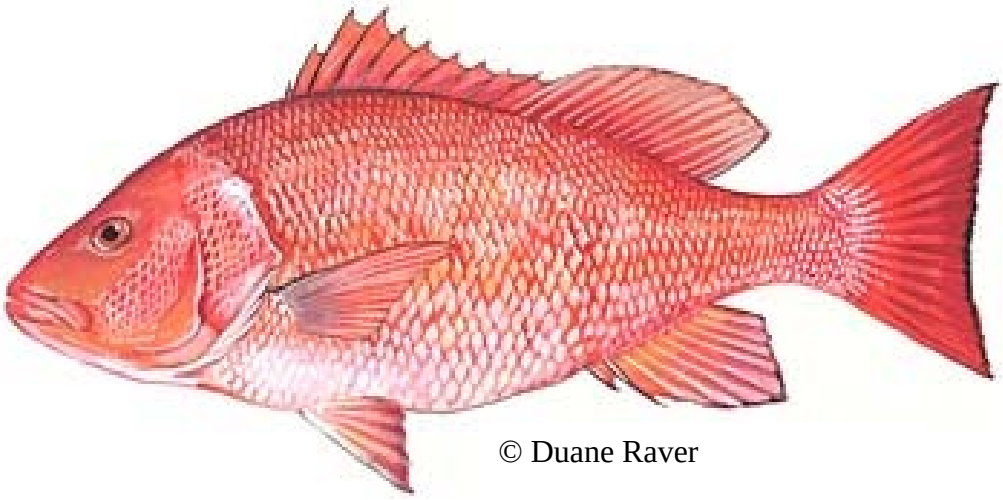
Potential Management Measures for Red Snapper



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Summary

The base run of the age-structured assessment model indicated that the stock is overfished ($SSB_{2006}/SSB_{MSY} = 0.037$) and that overfishing is occurring ($F_{2006}/F_{MSY} = 7.513$). These results were invariant to the 31 different configurations used in sensitivity runs and retrospective analyses. In addition, the same qualitative findings resulted from the age-aggregated surplus production model and its various sensitivity runs (SEDAR 15 2008).

Estimates of annual biomass have been well below B_{MSY} since the mid-1960s, with possibly some small amount of recovery since implementation of current size limits in 1992. The estimate of F_{2006}/F_{MSY} does not indicate severe overfishing in the terminal year; however, estimates of annual F have exceeded F_{MSY} substantially and regularly over the last half century. Sensitivity analyses indicated that qualitative results were invariant to assumptions about starting biomass and discards.

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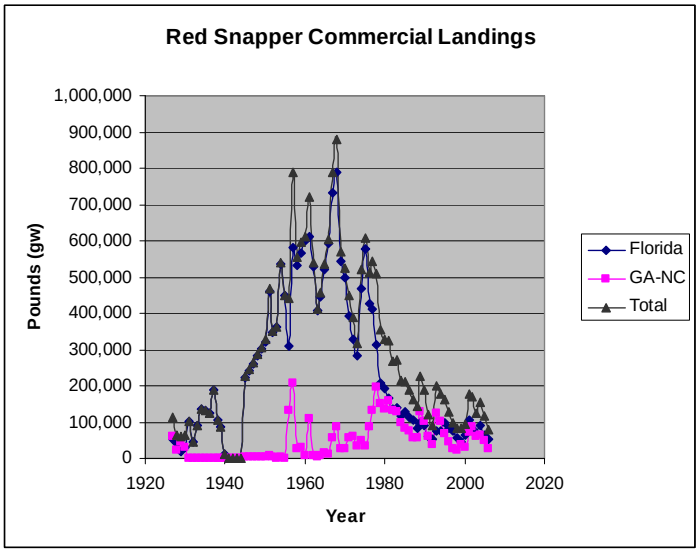
1 Red Snapper Landings

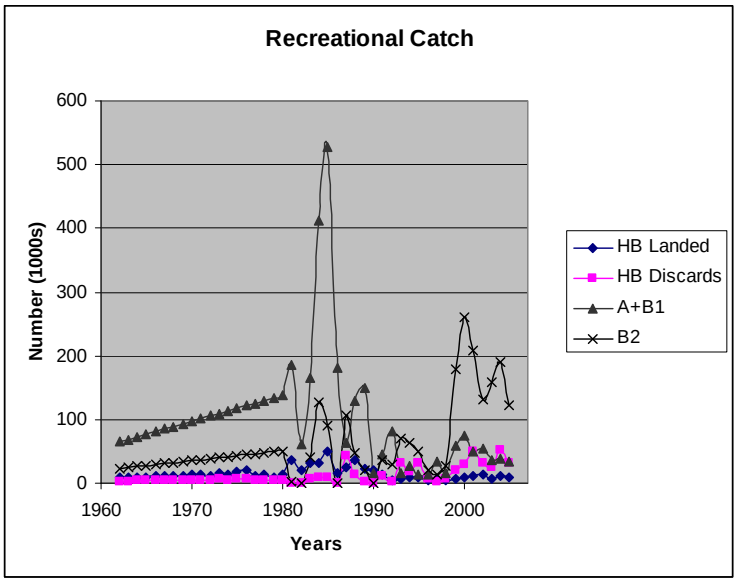
1.1 Red Snapper Commercial Landings (lbs gutted weight) From Assessment

Table 1. Table 3.2 from SEDAR 15 2008 assessment.

Year	Florida	GA-NC	Total
1927	53,153	58,584	111,737
1928	42,342	21,672	64,014
1929	17,117	43,619	60,736
1930	30,631	31,657	62,287
1931	100,901	1,852	102,753
1932	44,144	0	44,144
1933	90,541	0	90,541
1934	136,937	0	136,937
1935	131,532	0	131,532
1936	126,126	0	126,126
1937	189,189	0	189,189
1938	105,405	926	106,331
1939	86,486	1,852	88,338
1940	12,613	0	12,613
1941	0	0	0
1942	0	0	0
1943	0	0	0
1944	0	0	0
1945	221,622	3,704	225,325
1946	241,802	3,863	245,665
1947	261,982	4,022	266,004
1948	282,162	4,181	286,344
1949	302,342	4,341	306,683
1950	322,523	4,500	327,023
1951	459,459	6,944	466,404
1952	345,946	4,630	350,576
1953	362,162	1,802	363,964
1954	536,937	2,703	539,640
1955	448,649	0	448,649
1956	308,108	131,541	439,649
1957	579,279	209,326	788,605
1958	530,631	25,648	556,279
1959	566,667	30,459	597,126
1960	600,901	9,285	610,186
1961	610,811	109,866	720,676
1962	529,584	9,155	538,739
1963	406,379	3,839	410,218
1964	446,717	8,203	454,920
1965	519,844	14,670	534,515
1966	591,835	10,090	601,925
1967	733,301	55,863	789,164
1968	789,871	88,235	878,106
1969	544,517	27,023	571,540
1970	498,012	25,034	523,046



Year	Florida	GA-NC	Total
1971	391,932	56,029	447,962
1972	326,597	60,947	387,544
1973	284,717	33,488	318,205
1974	469,280	50,080	519,360
1975	576,252	32,654	608,906
1976	426,995	85,044	512,038
1977	409,869	131,921	541,790
1978	312,475	197,387	509,862
1979	206,477	149,680	356,157
1980	192,773	137,314	330,087
1981	166,062	158,669	324,731
1982	134,104	133,455	267,559
1983	141,099	130,138	271,237
1984	118,516	98,282	216,799
1985	127,659	83,071	210,730
1986	112,243	75,513	187,755
1987	105,465	56,591	162,056
1988	84,629	57,837	142,465
1989	98,692	129,212	227,904
1990	89,469	100,755	190,224
1991	61,923	60,329	122,252
1992	53,534	37,168	90,702
1993	74,326	124,096	198,422
1994	73,633	102,777	176,410
1995	96,745	66,246	162,991
1996	83,144	44,220	127,364
1997	73,618	25,884	99,501
1998	57,436	23,699	81,135
1999	44,352	38,750	83,102
2000	63,706	30,374	94,080
2001	104,467	73,128	177,595
2002	83,596	86,353	169,949
2003	66,078	59,689	125,768
2004	90,741	65,194	155,935
2005	65,890	50,475	116,366
2006	51,147	26,653	77,800



1.2 Red Snapper Recreational Landings (lbs gutted weight) From Assessment

Table 2. Red snapper recreational landings from SEDAR 17 assessment.

	Number of fish in 1000's										
	Landings			PSE	Discards			PSE	Landings + Discards		
Year	Headboat	MRFSS	total	MRFSS	Headboat	MRFSS	total	MRFSS	Headboat	MRFSS	total
1962*	8.502	64.8	73.305	25.2	3.1	23.63	26.734	30	11.602	88.437	100.039
1963*	9.033	68.85	77.886	25.2	3.29	25.11	28.405	30	12.327	93.964	106.291
1964*	9.564	72.9	82.468	25.2	3.49	26.59	30.076	30	13.052	99.491	112.544
1965*	10.096	76.95	87.049	25.2	3.68	28.06	31.747	30	13.777	105.019	118.796
1966*	10.627	81	91.631	25.2	3.88	29.54	33.418	30	14.503	110.546	125.049
1967*	11.158	85.05	96.212	25.2	4.07	31.02	35.089	30	15.228	116.073	131.301

	Number of fish in 1000's										
	Landings			PSE	Discards			PSE	Landings + Discards		
Year	Headboat	MRFSS	total	MRFSS	Headboat	MRFSS	total	MRFSS	Headboat	MRFSS	total
1968*	11.69	89.1	100.794	25.2	4.26	32.5	36.759	30	15.953	121.601	137.554
1969*	12.221	93.15	105.376	25.2	4.46	33.97	38.43	30	16.678	127.128	143.806
1970*	12.752	97.2	109.957	25.2	4.65	35.45	40.101	30	17.403	132.655	150.058
1971*	13.284	101.26	114.539	25.2	4.84	36.93	41.772	30	18.128	138.183	156.311
1972*	11.98	105.31	117.285	25.2	4.37	38.4	42.774	30	16.349	143.71	160.059
1973*	15.776	109.36	125.131	25.2	5.75	39.88	45.635	30	21.529	149.237	170.767
1974*	13.689	113.41	127.095	25.2	4.99	41.36	46.351	30	18.681	154.765	173.446
1975*	17.505	117.46	134.961	25.2	6.38	42.84	49.22	30	23.889	160.292	184.181
1976*	19.387	121.51	140.893	25.2	7.07	44.31	51.384	30	26.457	165.819	192.277
1977*	12.379	125.56	137.935	25.2	4.51	45.79	50.305	30	16.894	171.346	188.24
1978*	12.954	129.61	142.56	25.2	4.72	47.27	51.992	30	17.678	176.874	194.552
1979*	9.565	133.66	143.222	25.2	3.49	48.74	52.233	30	13.053	182.401	195.454
1980*	14.511	137.71	152.218	25.2	5.29	50.22	55.514	30	19.803	187.928	207.732
1981	35.719	186.52	222.234	25.1	0.38	2	2.383	100	36.102	188.515	224.617
1982	19.553	60.37	79.926	30.6	0	0	0	0	19.553	60.373	79.926
1983	30.698	165.96	196.66	19.8	7.41	40.04	47.451	38	38.105	206.006	244.111
1984	31.146	412.03	443.174	17.9	9.62	127.31	136.931	29.5	40.769	539.336	580.105
1985	50.336	527.14	577.475	19	8.62	90.29	98.912	43.9	58.958	617.429	676.387
1986	16.625	180.5	197.128	32.2	0	0	0	0	16.625	180.503	197.128
1987	24.996	63.25	88.247	19.7	42.18	106.73	148.906	57.8	67.174	169.979	237.153
1988	36.527	128.99	165.518	28.3	13.7	48.37	62.071	47.3	50.225	177.364	227.589
1989	23.453	149.92	173.368	19.9	3.13	20.04	23.173	41.9	26.588	169.953	196.541
1990	20.919	14.93	35.846	30.6	0	0	0	0	20.919	14.927	35.846
1991	13.857	46.28	60.133	33.1	10.78	35.99	46.771	51.5	24.635	82.269	106.904
1992	5.301	81.28	86.578	18.5	1.92	29.45	31.371	29.4	7.222	110.727	117.949
1993	7.347	16.32	23.67	21.8	31.74	70.51	102.242	28.4	39.082	86.83	125.912
1994	8.225	27.35	35.578	25.9	19.22	63.91	83.129	28.9	27.443	91.264	118.707
1995	8.826	14.01	22.837	29.7	32.05	50.87	82.918	20.2	40.872	64.883	105.755
1996	5.543	14.36	19.899	41.2	7.69	19.93	27.618	38	13.236	34.281	47.517
1997	5.77	34.33	40.097	48.5	2.31	13.74	16.052	26.9	8.08	48.069	56.149
1998	4.741	16.9	21.644	24	7.7	27.46	35.158	32.5	12.442	44.36	56.802
1999	6.836	58.18	65.017	20.9	21.11	179.67	200.775	15.9	27.946	237.846	265.792
2000	8.437	73.77	82.211	20.3	29.67	259.42	289.089	14.8	38.105	333.195	371.3
2001	12.028	50.81	62.842	16.6	49.44	208.89	258.329	13.8	61.472	259.699	321.171
2002	12.931	53.29	66.218	15.8	31.87	131.32	163.19	18.2	44.799	184.609	229.408
2003	5.706	35.66	41.367	16.5	25.47	159.18	184.646	16.2	31.175	194.838	226.013
2004	10.842	38.89	49.728	14.9	52.83	189.48	242.306	14.3	63.671	228.363	292.034
2005	8.907	33.71	42.615	18.2	32.52	123.06	155.576	13.4	41.424	156.767	198.191
2006	5.945	27.02	32.962	18.8	30.32	137.8	168.126	18.2	36.268	164.82	201.088

1.3 Red Snapper Landings (ALS), MRFSS, Headboat

Table 3. Red snapper commercial landings from ALS (includes all of Monroe County); MRFSS Web site; Headboat survey. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers. Landings converted to gutted weight using factor of 1.11.

Year	ALS	HB	MRFSS
1986	202,468	48,991	102,264
1987	176,866	73,728	120,427
1988	159,443	117,178	202,698
1989	241,755	63,779	242,157
1990	200,742	59,176	103,875
1991	132,881	64,891	118,480
1992	91,926	26,050	556,498
1993	204,283	38,484	127,557
1994	182,043	38,753	180,644
1995	166,342	51,778	59,463
1996	129,789	41,652	95,682
1997	102,111	46,130	80,095
1998	81,463	24,187	103,570
1999	85,786	39,241	152,641
2000	95,214	44,506	450,378
2001	178,579	61,607	318,580
2002	171,686	63,780	352,170
2003	146,579	37,255	233,616
2004	154,419	72,380	264,790
2005	118,924	52,878	236,294
2006	81,000	37,325	216,393
2007	91,475	0	266,008

1.4 Red Snapper Recreational Landings in Number

Table 4. Red Snapper Landings – Pounds Gutted Weight. Source: MRFSS Web site; Headboat survey. Data do not include dead discards and MRFSS data are A+B1; weight not converted from numbers.

Year	HB	MRFSS A+B1	PSE	Total
1986	16,625	113,513	27.3	130,138
1987	24,996	133,674	20	158,670
1988	36,527	224,995	23.4	261,522
1989	23,453	268,794	28.2	292,247
1990	20,919	115,301	7.9	136,220
1991	13,857	131,513	34.2	145,370
1992	5,301	617,713	38.3	623,014
1993	7,347	141,588	26.6	148,935
1994	8,225	200,515	35.9	208,740
1995	8,826	66,004	28	74,830
1996	5,543	106,207	50.2	111,750

Year	HB	MRFSS A+B1	PSE	Total
1997	5,770	88,905	43.6	94,675
1998	4,741	114,963	31.7	119,704
1999	6,836	169,432	17.9	176,268
2000	8,437	499,920	23.9	508,357
2001	12,028	353,624	18.8	365,652
2002	12,931	390,909	16.9	403,840
2003	5,706	259,314	18	265,020
2004	10,842	293,917	15.3	304,759
2005	8,907	262,286	17	271,193
2006	5,945	240,196	24.4	246,141
2007		295,269	29.7	295,269

Table 5. Red Snapper Landings – MRFSS Discards (B2). Source: MRFSS Web site.

Year	MRFSS B2s	PSE
1986	0	0
1987	106,728	57.8
1988	100,493	54.2
1989	26,738	40.1
1990	2,498	100
1991	44,619	43.8
1992	34,712	26.4
1993	70,507	28.4
1994	67,266	27.7
1995	54,796	19.4
1996	19,925	38
1997	15,011	26
1998	28,767	31.2
1999	182,436	15.7
2000	269,489	14.5
2001	210,793	13.7
2002	131,322	18.2
2003	160,229	16.1
2004	203,273	13.6
2005	125,739	13.3
2006	134,692	18.5
2007	448,144	12.7

1.5 Red snapper Landings by State

Table 6. Commercial landings (pounds) of red snapper by state, 2001-2006. Source ALS. Monroe County not divided into Atlantic and Gulf.

State	2001-2006	Avg ww	Avg GW	Percent
FL	518,166	86,361	77,803	55.06%
Monroe	25,335	4,223	3,804	2.69%
Georgia	108,047	18,008	16,223	11.48%
NC	80,616	13,436	12,105	8.57%
SC	208,902	34,817	31,367	22.20%

Table 7. Headboat landings (pounds) of red snapper by state, 2001-2006.

State	2001-2006	Avg ww	Avg GW	Percent
South FL	11,805	1,968	1,773	3.27%
GA & NFL	223,507	37,251	33,560	61.91%
SC	84,416	14,069	12,675	23.38%
NC	41,272	6,879	6,197	11.43%

Table 8. MRFSS landings (pounds) of red snapper by state, 2001-2006.

State	2001-2006	Avg ww	Avg GW	Percent
FL	1,563,204	260,534	234,715	86.83%
Georgia	99,494	16,582	14,939	5.53%
SC	69,668	11,611	10,461	3.87%
NC	67,880	11,313	10,192	3.77%

Table 9. MRFFS landings (number A+B1) of red snapper by state, 2001-2006.

State	2001-2006	Avg ww	Avg GW	Percent
FL	206,489	34,415	31,004	86.05%
Georgia	10,591	1,765	1,590	4.41%
SC	9,526	1,588	1,430	3.97%
NC	13,363	2,227	2,006	5.57%

Table 10. MRFSS number of red snapper released alive (B2) among states, 2001-2006.

MRFSS	2001-2006	avg	percent
FL	623,153	124,631	89.62%
GA	5,878	1,176	0.85%
SC	24,128	4,826	3.47%
NC	42,161	8,432	6.06%

Table 11. Percentage of red snapper MRFSS B2s by state. Average 2001-2006.

MRFSS	A+B1	B2	A+B1+B2	% B2
FL	29,396	124,631	154,027	80.92%
GA	1,089	1,176	2,265	56.60%
SC	2,136	4,826	6,962	62.40%
NC	12,849	8,432	21,281	40.50%
Total	45,470	139,065	184,535	75.36%

1.6 Red Snapper Landings by Month and State

1.6.1 Commercial 2001-2006

Table 12. Average red snapper commercial landings 2001-2006 (lbs gutted weight) by state and month. Includes Monroe County South Atlantic landings.

Month	Total	FL	GA	SC	NC
1	12,023	7,296	1,254	2,627	847
2	12,250	7,485	1,979	2,121	665
3	13,175	8,542	1,235	2,370	1,029
4	14,061	8,024	1,867	2,871	1,299
5	15,247	8,531	1,889	3,106	1,720
6	15,810	10,005	1,333	3,026	1,445
7	11,710	6,535	1,057	2,859	1,259
8	8,716	4,967	765	2,029	955
9	6,466	3,766	837	1,255	609
10	10,582	5,511	1,326	2,948	796
11	12,564	5,818	1,592	4,292	862
12	9,261	5,690	1,091	1,862	618
Total	141,865	82,170	16,223	31,367	12,105

Table 13. Percentage of red snapper (commercial) landed by month in FL, GA, SC, and NC during 2001-2006 (lbs gutted weight) by state and month.

Month	Total	FL	GA	SC	NC
1	8.48%	8.88%	7.73%	8.38%	6.99%
2	8.64%	9.11%	12.20%	6.76%	5.49%
3	9.29%	10.40%	7.61%	7.56%	8.50%
4	9.91%	9.76%	11.51%	9.15%	10.73%
5	10.75%	10.38%	11.65%	9.90%	14.21%
6	11.14%	12.18%	8.22%	9.65%	11.94%
7	8.25%	7.95%	6.52%	9.12%	10.40%
8	6.14%	6.04%	4.72%	6.47%	7.89%
9	4.56%	4.58%	5.16%	4.00%	5.03%
10	7.46%	6.71%	8.17%	9.40%	6.58%
11	8.86%	7.08%	9.81%	13.68%	7.12%
12	6.53%	6.92%	6.72%	5.94%	5.11%

1.6.2 Commercial – By Year

Table 14. Average red snapper commercial landings 2001-2006 (lbs gutted weight) by state and month. Includes Monroe County.

	2001				2002				2003			
Month	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	10,537	1,283	1,219	574	8,143	1,861	2,407	2,136	4,415	740	649	750
2	13,341	3,081	2,914	679	5,434	2,641	2,168	1,168	5,783	3,549	1,157	802
3	8,094	1,059	2,227	1,002	8,845	934	3,175	1,751	7,111	2,073	1,971	1,058
4	10,553	2,858	2,846	1,942	7,555	3,131	3,243	2,511	4,776	2,800	3,216	1,289
5	10,023	4,111	2,859	2,723	5,840	1,951	4,143	2,332	7,223	2,171	3,606	1,682
6	6,922	1,826	2,344	2,157	12,865	2,351	5,032	2,660	21,871	1,413	4,373	1,478
7	5,694	1,351	2,053	1,614	5,541	2,138	3,937	2,257	9,579	558	1,802	968
8	7,143	1,063	1,459	1,924	5,438	1,055	3,287	1,415	3,130	698	1,410	732
9	5,759	2,098	1,237	1,177	3,406	996	2,016	1,188	6,668	1,209	1,530	335
10	6,534	2,549	3,217	1,275	10,092	1,235	3,166	1,051	5,443	1,387	3,277	980
11	9,516	2,157	4,811	1,285	6,771	2,845	7,418	1,550	5,702	1,396	3,306	1,019
12	11,849	1,150	2,932	1,560	5,949	1,636	1,988	1,032	5,494	1,547	1,943	512
	105,963	24,586	30,119	17,911	85,879	22,776	41,981	21,050	87,194	19,541	28,240	11,605
	59.34%	13.77%	16.87%	10.03%	50.02%	13.27%	24.45%	12.26%	59.49%	13.33%	19.27%	7.92%

	2004				2005				2006			
Month	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	8,884	1,781	6,240	661	4,753	781	1,422	131	43,774	7,523	15,763	5,079
2	5,738	866	2,605	857	8,371	470	768	129	44,912	11,872	12,727	3,990
3	14,189	989	3,343	1,732	6,552	342	1,014	380	51,250	7,407	14,220	6,175
4	11,411	1,545	3,991	1,047	8,510	124	1,169	560	48,142	11,201	17,225	7,795
5	12,341	1,498	3,229	1,673	6,830	491	1,855	866	51,188	11,336	18,636	10,322
6	7,548	1,288	2,241	687	3,346	441	1,444	897	60,032	7,997	18,158	8,672
7	7,471	1,037	3,584	1,206	3,871	391	2,661	640	39,210	6,342	17,155	7,551
8	7,536	582	2,263	705	1,287	307	1,056	543	29,803	4,591	12,171	5,730

	2004				2005				2006			
Month	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
9	929	158	822	205	2,210	203	743	278	22,595	5,020	7,529	3,654
10	4,604	1,816	3,712	497	2,497	327	1,367	695	33,068	7,956	17,690	4,777
11	6,347	1,759	5,157	442	2,259	326	1,117	232	34,908	9,551	25,753	5,172
12	3,122	1,874	1,921	286	4,646	329	1,186	178	34,141	6,543	11,173	3,711
	90,119	15,194	39,107	9,999	55,133	4,533	15,803	5,531	493,022	97,340	188,200	72,627
	58.36%	9.84%	25.33%	6.48%	68.07%	5.60%	19.51%	6.83%	57.92%	11.44%	22.11%	8.53%

1.6.3 Headboat 2001-2006

Table 14. Average red snapper headboat landings 2001-2006 (lbs gutted weight) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	1,555	72	1,402	46	36
2	2,634	654	1,873	38	70
3	4,185	480	3,046	519	140
4	5,691	29	3,965	1,411	285
5	7,857	89	4,719	2,577	472
6	5,775	33	3,475	1,712	554
7	5,578	50	3,501	1,553	474
8	5,623	41	2,390	2,020	1,173
9	2,927	16	1,491	576	844
10	5,110	63	3,493	772	783
11	4,316	155	2,690	1,275	196
12	2,953	91	1,515	177	1,170
	54,204	1,773	33,560	12,675	6,197

Table 15. Average gag headboat landings 2001-2006 (percentage) by state and month.

Month	Total	South FL	GA - NFL	SC	NC
1	2.87%	4.04%	4.18%	0.36%	0.58%
2	4.86%	36.88%	5.58%	0.30%	1.12%
3	7.72%	27.07%	9.08%	4.09%	2.26%
4	10.50%	1.66%	11.81%	11.13%	4.60%
5	14.50%	5.04%	14.06%	20.33%	7.62%
6	10.65%	1.86%	10.36%	13.51%	8.95%
7	10.29%	2.82%	10.43%	12.25%	7.65%
8	10.37%	2.29%	7.12%	15.94%	18.93%
9	5.40%	0.90%	4.44%	4.54%	13.62%
10	9.43%	3.57%	10.41%	6.09%	12.63%
11	7.96%	8.75%	8.02%	10.06%	3.17%
12	5.45%	5.13%	4.51%	1.40%	18.88%

1.6.4 Headboat – By Year

Table 16. Average red snapper headboat landings 2001-2006 (lbs gutted weight) by state and month.

	2001				2002				2003			
Month	South FL	GA - NFL	SC	NC	South FL	GA - NFL	SC	NC	South FL	GA - NFL	SC	NC
1	8	222	3	4	14	143	43	3	2	80	0	3
2	22	392	38	41	5	146	0	21	13	139	0	7
3	13	515	100	30	81	433	123	61	5	333	0	26
4	0	715	341	101	0	579	190	116	0	449	291	41
5	56	703	559	81	0	881	480	278	0	579	841	34
6	15	537	229	131	1	819	639	301	8	433	238	34
7	3	606	371	94	3	733	411	286	9	215	177	38
8	5	491	764	361	4	306	212	757	5	139	112	40
9	0	306	149	402	0	244	155	225	3	200	93	186
10	0	160	161	95	14	404	258	54	0	466	64	95
11	148	458	235	96	3	295	736	30	1	312	8	49
12	10	360	131	6	8	121	16	0	0	446	0	0
Total	280	5,466	3,080	1,442	133	5,104	3,262	2,131	45	3,790	1,822	552
Percent	2.73%	53.23%	30.00%	14.04%	1.25%	48.02%	30.69%	20.05%	0.72%	61.04%	29.34%	8.90%

	2004				2005				2006			
Month	South FL	GA - NFL	SC	NC	South FL	GA - NFL	SC	NC	South FL	GA - NFL	SC	NC
1	1	241	0	17	42	322	0	7	4	395	0	2
2	0	211	0	0	550	540	0	0	64	446	0	0
3	12	384	266	15	334	754	21	5	35	627	9	3
4	4	807	424	21	14	792	111	0	12	624	54	7
5	0	705	488	29	11	1,116	130	33	22	735	79	17
6	4	775	374	18	0	465	147	64	5	446	86	7
7	0	1,112	334	15	7	511	116	39	28	324	144	4
8	0	943	80	15	7	340	789	0	20	171	63	0
9	4	44	43	13	2	319	95	5	7	378	42	13

10	34	1,494	189	524	0	405	79	10	15	564	21	6
11	1	777	192	16	0	333	73	5	2	515	32	0
12	70	177	28	1,165	0	221	0	0	3	189	2	0
Total	129	7,670	2,418	1,846	967	6,117	1,561	167	219	5,413	532	58
Percent	1.07%	63.58%	20.04%	15.31%	10.97%	69.41%	17.72%	1.90%	3.52%	87.01%	8.54%	0.93%

1.6.5 MRFSS 2001-2006

Table 17. Average red snapper MRFSS landings 2001-2006 (lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	40,764	40,764	0	0	0
2	54,953	50,729	1,212	2,421	591
3	56,191	43,387	6,013	2,694	4,097
4	32,870	28,210	1,309	1,980	1,371
5	34,424	25,023	4,877	934	3,591
6	51,104	46,602	1,528	2,431	543
	270,307	234,715	14,939	10,460	10,192

Table 18. Average red snapper MRFSS landings 2001-2006 (percent lbs gutted weight) by state and month.

Wave	Total	FL	GA	SC	NC
1	15.08%	17.37%	0.00%	0.00%	0.00%
2	20.33%	21.61%	8.11%	23.15%	5.80%
3	20.79%	18.49%	40.25%	25.76%	40.19%
4	12.16%	12.02%	8.76%	18.92%	13.45%
5	12.74%	10.66%	32.65%	8.93%	35.23%
6	18.91%	19.85%	10.23%	23.24%	5.33%

Table 19. Average red snapper MRFSS landings 2001-2006 (A+B1 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	6,585	6,585	0	0	0
2	7,732	7,096	101	472	64
3	8,143	6,182	740	351	870
4	4,612	3,900	142	240	330
5	5,116	3,477	573	186	880
6	7,807	7,176	208	339	84
	39,995	34,415	1,765	1,588	2,227

Table 20. Average red snapper MRFSS landings 2001-2006 (A+B1 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	16.47%	19.13%	0.00%	0.00%	0.00%
2	19.33%	20.62%	5.73%	29.70%	2.85%
3	20.36%	17.96%	41.95%	22.12%	39.07%
4	11.53%	11.33%	8.05%	15.13%	14.81%
5	12.79%	10.10%	32.47%	11.73%	39.50%
6	19.52%	20.85%	11.80%	21.32%	3.77%

Table 21. Average red snapper MRFSS landings 2001-2006 (B2 Number) by state and month.

Wave	Total	FL	GA	SC	NC
1	35,161	35,161	0	0	0
2	29,400	28,612	490	297	0

3	17,683	16,076	745	852	11
4	17,590	15,676	1,429	456	29
5	15,557	14,374	857	216	110
6	45,617	44,987	465	165	0
	161,008	154,886	3,986	1,986	149

Table 22. Average red snapper MRFSS landings 2001-2006 (B2 Number, percent) by state and month.

Wave	Total	FL	GA	SC	NC
1	21.84%	22.70%	0.00%	0.00%	0.00%
2	18.26%	18.47%	12.30%	14.96%	0.00%
3	10.98%	10.38%	18.69%	42.87%	7.04%
4	10.92%	10.12%	35.84%	22.96%	19.55%
5	9.66%	9.28%	21.50%	10.89%	73.41%
6	28.33%	29.04%	11.67%	8.32%	0.00%

1.6.6 MRFSS – By Year

Table 23. Average red snapper MRFSS landings 2001-2006 (lbs gutted weight) by state and month.

	2001				2002				2003			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	62,677	0	0	0	90,770	0	0	0	13,095	0	0	0
2	30,992	377	0	0	78,840	0	0	0	61,961	656	10,580	0
3	67,061	935	0	8,541	65,389	638	0	4,908	37,164	163	14,150	1,293
4	18,669	0	0	1,901	54,684	0	0	2,940	22,806	1,479	6,493	2,206
5	5,484	107	0	133	26,606	1,192	3,942	12,876	20,846	600	371	6,048
6	113,362	0	12,020	0	9,019	295	71	0	34,847	1,357	0	0
Total	298,245	1,420	12,020	10,575	325,308	2,125	4,014	20,723	190,719	4,255	31,594	9,547
Percent	92.55%	0.44%	3.73%	3.28%	92.37%	0.60%	1.14%	5.88%	80.77%	1.80%	13.38%	4.04%

	2004				2005				2006			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	10,087	0	0	0	19,248	0	0	0	48,708	0	0	0
2	32,334	1,309	1,347	0	53,950	4,930	1,042	3,545	46,298	0	1,559	0
3	44,104	7,877	467	514	38,013	3,317	1,019	4,467	8,594	23,149	531	4,858
4	35,452	1,297	570	0	24,753	5,078	4,814	1,177	12,895	0	0	0
5	28,171	11,414	1,291	0	22,070	15,949	0	0	46,958	0	0	2,488
6	77,050	7,514	1,649	3,259	30,984	0	648	0	20,155	0	198	0
Total	227,198	29,411	5,323	3,774	189,017	29,274	7,523	9,189	183,608	23,149	2,288	7,346
Percent	85.51%	11.07%	2.00%	1.42%	80.43%	12.46%	3.20%	3.91%	84.85%	10.70%	1.06%	3.39%

Table 24. Average red snapper MRFSS landings 2001-2006 (A+B1 Number) by state and month.

	2001				2002				2003			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	11,501	0	0	0	12,916	0	0	0	2,811	0	0	0
2	5,348	66	0	0	11,804	0	0	0	7,039	96	1,426	0
3	9,248	123	0	2,098	11,872	86	0	795	4,007	21	1,867	256
4	5,584	0	0	379	6,562	0	0	429	2,767	90	892	862

	2001				2002				2003			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
5	1,109	17	0	21	3,795	190	923	2,054	2,647	91	0	2,971
6	14,978	0	1,608	0	1,759	72	31	0	5,102	162	0	0
Total	47,768	206	1,608	2,498	48,708	348	954	3,278	24,373	460	4,185	4,089
Percent	91.72%	0.40%	3.09%	4.80%	91.41%	0.65%	1.79%	6.15%	73.62%	1.39%	12.64%	12.35%

	2004				2005				2006			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	1,827	0	0	0	4,368	0	0	0	6,088	0	0	0
2	5,994	110	179	0	6,890	335	103	381	5,501	0	1,121	0
3	5,672	1,037	64	71	5,413	408	88	468	878	2,767	88	1,533
4	4,102	262	75	0	3,308	500	474	309	1,074	0	0	0
5	4,531	1,064	47	0	5,488	1,815	147	0	3,289	262	0	233
6	12,668	1,016	255	504	5,332	0	113	0	3,218	0	24	0
Total	34,794	3,489	620	575	30,799	3,058	925	1,158	20,048	3,029	1,233	1,766
Percent	88.14%	8.84%	1.57%	1.46%	85.70%	8.51%	2.57%	3.22%	76.88%	11.62%	4.73%	6.77%

Table 25. Average red snapper MRFSS landings 2001-2006 (B2 Number) by state and month.

	2001				2002				2003			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	79,799	0	0	0	54,344	0	0	0	34,643	0	0	0
2	18,502	242	0	0	14,662	0	0	0	26,882	0	1,783	0
3	18,549	0	0	0	8,366	0	0	63	26,022	192	3,361	0
4	17,086	0	0	175	21,123	0	158	0	16,746	365	0	0
5	10,020	356	969	138	15,949	152	0	0	7,050	31	0	0
6	63,932	621	402	0	16,398	76	31	0	42,593	560	85	0
Total	207,888	1,219	1,371	313	130,842	228	189	63	153,936	1,148	5,229	0
Percent	98.62%	0.58%	0.65%	0.15%	99.63%	0.17%	0.14%	0.05%	96.02%	0.72%	3.26%	0.00%

	2004				2005				2006			
Wave	FL	GA	SC	NC	FL	GA	SC	NC	FL	GA	SC	NC
1	18,967	0	0	0	9,958	0	0	0	13,255	0	0	0
2	39,647	290	0	0	42,839	206	0	0	29,140	2,204	0	0
3	22,070	1,367	0	0	10,921	2,911	1,660	0	10,528	0	88	0
4	21,475	1,563	0	0	4,953	102	2,333	0	12,673	6,543	245	0
5	26,063	2,229	0	0	18,668	616	329	0	8,496	1,758	0	519
6	68,193	1,323	474	0	29,719	50	0	0	49,084	161	0	0
Total	196,415	6,772	474	0	117,058	3,885	4,322	0	123,176	10,666	333	519
Percent	96.44%	3.33%	0.23%	0.00%	93.45%	3.10%	3.45%	0.00%	91.45%	7.92%	0.25%	0.39%

1.7 Red Snapper Commercial Percentage

Table 26. Red Snapper % Commercial. Source ALS.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	57.2%	52.3%	44.7%	44.6%	46.4%	45.8%	38.8%	40.6%	41.1%	42.3%	42.7%	42.8%	42.6%	42.0%	39.3%	38.7%	37.9%	37.7%	37.3%	36.9%	36.4%
1987		47.7%	39.5%	41.3%	44.2%	43.9%	36.5%	38.7%	39.4%	40.9%	41.4%	41.6%	41.5%	40.9%	38.2%	37.6%	36.8%	36.7%	36.4%	36.0%	35.5%
1988			33.3%	39.1%	43.3%	43.0%	34.7%	37.5%	38.5%	40.2%	40.8%	41.0%	40.9%	40.3%	37.5%	36.9%	36.2%	36.1%	35.8%	35.4%	34.9%
1989				44.1%	48.5%	46.9%	35.1%	38.4%	39.4%	41.3%	41.9%	42.1%	41.9%	41.2%	37.9%	37.2%	36.4%	36.3%	36.0%	35.6%	35.0%
1990					55.2%	49.1%	31.4%	36.5%	38.2%	40.7%	41.5%	41.7%	41.5%	40.7%	37.0%	36.4%	35.6%	35.5%	35.2%	34.8%	34.3%
1991						42.0%	22.7%	31.5%	34.7%	38.1%	39.3%	39.8%	39.7%	38.9%	35.2%	34.8%	34.1%	34.2%	33.9%	33.6%	33.1%
1992							13.6%	28.4%	33.1%	37.4%	38.9%	39.5%	39.4%	38.6%	34.6%	34.2%	33.5%	33.7%	33.5%	33.1%	32.7%
1993								55.2%	50.1%	52.7%	51.8%	50.8%	49.4%	46.8%	39.9%	38.5%	37.1%	36.9%	36.3%	35.7%	35.0%
1994									45.3%	51.3%	50.5%	49.4%	47.8%	45.0%	37.4%	36.3%	35.1%	35.1%	34.7%	34.2%	33.5%
1995										59.9%	54.4%	51.5%	48.8%	44.9%	35.7%	34.8%	33.7%	33.9%	33.6%	33.2%	32.5%
1996											48.6%	46.8%	44.5%	40.6%	31.4%	31.6%	31.1%	31.6%	31.6%	31.3%	30.8%
1997												44.7%	42.0%	37.7%	27.9%	29.1%	29.2%	30.0%	30.2%	30.1%	29.6%
1998													38.9%	34.4%	24.4%	27.0%	27.6%	28.8%	29.2%	29.2%	28.7%
1999														30.9%	20.9%	25.2%	26.4%	27.9%	28.5%	28.6%	28.2%
2000															16.1%	23.8%	25.7%	27.5%	28.2%	28.3%	27.9%
2001																32.0%	30.6%	31.8%	31.7%	31.3%	30.4%
2002																	29.2%	31.7%	31.6%	31.1%	30.0%
2003																		35.1%	33.1%	31.9%	30.3%
2004																			31.4%	30.4%	28.7%
2005																				29.1%	26.9%
2006																					24.2%

1.8 Red Snapper Recreational Percentage

Table 27. Red Snapper % Recreational. Source MRFSS Web site, NMFS Headboat survey.

	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
1986	42.8%	47.7%	55.3%	55.4%	53.6%	54.2%	61.2%	59.4%	58.9%	57.7%	57.3%	57.2%	57.4%	58.0%	60.7%	61.3%	62.1%	62.3%	62.7%	63.1%	63.6%
1987		52.3%	60.5%	58.7%	55.8%	56.1%	63.5%	61.3%	60.6%	59.1%	58.6%	58.4%	58.5%	59.1%	61.8%	62.4%	63.2%	63.3%	63.6%	64.0%	64.5%
1988			66.7%	60.9%	56.7%	57.0%	65.3%	62.5%	61.5%	59.8%	59.2%	59.0%	59.1%	59.7%	62.5%	63.1%	63.8%	63.9%	64.2%	64.6%	65.1%
1989				55.9%	51.5%	53.1%	64.9%	61.6%	60.6%	58.7%	58.1%	57.9%	58.1%	58.8%	62.1%	62.8%	63.6%	63.7%	64.0%	64.4%	65.0%
1990					44.8%	50.9%	68.6%	63.5%	61.8%	59.3%	58.5%	58.3%	58.5%	59.3%	63.0%	63.6%	64.4%	64.5%	64.8%	65.2%	65.7%
1991						58.0%	77.3%	68.5%	65.3%	61.9%	60.7%	60.2%	60.3%	61.1%	64.8%	65.2%	65.9%	65.8%	66.1%	66.4%	66.9%
1992							86.4%	71.6%	66.9%	62.6%	61.1%	60.5%	60.6%	61.4%	65.4%	65.8%	66.5%	66.3%	66.5%	66.9%	67.3%
1993								44.8%	49.9%	47.3%	48.2%	49.2%	50.6%	53.2%	60.1%	61.5%	62.9%	63.1%	63.7%	64.3%	65.0%
1994									54.7%	48.7%	49.5%	50.6%	52.2%	55.0%	62.6%	63.7%	64.9%	64.9%	65.3%	65.8%	66.5%
1995										40.1%	45.6%	48.5%	51.2%	55.1%	64.3%	65.2%	66.3%	66.1%	66.4%	66.8%	67.5%
1996											51.4%	53.2%	55.5%	59.4%	68.6%	68.4%	68.9%	68.4%	68.4%	68.7%	69.2%
1997												55.3%	58.0%	62.3%	72.1%	70.9%	70.8%	70.0%	69.8%	69.9%	70.4%
1998													61.1%	65.6%	75.6%	73.0%	72.4%	71.2%	70.8%	70.8%	71.3%
1999														69.1%	79.1%	74.8%	73.6%	72.1%	71.5%	71.4%	71.8%
2000															83.9%	76.2%	74.3%	72.5%	71.8%	71.7%	72.1%
2001																68.0%	69.4%	68.2%	68.3%	68.7%	69.6%
2002																	70.8%	68.3%	68.4%	68.9%	70.0%
2003																		64.9%	66.9%	68.1%	69.7%
2004																			68.6%	69.6%	71.3%
2005																				70.9%	73.1%
2006																					75.8%

2 Monthly catch and reduction provided by seasonal closure

2.1 Commercial

Table 28. Monthly catch (pounds gutted weight) of red snapper 2001-2006 (average). Data are from ALS.

Month	Total
1	12,023
2	12,250
3	13,175
4	14,061
5	15,247
6	15,810
7	11,710
8	8,716
9	6,466
10	10,582
11	12,564
12	9,261
Total	141,865

2.1.1 Effectiveness of Commercial Closure

Five steps were taken to determine the effectiveness of a commercial closure. Logbook data from 2001-2006 were examined to identify species most commonly caught on trips with red snapper by restricting trips to those that caught at least 1 lb of red snapper. Incidental catch during a seasonal closure was determined by identifying trips that targeted (caught at least 100 lbs) of co-occurring species; and calculating the catch of red snapper on those trips. Trips targeting red snapper were removed from analyses assuming that targeting would not occur in the future. A trip would be considered to be targeting red snapper if greater than 300 lb whole weight of the landings on a trip included the species. In addition, trips that employed diving gear, were not considered in analyses since fishermen can recognize a species before it is captured.

There is a possibility some trips would not be taken during a seasonal closure for species such as gag or vermilion snapper. However, it was assumed that there would not be any reduction in trips made if red snapper was closed. The ability to avoid red snapper was considered by adjusting values by 0 to 60% to account for fishermen's ability to avoid red snapper by changing hook size, location, and fishing methods. Dead discards were determined by applying a 90% release mortality rate for red snapper (SEDAR 15 2008). Effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings. Effectiveness of a seasonal closure for red snapper could be increased through seasonal closures of co-occurring species.

STEP 1 - Determine landings of red snapper during 2001-2006

Table 29. Landings of red snapper during 2001-2006 from logbook.

Month	Tot WW	Tot GW	Avg GW
1	77,834	70,120	11,687
2	80,182	72,236	12,039
3	75,730	68,226	11,371
4	84,599	76,215	12,703
5	107,954	97,256	16,209
6	82,833	74,625	12,437
7	68,230	61,468	10,245
8	60,277	54,303	9,051
9	41,581	37,460	6,243
10	70,417	63,439	10,573
11	81,736	73,636	12,273
12	60,763	54,741	9,124
		sum	133,954

STEP 2 - Identify most common species taken with red snapper

Table 30. Species most commonly taken on trips where at least 1 lb of red snapper was caught.

Species	sum	percent	cum %
SNAPPER,VERMILION	1,196,673	29.48%	29.48%
GROUPER,GAG	536,337	13.21%	42.69%
SCAMP	350,126	8.62%	51.31%
AMBERJACK,GREATER	266,201	6.56%	57.87%
TRIGGERFISH,GRAY	235,453	5.80%	63.67%

Species	sum	percent	cum %
SNAPPER,RED	206,503	5.09%	68.75%
GROUPER,RED	197,286	4.86%	73.61%
JACK,ALMACO	138,184	3.40%	77.02%
GROUPER,BLACK	102,904	2.53%	79.55%
GROUPER,SNOWY	68,959	1.70%	81.25%
KING MACKEREL	61,016	1.50%	82.75%
SEA BASSE,ATLANTIC,BLACK,UNC	60,606	1.49%	84.24%
DOLPHINFISH	50,162	1.24%	85.48%
PORGY,RED,UNC	47,059	1.16%	86.64%
SNAPPER,MUTTON	45,057	1.11%	87.75%
SHARK,SANDBAR	44,004	1.08%	88.83%
GRUNTS	36,828	0.91%	89.74%
PORGY,JOLTHEAD	29,657	0.73%	90.47%
GRUNT,WHITE	27,815	0.69%	91.16%

STEP 3 – Identify trips that target co-occurring species.
Identify trips that caught at least 100 lbs (directed catch) of co-occurring species during a seasonal closure.

STEP 4 - Determine incidental catch.
This step determines the incidental catch red snapper during a seasonal closure. Trips that use diving gear or target red snapper (where > 300 lbs ww are caught) are dropped. This step does not take into consideration trips that will not be taken during a closure or ability of fishermen to avoid red snapper.

Table 31. Incidental catch of red snapper during a seasonal closure. Dead discards determined by applying 40% release mortality rate. Not adjusted for behavior.

Month	Tot WW	Tot GW	Avg GW	Dead discards
1	43,001	38,740	6,457	5,811
2	41,160	37,081	6,180	5,562
3	39,223	35,336	5,889	5,300
4	48,137	43,366	7,228	6,505
5	60,886	54,852	9,142	8,228
6	53,904	48,562	8,094	7,284
7	41,600	37,477	6,246	5,622
8	34,415	31,004	5,167	4,651
9	24,182	21,785	3,631	3,268
10	40,176	36,194	6,032	5,429
11	46,262	41,677	6,946	6,252
12	30,651	27,614	4,602	4,142
		sum	75,615	68,053

STEP 5 – Determine incidental catch for reduced trips after quota.
Assumption is that no trips would be reduced because of complete closure for red snapper since it is not likely that this is the primary species taken on trips.

Table 32. Dead discards (lbs gutted weight) of red snapper during a seasonal closure (Average 2001-2006). Dead discards determined by applying 90% release mortality rate. Assumes fishermen can avoid 0-60% of red snapper by fishing differently.

	Reduction			
Month	0%	20%	40%	60%
1	5,811	4,649	3,487	2,324
2	5,562	4,450	3,337	2,225
3	5,300	4,240	3,180	2,120
4	6,505	5,204	3,903	2,602
5	8,228	6,582	4,937	3,291
6	7,284	5,827	4,371	2,914
7	5,622	4,497	3,373	2,249
8	4,651	3,721	2,790	1,860
9	3,268	2,614	1,961	1,307
10	5,429	4,343	3,257	2,172
11	6,252	5,001	3,751	2,501
12	4,142	3,314	2,485	1,657
Total removals	68,053	54,443	40,832	27,221
Reduction in total removals (Effectiveness of closure)	49.2%	59.4%	69.5%	79.7%

2.1.2 Monthly reduction in total removals from commercial seasonal closure

Table 33. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.09	0.18	0.26	0.36	0.48	0.57	0.65	0.71	0.76	0.84	0.93	1.00
2		0.09	0.17	0.27	0.39	0.48	0.56	0.63	0.67	0.75	0.84	0.91
3			0.08	0.18	0.30	0.39	0.47	0.54	0.58	0.66	0.75	0.82
4				0.09	0.22	0.31	0.39	0.45	0.50	0.58	0.67	0.74
5					0.12	0.21	0.29	0.36	0.40	0.48	0.58	0.64
6						0.09	0.17	0.24	0.28	0.36	0.45	0.52
7							0.08	0.14	0.19	0.27	0.36	0.43
8								0.07	0.11	0.19	0.28	0.35
9									0.05	0.13	0.22	0.29
10										0.08	0.17	0.24
11											0.09	0.16
12												0.07

Table 34. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 59% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.05	0.11	0.16	0.21	0.28	0.34	0.38	0.42	0.45	0.50	0.55	0.59
2		0.05	0.10	0.16	0.23	0.29	0.33	0.37	0.40	0.45	0.50	0.54
3			0.05	0.11	0.18	0.23	0.28	0.32	0.35	0.39	0.45	0.49
4				0.06	0.13	0.18	0.23	0.27	0.30	0.34	0.40	0.44
5					0.07	0.13	0.17	0.21	0.24	0.29	0.34	0.38

Month	1	2	3	4	5	6	7	8	9	10	11	12
6						0.06	0.10	0.14	0.17	0.22	0.27	0.31
7							0.05	0.09	0.11	0.16	0.21	0.26
8								0.04	0.07	0.11	0.17	0.21
9									0.03	0.07	0.13	0.17
10										0.05	0.10	0.14
11											0.05	0.09
12												0.04

2.2 Recreational

Table 35. Commercial, headboat, and MRFSS (A+B1) landings in pounds whole weight.

Year	ALS	HB	MRFSS
1986	202,468	48,991	102,264
1987	176,866	73,728	120,427
1988	159,443	117,178	202,698
1989	241,755	63,779	242,157
1990	200,742	59,176	103,875
1991	132,881	64,891	118,480
1992	91,926	26,050	556,498
1993	204,283	38,484	127,557
1994	182,043	38,753	180,644
1995	166,342	51,778	59,463
1996	129,789	41,652	95,682
1997	102,111	46,130	80,095
1998	81,463	24,187	103,570
1999	85,786	39,241	152,641
2000	95,214	44,506	450,378
2001	178,579	61,607	318,580
2002	171,686	63,780	352,170
2003	146,579	37,255	233,616
2004	154,419	72,380	264,790
2005	118,924	52,878	236,294
2006	81,000	37,325	216,393
2007	91,475	0	266,008

2.2.1 Headboat

Six steps were taken to determine the effectiveness of a closure for the headboat fishery. Headboat data from 2001-2006 were examined to identify species most commonly caught on trips with red snapper by restricting trips to those that caught at least 1 of red snapper. Incidental catch during a seasonal closure was determined by identifying trips that caught co-occurring species; and calculating the catch of red snapper on those trips.

There is a possibility some trips would not be taken during a seasonal closure for species such as gag or vermilion snapper. However, it was assumed that there would not be any reduction in trips made if red snapper was closed. The ability to avoid red snapper was considered by adjusting values by 0 to 60% to account for fishermen's ability to avoid red snapper by changing hook size, location, and fishing methods. Dead discards were

determined by applying a 40% release mortality rate for red snapper (SEDAR 15 2008). Effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings. Effectiveness of a closure for red snapper could be increased by closing co-occurring species.

STEP 1 - Determine landings of red snapper during 2001-2006

Table 36. Landings of red snapper during 2001-2006 from headboat.

Month	tot ww	tot gw	avg gw
1	10,355	9,329	1,555
2	17,546	15,807	2,634
3	27,872	25,109	4,185
4	37,900	34,144	5,691
5	52,331	47,145	7,857
6	38,459	34,648	5,775
7	37,148	33,466	5,578
8	37,448	33,737	5,623
9	19,491	17,560	2,927
10	34,035	30,662	5,110
11	28,747	25,898	4,316
12	19,669	17,719	2,953
			54,204

STEP 2 - Identify most common species taken with red snapper

Table 37. Species most commonly taken on trips where at least 1 red snapper was caught. Represents sample (catch in numbers) during 2001-2005 not total catch.

Species	sum	Percent	Cum %
Vermilion Snapper	405,485	50.34%	50.34%
Black Sea Bass	98,090	12.18%	62.52%
Tomtate	48,416	6.01%	68.53%
White Grunt	31,711	3.94%	72.46%
Gray Triggerfish	27,885	3.46%	75.93%
Red Porgy	25,053	3.11%	79.04%
Red Snapper	20,870	2.59%	81.63%
Spottail Pinfish	20,388	2.53%	84.16%
Banded Rudderfish	11,744	1.46%	85.62%
Scamp	11,643	1.45%	87.06%
Mutton Snapper	10,955	1.36%	88.42%
Sharpnose Shark	10,893	1.35%	89.77%
Lane Snapper	8,367	1.04%	90.81%
Knobbed Porgy	7,954	0.99%	91.80%

STEP 3 – Identify trips that target co-occurring species.

Identify trips that caught of co-occurring species during a seasonal closure.

STEP 4 - Determine incidental catch.

This step determines the incidental catch red snapper during a seasonal closure. This step does not take into consideration trips that will not be taken during a closure or ability of fishermen to avoid red snapper.

Table 38. Incidental catch (numbers) of red snapper during a seasonal closure. Dead discards determined by applying 40% release mortality rate. Value represents sample, not total catch.

Species	sum	dead discards
Red Snapper	20,265	8,106

STEP 5 – Determine effectiveness of closure.
A comparison of the estimate of dead discards (8,106) in step 4 to sampled catch in step 2 (20,870) indicates during a complete prohibition in catch of red snapper by headboat 38.8% would be discarded and die due to incidental catch.

STEP 6 – Determine dead discards for reduced trips and behavior after quota. This step assumes that fishermen could have the ability to avoid red snapper by fishing differently.

Table 39. Dead discards (lbs gutted weight) of red snapper during a seasonal closure (Average 2001-2006). Dead discards determined by applying 40% release mortality rate. Assumes fishermen can avoid 0-60% of red snapper by fishing differently.

	Reduction			
Month	0%	20%	40%	60%
1	604	483	362	242
2	1,023	819	614	409
3	1,625	1,300	975	650
4	2,210	1,768	1,326	884
5	3,052	2,442	1,831	1,221
6	2,243	1,794	1,346	897
7	2,166	1,733	1,300	867
8	2,184	1,747	1,310	874
9	1,137	909	682	455
10	1,985	1,588	1,191	794
11	1,677	1,341	1,006	671
12	1,147	918	688	459
Number that die	21,053	16,843	12,632	8,421
Percent that live	61.2%	68.9%	76.7%	84.5%
Percent that die	38.8%	31.1%	23.3%	15.5%

2.2.2 Monthly reduction in total removals from headboat seasonal closure

Table 40. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.03	0.08	0.15	0.26	0.40	0.51	0.61	0.72	0.77	0.87	0.95	1.00
2		0.05	0.13	0.23	0.38	0.48	0.59	0.69	0.74	0.84	0.92	0.97
3			0.08	0.18	0.33	0.43	0.54	0.64	0.69	0.79	0.87	0.92
4				0.10	0.25	0.36	0.46	0.56	0.62	0.71	0.79	0.85
5					0.14	0.25	0.35	0.46	0.51	0.61	0.69	0.74

Month	1	2	3	4	5	6	7	8	9	10	11	12
6						0.11	0.21	0.31	0.37	0.46	0.54	0.60
7							0.10	0.21	0.26	0.35	0.43	0.49
8								0.10	0.16	0.25	0.33	0.39
9									0.05	0.15	0.23	0.28
10										0.09	0.17	0.23
11											0.08	0.13
12												0.05

Table 41. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 69% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.02	0.05	0.11	0.18	0.28	0.35	0.42	0.49	0.53	0.60	0.65	0.69
2		0.03	0.09	0.16	0.26	0.33	0.40	0.47	0.51	0.58	0.63	0.67
3			0.05	0.13	0.23	0.30	0.37	0.44	0.48	0.54	0.60	0.64
4				0.07	0.17	0.25	0.32	0.39	0.43	0.49	0.55	0.58
5					0.10	0.17	0.24	0.32	0.35	0.42	0.47	0.51
6						0.07	0.14	0.22	0.25	0.32	0.37	0.41
7							0.07	0.14	0.18	0.24	0.30	0.34
8								0.07	0.11	0.17	0.23	0.27
9									0.04	0.10	0.16	0.19
10										0.06	0.12	0.16
11											0.05	0.09

2.2.3 MRFSS

Six steps were taken to determine the effectiveness of a closure for the recreational (MRFSS) fishery. MRFSS data from 2001-2006 were examined to identify species most commonly caught on trips with red snapper by restricting trips to those that caught at least 1 red snapper. Incidental catch during a seasonal closure was determined by identifying trips that caught co-occurring species; and calculating the catch of red snapper on those trips.

There is a possibility some trips would not be taken during a seasonal closure for species such as gag or vermilion snapper. However, it was assumed that there would not be any reduction in trips made if red snapper was closed. The ability to avoid red snapper was considered by adjusting values by 0 to 60% to account for fishermen's ability to avoid red snapper by changing hook size, location, and fishing methods. Dead discards were determined by applying a 40% release mortality rate for red snapper (SEDAR 15 2008). Effectiveness of closure was determined by comparing the magnitude of dead discards to actual landings.

STEP 1 - Determine landings of red snapper during 2001-2006

Table 42. Landings of red snapper during 2001-2006 from MRFSS Web site.

Month	tot ww	tot gw	avg gw
1	135,745	122,292	20,382
2	135,745	122,292	20,382
3	182,995	164,860	27,477
4	182,995	164,860	27,477
5	187,118	168,574	28,096
6	187,118	168,574	28,096
7	109,456	98,609	16,435
8	109,456	98,609	16,435
9	114,634	103,273	17,212
10	114,634	103,273	17,212
11	170,176	153,312	25,552
12	170,176	153,312	25,552
			270,307

STEP 2 - Identify most common species taken with red snapper

Table 43. Species most commonly taken on trips where at least 1 red snapper was caught. Represents sample (A+B1 in numbers) during 2001-2005 not total catch.

Species	sum	percent	cum per
vermilion snapper	4,278	26.91%	26.91%
black sea bass	3,271	20.58%	47.49%
red snapper	1,300	8.18%	55.66%
white grunt	903	5.68%	61.34%
gray triggerfish	804	5.06%	66.40%
greater amberjack	386	2.43%	68.83%
red porgy	351	2.21%	71.04%
Gag	345	2.17%	73.21%
Tomtate	341	2.15%	75.35%
king mackerel	335	2.11%	77.46%

Species	sum	percent	cum per
gray snapper	330	2.08%	79.54%
atlantic sharpnose shark	308	1.94%	81.47%
round scad	297	1.87%	83.34%
Scamp	210	1.32%	84.66%
lane snapper	209	1.31%	85.98%
Dolphin	198	1.25%	87.22%
spanish sardine	171	1.08%	88.30%
spottail pinfish	142	0.89%	89.19%
red grouper	126	0.79%	89.99%
almaco jack	109	0.69%	90.67%

STEP 3 – Identify trips that target co-occurring species.
Identify trips that caught of co-occurring species during a seasonal closure.

STEP 4 - Determine incidental catch.
This step determines the incidental catch red snapper during a seasonal closure. This step does not take into consideration trips that will not be taken during a closure or ability of fishermen to avoid red snapper.

Table 44. Incidental catch (numbers) of red snapper during a seasonal closure. Dead discards determined by applying 40% release mortality rate. Value represents sample, not total catch.

Species	sum	dead discards
Red Snapper	1,166	466.4

STEP 5 – Determine effectiveness of closure.
A comparison of the estimate of dead discards (466) in step 4 to sampled catch in step 2 (1,300) indicates during a complete prohibition in catch of red snapper by recreational fishermen 35.9% could still die when due to incidental catch.

STEP 6 – Determine dead discards for reduced trips and behavior after quota. This step assumes that fishermen could have the ability to avoid red snapper by fishing differently.

Table 45. Dead discards (lbs gutted weight) of red snapper during a seasonal closure (Average 2001-2006). Dead discards determined by applying 40% release mortality rate. Assumes fishermen can avoid 0-60% of red snapper by fishing differently.

	Reduction			
Month	0%	20%	40%	60%
1	7,312	5,850	4,387	2,925
2	7,312	5,850	4,387	2,925
3	9,858	7,886	5,915	3,943
4	9,858	7,886	5,915	3,943
5	10,080	8,064	6,048	4,032
6	10,080	8,064	6,048	4,032
7	5,896	4,717	3,538	2,359
8	5,896	4,717	3,538	2,359
9	6,175	4,940	3,705	2,470
10	6,175	4,940	3,705	2,470

11	9,167	7,334	5,500	3,667
12	9,167	7,334	5,500	3,667
Number that die	96,978	77,582	58,187	38,792
Percent that live	64.1%	71.3%	78.5%	85.6%
Percent that die	35.9%	28.7%	21.5%	14.4%

2.2.4 Monthly reduction in total removals from MRFSS seasonal closure

Table 46. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 100% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.08	0.15	0.25	0.35	0.46	0.56	0.62	0.68	0.75	0.81	0.91	1.00
2		0.08	0.18	0.28	0.38	0.49	0.55	0.61	0.67	0.74	0.83	0.92
3			0.10	0.20	0.31	0.41	0.47	0.53	0.60	0.66	0.75	0.85
4				0.10	0.21	0.31	0.37	0.43	0.49	0.56	0.65	0.75
5					0.10	0.21	0.27	0.33	0.39	0.46	0.55	0.65
6						0.10	0.16	0.23	0.29	0.35	0.45	0.54
7							0.06	0.12	0.19	0.25	0.34	0.44
8								0.06	0.12	0.19	0.28	0.38
9									0.06	0.13	0.22	0.32
10										0.06	0.16	0.25
11											0.09	0.19
12												0.09

Table 47. Monthly reduction in take based on 2001-2006 data if a seasonal closure is 71.3% effective.

Month	1	2	3	4	5	6	7	8	9	10	11	12
1	0.05	0.11	0.18	0.25	0.33	0.40	0.44	0.49	0.53	0.58	0.65	0.71
2		0.05	0.13	0.20	0.27	0.35	0.39	0.43	0.48	0.52	0.59	0.66
3			0.07	0.14	0.22	0.29	0.34	0.38	0.43	0.47	0.54	0.61
4				0.07	0.15	0.22	0.26	0.31	0.35	0.40	0.47	0.53
5					0.07	0.15	0.19	0.23	0.28	0.33	0.39	0.46
6						0.07	0.12	0.16	0.21	0.25	0.32	0.39
7							0.04	0.09	0.13	0.18	0.24	0.31
8								0.04	0.09	0.13	0.20	0.27
9									0.05	0.09	0.16	0.23
10										0.05	0.11	0.18
11											0.07	0.13
12												0.07

2.3 Reduction in total removals from prohibition in catch of red snapper

Methodology is similar to determining effectiveness of seasonal closure with exception that reductions are applied to landings and discards in numbers for the sectors.

STEP 1 - Determine landings in numbers for red snapper during 2001-2006 using information from SEDAR 15 (2008).
STEP 2 – Determine average landings in lbs from logbook and average sampled landings from Headboat and MRFSS in numbers for 2001-2006.

STEP 3 - Identify most common species taken with red snapper.

- Logbook data from 2001-2006 were examined to identify species most commonly caught on trips with red snapper by restricting trips to those that caught at least 1 lb of red snapper.
- Headboat and MRFSS data from 2001-2006 were examined to identify species most commonly caught on trips with red snapper by restricting trips to those that caught at least 1 red snapper.

STEP 4 – Identify trips that target co-occurring species.

STEP 5 - Determine incidental catch.

- For the commercial sector, incidental catch during a seasonal closure was determined by identifying trips that targeted (caught at least 100 lbs) of co-occurring species; and calculating the catch of red snapper on those trips. Trips targeting red snapper were removed from analyses assuming that targeting would not occur in the future. A trip would be considered to be targeting red snapper if greater than 300 lb whole weight of the landings on a trip included the species. In addition, trips that employed diving gear, were not considered in analyses since fishermen can recognize a species before it is captured.
- For the recreational sector, incidental catch during a seasonal closure was determined by identifying trips that caught co-occurring species; and calculating the catch of red snapper on those trips.

STEP 6 – Determine total removals for reduced trips and behavior after quota. This step assumes that fishermen could have the ability to avoid red snapper by fishing differently.

STEP 7 – Compare estimate of total removals in step 6 to landings for database in step 2.

STEP 8 – Apply reduction in total removals to landings and discards in step 1.

The SEDAR 15 (2008) stock assessment and an addendum to the stock assessment provides the number of dead discards that could be taken and allow the stock to rebuild if there was no allowable catch. The initial values for 2009 are 37,000 individuals at Frebuild and 21,000 individuals at F40% (Table 48).

Table 48. Allowable discards during initial part of rebuilding schedule needed to rebuild red snapper.

Year	Frebuild[1]	F40%[2]	75%F40[2]
2009	37,000	21,000	16,000
2010	49,000	28,000	21,000
2011	86,000	36,000	28,000
2012	122,000	47,000	36,000
2013	167,000	57,000	44,000

1. SEDAR 15 (2008)
2. Addendum to SEDAR 15 (2008)

Table 49 indicates the average catch of red snapper during 2004-2006 was 53,296 individuals and the total number of discards (live and dead) was 204,670. If all catch of red snapper was prohibited and there was no reduction in fishing effort the total removals, which would be dead discards, would be 116,948 individuals.

Table 49. Number of red snapper landed and discarded by sector during 2001-2006 and number of dead discards that would occur if all catch of red snapper was prohibited.

Item	Comm	MRFSS	HB	Total
Current landings	11,525	33,207	8,565	53,296
Current discards	16,000	150,113	38,557	204,670
Current landings and all discards	27,524	183,320	47,121	257,966
Dead discards	24,772	73,328	18,849	116,948

Although a large number of red snapper are probably taken when targeting co-occurring species, there is probably some degree of targeting. If one assumes that during a closure red snapper are only taken when targeting major co-occurring species, some trips will not be taken during a seasonal closure for gag, and fishermen have some ability to avoid red snapper by avoiding locations and changing fishing gear, an estimate of the number of dead discards is 41,320 (Table 50).

Table 50. Current total removals (landings and dead discards) of red snapper by sector in number during 2004-2006, total removals (number) assuming fishermen cannot avoid red snapper incidental catch, and reduction in total removals assuming fishermen can avoid 20% of red snapper incidental catch.

Item	Comm	MRFSS	HB	Total
Current landings and dead discards	25,924	93,252	23,987	143,164
Dead discards assuming 0% avoidance	7,448	33,974	9,595	51,016
Dead discards assuming 20% avoidance	5,958	27,179	7,676	40,813

2.4 Reduction in total removals from prohibition in catch of red snapper considering Jan-April closure for shallow water grouper species

The preferred alternative in Amendment 16 would establish a January through April closure for gag and other shallow water groupers. Furthermore, a quota would be established for gag and all shallow water groupers would be closed when the quota was met. Based on recent landings, it is expected a gag quota would be met in November and the commercial fishery for shallow water groupers would be closed during December.

Since red snapper is taken on trips with gag and other shallow water groupers including red grouper and scamp, any closure of shallow water grouper would be expected to reduce the magnitude of red snapper discards.

Table 51. Current total removals (landings and dead discards) of red snapper by sector in number during 2004-2006, total removals (number) assuming fishermen cannot avoid red snapper incidental catch, and reduction in total removals assuming fishermen can avoid 20% of red snapper incidental catch. This assumes there would be a January-April seasonal closure for gag and other shallow water groupers 20% of the trips would not be made during seasonal closures.

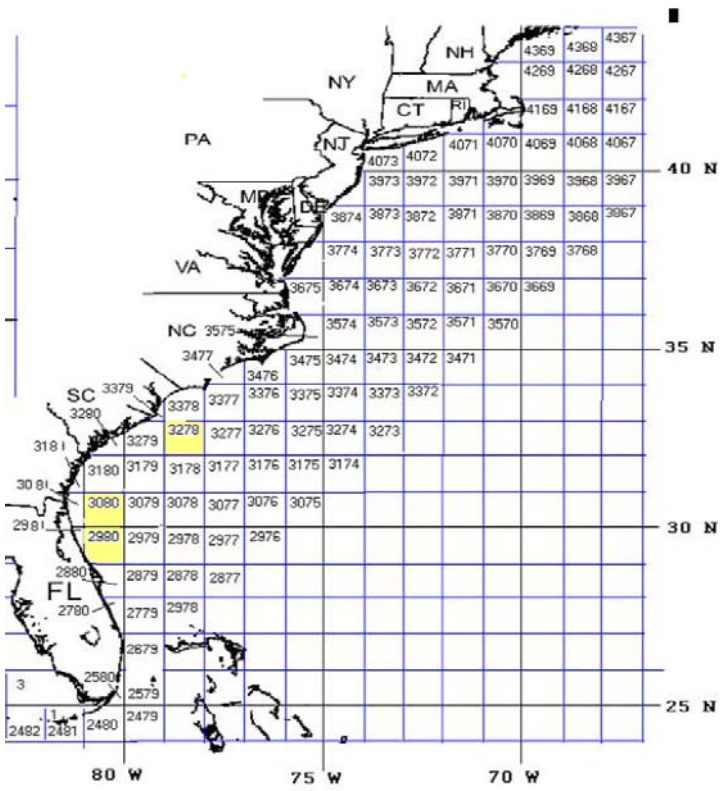
Item	Comm	MRFSS	HB	Total
Current landings and dead discards	25,924	93,252	23,987	143,164
Dead discards assuming 0% avoidance	5,957	31,670	9,595	47,222
Dead discards assuming 20% avoidance	4,766	25,337	7,676	37,778

2.5 Locations where red snapper are caught

2.5.1 Commercial

Table 52. Commercial landings (pounds whole weight) of red snapper by statistical grid 2001-2006. Shaded area represents locations where 53% of the red snapper were caught.

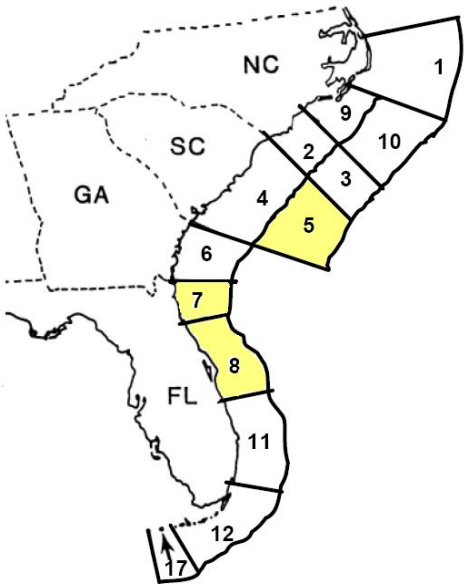
Grid	Average	2001-06	Percent
2479	6	37	0.00%
2480	485	2,912	0.36%
2481	1,054	6,323	0.79%
2482	1,490	8,941	1.12%
2579	104	621	0.08%
2580	192	1,153	0.14%
2679	347	2,084	0.26%
2680	24	145	0.02%
2779	210	1,257	0.16%
2780	450	2,698	0.34%
2878	13	80	0.01%
2879	1,198	7,187	0.90%
2880	5,813	34,880	4.36%
2978	39	235	0.03%
2979	253	1,520	0.19%
2980	23,489	140,932	17.63%
2981	499	2,995	0.37%
3076	89	535	0.07%
3079	1,333	8,000	1.00%
3080	33,068	198,408	24.83%
3081	5,282	31,694	3.97%
3174	2	13	0.00%
3175	28	167	0.02%
3177	411	2,467	0.31%
3178	550	3,299	0.41%
3179	11,234	67,402	8.43%
3180	6,469	38,816	4.86%
3181	31	189	0.02%
3275	5	32	0.00%
3276	101	606	0.08%
3277	334	2,005	0.25%
3278	13,375	80,250	10.04%
3279	10,221	61,327	7.67%
3280	781	4,684	0.59%
3372	11	66	0.01%
3374	27	164	0.02%
3375	132	789	0.10%
3376	556	3,334	0.42%
3377	3,767	22,604	2.83%
3378	9,494	56,963	7.13%
3379	231	1,385	0.17%
3471	1	9	0.00%
3472	112	675	0.08%
3473	1	9	0.00%
3474	695	4,172	0.52%
3475	142	851	0.11%
3476	7,092	42,553	5.32%
3477	972	5,835	0.73%
3571	14	87	0.01%
3572	242	1,451	0.18%
3573	59	355	0.04%
3574	2,821	16,929	2.12%
3575	98	591	0.07%
3576	1	3	0.00%
3674	3	16	0.00%
		799,207	



2.5.2 Headboat

Table 53. Headboat landings (pounds whole weight) of red snapper by area code 2001-2006. Shaded area represents locations where 74% of the red snapper were caught.

Area Code	Description	Average	2001-2006	Percentage
3	CAPE FEAR, NC (OFFSHORE) TOPSAIL ISLAND - OCEAN ISLE BEACH, NC	1,957	11,742	3.25%
4	SOUTH CAROLINA (INSHORE)	1,409	8,454	2.34%
5	SOUTH CAROLINA (OFFSHORE)	12,660	75,962	21.04%
6	GEORGIA	5,627	33,759	9.35%
7	FERNANDINA BEACH -ST. AUGUSTINE, FL	14,250	85,498	23.68%
8	DAYTONA BEACH - SEBASTIAN, FL	17,375	104,250	28.88%
9	CAPE LOOKOUT (INSHORE) MOREHEAD CITY - SNEADS FERRY, NC	44	262	0.07%
10	CAPE LOOKOUT (OFFSHORE) MOREHEAD CITY - SNEADS FERRY, NC	4,878	29,268	8.11%
11	FORT PIERCE - MIAMI, FL	1,706	10,238	2.84%
12	KEY LARGO - KEY WEST, FL	135	807	0.22%
17	DRY TORTUGAS, FLORIDA (Vessels docked in FL Keys)	127	760	0.21%
			361,000	



2.5.3 MRFSS

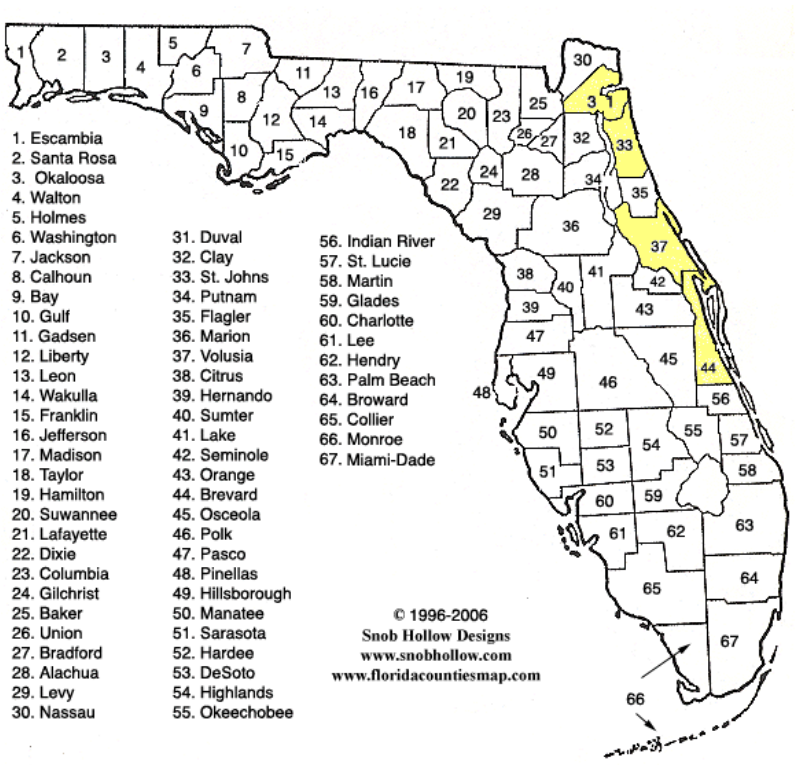
Table 54. Locations where red snapper where caught during 2001-2005. Represents sample and not adjusted for effort. Shaded area represents locations where 69% of the red snapper were taken.

East FL Counties	unadjusted number	percent
Dade	3.17	0.61%
Broward	0	0.00%
Palm Beach	2.7	0.52%
Martin	4.75	0.92%
St. Lucie	6.88	1.33%
Indian River	7.67	1.49%
Brevard	59.1	11.45%
Volusia	123.03	23.83%
St. Johns	58.87	11.40%
Duval	61.1	11.84%
Nassau	4.53	0.88%

Georgia	unadjusted number	percent
Bryan	0	0.00%
Camden	1	0.19%
Clay	45.9	8.89%
Glynn	14.48	2.80%
Early	0.2	0.04%
McIntosh	0	0.00%

South Carolina	unadjusted number	percent
Beaufort	5	0.97%
Charleston	5.85	1.13%
Georgetown	53.27	10.32%
Horry	16.33	3.16%

North Carolina	unadjusted number	percent
Brunswick	1.53	0.30%
Carteret	35.47	6.87%
Dare	0.5	0.10%
Davie	4.9	0.95%
	516.23	



2.6 Reduction in total removals from prohibition in catch of red snapper considering Jan-April closure for shallow water grouper species and closure of areas of greatest red snapper catch

The preferred alternative in Amendment 16 would establish a January through April closure for gag and other shallow water groupers. Furthermore, a quota would be

established for gag and all shallow water groupers would be closed when the quota was met. Based on recent landings, it is expected a gag quota would be met in November and the commercial fishery for shallow water groupers would be closed during December.

Since red snapper is taken on trips with gag and other shallow water groupers including red grouper and scamp, any closure of shallow water grouper would be expected to reduce the magnitude of red snapper discards. Furthermore, a closure of areas where greatest catches of red snapper occur (see Section 2.5) by commercial, MRFSS, and headboat fishermen would further reduce the magnitude of dead discards.

Table 55. Current total removals (landings and dead discards) of red snapper by sector in number during 2004-2006, total removals (number) assuming fishermen cannot avoid red snapper incidental catch, and reduction in total removals assuming fishermen can avoid 20% of red snapper incidental catch. This assumes there would be a January-April seasonal closure for gag and other shallow water groupers 20% of the trips would not be made during seasonal closures. Also assumes areas of greatest catch (> 10%) in commercial, MRFSS, and headboat would be closed to all fishing.

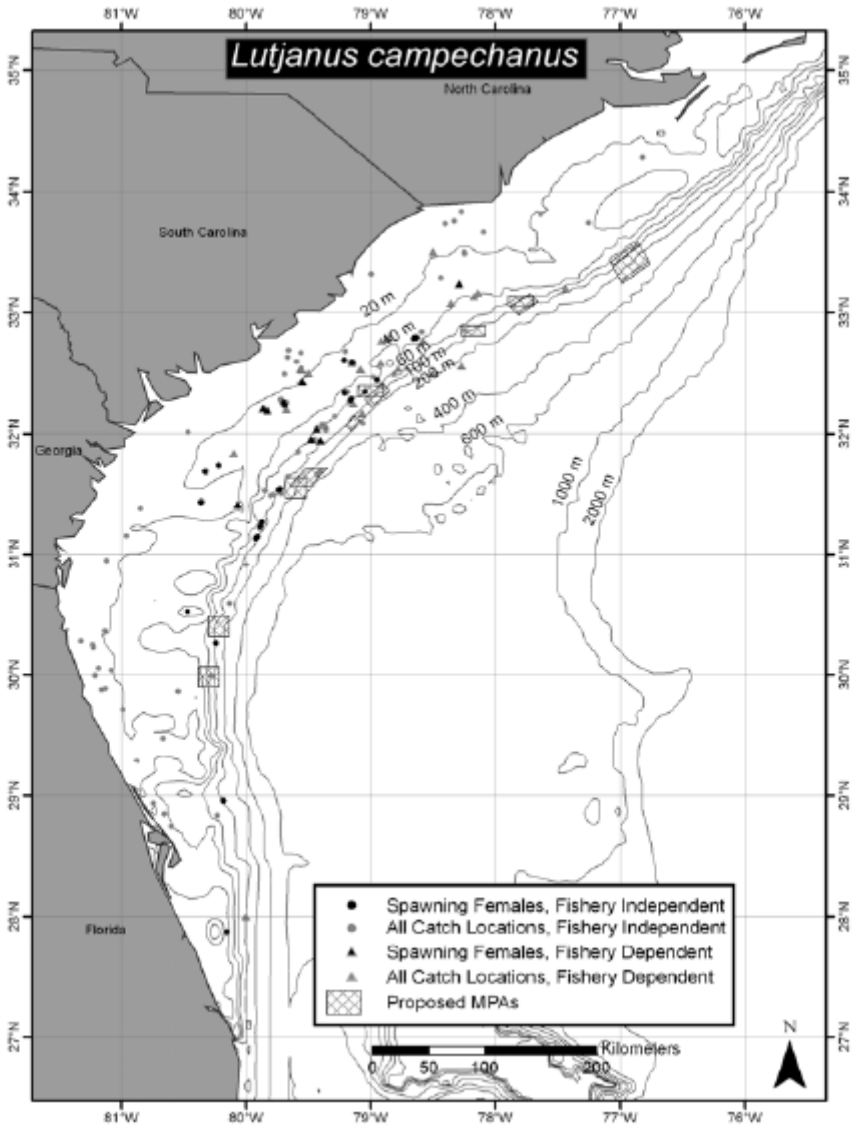
Item	Comm	MRFSS	HB	Total
Current landings and all discards	27,524	183,320	47,121	257,966
Dead discards	24,772	73,328	18,849	116,948
Current landings and dead discards	25,924	93,252	23,987	143,164
Dead discards assuming 0% avoidance	3,778	12,540	1,482	17,801
Dead discards assuming 20% avoidance	3,023	10,032	1,186	14,241

3 Commercial Trip Limit Analysis

Table 56. Trip limit analysis for red snapper data from 2001-2006.

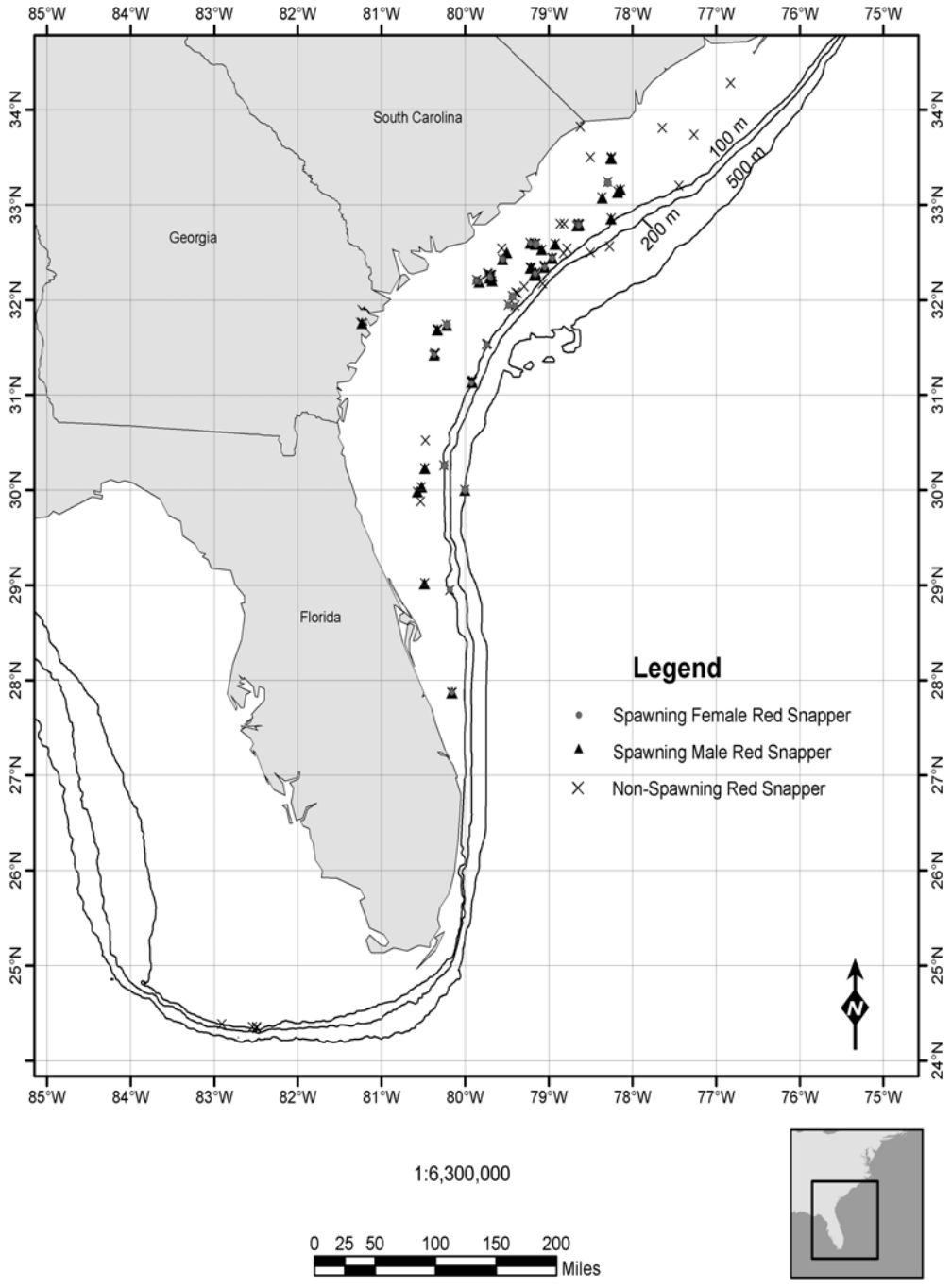
Avg 2001-2006					
Trip Limit (lbs gutted weight)	Avg no. trips	Avg pounds over limit	Expected catch	% trips over limit	% reduction in catch from limit
0	1,751.2	148,689	0	100.0%	100.0%
23	1,028.7	113,738	34,952	58.7%	76.5%
45	689.5	92,679	56,010	39.4%	62.3%
68	505.7	77,849	70,840	28.9%	52.4%
90	386.7	66,826	81,863	22.1%	44.9%
135	256.7	51,019	97,671	14.7%	34.3%
225	136.8	32,205	116,484	7.8%	21.7%
270	102.7	26,241	122,448	5.9%	17.6%
450	41.3	12,926	135,763	2.4%	8.7%
541	26.7	9,568	139,122	1.5%	6.4%
631	17.7	7,329	141,360	1.0%	4.9%
721	12.7	5,805	142,885	0.7%	3.9%
811	9.8	4,675	144,014	0.6%	3.1%
901	7.7	3,793	144,896	0.4%	2.6%
991	5.8	3,145	145,544	0.3%	2.1%
1,081	4.3	2,650	146,039	0.2%	1.8%
1,171	3.3	2,278	146,411	0.2%	1.5%
1,261	2.8	1,965	146,724	0.2%	1.3%
1,351	2.2	1,732	146,957	0.1%	1.2%
1,441	1.8	1,533	147,156	0.1%	1.0%
1,532	1.8	1,350	147,339	0.1%	0.9%
1,622	1.5	1,193	147,496	0.1%	0.8%
1,712	1.2	1,048	147,641	0.1%	0.7%
1,802	1.2	932	147,758	0.1%	0.6%
2,027	0.8	695	147,994	0.0%	0.5%
2,252	0.5	513	148,177	0.0%	0.3%
2,477	0.3	394	148,296	0.0%	0.3%
2,703	0.3	310	148,379	0.0%	0.2%
2,928	0.2	258	148,431	0.0%	0.2%
3,153	0.2	217	148,472	0.0%	0.1%
3,378	0.2	175	148,514	0.0%	0.1%
3,604	0.2	133	148,556	0.0%	0.1%
3,829	0.2	92	148,597	0.0%	0.1%
4,054	0.2	50	148,639	0.0%	0.0%
4,279	0.2	8	148,681	0.0%	0.0%
4,505	0.0	0	148,689	0.0%	0.0%

4 Spawning locations for red snapper



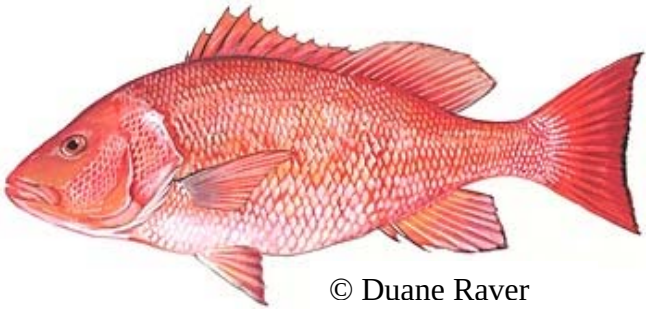
From Sedberry et al. (2006)

5 LOCATIONS WHERE RED SNAPPER WERE COLLECTED



6 SPECIES DESCRIPTIONS OF RED SNAPPER

The red snapper is found from North Carolina to the Florida Keys, and throughout the Gulf of Mexico to the Yucatan (Robins and Ray 1986). It can be found at depths from 10 to 190 m (33-623 ft). Adults usually occur over rocky bottoms. Juveniles inhabit shallow waters and are common over sandy or muddy bottom habitat (Allen 1985).



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The maximum size reported for this species is 100 cm (39.7 in) TL (Allen 1985, Robins and Ray 1986) and 22.8 kg (50 lbs) (Allen 1985). Maximum reported age in the Gulf of Mexico is reported as 53 years by Goodyear (1995) and 57 years by Allman et al. (2002). For samples collected from North Carolina to eastern Florida, maximum reported age is 45 years (White and Palmer 2004). McInerny (2007) reports a maximum age of 54 years red snapper in the South Atlantic. Natural mortality (M) is estimated to be 0.078 using the Hoenig (1983) method with a maximum age of 53 years (SEDAR 15 2008). Manooch et al. (1998) estimated M at 0.25 but the maximum age in their study was 25 years (Manooch and Potts 1997).

Red snapper are gonochorists. In the U.S. South Atlantic Bight and in the Gulf of Mexico, Grimes (1987) reported that size at first maturity is 23.7 cm (9.3 in) FL. For red snapper collected along the Southeastern United States, White and Palmer (2004) found that the smallest mature male was 20.0 cm (7.9 in) TL, and the largest immature male was 37.8 cm (15 in) TL. 50% of males are mature at 22.3 cm (8.8 in) TL, while 50% of females are mature at 37.8 cm (15 in) TL. Males are present in 86% of age 1, 91% of age 2, 100% of age 3, 98% of age 4, and 100% of older age fish. Mature females are present in 0% of age 1, 53% of age 2, 92% of age 3, 96% of age 4, and 100% of older age individuals. Grimes (1987) found that the spawning season of this species varies with location, but in most cases occurs nearly year round. White and Palmer (2004) reported that the spawning season for female red snapper off the southeastern United States extends from May to October, peaking in July through September. Red snapper eat fishes, shrimps, crabs, worms, cephalopods, and some planktonic items (Szedlemayr and Lee 2004).

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