967			14,172	0	0		2,570	6,710	9,280	32,732
1968			31,936	0	0		2,470	6,730	9,200	50,336
1969			31,347	0	0		2,380	6,720	9,090	49,537
1970			19,511	0	0		2,330	6,690	9,020	37,551
1971			66,321	395	0		2,350	6,640	9,000	84,707
1972	303,495		68,794	0	11,790		2,740	6,590	9,340	402,749
1973	281,197		86,193	1,922	4,190		2,620	6,540	9,150	391,811
1974	313,633		119,387	0	2,728		2,870	6,470	9,340	454,428
1975	373,680		218,655	729	2,096		3,250	6,390	9,640	614,441
1976	285,250		212,410	7,144	378		2,720	6,300	9,020	523,221
1977	211,849		273,322	10,985	312		2,200	7,180	9,380	515,228
1978	319,331		345,076	1,047	0		3,370	7,480	10,850	687,153
1979	275,740		430,888	54,161	0		2,850	5,300	8,150	777,089
1980	229,989		482,636	268,613	0		2,230	6,440	8,670	998,578
1981	229,984	4,893	500,886	242,732	161		1,880	9,450	11,330	1,001,317
1982	339,840	250,524	672,796	215,630	36		2,470	10,160	12,630	1,504,086
1983	295,385	435,880	645,732	142,058	725		2,710	7,370	10,080	1,539,939
1984	244,964	226,955	734,077	117,694	262		2,180	4,710	6,900	1,337,742
1985	372,168	459,092	920,506	24,028	955		3,620	5,600	9,220	1,795,190
1986	349,315	6,068	896,379	10,587	13,390		3,610	5,230	8,840	1,293,419
1987	451,941	207,331	697,928	23,627	28,004		4,960	5,340	10,300	1,429,432
1988	418,638	134,721	854,227	89,294	42,243		5,080	6,120	11,200	1,561,523
1989	346,539	105,966	1,041,509	1,232	88,834		4,490	14,260	18,750	1,621,580
1990	386,774	82,859	1,141,190	4,613	144,100		4,480	16,750	21,230	1,801,995
1991	333,303	104,889	1,332,693	4,146	57,272		4,010	8,230	12,240	1,856,784
1992	249,597	118,437	764,936	33	244	13,580	7,570	26,340	47,490	1,228,227
1993	257,200	96,424	866,361	58	8,494	16,000	7,030	15,200	38,220	1,304,987
1994	281,647	73,482	948,426	0	9,734	19,680	7,870	19,940	47,490	1,408,269
1995	271,859	40,493	928,497	6	2,870	23,230	7,760	40,130	71,120	1,385,965
1996	276,308	71,478	743,692	40	1,354	31,150	7,270	12,830	51,240	1,195,363
1997	299,912	73,758	759,005	0	2,012	28,180	7,910	13,430	49,510	1,233,717
1998	275,492	125,159	708,112	1,101	1,293	22,420	7,320	18,400	48,140	1,207,437
1999	335,732	148,354	876,584	386	4,124	18,470	11,220	90,220	119,910	1,604,999
2000	406,785	255,373	1,348,519	0	1,592	19,280	12,600	75,550	107,420	2,227,120
2001	402,620	247,189	1,633,594	0	3,230	22,980	12,400	48,830	84,210	2,455,053
2002	326,447	175,941	1,334,418	67	1,271	43,850	9,840	37,680	91,370	2,020,884
2003	287,444	204,891	727,859	0	6,970	18,050	7,410	64,150	89,620	1,406,394
2004	361,562	274,425	1,086,300	378	2,298	9,160	11,570	54,440	75,170	1,875,303
2005	311,977	146,026	1,100,916	2	869	13,970	6,870	31,660	52,510	1,664,800
2006	402,351	213,931	827,160	0	1,460	8,780	9,950	29,630	48,350	1,541,612
2007	613,765	228,589	1,012,612	0	7,693	9,570	20,490	111,790	141,850	2,146,359

Table 2. Time series of exploitation, biomass, recruitment, and status indicators.

Year	F	F/Fmsy	Biomass	B/Bunfished	SSB	SSB/SSBMSY	SSB/MSST	SPR	Recruits
1946	0.00	0.00	10,472	1.00	31.39	3.43	4.39	1.00	667
1947	0.00	0.00	10,472	1.00	31.37	3.43	4.39	0.99	461
1948	0.00	0.01	10,460	1.00	31.31	3.42	4.38	0.98	399
1949	0.00	0.01	10,438	1.00	31.23	3.41	4.37	0.98	468
1950	0.01	0.02	10,405	0.99	31.11	3.40	4.36	0.97	610
1951	0.01	0.02	10,363	0.99	30.97	3.38	4.34	0.96	668
1952	0.01	0.02	10,314	0.99	30.80	3.36	4.31	0.95	379
1953	0.01	0.03	10,256	0.98	30.61	3.34	4.29	0.94	703
1954	0.01	0.03	10,192	0.97	30.40	3.32	4.26	0.93	154
1955	0.01	0.04	10,122	0.97	30.17	3.29	4.22	0.92	310
1956	0.02	0.04	10,045	0.96	29.92	3.27	4.19	0.91	557
1957	0.02	0.05	9,963	0.95	29.65	3.24	4.15	0.90	753
1958	0.02	0.06	9,875	0.94	29.37	3.21	4.11	0.89	213
1959	0.02	0.06	9,781	0.93	29.06	3.17	4.07	0.88	281
1960	0.03	0.07	9,682	0.93	28.75	3.14	4.02	0.87	352
1961	0.04	0.12	9,577	0.92	28.38	3.10	3.97	0.84	281
1962	0.06	0.15	9,446	0.90	27.95	3.05	3.91	0.83	284
1963	0.04	0.09	9,305	0.89	27.53	3.01	3.85	0.83	248
1964	0.04	0.09	9,182	0.88	27.17	2.97	3.80	0.83	334
1965	0.04	0.10	9,071	0.87	26.83	2.93	3.76	0.82	169
1966	0.04	0.10	8,962	0.86	26.53	2.90	3.71	0.82	130
1967	0.04	0.10	8,876	0.85	26.28	2.87	3.68	0.82	128
1968	0.04	0.10	8,801	0.84	26.06	2.85	3.65	0.82	129
1969	0.04	0.10	8,736	0.83	25.89	2.83	3.62	0.83	178
1970	0.04	0.09	8,685	0.83	25.76	2.81	3.61	0.83	185
1971	0.04	0.11	8,651	0.83	25.62	2.80	3.59	0.82	394
1972	0.05	0.14	8,599	0.82	25.42	2.78	3.56	0.80	454
1973	0.05	0.13	8,522	0.81	25.20	2.75	3.53	0.80	366
1974	0.06	0.14	8,457	0.81	24.96	2.73	3.49	0.78	254
1975	0.07	0.18	8,371	0.80	24.59	2.69	3.44	0.75	302
1976	0.09	0.25	7,508	0.72	22.22	2.43	3.11	0.73	213
1977	0.11	0.28	6,705	0.64	19.57	2.14	2.74	0.71	260
1978	0.10	0.26	7,492	0.72	21.30	2.33	2.98	0.69	274
1979	0.25	0.65	6,746	0.64	19.80	2.16	2.77	0.60	280
1980	0.79	2.05	6,019	0.58	17.25	1.88	2.41	0.36	286
1981	0.43	1.11	5,452	0.52	15.41	1.68	2.16	0.50	284
1982	0.40	1.03	5,069	0.48	13.94	1.52	1.95	0.47	248
1983	0.27	0.70	5,244	0.50	14.43	1.58	2.02	0.53	334
1984	0.38	1.00	4,872	0.47	13.72	1.50	1.92	0.47	169
1985	0.45	1.17	4,870	0.47	13.38	1.46	1.87	0.44	130
1986	0.54	1.41	4,767	0.46	13.30	1.45	1.86	0.44	128
1987	0.48	1.25	4,281	0.41	12.10	1.32	1.69	0.42	129
1988	0.66	1.70	4,080	0.39	11.09	1.21	1.55	0.38	178
1989	0.86	2.22	3,480	0.33	9.19	1.00	1.29	0.34	185
1990	0.85	2.22	4,785	0.46	12.53	1.37	1.75	0.40	394
1991	2.22	5.75	3,996	0.38	10.94	1.20	1.53	0.28	454
1992	0.27	0.70	3,533	0.34	10.26	1.12	1.44	0.49	366
1993	0.27	0.69	4,542	0.43	12.81	1.40	1.79	0.50	254
1994	0.35	0.90	4,120	0.39	12.05	1.32	1.69	0.45	302
1995	0.26	0.68	4,266	0.41	12.14	1.33	1.70	0.50	213
1996	0.25	0.64	3,977	0.38	11.50	1.26	1.61	0.52	260
1997	0.26	0.68	4,062	0.39	11.50	1.26	1.61	0.50	274
1998	0.27	0.70	4,268	0.41	12.13	1.33	1.70	0.50	280
1999	0.28	0.74	4,500	0.43	12.77	1.39	1.79	0.46	286
2000	0.37	0.96	4,384	0.42	12.19	1.33	1.71	0.41	284
2001	0.43	1.13	4,323	0.41	11.71	1.28	1.64	0.39	248
2002	0.42	1.09	4,168	0.40	11.52	1.26	1.61	0.40	334
2003	0.25	0.65	3,770	0.36	10.93	1.19	1.53	0.49	169
2004	0.31	0.81	3,610	0.35	10.07	1.10	1.41	0.44	130
2005	0.34	0.88	3,336	0.32	9.18	1.00	1.29	0.43	128
2006	0.34	0.88	3,143	0.30	8.67	0.95	1.21	0.42	129
2007	0.49	1.27	2,966	0.28	7.88	0.86	1.10	0.35	178
2008			2,642	0.25					185

Table 3. Summary of sensitivity runs.

Run		FMSY	SSBMSY	MSY(klb)	F2007/FMSY	SSB2007/SSBMSY	SSB2007/MSST	steep	R0(1000)
Base	Desc	0.386	9.16	1665	1.27	0.86	1.1	0.56	4326
S1	hest	0.9	3.6	2278	0.1	2.47	3.17	0.95	4340
S2	h=0.73	0.666	7.36	1784	0.72	1.2	1.54	0.73	4660
S3	h=0.67	0.521	8.16	1705	0.92	1.08	1.38	0.67	4789
S4	h=0.53	0.307	10.55	1580	1.49	0.82	1.06	0.53	5217
S5	h=0.47	0.236	12.3	1507	1.83	0.72	0.92	0.47	5496
S6	HighM	0.719	8.36	1819	0.84	1.03	1.44	0.56	6686
S7	lowM	0.199	12.49	1466	2.5	0.55	0.66	0.56	3307
S8	q 0%	0.36	9.43	1666	1.07	1	1.29	0.56	4560
S9	q 4%	0.391	9.17	1696	1.44	0.77	0.99	0.56	4275
S10	High Disc	0.341	10.08	1601	1.39	0.87	1.11	0.56	5156
S11	Low Disc	0.354	9.6	1616	1.27	0.9	1.15	0.56	5015
S12	rec*0.5	0.336	10.04	1555	1.35	0.88	1.13	0.56	5074
S13	rec*1	0.349	9.88	1627	1.34	0.87	1.12	0.56	5124
S14	rec*1.25	0.339	10.32	1603	1.41	0.83	1.07	0.56	5229
S15	com low	0.383	8.39	1529	1.34	0.85	1.09	0.56	3960
S16	com high	0.388	9.93	1804	1.22	0.87	1.12	0.56	4692
S17	HB index	0.38	9.64	1546	1.51	0.81	1.03	0.56	4737
S18	CVT index low len	0.417	8.77	1556	2.82	0.56	0.71	0.56	4145
S19	comp	0.334	9.19	2005	1.22	0.9	1.15	0.56	4682
S20	Retro06	0.368	9.96	1583	0.96	0.87	1.12	0.56	4832
S21	Retro05	0.427	9.47	1741	0.84	0.89	1.15	0.56	3794
S22	Retro04	0.348	9.82	1485	1.2	0.92	1.18	0.56	5154
S23	Retro03	0.349	9.19	1564	0.94	0.83	1.06	0.56	4454

Table 5. Summary of estimated benchmark values and confidence intervals expected at equilibrium conditions.

Parameter	Estimate	10th Pctile	90th Pctile
FMSY	0.386	0.199	0.792
85%FMSY	0.328	–	–
75%FMSY	0.289	–	–
65%FMSY	0.251	–	–
BMSY(MT)	3300	2352	4525
SSBMSY (eggs)	9.157	6.206	12.911
MSST (eggs)	7.142	4.84	10.071
MSY (1000lb)	1665	1216	2132
DMSY (1000 N)	130	74	222
RMSY (1000 N)	4466	3628	5401
<u>Y@85%FMSY</u>	1656	–	–
<u>y@75%FMSY</u>	1635	–	–
<u>Y@65%FMSY</u>	1599	–	–

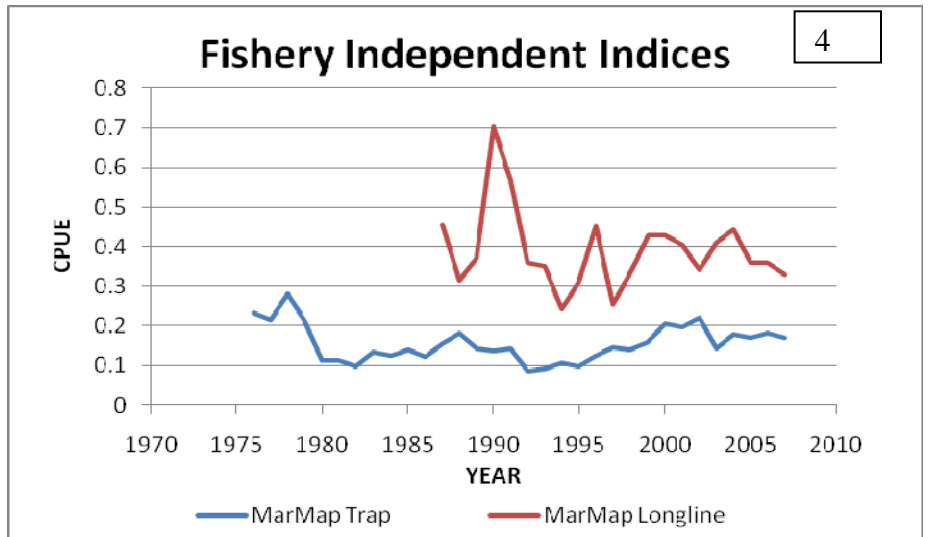
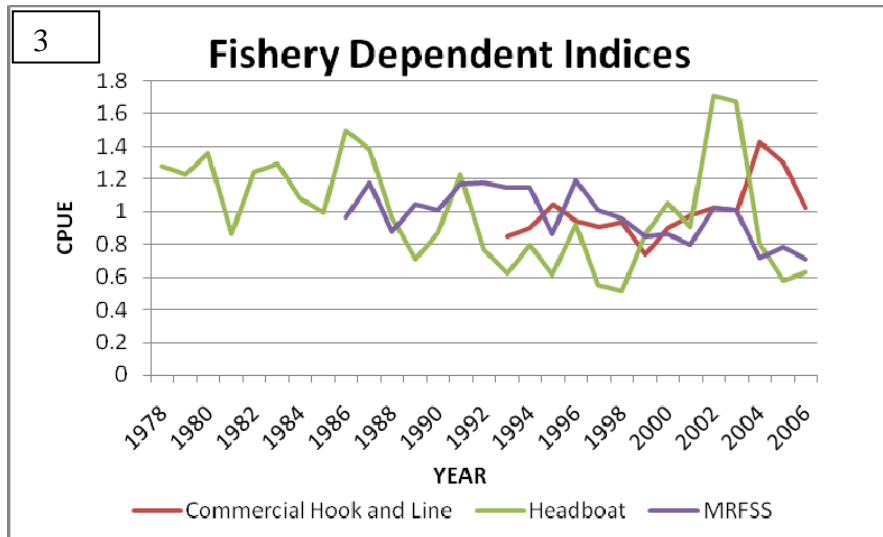
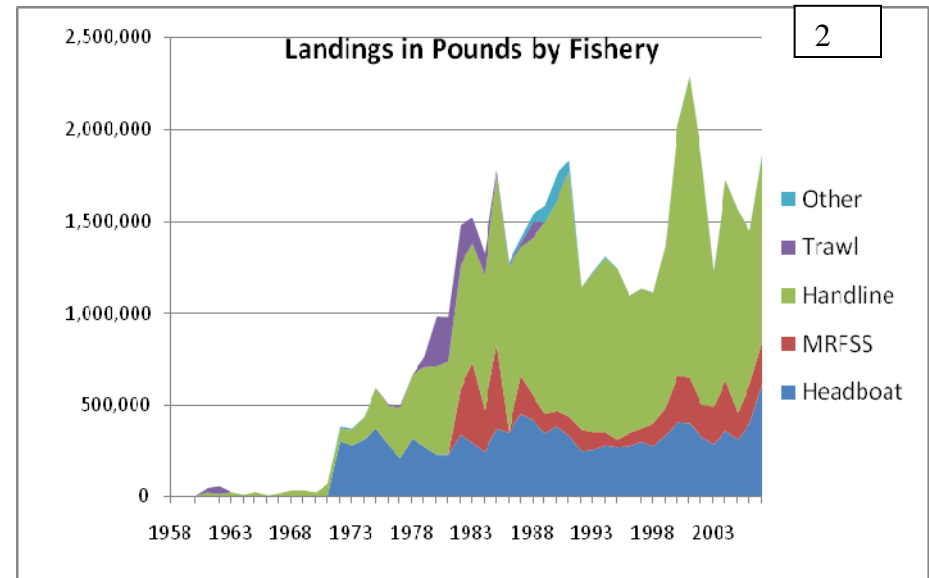
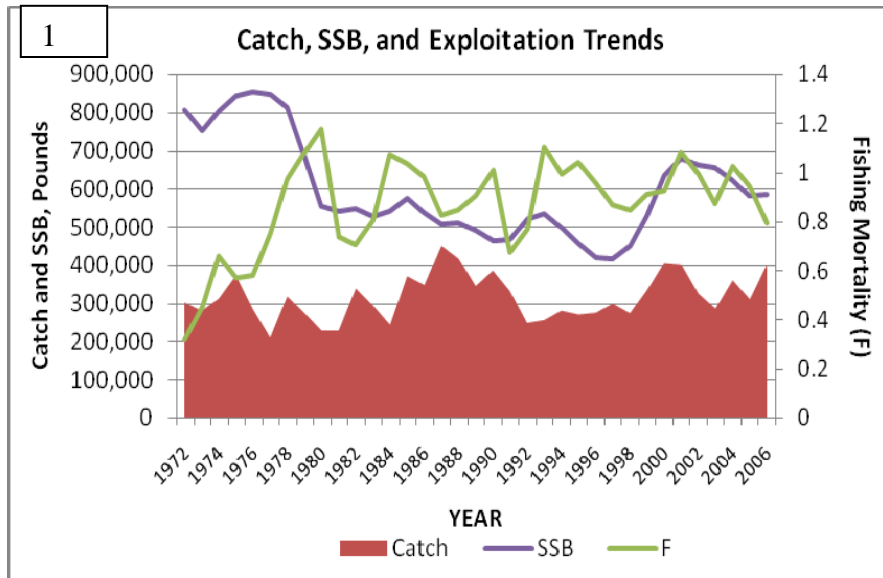
Table 6. Projections Summary

F=Fcurrent

Year	F	Pr SSB>SSBmsy	SSB	R	D#	DIb	L#	Landings
2006	0.341		8.67				45	1441
2007	0.491		7.88				50	1928
2008	0.384	0.25	7.7	4211	99	42	1055	1390
2009	0.384	0.29	7.92	4170	107	46	1058	1372
2010	0.384	0.31	8.15	4219	117	50	1109	1417
2011	0.384	0.33	8.34	4268	120	51	1159	1472
2012	0.384	0.34	8.51	4309	122	52	1191	1511
2013	0.384	0.34	8.64	4342	123	53	1214	1542
2014	0.384	0.35	8.75	4368	125	53	1233	1566
2015	0.384	0.36	8.83	4389	126	54	1247	1587
2016	0.384	0.36	8.9	4406	126	54	1258	1603
2017	0.384	0.36	8.96	4419	127	54	1267	1616
2018	0.384	0.37	9.01	4430	128	55	1274	1626

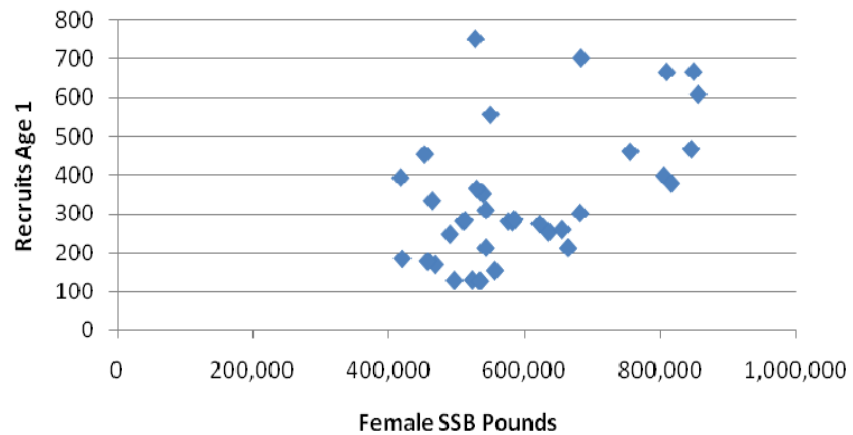
F=Fmsy

Year	F	Pr SSB>SSBmsy	SSB	R	D#	DIb	L#	Llb
2006	0.341		8.67				45	1441
2007	0.491		7.88				50	1928
2008	0.384	0.25	7.7	4211	99	42	1055	1390
2009	0.386	0.29	7.92	4170	107	46	1061	1376
2010	0.386	0.31	8.14	4219	117	50	1111	1419
2011	0.386	0.33	8.34	4267	120	51	1161	1475
2012	0.386	0.34	8.5	4308	122	52	1193	1513
2013	0.386	0.34	8.63	4340	124	53	1216	1543
2014	0.386	0.35	8.73	4366	125	53	1234	1568
2015	0.386	0.36	8.82	4386	126	54	1248	1588
2016	0.386	0.36	8.89	4403	127	54	1259	1603
2017	0.386	0.36	8.94	4416	127	54	1268	1616
2018	0.386	0.37	8.99	4427	128	55	1275	1626



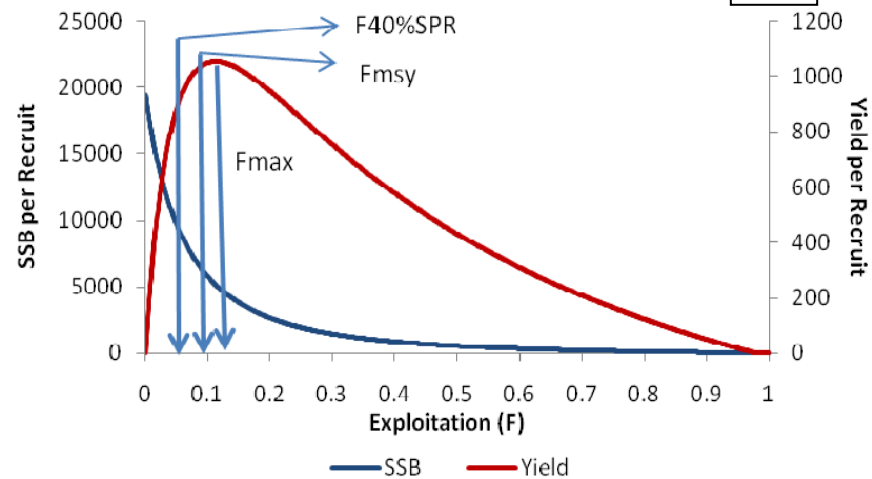
5

Stock - Recruitment



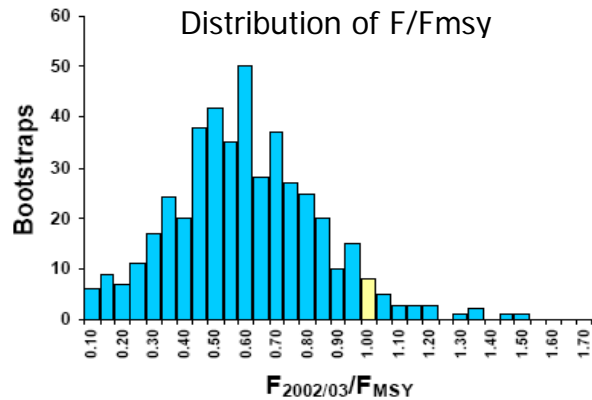
6

Yield and SSB per Recruit



7

Distribution of F/Fmsy



8

Distribution of B/Bmsy

