

**DRAFT – SUBJECT TO SOUTHEAST FISHERIES SCIENCE CENTER REVIEW****Cumulative Effects of Amendment 31 Regulations upon Effective Effort Impacting Sea Turtle Takes in the Gulf of Mexico Reef Fish Bottom Longline Fishery**

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**Introduction**

Analyses of recent Southeast Fishery Science Center (SEFSC) observer program data indicate the number of loggerhead sea turtle takes authorized in the 2005 Biological Opinion (BiOp) by the bottom longline component of the reef fish fishery in the Gulf of Mexico (Gulf) has been exceeded (NMFS 2009). Aerial surveys (Garrison 2009) and tracking studies (Foley et al. 2008, Girard et al. 2009, TEWG 2009) suggest the west Florida shelf is an important foraging habitat for this threatened species. Sexually immature juveniles and mature adult loggerhead sea turtles appear especially vulnerable to incidental take by bottom longline gear (NMFS 2009). Concern exists that observed declines in loggerhead sea turtle nesting activity in peninsular Florida may be due to a diminishing number of adult female loggerhead sea turtles in the population (Witherington et al. 2009).

The Endangered Species Act (ESA) mandates a reduction in the reef fish bottom longline fishery's impact on loggerhead sea turtles. Additionally, National Standard 9 of the Magnuson Stevens Fishery Conservation and Management Act (MSFCMA) requires a reduction in sea turtle bycatch and bycatch mortality. In response to these mandates, the Gulf of Mexico Fishery Management Council (Gulf Council) is developing Amendment 31 to the Reef Fish Fishery Management Plan to implement conservation and management measures that to the extent practicable minimize bycatch of sea turtles and to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

Several actions in Amendment 31 propose measures for reducing sea turtle interactions with bottom longline gear (see Appendix). The analyses in this document are focused on Actions 2 and 3. Action 2 would prohibit bottom longline fishing by area, depth, or season. Action 3 would establish an endorsement for longline fishing in the eastern Gulf of Mexico (east of 85°30' W longitude, near Cape San Blas, Florida). The intent of this analysis is to evaluate the impacts of several endorsement and depth/time closure alternatives currently under consideration in Amendment 31, and to evaluate the combined effects of these alternatives upon effective effort in the reef fish bottom longline fishery as it impacts loggerhead sea turtles.

## **Methods and Results**

Commercial logbook data were obtained from the SEFSC (NMFS SEFSC Miami, FL) on July 8, 2009. Effort was computed as hooks per set times the number of sets per trip. Effort in this analysis is referred to as 'effective effort' because although it is based upon the number of hooks in use in the fishery, reduction of hooks is used as a proxy for sea turtle bycatch reduction. A major assumption of the model is that reducing the number of hooks will lead to reduced sea turtle bycatch. This is a common assumption in sea turtle bycatch studies (Johnson et al. 1999, Richards 2006, Walsh and Garrison 2006, SEFSC 2007, SEFSC 2009).

Participation in the Gulf of Mexico reef fish fishery was determined using methods consistent with SEFSC (2009). Logbook data were summarized at the trip level, aggregating total landings into three general categories: managed reef fish (50 CFR 622, App. A), shark, and other. Logbook reported effort was assumed to be a part of the reef fish fishery if the fisher reported landings of reef fish using bottom longline gear and the fisher was not in possession of a directed shark permit, or if the fisher was in possession of a directed shark permit, then if greater than 2/3 of landings by weight were species other than sharks. Trips with obvious effort reporting errors (e.g., <30 hooks per longline, <1 set per trip, >24 sets per day, >25 miles of longline) were also eliminated from consideration consistent with SEFSC (2009). This eliminated 161 hooks (< 0.001%) from the baseline.

Baseline effort was computed as the average number of hooks reported on reef fish trips in areas 1-10 (e.g., Key West to Pensacola) during 2007-2008. The years 2007-2008 were selected because they represent the most recent complete time series available and provide the most accurate depth reporting, an important consideration for evaluation of the bathymetric closures proposed in Amendment 31. Logbook data were summarized by vessel, month, and year. Year and month were assigned using the date fish were landed. As only effort in areas 1-8 (e.g., east of Cape San Blas, Florida) will be impacted by the management measures in Amendment 31, baseline effort in areas 9-10 (approximately 2 million hooks) was removed from the dataset for subsequent analyses and added back into resultant grand totals as a constant. Effort for non-endorsed vessels was eliminated by deleting records for these vessels during evaluations of the impacts of various endorsement levels.

Because Action 2 establishes seasonal closures along bathymetric contours, the accuracy of depth reported in the logbook dataset was an important consideration. Several steps were taken to diagnose and correct misreporting. Logbook records were sorted by descending depth so that the deepest depth of fishing recorded for each trip was retained during summarization at the trip level. Deepest depth was retained to avoid problems with depths associated with shark landings being assigned to a trip that primarily targeted reef fish in deeper water. There was only one record in the 2007-2008 dataset that did not report depth (e.g., one vessel in January 2007). The majority of the landings by this vessel on the non-reporting trip were red grouper (a SWG species). Most subsequent trips by this vessel in the same area with similar catch compositions reported fishing in 150 ft, so the missing depth record was similarly assigned a depth of 150 ft.

As reef fish longline fishing is prohibited within 20 fathoms, the next step was to examine and correct records reporting fishing activity shallower than 120 ft. It seemed probable that these vessels were misreporting their depth of fishing in fathoms rather than feet. Records with depths fished >120 ft were assumed to be correctly reporting in feet, as the distribution of the reef fish fishery does not extend far beyond 720 ft. A total of 18 vessels reported fishing activity in less than 20 fathoms, with a total effort of 1.6 million hooks (Table 1A). The maximum depth recorded by each vessel by month was examined. If this maximum monthly fishing depth was less than 120 ft, it was assumed the vessel reported in fathoms rather than feet during that month, and the reported depths for that vessel during that month were multiplied by 6 to compensate. Several vessels reporting abundant shallow water grouper (SWG) landings were examined by hand to validate this approach; all of their reported fishing depths were between '20' and '80', with the majority between '20' and '25' – subsequent adjustment to 120-480 ft appeared appropriate. This adjustment based on monthly misreporting trends by vessel relocated 93% of the effort reported within 0-20 fathoms to deeper waters.

Following the adjustment of feet to fathoms for obvious misreporting, a total of ten records from nine unique vessels remained with reported fishing depths less than 20 fathoms, with a total effort of 0.1 million hooks (Table 1B). These vessels all had reported depths of fishing >120 ft at some point during the same month of the misreported record, and were examined in detail to determine the appropriate adjustment. Of these, one vessel was obviously reporting in fathoms until midway through Dec 2008, and its misreported record from early Dec 2008 was adjusted accordingly. Two vessels landing snowy grouper (a DWG species) appeared to be reported in fathoms given the known depth distribution of this species. One vessel never fished deeper than 150 ft and had just completed a trip landing a similar suite of species in 120 ft, so its record was adjusted to 120 ft. One vessel misreported in Jan 2007 but typically fished deeper than 50 fathoms for the remainder of the time series, so the Jan 2007 record was assumed to be reported in fathoms. Four vessels exhibited no obvious trends in reporting. Rather than assume these vessels were reporting illegal fishing activity in less than 20 fathoms, the default adjustment from fathoms to feet was applied (Table 1C). Figure 1 presents a histogram of fishing depths before and after these adjustments.

The impacts of proposed alternatives in Amendment 31 Action 2 and Action 3 were evaluated through filtering and adjustment of this corrected average effort dataset. For example, to evaluate the impacts of Action 2, effort between 20-35 fathoms was relocated to 35-50 fathoms during proposed closed months. The impacts of temporal closures from Jun-Aug, Apr-Aug, and an annual closure were evaluated. To capture the change in effective effort upon sea turtle take likely to result from this closure, the relocated effort was scaled down before being added to the existing effort in 35-50 fathoms. The scalar used for summer and year-round closure scenarios was the ratio of sea turtle population density (turtles/km<sup>2</sup>) in 20-35 fathoms (0.0781) versus 35-50 fathoms (0.0231), derived from summer 2007 aerial survey data (Garrison 2009). This approach effectively reduced the impact upon sea turtles of the redistributed effort from 20-35 fathoms by approximately 70%. Aerial survey data from winter

2007 was not used because the density of sea turtles in 35-50 fathoms was zero, which does not allow for calculation of a ratio for reducing 'effective effort.' Given that sea turtle densities/observations were lower during winter vs. summer, year round closure scenarios in this report may underestimate the percent reduction in 'effective effort' that may occur.

To evaluate the impacts of Action 3, the dataset was filtered to exclude effort from non-endorsed vessels. Endorsement categories evaluated were 40K, 50K, and 60K. Endorsements by commercial reef fish permit were based upon average reef fish logbook landings using bottom longline and/or trap during the qualifying period of 1999-2007. Only currently active or renewable permits provided by the Southeast Region's Permits Office were considered eligible for longline endorsements. Trap vessels could qualify only if they reported reef fish landings using longline gear following the prohibition of trap gear in Feb 2007.

The impacts of Actions 2 and 3 in Amendment 31 were considered separately and in combination with each other. Additionally, the impacts of a closure within 50 fathoms, such as that implemented by the May 18, 2009 Emergency Rule, were considered. To evaluate the impacts of this action upon effective effort, all effort within 50 fathoms was eliminated, under the assumption that the DWG and tilefish quota, along with the Grouper-Tilefish IFQ, would prohibit any profitable relocation of effort into deeper waters. The outcomes of the various baseline effort shifting scenarios are provided in Table 2. Under this scenario, endorsements were very effective at reducing effort. A 50K endorsement coupled with no closure and a 40K endorsement coupled with an annual closure would both result in reductions around 50%. A 50-fathom annual closure would result in a 71% reduction in effort.

As some endorsed vessels may choose not to fish rather than relocate outside of 35 fathoms during closed months, analyses were conducted assuming 75% (Table 3) and 50% (Table 4) of effort relocates from 20-35 to 35-50 fathoms during closed months. Assuming a 50% effort shift, a 40K endorsement coupled with an Apr-Aug closure would result in a 51% reduction in effort.

Because the proposed alternatives in Amendment 31 eliminate vessels from the fishery and reduce fishable waters but provide no caps on effort by remaining vessels in available waters, additional analyses were performed to evaluate the impacts of Actions 2 and 3 assuming an increase in fishing effort. Changes in fishing behavior are influenced by a variety of factors that are difficult to predict and quantify. Evaluation of logbook data from 1999-2008 indicated that 2003 was the year of highest overall effort in the bottom longline fishery. To capture the dynamics of increased effort, vessel effort by month from 2003 was substituted into the baseline dataset. This effort was partitioned by depth according to the percent of effort occurring in each depth each month. If a vessel fished during a month in 2003 but had no corresponding fishing during the same month in 2007-2008, effort from 2003 was assigned to an 'unknown' depth. Since the trap prohibition did not go into effect until Feb 2007, endorsed vessels with a history of trap fishing were assigned effort data from 2008 (e.g., their first full year of dedicated longline fishing) instead of 2003. Effort for vessels that did not fish in 2003 remained at 2007-2008 baseline average effort levels. Finally, effort assigned to 'unknown'

depth was redistributed to known depths based upon the aggregated proportional distribution of effort at known depths by month.

The projected impacts of Actions 2 and 3 under the assumption that the effort of vessels remaining in the fishery will increase proportional to 2003 levels are provided in Table 5. This increase in effort is approximately 36% higher than the baseline, and would require a 40K endorsement with an annual closure, a 50K endorsement coupled with an Apr-Aug closure, or a 60K endorsement with no closure to achieve greater than a 50% reduction in effective effort.

As some endorsed vessels may choose not to fish outside of 35 fathoms during closed months, analyses were conducted assuming 75% (Table 6) and 50% (Table 7) of effort relocates from 20-35 to 35-50 fathoms during closed months. Projections suggest that both a 75% shift and a 50% shift in effort would still require a 40K endorsement with an annual closure, a 50K endorsement coupled with an Apr-Aug closure, or a 60K endorsement with no closure to achieve a greater than 50% reduction in effective effort.

To capture additional uncertainty around estimated percent reductions, the upper and lower 95% confidence limits of the ratio of sea turtle population density in 20-35 fathoms versus 35-50 fathoms (13-66%) derived from aerial survey data (Garrison 2009) were used to generate confidence limits around the mean effort shift estimates for all 35-fathom closure scenarios. The influence of this variability upon estimated reductions is shown in Table 8 for all scenarios.

## **Discussion**

These analyses of commercial logbook data indicate that various combinations of the depth closure and endorsement alternatives proposed in Actions 2 and 3 of Amendment 31 may achieve significant reductions in effective effort that impact sea turtle takes by the bottom longline component of the reef fish fishery in the eastern Gulf of Mexico. As with any model, the outcomes are sensitive to the assumptions.

Significant efforts were made to validate the depth of fishing reported on a trip by trip basis in the logbook to best capture the actual utilization of the proposed closed area shoreward of 35 fathoms. Given the limited number of vessels (19 out of 126) with potential errors in depth reported, and the limited number of trips by these vessels with these reporting errors, this correction was more esthetic and probably had little impact upon the overall projected percent reductions.

Vessels operating in areas 9-10 were assumed to maintain constant effort regardless of alternatives under consideration. If a vessel did not qualify under the considered endorsement level, it was assumed to cease longline operations rather than relocate longline effort into the deeper waters in areas 9 - 10. This decision was based upon the pending implementation of the Gulf of Mexico Grouper-Tilefish IFQ program and the fact that annual quotas for DWG and tilefish have been consistently met during Apr-Jun in recent years.

A subset of the alternatives listed under Action 2 and Action 3 (see Appendix) were considered for this analysis. Although alternatives exist for endorsement levels less than 40K, only an annual closure at a 40K endorsement level was projected to attain a 50% reduction in effective effort under both effort shifting scenarios. Similarly, several alternative depth closures (e.g., 30, 40, or 50 fathoms) proposed in Amendment 31 were not considered in this report. Given that Garrison (2009) only provides sea turtle density estimates for 20-35 fathoms and 35-50 fathoms, it was not possible to evaluate the effects of a 30 or 40 fathom closure. The reduction in effort resulting from a 30 fathom closure is expected to be intermediate to the reductions in effort associated with the current 20 fathom closure (status quo) and a 35 fathom closure. Similarly, reductions in effort would be greater than those summarized in this report if a 40 fathom closure were considered by the Gulf Council. The reduction in effort associated with an annual 50 fathom closure, and no endorsement criterion, is estimated to be 71%.

The sensitivity of model outputs to the ratio of sea turtles in 20-35 fathoms versus 35-50 fathoms was investigated using the confidence interval around the mean ratio. Depending upon the scenario, this led to variability around the mean estimate between 1-21%. On average, the variability around the mean was less than 5%. Variability was surprisingly low, especially for scenarios with longline endorsement criterion. This was because endorsements removed large amounts of effort from all areas fished prior to shifting effort from 20-35 fathoms out to 35-50 fathoms during area/season closures.

Two forms of effort shifting were considered in these analyses. First, the sensitivity of model outputs to the percentage of effort transitioning from 20-35 fathoms to 35-50 fathoms during closed months was investigated using effort shifting rates of 100%, 75%, and 50%. On average, the variability around the mean was <2%, suggesting the model was not very sensitive to this effort shift parameter.

The second form of effort shifting investigated was the possibility of endorsed vessels increasing their effort as their competition is forced out of the fishery. In the baseline scenario, effort was assumed constant at 2007-2008 levels. In the increasing effort scenario, endorsed vessels were assumed to increase their effort to 2003 levels; the year of highest effort in the fishery. On first pass, the increasing effort scenario seems more likely, as historically successful longliners will have less competition and may be able to land more fish to fill market demand. However, less competition may mean that their catch per unit effort will increase, and the expectation of increased landings may not necessarily imply increased effort.

Although catch per unit effort may increase for the remaining vessels, several upcoming management actions may prevent landings (and effort) from increasing in coming years. For example, during the Gulf Council's Scientific and Statistical Committee meeting in June 2009, total allowable catch levels of 5.96 million pounds (mp) for red grouper and 0.82 mp for gag were recommended. The commercial allocation for red grouper is 76%, which would provide a maximum quota of 4.53 mp. This new quota is a 21% reduction from the current 5.75 mp quota for red grouper. Similarly, the commercial allocation for gag is 39%, which would provide a maximum quota of 0.32 mp. This new quota is a 76% reduction from the current quota for

gag of 1.32 mp. These reduced quotas and the regulations required to achieve them given the substantial disparity between the available catch for these co-occurring stocks will likely have a substantial effect on reducing fishing effort above and beyond the impacts of alternatives considered in Amendment 31. They may limit the ability of endorsed vessels to expand upon their current level of effort, and indeed may restrict their effort to levels lower than the 2007-2008 baseline presented in this analysis.

Although the Gulf of Mexico Grouper-Tilefish IFQ program will be implemented in January 2010, it is unclear what consequences this program will have upon effort as it impacts sea turtle bycatch. The IFQ program will provide fishermen with a percentage of the quota based upon their relative 1999-2004 landings. There are no provisions in the IFQ program to prevent endorsed longliners from buying catch shares from non-endorsed longliners or vertical line fishers. Although they will have to pay to obtain these shares and will be subject to an individual share cap, they will be theoretically capable of increasing their landings above individual historical levels. However, the IFQ program will probably also lead to consolidation of shares among a limited number of vessels in the fishery, and those that survive this consolidation will presumably be the most efficient vessels in operation. As such, although landings per vessel may increase above historical averages, effort by vessels may not necessarily increase. Indeed, catch per unit effort would be expected to increase given the elimination of many competitors by the endorsement action.

Overall, results of this analysis suggest that large reductions in effort, and corresponding sea turtle takes, may occur if longline endorsements and area closures are implemented. There is a large amount of uncertainty surrounding the reduction estimates presented herein, given that fisherman behavior is difficult to predict. Sources of uncertainty are numerous and include: depth of fishing reported; sea turtle density estimates; potential changes in grouper quotas and how those changes will affect effort; and implementation of the IFQ program, which is expected to result in consolidation and modifications in effort levels. Given these uncertainties, these analyses indicate endorsements will result in greater reductions in effort than seasonal or year-round area closures inside 35 fathoms. Seasonal/area closures combined with a 40K longline endorsement will reduce effort and corresponding sea turtle takes by 30-49%, depending on what assumptions are used for effort shifting. A seasonal/area closure during summer combined with a 50K or 60K endorsement would reduce effort and sea turtle takes by 49-61% and 70-78%, respectively, depending on what assumptions are used for effort shifting.

## Citations

- Foley, A.M., Schroeder, B.A., and S.L. MacPherson. 2008. Post-nesting migrations and resident areas of Florida loggerheads, p. 75. *In*: H. Kalb, A. Rohde, K. Gayheart, and K. Shanker (compilers), Proceedings of the Twenty-Fifth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFSC-582.
- Garrison, L.P. 2009. Response to SERO sea turtle density analysis from 2007 aerial surveys of the eastern Gulf of Mexico: June 9, 2009. Protected Resources and Biodiversity Division Report #PRBD-08/09-11.
- Girard, C., Tucker, A.D., and B. Calmettes. 2009. Post-nesting migrations of loggerhead sea turtles in the Gulf of Mexico: dispersal in highly dynamic conditions. *Marine Biology*, 156: 1827-1839.
- Johnson, D.R., C. Yeung, and C.A. Brown. 1999. Estimates of marine mammal and marine turtle bycatch by the U.S. Atlantic pelagic longline fleet in 1992-1997. NOAA Technical Memorandum NMFS-SEFSC-418: 70 p.
- SEFSC (Southeast Fisheries Science Center). 2007. Estimated takes of protected species in the commercial directed shark bottom longline fishery 2006. NMFS Southeast Fisheries Science Center Contribution PRD-07/08-05. November 2007, 15 p. Available at [www.sefsc.noaa.gov/seaturtlesprogram.jsp](http://www.sefsc.noaa.gov/seaturtlesprogram.jsp)
- SEFSC (Southeast Fisheries Science Center). 2009. Estimated takes of sea turtles in the bottom longline portion of the Gulf of Mexico reef fish fishery July 2006 through December 2008 based on observer data. NMFS Southeast Fisheries Science Center Contribution PRD-07/09-07. 23 p. plus appendices.
- Richards, P. M. 2007. Estimated takes of protected species in the commercial directed shark bottom longline fishery 2003, 2004, and 2005. NMFS Southeast Fisheries Science Center Contribution PRD-06/07-08, June 2007, 21 p. Available at [www.sefsc.noaa.gov/seaturtlesprogram.jsp](http://www.sefsc.noaa.gov/seaturtlesprogram.jsp)
- TEWG (Turtle Expert Working Group). 2009. An assessment of the loggerhead turtle population in the western North Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-575, 131 pp.
- Walsh, C. Fairfield and L. P. Garrison. 2006. Estimated bycatch of marine mammals and turtles in the U.S. Atlantic pelagic longline fleet during 2005. NOAA Technical Memorandum NMFS-SEFSC-539, 52 p.
- Witherington, B., Kubilis, P., Brost, B., and A. Meylan. 2009. Decreasing annual nest counts in a globally important loggerhead sea turtle population. *Ecological Applications*, 19(1): 30-54.

**Table 1A.** Raw logbook hooks (avg. 2007-2008) set by reef fish bottom longline vessels in eastern Gulf of Mexico (areas 1-10) prior to adjustment of depths misreported in fathoms. No depth specific effort information is provided for areas 9-10.

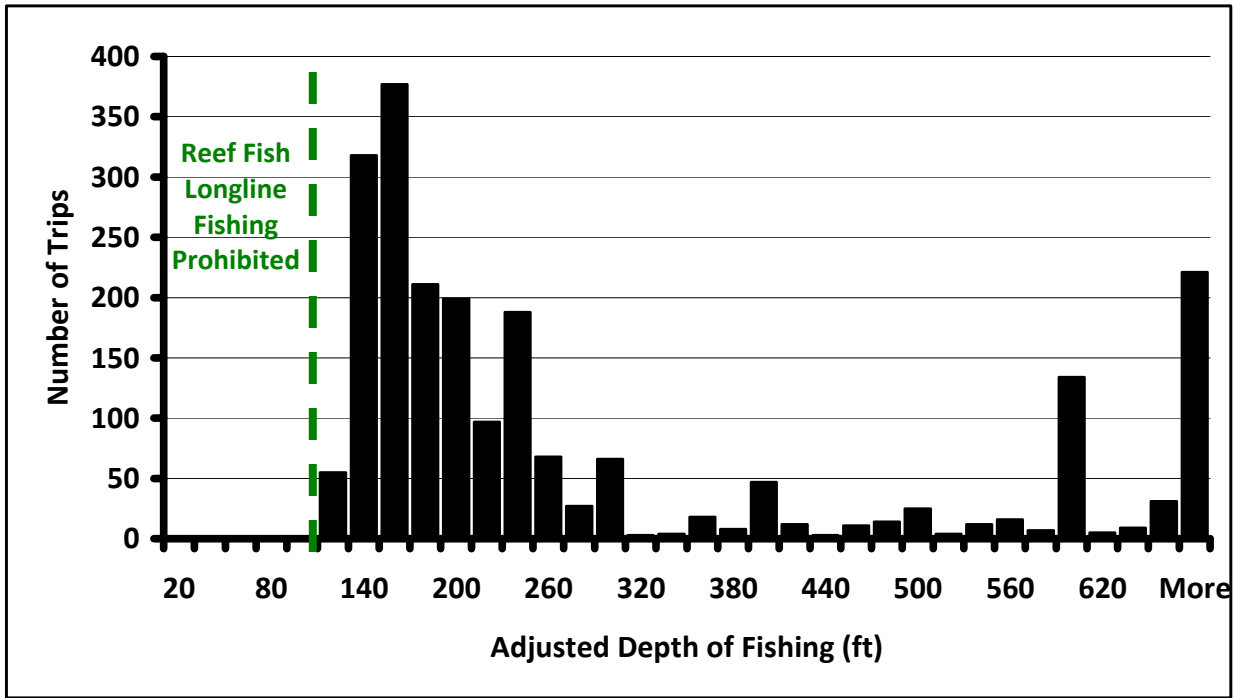
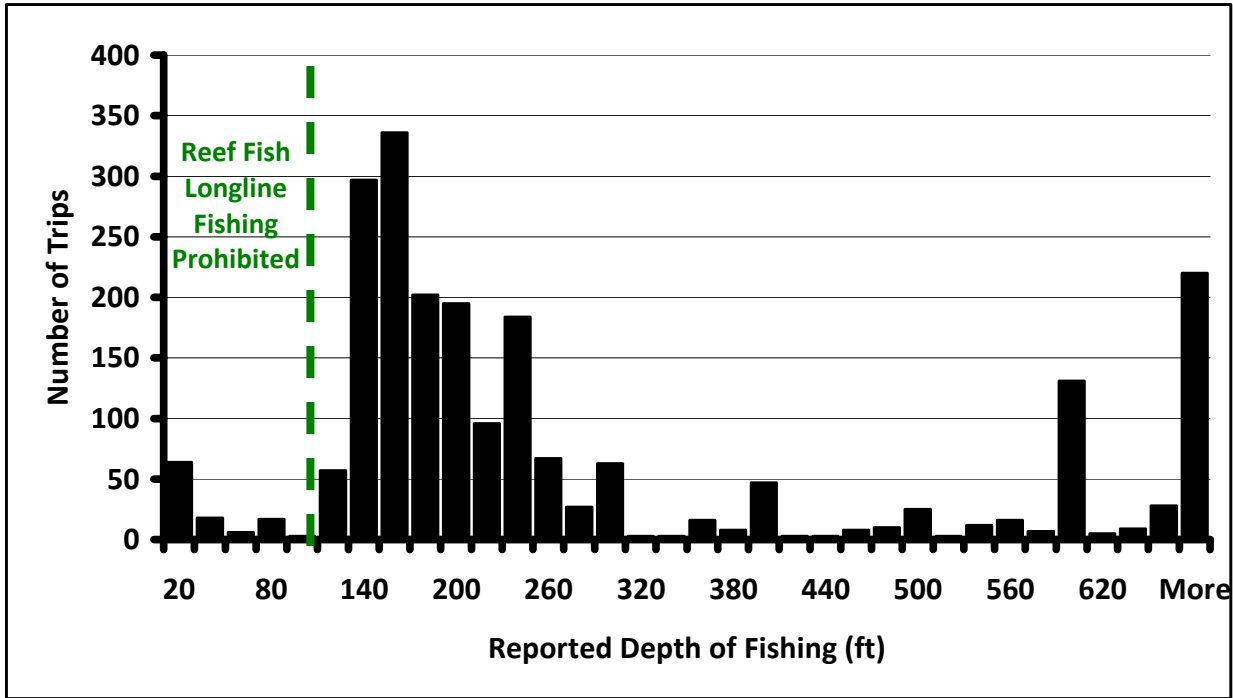
Depth (fathoms)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1-20	170,000	295,900	120,950	171,129	75,650	103,750	148,900	102,900	163,050	78,458	78,600	104,300	1,613,587
20-35	770,420	651,290	501,875	1,195,780	1,294,025	1,809,125	1,973,315	1,459,300	1,294,545	1,459,152	1,172,350	1,449,275	15,030,452
35-50	190,125	101,010	54,150	165,450	273,650	522,100	441,200	491,320	513,935	383,850	488,890	443,425	4,069,105
50+	1,082,150	1,155,435	1,415,900	985,575	1,207,550	202,000	74,400	147,200	118,250	133,700	395,430	116,600	7,034,190
unknown	18,000	0	0	0	0	0	0	0	0	0	0	0	18,000
Areas 9-10	150,100	220,750	224,000	206,900	58,000	16,000	0	25,150	18,000	30,000	29,100	19,000	997,000
<b>TOTAL</b>	<b>2,380,795</b>	<b>2,424,385</b>	<b>2,316,875</b>	<b>2,724,834</b>	<b>2,908,875</b>	<b>2,652,975</b>	<b>2,637,815</b>	<b>2,225,870</b>	<b>2,107,780</b>	<b>2,085,160</b>	<b>2,164,370</b>	<b>2,132,600</b>	<b>28,762,334</b>

**Table 1B.** Hooks (avg. 2007-2008) set by reef fish bottom longline vessels in eastern Gulf of Mexico (areas 1-10) following adjustment of depths clearly misreported in fathoms in areas 1-8. No depth specific effort information is provided for areas 9-10.

Depth	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
1-20	35,000	29,800	15,250	1,000	0	29,500	0	0	0	0	0	1,500	112,050
20-35	805,220	869,990	508,175	1,365,909	1,335,925	1,883,375	2,072,015	1,562,200	1,429,095	1,537,610	1,233,850	1,532,875	16,136,239
35-50	190,125	101,010	54,150	165,450	273,650	522,100	470,600	491,320	542,435	383,850	492,490	462,625	4,149,805
50+	1,182,350	1,202,835	1,515,300	985,575	1,241,300	202,000	95,200	147,200	118,250	133,700	408,930	116,600	7,349,240
unknown	18,000	0	0	0	0	0	0	0	0	0	0	0	18,000
Areas 9-10	150,100	220,750	224,000	206,900	58,000	16,000	0	25,150	18,000	30,000	29,100	19,000	997,000
<b>TOTAL</b>	<b>2,380,795</b>	<b>2,424,385</b>	<b>2,316,875</b>	<b>2,724,834</b>	<b>2,908,875</b>	<b>2,652,975</b>	<b>2,637,815</b>	<b>2,225,870</b>	<b>2,107,780</b>	<b>2,085,160</b>	<b>2,164,370</b>	<b>2,132,600</b>	<b>28,762,334</b>

**Table 1C.** Total hooks (avg. 2007-2008) set by reef fish bottom longline vessels in eastern Gulf of Mexico (areas 1-10) following adjustment of misreported depths in areas 1-8. No depth specific effort information is provided for areas 9-10.

Depth (fathoms)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
20-35	823,220	869,990	518,175	1,365,909	1,335,925	1,905,375	2,072,015	1,562,200	1,429,095	1,537,610	1,233,850	1,534,375	16,187,739
35-50	190,125	101,010	54,150	165,450	273,650	522,100	470,600	491,320	542,435	383,850	492,490	462,625	4,149,805
50+	1,217,350	1,232,635	1,520,550	986,575	1,241,300	209,500	95,200	147,200	118,250	133,700	408,930	116,600	7,427,790
Areas 9-10	150,100	220,750	224,000	206,900	58,000	16,000	0	25,150	18,000	30,000	29,100	19,000	997,000
<b>TOTAL</b>	<b>2,380,795</b>	<b>2,424,385</b>	<b>2,316,875</b>	<b>2,724,834</b>	<b>2,908,875</b>	<b>2,652,975</b>	<b>2,637,815</b>	<b>2,225,870</b>	<b>2,107,780</b>	<b>2,085,160</b>	<b>2,164,370</b>	<b>2,132,600</b>	<b>28,762,334</b>



**Figure 1.** Histograms of (A) uncorrected and (B) corrected depth of reef fish fishing using bottom longline reported to commercial logbook, 2007 – 2008. Note only depth range impacted by adjustment is shown. Reef fish landings using longline are prohibited in less than 120 ft.

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**Table 2A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008. Projection assumes 100% effort shift from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	28,762,333	18,246,076	13,360,727	7,545,380
<b>Jun - Aug (&lt;35 fathoms)</b>	24,861,213	15,894,674	11,864,572	6,729,465
<b>Apr - Aug (&lt;35 fathoms)</b>	22,958,513	14,735,953	11,121,646	6,400,764
<b>Annual (&lt;35 fathoms)</b>	17,362,517	11,142,642	8,615,567	5,222,929
<b>Annual (&lt;50 fathoms)</b>	8,424,790			

**Table 2B.** Percent reductions in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take from 2007-2008 baseline under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008. Projection assumes 100% effort shift from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	0.0%	36.6%	53.5%	73.8%
<b>Jun - Aug (&lt;35 fathoms)</b>	13.6%	44.7%	58.7%	76.6%
<b>Apr - Aug (&lt;35 fathoms)</b>	20.2%	48.8%	61.3%	77.7%
<b>Annual (&lt;35 fathoms)</b>	39.6%	61.3%	70.0%	81.8%
<b>Annual (&lt;50 fathoms)</b>	70.7%			

**Table 3A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008, with additional assumption that only 75% of effort shifts from 20-35 fathoms to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	28,762,333	18,246,076	13,360,727	7,545,380
Jun - Aug (<35 fathoms)	24,451,596	15,647,777	11,707,475	6,643,793
Apr - Aug (<35 fathoms)	22,349,112	14,367,390	10,886,542	6,280,579
Annual (<35 fathoms)	16,165,536	10,396,781	8,117,325	4,979,072

**Table 3B.** Percent reductions in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008, with additional assumption that only 75% of effort shifts from 20-35 fathoms to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	0.0%	36.6%	53.5%	73.8%
Jun - Aug (<35 fathoms)	15.0%	45.6%	59.3%	76.9%
Apr - Aug (<35 fathoms)	22.3%	50.0%	62.2%	78.2%
Annual (<35 fathoms)	43.8%	63.9%	71.8%	82.7%

**Table 4A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008, with additional assumption that only 50% of effort shifts from 20-35 fathoms to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	28,762,333	18,246,076	13,360,727	7,545,380
Jun - Aug (<35 fathoms)	24,041,978	15,400,880	11,550,379	6,558,122
Apr - Aug (<35 fathoms)	21,739,711	13,998,827	10,651,439	6,160,394
Annual (<35 fathoms)	14,968,556	9,650,921	7,619,083	4,735,215

**Table 4B.** Percent reductions in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon baseline effort reported to coastal logbook 2007-2008, with additional assumption that only 50% of effort shifts from 20-35 fathoms to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	0.0%	36.6%	53.5%	73.8%
Jun - Aug (<35 fathoms)	16.4%	46.5%	59.8%	77.2%
Apr - Aug (<35 fathoms)	24.4%	51.3%	63.0%	78.6%
Annual (<35 fathoms)	48.0%	66.4%	73.5%	83.5%

**Table 5A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	39,115,910	23,707,217	16,895,574	9,802,454
<b>Jun - Aug (&lt;35 fathoms)</b>	33,470,515	20,212,173	14,825,849	8,673,391
<b>Apr - Aug (&lt;35 fathoms)</b>	31,108,705	18,745,618	13,847,936	8,317,085
<b>Annual (&lt;35 fathoms)</b>	22,806,072	13,911,122	10,670,856	6,793,270

**Table 5B.** Percent reductions in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take from 2007-2008 baseline under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	-36.0%	17.6%	41.3%	65.9%
<b>Jun - Aug (&lt;35 fathoms)</b>	-16.4%	29.7%	48.5%	69.8%
<b>Apr - Aug (&lt;35 fathoms)</b>	-8.2%	34.8%	51.9%	71.1%
<b>Annual (&lt;35 fathoms)</b>	20.7%	51.6%	62.9%	76.4%

**Table 6A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy, with 75% of effort shifting from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	39,115,910	23,707,217	16,895,574	9,802,454
<b>Jun - Aug (&lt;35 fathoms)</b>	32,877,749	19,845,193	14,608,528	8,554,839
<b>Apr - Aug (&lt;35 fathoms)</b>	30,267,949	18,224,650	13,527,935	8,161,121
<b>Annual (&lt;35 fathoms)</b>	21,093,539	12,882,532	10,017,260	6,477,306

**Table 6B.** Percent reduction in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy, with 75% of effort shifting from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
<b>No Closure</b>	-36.0%	17.6%	41.3%	65.9%
<b>Jun - Aug (&lt;35 fathoms)</b>	-14.3%	31.0%	49.2%	70.3%
<b>Apr - Aug (&lt;35 fathoms)</b>	-5.2%	36.6%	53.0%	71.6%
<b>Annual (&lt;35 fathoms)</b>	26.7%	55.2%	65.2%	77.5%

**Table 7A.** Effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy, with 50% of effort shifting from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	39,115,910	23,707,217	16,895,574	9,802,454
Jun - Aug (<35 fathoms)	32,284,983	19,478,213	14,391,206	8,436,288
Apr - Aug (<35 fathoms)	29,427,192	17,703,682	13,207,933	8,005,157
Annual (<35 fathoms)	19,381,006	11,853,942	9,363,665	6,161,341

**Table 7B.** Percent reduction in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take under various proposed Alternatives from Actions 2 and 3 in Amendment 31. Projections based upon increasing effort for remaining vessels to 2003 proxy, with 50% of effort shifting from 20-35 to 35-50 fathoms during closures.

	No Endorsement	40K	50K	60K
No Closure	-36.0%	17.6%	41.3%	65.9%
Jun - Aug (<35 fathoms)	-12.2%	32.3%	50.0%	70.7%
Apr - Aug (<35 fathoms)	-2.3%	38.4%	54.1%	72.2%
Annual (<35 fathoms)	32.6%	58.8%	67.4%	78.6%

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**Table 8.** Percent reductions in effective effort in eastern Gulf of Mexico (areas 1-10) bottom longline reef fish fishery impacting sea turtle take from 2007-2008 baseline under various proposed Alternatives from Actions 2 and 3 in Amendment 31.

		Effort Shift	ENDORSEMENT LEVEL												
			None			40K			50K			60K			
			LE	Mean	UE	LE	Mean	UE	LE	Mean	UE	LE	Mean	UE	
SEASONAL CLOSURE	None	Baseline	n/a	0	<b>0</b>	0	37	<b>37</b>	37	54	<b>54</b>	54	74	<b>74</b>	74
		Increased	n/a	-36	<b>-36</b>	-36	18	<b>18</b>	18	41	<b>41</b>	41	66	<b>66</b>	66
	Jun-Aug	Baseline	100	7	<b>14</b>	17	41	<b>45</b>	47	56	<b>59</b>	60	75	<b>77</b>	77
			75	10	<b>15</b>	17	42	<b>46</b>	47	57	<b>59</b>	60	76	<b>77</b>	77
			50	13	<b>16</b>	18	44	<b>47</b>	47	59	<b>60</b>	61	77	<b>77</b>	78
		Increased	100	-27	<b>-16</b>	-12	23	<b>30</b>	33	45	<b>49</b>	50	68	<b>70</b>	71
			75	-22	<b>-14</b>	-11	26	<b>31</b>	33	46	<b>49</b>	51	69	<b>70</b>	71
			50	-17	<b>-12</b>	-10	29	<b>32</b>	34	48	<b>50</b>	51	70	<b>71</b>	71
	Apr-Aug	Baseline	100	10	<b>20</b>	25	43	<b>49</b>	52	57	<b>61</b>	63	76	<b>78</b>	79
			75	15	<b>22</b>	26	45	<b>50</b>	52	59	<b>62</b>	64	77	<b>78</b>	79
			50	19	<b>24</b>	27	48	<b>51</b>	53	61	<b>63</b>	64	78	<b>79</b>	79
		Increased	100	-23	<b>-8</b>	-2	26	<b>35</b>	39	46	<b>52</b>	54	68	<b>71</b>	72
			75	-16	<b>-5</b>	0	30	<b>37</b>	40	49	<b>53</b>	55	70	<b>72</b>	73
			50	-10	<b>-2</b>	1	34	<b>38</b>	41	51	<b>54</b>	55	71	<b>72</b>	73
	Annual	Baseline	100	19	<b>40</b>	49	49	<b>61</b>	67	62	<b>70</b>	74	78	<b>82</b>	84
			75	28	<b>44</b>	51	54	<b>64</b>	68	65	<b>72</b>	75	80	<b>83</b>	84
			50	38	<b>48</b>	53	60	<b>66</b>	69	69	<b>74</b>	76	81	<b>84</b>	85
		Increased	100	-9	<b>21</b>	34	34	<b>52</b>	60	52	<b>63</b>	68	71	<b>76</b>	79
75			5	<b>27</b>	37	42	<b>55</b>	61	57	<b>65</b>	69	73	<b>78</b>	79	
50			18	<b>33</b>	39	50	<b>59</b>	63	62	<b>67</b>	70	76	<b>79</b>	80	

**Note:** ‘Baseline’ assumes no increase in effort from 2007-2008 average. ‘Increased’ scenario assumes remaining vessels will exert effort equivalent to 2003 effort levels. ‘LE’ denotes lower estimate; ‘UE’ denotes upper estimate based on 95% confidence interval in ratio of sea turtle population density in 20-35 fathoms versus 35-50 fathoms.

## **APPENDIX: Actions in Amendment 31**

### **Action 1: Allow or Disallow Squid Bait in the Bottom Longline Reef Fish Fishery**

**Preferred Alternative 1** – No action. Do not modify bait in the bottom longline reef fish fishery.

**Alternative 2** – Prohibit the possession of squid or squid parts on a vessel that has reef fish and longline gear aboard, unless the longline gear is “stowed appropriately”, defined below.

### **Action 2: Restrict the Use of Bottom Longline Gear for Reef Fish in the Eastern Gulf of Mexico (east of 85°30' W longitude, near Cape San Blas, Florida)**

**Alternative 1** – No Action. Allow the use of bottom longline gear throughout the eastern Gulf year round in waters seaward of a line approximating the 20 fathom contour.

**Preferred Alternative 2** – Establish north-south boundaries for prohibition on the use of bottom longline gear. Options in this alternative may be combined with options from other alternatives to refine these restrictions.

Option a: between 27° and 28° N latitude (approximately Charlotte Harbor to Tarpon Springs, Florida)

Option b: between 26° and 28° N latitude (approximately Naples to Tarpon Springs, Florida)

**Preferred** Option c: the entire latitudinal extent of the eastern Gulf

**Preferred Alternative 3** – Establish depth boundaries for prohibition on the use of bottom longline gear. Longline gear would be prohibited shoreward of a line approximating a specific depth contour. Options in this alternative may be combined with options from other alternatives to refine these restrictions.

Option a: 30 fathoms

**Preferred** Option b: 35 fathoms

Option c: 40 fathoms

Option d: 50 fathoms

**Preferred Alternative 4** – Establish seasons for prohibition on the use of bottom longline gear. Options in this alternative may be combined with options from other alternatives to refine these restrictions.

**Preferred** Option a: June-August

Option b: April-August

Option c: Year-round

### **Action 3: Longline Endorsements to fish east of Cape San Blas**

**Alternative 1** – No Action – Do not establish a longline endorsement to the commercial reef fish permit

**Alternative 2** – Establish a longline endorsement to the reef fish permit; a minimum annual average reef fish landings using longline gear of 20,000 pounds (gutted weight) per permit will be required to qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings

Option a: during the 1999-2004 period

Option b: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-option (i): prohibited

Sub-option (ii): unrestricted between commercial reef fish permit holders;

Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length

**Alternative 3** – Establish a longline endorsement to the reef fish permit; a minimum annual average reef fish landings using longline gear of 30,000 pounds (gutted weight) per permit will be required to qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings

Option a: during the 1999-2004 period

Option b: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-option (i): prohibited

Sub-option (ii): unrestricted between commercial reef fish permit holders;

Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length

**Preferred Alternative 4** – Establish a longline endorsement to the reef fish permit; a minimum annual average reef fish landings using longline gear of 40,000 pounds (gutted weight) per permit will be required to qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings

Option a: during the 1999-2004 period

**Preferred** Option b: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-option (i): prohibited

**Preferred** Sub-option (ii): unrestricted between commercial reef fish permit holders;

Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length

**Alternative 5** – Establish a longline endorsement to the reef fish permit; a minimum annual average reef fish landings using longline gear of 50,000 pounds (gutted weight) per permit will be required to qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings

Option a: during the 1999-2004 period

Option b: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-option (i): prohibited

Sub-option (ii): unrestricted between commercial reef fish permit holders;

Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length

**Alternative 6** – Establish a longline endorsement to the reef fish permit; a minimum annual average reef fish landings using longline gear of 60,000 pounds (gutted weight) per permit will be required to qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings

Option a: during the 1999-2004 period

Option b: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-option (i): prohibited

Sub-option (ii): unrestricted between commercial reef fish permit holders;

Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length

**Alternative 7** – Establish a longline endorsement to the reef fish permit to allow sustained participation of fishing communities substantially reliant on red grouper longline landings. Long line vessels reporting landings at these communities for at least 5 years during the period of 1999-2007 with a minimum annual average reef fish landings using longline gear of 30,000 pounds (gutted weight) per permit will qualify for a longline endorsement. Annual average landings will be calculated based on logbook landings.

Option a. Apalachicola, Steinhatchee and Tarpon Springs (fishing communities where 12%-15% of value/pounds landed is red grouper)

Option b. Madeira Beach and Cortez (fishing communities where 35%-40% value/pounds landed is red grouper)

Sub-option i: during the 1999-2004 period

Sub-option ii: during the 1999-2007 period

The transfer of a longline endorsement will be

Sub-Sub-option (i): prohibited

Sub-Sub-option (ii): unrestricted between commercial reef fish permit holders at the same community of landings;

Sub-Sub-option (iii): limited to commercial reef fish permit holders with a vessel of equal or lesser length at the same community of landings

**Action 4: Modify Fishing Practices and Gear**

**Preferred Alternative 1** – No Action - Allow current fishing practices and gear throughout the eastern Gulf.

**Alternative 2** – Limit mainline length

Option a: 1 nautical mile<sup>1</sup>

Option b: 2 nautical miles

Option c: 4 nautical miles

Option d: 5 nautical miles

**Alternative 3** – Limit number of hooks per vessel

Option a: 500 hooks

Option b: 1,000 hooks

Option c: 1,500 hooks

**Alternative 4** – Limit gangion length

Option a: 2 feet

Option b: 4 feet

Option c: 6 feet

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<sup>1</sup> 1 nautical mile is equal to 1.1508 statute miles