Appendix R.

1 Bycatch Practicability

1.1 Population Effects for the Bycatch Species

Background

Amendment 17A includes alternatives for management measures that could prohibit fishing for or retention of all snapper grouper species in areas off of north Florida and Georgia to end overfishing of red snapper by reducing the incidental catch of the species. Snapper grouper species commonly taken with red snapper could be affected by the action. Furthermore, proposed actions in Amendment 17A include provisions, which would allow fishing with spearfish gear, black sea bass pots, and bottom longline. Therefore, in addition to species that co-occur with red snapper, species such as golden tilefish and snowy grouper that commonly occur in deeper water could be affected by the proposed actions.

The directed commercial fishery for red snapper and it's top co-occurring species (vermilion snapper, gag, scamp, greater amberjack, gray triggerfish, black sea bass, and red grouper is executed primarily with hook and line gear (Table 1). Black sea bass are predominantly taken with pots; whereas, longline gear has been the predominant gear type used to capture golden tilefish.

Table 1. Percentage of commercial catch by gear based on data from 2005-2008.

Species	H&L	Diving	LL	Pot	Other
Red Snapper	92.56%	5.95%	0.58%	0.01%	0.91%
Gag	94.85%	3.62%	1.31%	0.02%	0.20%
Black sea bass	11.07%	0.01%	0.01%	88.81%	0.10%
Vermilion snapper	99.75%	0.05%	0.05%	0.10%	0.05%
Red grouper	76.53%	1.30%	21.75%	0.20%	0.23%
Scamp	94.85%	3.62%	1.31%	0.02%	0.20%
Greater amberjack	90.06%	6.87%	1.11%	0.00%	1.97%
Gray triggerfish	96.26%	0.63%	1.13%	1.77%	0.22%
Snowy grouper	73.55%	0.00%	26.25%	0.01%	0.19%
Golden tilefish	10.03%	0.00%	89.61%	0.00%	0.35%

Source: NMFS SEFSC Logbook Program.

Landings during 2005-2008 were split fairly evenly between commercial and recreational sources for red grouper, gag, greater amberjack, and gray triggerfish (Table 2). In previous years, the catch of vermilion snapper was dominated by commercial landings (~68%). The commercial sector dominated landings of golden tilefish, snowy grouper, and scamp; whereas, red snapper and black sea bass landings were most abundant in the recreational sector.

Table 2. Landings (lbs whole weight) during 2005-2008 for commercial (ALS), headboat (HB), MRFSS, and HB MRFSS combined. Commercial landings include all of Monroe County, FL; MRFSS landings do not include Monroe County, FL.

Species	Commercial	HB	MRFSS	HB/MRFSS

Red Snapper	143,029	93,894	539,640	633,534
Gag	634,628	63,470	375,349	438,819
Black sea bass	453,254	153,774	647,776	801,550
Vermilion snapper	1,050,800	407,322	321,564	728,886
Red grouper	508,490	64,382	539,640	604,022
Scamp	327,480	62,684	98,738	161,422
Greater amberjack	826,346	65,865	792,826	858,691
Gray triggerfish	317,582	95,354	317,398	412,752
Snowy grouper	193,962	671	60,113	60,784

Management measures proposed in Amendment 17A would establish ACLs and AMs, modify management measures to reduce harvest to achieve ACLs and ACTs, and establish a rebuilding plan for red snapper. These alternatives are described in detail in **Sections 2.0** and **4.0**.

Commercial Fishery

During 2004 to 2008, approximately 20% of snapper grouper permitted vessels from the Gulf of Mexico and South Atlantic were randomly selected to fill out supplementary logbooks. The average number of trips per year during 2005 to 2008 was 14,005 (Table 3). Fishermen spent an average of 1.69 days at sea per trip.

Table 3. Snapper grouper fishery effort for South Atlantic.

Year	Trips	Days	Days per Trip
2005	13,783	22,876	1.66
2006	13,273	23,335	1.76
2007	14,835	24,446	1.65
2008	14,127	23,898	1.69
Mean	14,005	23,639	1.69

Source: NMFS SEFSC Logbook Program.

For species in Snapper Grouper Amendment 17A, the number of trips that reported discards was greatest for vermilion snapper and scamp, followed by red grouper, gag, and black sea bass (Table 4). The average percentage of trips that reported discards was 5.35% for vermilion snapper, 4.80% for scamp, 3.52% for red grouper, and 2.67% for black sea bass (Table 5). During 2005-2008, the average number of individuals discarded per trip was greatest for vermilion snapper (63), followed by black sea bass (47) (Table 6).

Since the discard logbook database represents a sample, data were expanded to estimate the number of discard fish in the whole fishery (Table 7). The method for expansion was to: (1) estimate the probability of discarding a species; (2) estimate the number of fish discarded per trip; and (3) estimate the number discarded in the whole fishery (total discarded = total trips * % trips discarding * discard number). The 50 most commonly discarded species by the commercial sector is presented in Table 8.

Table 4. Annual number of trips reporting discard of Amendments 17A species.
Source: NMFS SEFSC Logbook Program.

Year	Red grouper	Black grouper	Vermilion snapper	Gag	Red snapper	Golden tilefish	Snowy grouper	Black sea bass	Greater amberjack	Gray triggerfish	Scamp
2005	118	115	78	64	29	0	8	54	30	10	104
2006	74	44	96	23	28	0	1	54	19	2	77
2007	143	82	158	88	58	1	10	55	56	10	148
2008	110	96	472	221	180	1	29	215	130	98	370
Mean	111.3	84.3	201.0	99.0	73.8	0.5	12.0	94.5	58.8	30.0	174.8

Table 5. Percentage of trips that discarded Amendments 17A species.

Year	Red grouper	Black grouper	Vermilion snapper	Gag	Red snapper	Golden tilefish	Snowy grouper	Black sea bass	Greater amberjack	Gray triggerfish	Scamp
2005	5.00	4.87	3.31	2.71	1.23	0.00	0.34	2.29	1.27	0.42	4.41
2006	3.78	2.25	4.91	1.18	1.43	0.00	0.05	2.76	0.97	0.10	3.93
2007	2.99	1.72	3.31	1.84	1.21	0.02	0.21	1.15	1.17	0.21	3.10
2008	2.30	2.01	9.88	4.62	3.77	0.01	0.61	4.50	1.56	1.18	7.74
Mean	3.52	2.71	5.35	2.59	1.91	0.01	0.30	2.67	1.24	0.48	4.80

Source: NMFS SEFSC Logbook Program.

Table 6. Average number (unexpanded) of Amendments 17A species.

Year	Red grouper	Black grouper	Vermilion snapper	Gag	Red snapper	Golden tilefish	Snowy grouper	Black sea bass	Greater amberjack	Gray triggerfish	Scamp
2005	4.9	6.6	62.9	6.1	22.7	0.0	3.8	21.4	5.8	12.1	8.1
2006	7.1	4.6	45.5	2.9	9.8	0.0	1.0	21.6	5.3	5.5	11.6
2007	6.0	3.0	62.8	4.8	24.0	2.0	2.2	57.0	7.5	11.2	10.2
2008	4.4	3.8	81.6	8.5	20.8	2.0	6.9	87.7	8.0	13.0	9.5
Mean	5.6	4.5	63.2	5.6	19.3	1.0	3.5	46.9	6.6	10.5	9.8

Source: NMFS SEFSC Logbook Program.

Table 7. Expanded number of discarded Amendments 17A species.

Year	Red grouper	Black grouper	Vermilion snapper	Gag	Red snapper	Golden tilefish	Snowy grouper	Black sea bass	Greater amberjack	Gray triggerfish	Scamp
2005	3,389	4,458	28,647	2,290	3,850	0	175	6,760	1,011	707	4,902
2006	3,540	1,377	29,646	448	1,852	0	7	7,929	685	75	6,036
2007	2,676	767	30,778	1,301	4,315	6	68	9,725	1,301	348	4,694
2008	1,493	1,136	119,568	5,845	11,604	3	624	58,511	1,767	2,159	10,930
Mean	2,775	1,934	52,160	2,471	5,405	2	219	20,731	1,191	822	6,640

Table 8. The 50 most commonly discarded species during 2005-2008 for the South Atlantic.

Species	Number of trips reported discarding the species	Number discarded
RED PORGY	1,027	106,888
SNAPPER,VERMILION	831	58,956
SHARK,UNC	383	26,882
BLACK SEA BASS	394	24,682
SNAPPER,YELLOWTAIL	1,539	15,764
SHARK,DOGFISH,SPINY	63	12,870
SCAMP	706	6,793
SNAPPER,RED	298	6,068
KING MACKEREL	1,052	5,688
SNAPPER, GRAY	273	4,730
TUNA,LITTLE (TUNNY)	121	4,092
MENHADEN	46	3,400
SHARK,DOGFISH,UNC	52	3,397
SHARK,ATLANTIC SHARPNOSE	151	3,304
PINFISH,SPOTTAIL	96	3,203
GROUPER,GAG	404	2,820
BLUEFISH	62	2,582
GROUPER,RED	451	2,466
SCUPS OR PORGIES,UNC	54	2,154
SHARK,DOGFISH,SMOOTH	31	2,136
GRUNTS	135	2,092
SHARK,BLACKTIP	155	2,080
BLUE RUNNER	232	1,776
AMBERJACK,GREATER	235	1,736
SHARK,SANDBAR	114	1,715
GRAY TRIGGER FISH	129	1,597
GROUPER,BLACK	340	1,592
SHARK,TIGER	110	1,492
GRUNT,TOMTATE	15	1,323
GRUNT,WHITE	83	1,188
SNAPPER,MUTTON	191	897
DOLPHINFISH	157	786
AMBERJACK	156	776
BONITO,ATLANTIC	154	762
REMORA	227	731
HIND,SPECKLED	101	688
BARRACUDA	55	626
BALLYHOO	18	600
SNAPPERS,UNC	21	506
FINFISHES,UNC FOR FOOD	68	478
TRIGGERFISHES	79	470
SNAPPER,LANE	53	385

Species	Number of trips reported discarding the species	Number discarded
GROUPERS	52	365
SPANISH MACKEREL	78	345
SHARK,CARIBBEAN SHARPNOSE	8	334
RAYS,UNC	44	320
STINGRAYS	28	305
NEEDLEFISH,ATLANTIC	71	297
CERO	95	285

Recreational Fishery

For the recreational fishery, estimates of the number of recreational discards are available from MRFSS and the NMFS headboat survey. The MRFSS system classifies recreational catch into three categories:

- Type A - Fishes that were caught, landed whole, and available for identification and enumeration by the interviewers.
- Type B - Fishes that were caught but were either not kept or not available for identification:
    - Type B1 - Fishes that were caught and filleted, released dead, given away, or disposed of in some way other than Types A or B2.
    - Type B2 - Fishes that were caught and released alive.

For species in Snapper Grouper Amendment 17A, the number of released fish was greatest for black sea bass (12,155,946), followed by red snapper (1,119,080), vermilion snapper (782,111), and gag (631,667) (Table 9). During 2005-2008, 86% black grouper, 84% red snapper, 82% black sea bass, and 79% gag were released by recreational fishermen (Table 9).

Table 9. Estimated number total catch (A+B1+B2), harvests (A+B1), and released (B2) fish in numbers for the South Atlantic during 2005-2008.

Species	Total	A+B1	B2	% B2
Vermilion Snapper	1,867,502	1,085,391	782,111	42
Gag	799,283	167,616	631,667	79
Red Grouper	599,114	235,959	363,155	61
Black grouper	89,144	12,499	76,645	86
Red Snapper	1,333,800	214,720	1,119,080	84
Golden Tilefish	86,228	85,192	1,036	1
Snowy Grouper	34,770	29,963	4,807	14
Black Sea Bass	14,741,374	2,585,428	12,155,946	82
Scamp	107,437	66,393	41,044	38
Greater Amberjack	293,793	146,189	147,604	50
Gray Triggerfish	1,340,620	585,867	754,753	56

Source: MRFSS Web Site.

For species in Snapper Grouper Amendments 17A, black sea bass, followed by red snapper and vermilion snapper were most often discarded by headboat fishermen during 2005-2008 (Table 10). Golden tilefish were not harvested or discarded by headboat fishermen during 2005-2008.

Table 10. Total fish released alive or dead on sampled headboat trips during 2005-2008. Release mortality rates used to estimate dead discards are: 15% black sea bass; 38% vermilion snapper; 25% gag; 25% scamp; 20% black grouper; 20% red grouper; 20% greater amberjack; 0% gray triggerfish; 40% red snapper; and 100% snowy grouper and golden tilefish. Dead discards = (no. released alive * % release mortality rate) + no. released dead.

Species	released alive	mean#/trip	released dead	mean#/trip	#trips alive	# trips dead	dead discards
Red Snapper	159,491	24.00	2,695	0.41	6,645	6,642	66,491
Gag	12,851	1.83	252	0.04	7,015	7,011	3,465
Black sea bass	480,079	38.05	13,032	1.03	12,616	12,613	85,044
Vermilion snapper	56,434	6.63	14,354	1.69	8,515	8,510	35,799
Red grouper	15,743	2.81	217	0.04	5,612	5,609	6,514
Black grouper	2,163	1.16	33	0.02	1,868	1868	466
Scamp	13,271	3.56	242	0.07	3,724	3722	3,560
Greater amberjack	6,740	2.08	94	0.03	3,234	3233	1,442
Gray triggerfish	8,612	0.87	299	0.03	9,848	9848	299
Snowy grouper	101	0.68	5	0.03	149	149	106
Golden tilefish	0	0.00	0	0.00	0	0	0

Source: NMFS Headboat survey.

Finfish Bycatch Mortality

SEDAR 17 (2008) recommended a release mortality rate for vermilion snapper of 38% for both the commercial and recreational fisheries. This was based on a recent mortality study conducted by Ruderhshausen *et al*. (2007). Previously, SEDAR 2 (2003) estimated a release mortality rate of 40% and 25% for vermilion snapper taken by commercial and recreational fishermen, respectively. Release mortality rates from SEDAR 2 (2003) were based on cage studies conducted by Collins (1996) and Collins *et al*. (1999). Burns *et al*. (2002) suggested that release mortality rates of vermilion snapper could be higher than those estimated from cage studies because cages protect the fish from predators. A higher release mortality rate is supported by low recapture rates of vermilion snapper in tagging studies. Burns *et al*. (2002) estimated a 0.7% recapture rate for 825 tagged vermilion snapper; whereas, recapture rates for red grouper, gag, and red snapper ranged from 3.8% to 6.0% (Burns *et al*. 2002). McGovern and Meister (1999) estimated a 1.6% recapture rate for 3,827 tagged vermilion snapper. Alternatively, recapture rates could be low if population size was very high or tagged fish were unavailable to fishing gear. Harris and Stephen (2005) indicated approximately 50% of released vermilion snapper caught by one commercial fisherman were unable to return to the bottom. Higher recapture rates were estimated for black sea bass (10.2%), gray triggerfish (4.9%), gag (11%), and greater amberjack (15.1%) (McGovern and Meister 1999; McGovern *et al*. 2005). Burns *et al*. (2002) suggested released vermilion snapper did not survive as well as other species due to predation. Vermilion snapper, which do not have air removed from swim bladders, are subjected to predation at the surface of the water. Individuals with a ruptured swim bladder or those that have air removed from the swim bladder are subject to bottom predators, since fish would not be able to join schools of other vermilion snapper hovering above the bottom (Burns *et al*. 2002). However, Wilde (2009) reports that venting appears to be increasingly harmful for fish captured from deepwater.

SEDAR 10 (2006) estimated release mortality rates of 40% and 25% for gag taken by commercial and recreational fishermen, respectively. A tagging study conducted by McGovern *et al.* (2005) indicated recapture rates of gag decreased with increasing depth. The decline in recapture rate was attributed to depth related mortality. Assuming there was no depth related mortality at 0 m, McGovern *et al.* (2005) estimated depth related mortality ranged from 14% at 11 – 20 m (36 – 65 feet) to 85% at 71 – 80 m (233 – 262 feet). Similar trends in depth related mortality were provided by a gag tagging study conducted by Burns *et al.* (2002). Overton *et al.* (2008) reported a post-release mortality for gag as 13.3%. Release mortality rates are not known for other shallow water grouper species but could be similar to gag since they have a similar depth distribution.

A recent study conducted by Rudershausen *et al.* (2007) estimated release mortality rates of 15% for undersized vermilion snapper and 33% for undersized gag taken with J- hooks in depths of 25 – 50 m off North Carolina. Immediate mortality of vermilion snapper was estimated to be 10% at depths of 25 – 50 m and delayed mortality was estimated to be 45% at the same depths. For gag caught at depths of 25 – 50 m, no immediate mortality was observed but delayed mortality was estimated to be 49%. McGovern *et al.* (2005) estimated a release mortality rate of 50% at 50 m, which is similar to the findings of Rudershausen *et al.* (2007). Rudershausen *et al.* (2007)

also concluded minimum size limits were moderately effective for vermilion snapper and gag over the shallower portions of their depth range.

SEDAR 15 (2008) estimates acute release mortality rates of red snapper to be 90% and 40% for the commercial and recreational fisheries, respectively, in the South Atlantic. Diamond and Campbell (2009) report a delayed mortality rate of 64% off Texas. A study by Burns *et al.* (2004) conducted on headboats off Florida in the Atlantic and Gulf of Mexico found a release mortality of 64% for red snapper. The majority of acute mortalities in this study (capture depth of 9–42 m) were attributed to hooking (49%), whereas barotrauma accounted for 13.5%. An earlier study by Burns *et al.* (2002), also conducted in the Atlantic and Gulf of Mexico, had similar results, as J-hook mortality accounted for 56% of the acute mortalities of red snapper on headboats. Using tagging data and cage studies, Burns *et al.* (2002) determined the depth at which 50% of the released red snapper would die is 43.7 m (143 feet). SEDAR 15 (2008) indicated red snapper were most often caught at depths of 141 to 190 feet by the recreational sector and 141 to 234 feet by the commercial sector. Rummer and Bennett (2005) reported over 70 different overexpansion injuries related to barotrauma in red snapper, and Wilde (2009) observed reduced survival of this species when vented.

Release mortality rates were estimated as 20% for black grouper and red grouper taken by recreational fishermen in SEDAR 19 (2010) during the data workshop. Wilson and Burns (1996) reported potential mortality rates for released red grouper to be low (0 - 14%) as long as the fish were caught from waters shallower than 44 m. Overton et al. (2008) reported a release mortality rate of 13% for gag held in enclosures. SEDAR 15 (2008) estimated a 20% release mortality rate for greater amberjack. In the Gulf of Mexico, SEDAR 9 (2006) assume a 0% release mortality rate for gray triggerfish.

Snowy grouper are primarily caught in water deeper than 300 feet and golden tilefish are taken at depths greater than 540 feet; therefore, release mortality of the species are probably near 100% (SEDAR 4 2004). Tables 4-30, 4-32, 4-33 indicate there were fewer golden tilefish and snowy grouper discarded by commercial and recreational fishermen during 2005-2008, when compared with the other species considered in Amendments 17A.

Release mortality of black sea bass is considered to be low (15%) (SEDAR 2-SAR 3 2005) indicating minimum size limits are probably an effective management tool for black sea bass. McGovern and Meister (1999) report a recapture rate of 10.2% for 10,462 that were tagged during 1993-1998 suggesting that survival of released black sea bass is high. Rudershausen *et al.* (2007) reported a sub-legal discard rate of 12% for black sea bass. Collins *et al.* (1999) reported venting of the swim bladder yielded reductions in release mortality of black sea bass, and the benefits of venting increased with capture depth. The same study was analyzed by Wilde (2009) to suggest that venting increased the survival of black sea bass, although this was an exception to the general findings of Wilde's (2009) study.

Practicability of Management Measures in Directed Fisheries Relative to their Impact on Bycatch and Bycatch Mortality

Vermilion snapper, gag, black sea bass, red grouper, scamp, and red snapper
Vermilion snapper and black sea bass were among the most commonly discarded species in the commercial fishery in recent years (2005-2008, Table 4-30). During 2005-2008, 86% black grouper, 84% of red snapper, 82% black sea bass, and 79% of gag were released by recreational fishermen (Table 4-32). For species in Snapper Grouper Amendments 17A, black sea bass, followed by red snapper and vermilion snapper were most often discarded by headboat fishermen during 2005-2008 (Table 4-33).

Section 2 considers management reference point alternatives for red snapper including maximum sustainable yield (MSY), optimum yield (OY) and minimum stock size threshold (MSST). A rebuilding schedule for red snapper stocks, using 2010 as year 1 and with different periods of 15, 25 and 35 years to rebuild, is reported in **Section 2**. **Section 2** includes alternatives intended to end overfishing and rebuild the red snapper stock. Alternatives for red snapper include area closures for all snapper grouper species as well as prohibition for retention and possession of red snapper. Red snapper co-occur with vermilion snapper, as well as black sea bass, red grouper, and scamp. Therefore, alternatives, which would prohibit all fishing for or retention of snapper grouper species within certain areas would eliminate all bycatch of red snapper and co-occurring species. However, effort could increase outside of the closed areas.

Seasonal and/or longer closures of both commercial and recreational fisheries specified in Amendment 16, which has been approved, could also reduce bycatch mortality of red snapper. Expected harvest reductions for red snapper from Amendment 16 in total kill is estimated to be 16.5% (commercial sector), 1.1 to 7.7% (headboat sector), and 2.3% (private/charter sector). A longer spawning seasonal closure could enhance the reproductive potential of grouper stocks. For example Amendment 16 will establish a January – April spawning season closure for gag, red grouper, black grouper, and shallow water grouper species. Gag are in spawning condition from December through April each year. There is some evidence spawning aggregations may be in place before and after a spawning season (Gilmore and Jones 1992). When aggregated, gag are extremely susceptible to fishing pressure since the locations are often well known by fishermen. Gilmore and Jones (1992) showed that the largest and oldest gag in aggregations are the most aggressive and first to be removed by fishing gear. Since gag change sex, larger and older males can be selectively removed. As a result, a situation could occur where there are not enough males in an aggregation to spawn with the remaining females. Furthermore, the largest most fecund females could also be selectively removed by fishing gear. Therefore, a spawning season closure for all shallow water grouper species would be expected to protect grouper species when they are most vulnerable to capture, reduce bycatch of co-occurring grouper species, increase the percentage of males in grouper populations, enhance reproductive success, and increase the magnitude of recruitment. Increased bycatch mortality is accounted for in analyses and overall mortality is expected to decrease over time. Other actions in Amendment 16, which could reduce bycatch of snapper grouper species, include a reduction in the recreational bag limit to 1 gag or black grouper (combined) per day within a grouper aggregate bag limit of 3 fish and the establishment of a commercial quota for gag. When the commercial quota is met, all fishing for or possession of shallow water grouper species will be prohibited.

Unobserved mortality due to predation or trauma associated with capture could be substantial (; Burns *et al.* 1992; Rummer and Bennett 2005; St. John and Syers 2005; Parker *et al*. 2006; Rudershausen *et al.* 2007; Hannah *et al.* 2008; Diamond and Campbell 2009). Amendment 16 includes actions that require the use of dehooking devices, which could help reduce bycatch of vermilion snapper, black sea bass, gag, red grouper, black grouper, and red snapper. Dehooking devices can allow fishermen to remove hooks with greater ease and more quickly from snapper grouper species without removing the fish from the water. If a fish does need to be removed from the water, dehookers could still reduce handling time in removing hooks, thus increasing survival (Cooke *et al.* 2001).

1.2 Ecological Effects Due to Changes in the Bycatch

The ecological effects of bycatch mortality are the same as fishing mortality from directed fishing efforts. If not properly managed and accounted for, either form of mortality could potentially reduce stock biomass to an unsustainable level.

Overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures; thereby, reducing the potential for bycatch. Alternatives for red snapper include a prohibition on retention of the species as well as area closures, which would prohibit retention of snapper grouper species. Furthermore, Amendment 17A includes an action, which could require the use of circle hooks in some portion of the EEZ for snapper-grouper species. These actions for red snapper could result in substantial reductions in discards and co-occurring species. Thus ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch of species in Amendments 17A as well as other species. However, many of the species in the snapper-grouper FMU have spatial and temporal coincidence and the benefits could be shared among them.

Data from North Carolina presented to the Council indicated fishermen with snapper grouper permits also fish in the nearshore gillnet fisheries. Fishermen with snapper grouper permits in other areas also participate in various state fisheries. It is expected that if efforts shift to these fisheries, there could be impacts to protected species. Current monitoring programs will allow NOAA Fisheries Service to track and evaluate any increased risk to protected species. If necessary, an ESA consultation can be re-initiated to address any increased levels of risk to ESA-listed species.

A Limited Access Privilege (LAP) program was under consideration for the snapper grouper fishery that could substantially reduce bycatch by providing fishery participants an incentive to fish efficiently and to better handle their catch to maximize profits. An IFQ program could stabilize markets and prices by allowing catches to be delivered on demand. This would help fishermen target when they wanted to fish, where they wanted to fish, and which species they wanted to catch thereby reducing bycatch. At the March 2008 meeting, the Council determined this was not the appropriate time to move forward with consideration of a Limited Access Privilege Program for the snapper grouper fishery in the South Atlantic.

The Comprehensive ACL Amendment for species in FMPs not experiencing overfishing could propose additional measures to reduce bycatch in the snapper grouper fishery with the possible establishment of species units. Species grouping would be based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. Each group would be represented by an indicator species that has been recently assessed or is scheduled for a SEDAR assessment in the future. Amendment 14 is currently in place, which establishes Marine Protected Areas, and could also reduce bycatch of red snapper.

1.3 Changes in the Bycatch of Other Fish Species and Resulting Population and Ecosystem Effects

Management measures proposed in Snapper Grouper Amendment 17A are intended to end overfishing of red snapper. Amendment 17A includes area closure alternatives to end overfishing and rebuild red snapper. Since fishing for or possession of all snapper grouper species with hook and line gear would be prohibited, there would be no bycatch and fishing mortality of species that co-occur with red snapper.

More restrictive management measures proposed in Amendment 17A could result in an effort shift to other species and fisheries causing a change in the magnitude of harvest and number of discards in those fisheries. Reduced fishing pressure on species in this amendment would be expected to result in an increase in the mean size and age. In addition, biomass and the percentage of males for grouper species would be expected to increase. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure on species in Amendment 17A as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through the proposed actions. These ecological changes could affect the nature and magnitude of bycatch over time.

1.4 Effects on Marine Mammals and Birds

Under Section 118 of the Marine Mammal Protection Act (MMPA), NMFS must publish, at least annually, a List of Fisheries (LOF) that places all U.S. commercial fisheries into one of three categories based on the level of incidental serious injury and mortality of marine mammals that occurs in each fishery. Of the gear utilized within the snapper grouper fishery, only the black sea bass pot is considered to pose an entanglement risk to marine mammals. The southeast U.S. Atlantic black sea bass pot fishery is included in the grouping of the Atlantic mixed species trap/pot fisheries, which the 2010 proposed List of Fisheries classifies as a Category II (74 FR 27739; June 11, 2009). Gear types used in these fisheries are determined to have occasional incidental mortality and serious injury of marine mammals. For the snapper grouper fishery, the best available data on protected species interactions are from the Southeast Fisheries Science Center (SEFSC) Supplementary Discard Data Program (SDDP) initiated in July of 2001 and sub-samples 20% of the vessels with an active permit. Since August 2001, only three interactions with marine mammals have been documented; each was taken by handline gear and each released alive (McCarthy SEFSC database). The bottom longline/hook-and-line component of the South Atlantic snapper grouper fishery remains a Category III under the LOF.

Although the black sea bass pot fishery can pose an entanglement risk to large whales due to their distribution and occurrence, sperm, fin, sei, and blue whales are unlikely to overlap with the black sea bass pot fishery operated within the snapper grouper fishery since it is executed primarily off North Carolina and South Carolina in waters ranging from 70-120 feet deep (21.3-36.6 meters). There are no known interactions between the black sea bass pot fishery and large whales. NOAA Fisheries Service's biological opinion on the continued operation of the South Atlantic snapper grouper fishery determined the possible adverse effects resulting from the fishery are extremely unlikely. Thus, the continued operation of the snapper grouper fishery in the southeast U.S. Atlantic EEZ is not likely to adversely affect sperm, fin, sei, and blue whales (NMFS 2006).

North Atlantic right and humpback whales may overlap both spatially and temporally with the black sea bass pot fishery. Recent revisions to the Atlantic Large Whale Take Reduction Plan have folded the Atlantic mixed species trap/pot fisheries into the plan (72 FR 193; October 5, 2007). The new requirements will help further reduce the likelihood of North Atlantic right and humpback whale entanglement in black sea bass pot gear.

The Bermuda petrel and roseate tern occur within the action area. Bermuda petrels are occasionally seen in the waters of the Gulf Stream off the coasts of North and South Carolina during the summer. Sightings are considered rare and only occurring in low numbers (Alsop 2001). Roseate terns occur widely along the Atlantic coast during the summer but in the southeast region, they are found mainly off the Florida Keys (unpublished USFWS data). Interaction with fisheries has not been reported as a concern for either of these species.

Fishing effort reductions have the potential to reduce the amount of interactions between the fishery and marine mammals and birds. Although, the Bermuda petrel and roseate tern occur within the action area, these species are not commonly found and neither has been described as associating with vessels or having had interactions with the snapper grouper fishery. Thus, it is believed that the snapper grouper fishery is not likely to negatively affect the Bermuda petrel and the roseate tern.

1.5 Changes in Fishing, Processing, Disposal, and Marketing Costs

Management alternatives in Snapper Grouper Amendment 17A would be expected to affect the cost of fishing operations. It is likely that all four states (NC, SC, GA & FL) would be affected by the regulations (closures, ACLs, etc.) and the variety/number of species included in this Amendment.

Additionally, factors such as waterfront property values, availability of less expensive imports, etc. may affect economic decisions made by recreational and commercial fishermen.

Amendment 18 (under development) proposes to enhance current data collection programs. This might provide more insight in calculating the changes in fishing, processing, disposal and marketing costs.

1.6 Changes in Fishing Practices and Behavior of Fishermen

Management regulations proposed in Snapper Grouper Amendment 17A could result in a modification of fishing practices by commercial and recreational fishermen, thereby affecting the magnitude of discards. Furthermore, closed seasons, new or reduced quotas could cause some commercial and recreational fishermen to reduce effort. However, it is difficult to quantify any of the measures in terms of reducing discards until the magnitude of bycatch has been monitored over several years.

1.7 Changes in Research, Administration, and Enforcement Costs and Management Effectiveness

Research and monitoring is needed to understand the effectiveness of proposed management measure in reducing bycatch. If all fishing for red snapper is prohibited, a monitoring program will be essential to track changes in stock structure and will be a component of Snapper Grouper Amendment 17A. Additional work is needed to determine the effectiveness of measures in Amendment 16 and by future actions being proposed by the Council to reduce bycatch. Amendment 18 is being developed, which proposes to enhance current data collection programs. Some observer information has recently been provided by MARFIN and Cooperative Research Programs but more is needed. Approximately 20% of commercial fishermen are asked to fill out discard information in logbooks; however, a greater percentage of fishermen could be selected with emphasis on individuals that dominate landings. Furthermore, the use of electronic logbooks could be enhanced to enable fishery managers to obtain information on species composition, size distribution, geographic range, disposition, and depth of fishes that are released. Additional administrative and enforcement efforts will be needed to implement and enforce these regulations.

1.8 Changes in the Economic, Social, or Cultural Value of Fishing Activities and Non-Consumptive Uses of Fishery Resources

Preferred management measures, including those that are likely to increase or decrease discards could result in social and/or economic impacts as discussed in Section 4.

1.9 Changes in the Distribution of Benefits and Costs

Attempts were made to ensure reductions provided by preferred management measures are equal in the commercial and recreational sectors. The extent to which these management measures will increase or decrease the magnitudes of discards is unknown. Proposed closures for deepwater species as well as area closures for red snapper are likely to provide substantial decreases in bycatch. Some measures specified in Amendment 16, such as the requirement for dehooking devices, a recreational/commercial seasonal closure for gag, reduction of recreational bag limits, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure could help to reduce bycatch. It is likely that some proposed management measures such as bag limits for snowy grouper and golden tilefish could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as

changes in community structure and age/size structures that could result from ending overfishing.

1.10 Social Effects

The social effects of all the management measure, including those most likely to reduce bycatch, are described in **Section 4**.

1.11 Conclusion

This section evaluates the practicability of taking additional action to minimize bycatch and bycatch mortality in the South Atlantic snapper grouper fishery using the ten factors provided at 50 CFR 600.350(d)(3)(i). In summary, proposed closures for deepwater species in Amendment 17B as well as area closures for red snapper in Amendment 17A could provide substantial decreases in bycatch of Snapper Grouper Amendment 17A species and also co-occurring species. The requirement of dehooking devices, a recreational/commercial seasonal closure for gag, reduction of recreational bag limits, and closing all shallow water groupers when a gag quota is met or during a gag seasonal closure specified in Amendment 16 could also help to reduce bycatch. It is likely that some management measures such as bag limits for snowy grouper and golden tilefish could increase the number of discards. However, this depends on if fishermen shift effort to other species, seasons, or fisheries and if effort decreases in response to more restrictive management measures as well as changes in community structure and age/size structures that could result from ending overfishing. Furthermore, overall fishing effort could decrease in the commercial and recreational sectors in response to more restrictive management measures, thereby reducing the potential for bycatch.

There is likely to be an interactive effect of the preferred management measures in Snapper Grouper Amendment 17A on bycatch of species addressed in the amendment with associated species in reef ecosystems. The area prohibitions to protect red snapper would eliminate bycatch of red snapper and co-occurring species. Reduced fishing pressure on species in Amendment 17A would be expected to result in an increase in the mean size/age of affected species. A requirement of the use of circle hooks could reduce bycatch mortality of red snapper and other snapper grouper species. In addition, an increase would be expected in the percentage of male groupers and population biomass. Overlapping seasonal closures for red porgy, greater amberjack, mutton snapper, gag, shallow water groupers and vermilion snapper with proposed actions in this amendment could be expected to reduce bycatch and fishing mortality of many co-occurring species. The relative abundance, size structure, and age structure of other species in reef communities could be expected to change in response to reduced fishing pressure as well as potential shifts in effort. Thus, ecological changes could occur in the community structure of reef ecosystems through actions that would end overfishing. These ecological changes could affect the nature and magnitude of bycatch over time.

Additional measures to reduce bycatch in the snapper grouper fishery are being developed. The Comprehensive ACL Amendment could propose measures to reduce bycatch in the snapper grouper fishery including species grouping based on biological, geographic, economic, taxonomic, technical, social, and ecological factors. Each group could be represented by an

indicator species, which has been recently assessed or is scheduled for a SEDAR assessment in the future.