Annual Report for 2013 on the Implementation of the Terms and Conditions of the 2011 Biological Opinion for the Gulf of Mexico Reef Fish Fishery

National Marine Fisheries Service
National Oceanic and Atmospheric Administration
Southeast Fisheries Science Center

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December 4, 2014

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Introduction

The Gulf of Mexico reef fish fishery uses bottom longlines and vertical lines to target snappers, groupers, tilefish, jacks, and other species. The National Marine Fisheries Service (NMFS) began placing observers on Gulf of Mexico reef fish fishery vessels in the second half of 2006 and continues to sample the fishery. On September 30, 2011, a new Biological Opinion on the Gulf of Mexico reef fish fishery was completed and the corresponding incidental take statement was issued. This Biological Opinion included several reasonable and prudent measures (RPMs) to minimize the impacts of future takes of sea turtles and smalltooth sawfish by the Gulf reef fish fishery and to monitor levels of incidental take. These RPMs require NMFS to: (1) avoid and minimize take through outreach and education; (2) minimize future gear impacts through research; and (3) monitor the frequency, magnitude, and impact of incidental take. Non-discretionary Terms and Conditions (T&C) are specified for each of these RPMs.

This report satisfies several Terms and Conditions of the 2011 Biological Opinion on the Gulf of Mexico reef fish fishery that NMFS is required to implement. It specifically addresses T&C 1a-c – requirement for NMFS to develop and implement a comprehensive outreach plan to promote that takes be avoided to the extent practicable and that any captured sea turtle or smalltooth sawfish are handled in a way that minimize adverse effects from incidental take and reduces the likelihood of mortality; T&C 3 – requirement for NMFS to conduct or fund projects to characterize the fishery and its interactions with sea turtles and smalltooth sawfish, and potential fishing gear and fishing behavior modifications that reduce adverse impacts from this fishery; T&C 5 – requirement to observe a minimum of 100,000 bottom longline hooks per year; T&C 6 – requirement to provide a minimum of 105 sea days per year of observer coverage for the vertical line component of the fishery; T&C's 8-11 – requirement for NMFS to specify observer data and sample collection and record keeping requirements, review observer data, and provide information on captures[1] and release condition of each bycaught sea turtle in the bottom longline portion of the U.S. Gulf of Mexico reef fish fishery; T&C 13 – NMFS' progress towards improving quantitative stock assessments of the primary incidentally-caught species; T&C 15 – requirement for NMFS to maintain a database on fishing gear found associated with sea turtle strandings and to share the results with SERO; and T&C 18 – requirement for NMFS to provide an annual bycatch report including bycatch estimates and CPUEs, a summary of the methods and data used, the distribution of observed and total fishing effort for the bottom longline component of the Gulf reef fish fishery, and every year starting after the 2012 fishing year a total three-year running take estimate for each component of the fishery must be provided.

One significant difference between the 2009 and 2011 Biological Opinions is the establishment of a rarity threshold for sea turtle takes. NMFS determined that the best way to deal with statistical problems caused by the rarity of sea turtle takes per unit effort was to devise a rarity metric which would confirm the rarity of the event in a statistical manner and provide confidence that the overall take in the fishery is below the Incidental Take Statement (and is on

[1] For the purpose of this report, captures of sea turtles (hereafter "takes") refers to sea turtles that were incidentally captured during fishing operations.

track to remain below the three-year Incidental Take Statement). NMFS is confident that the annual take level would not be exceeded if the observed take level is 1 or less per 100,000 hooks; this is the rarity threshold established for sea turtle takes. For any year in which there is a take rate of one or fewer loggerheads per 100,000 hooks, an annual estimated take will not be calculated because the take rate is too low to derive a precise point estimate of take.

To comply with government regulations (*i.e.*, Magnuson-Stevens Fishery Conservation and Mangement Act - MSFCMA), confidential information has been removed from this Annual Report; therefore, exact reproduction of the estimates provided in the appendix may not be possible.

1. RPM 1: Avoiding and Minimizing Take Through Outreach and Education

1.1. T&C 1 Develop and Implement a Comprehensive Outreach Plan

The Reef Fish Outreach Plan for the Gulf of Mexico is designed to meet the requirements of the Terms and Conditions of the Biological Opinion by training permitted participants in the reef fish fisheries as well as government officials from both State and Federal Agencies, and non-governmental organizations (NGOs). The required in-person training and education of commercial and recreational fishermen on: (1) identification of sea turtle species, (2) how to use required and recommended sea turtle gear-removal equipment, (3) the "Careful Release and Protocols for Sea Turtle Release with Minimal Injury," and (4) the importance of maximizing gear removal to maximize post-release survival of sea turtles, and can be conducted through voluntary workshops, fishing club meetings, and/or dockside visits. SEFSC, working with the Gulf of Mexico Fishery Management Council (GMFMC), identifies groups and offers training throughout the region.

1.1.1. T&C 1a Establishment of a POC to interact with constituents on sea turtle interactions

The SEFSC's point of contact (POC), Charles Bergmann, is a member of the SEFSC Harvesting Systems Unit and is assisted by Nick Hopkins. Mr. Bergmann and Mr. Hopkins answer constituent questions about sea turtle release gear and safe handling and release protocols, and actively reach out to fishermen to learn about their experiences, trouble-shoot problems, and share solutions and successful experiences with other fishermen and NMFS scientists and managers.

1.1.2. T&C 1b In-Person Training and Education of Commercial and Recreational Fishermen

Outreach and training on sea turtle safe handling and release procedures were conducted with commercial and recreational fishers at 14 locations in 2013 (DuLac and Mobile, LA; Galveston, Port Arthur, Angleton, Port Lavaca, Port Aransas, and Corpus Christi, TX; Panama City, Carrabelle, Cedar Key, Madeira Beach, Cortex, and Sarasota, FL), reaching more than 170 individuals, throughout the Gulf of Mexico region. The web address for NMFS Technical

Memorandum NMFS-SEFSC-580 ("Careful Release Protocols for Sea Turtle Release with Minimal Injury") and placards were distributed to fishers.

1.1.3. T&C 1c Increased Collaboration and Communication with Federal and State Agency Partners

Training was conducted with Federal and State Agency partners at 9 of the 14 locations mentioned in 1.2. Partners that attended these events included NOAA Sea Grant, NMFS Southeast Regional Office, National Park Service, and Texas Parks and Wildlife.

2. RPM 2: Minimizing Future Gear Impacts through Research

2.1. T&C 3 NMFS Conducted or Funded Research that Better Characterizes the Fishery and its Interactions with Sea Turtles and Smalltooth Sawfish

2.1.1. Hook Timer Project

In 2010, NMFS conducted a pilot study, *Characterization of Target Catch CPUE as a Function of Bait Soak Time in the Gulf of Mexico Bottom Longline Reef Fish Fishery: A Pilot Study to Examine Potential Sea Turtle Mitigation Measures*, to investigate the potential of reducing gear soak times as a method for reducing sea turtle interactions and mortality on reef fish bottom longlines. The objective of the fishery-dependent project was to characterize the catch per unit effort of the primary target species as it relates to hook soak time in the Gulf of Mexico reef fish bottom longline fishery. The initial phase of the hook timer study carried out Sept.–Dec., 2010 found that the duration of typical sets are longer than necessary to effectively catch reef fish. The study results indicate that reduced soak times could reduce bycatch of sharks and possibly sea turtles, and could reduce the mortality of turtles that are caught. The results of Phase I were presented at a series of industry workshops in August 2011. Fishers suggested exploring seasonal and bait type effects for reef fish bite times in future research.

Based on industry feedback, Phase II of the research was conducted January – May 2013. The experimental design was the same as for Phase I, with the exception of season and alternating bait between sets. Comparing the results from the two phases, we were unable to detect a seasonal effect or bait effect for how quickly reef fish take the hook. The findings of the two phases of the research indicate that reducing the soak time of sets in the bottom longline reef fish fishery has the potential to mitigate the impact of the fishery on sharks and sea turtles without affecting the harvest of target catch.

2.1.2. T&C 4 Updates to Careful Release Protocols and Modifications of Release Gears as New Information Becomes Available

No updates to release protocols or modifications to release gears were made in 2013.

3. RPM 3: Monitoring the Frequency, Magnitude, and Impact of Incidental Take

3.1. Coastal Logbook Data

Landings and fishing effort of commercial bottom longline vessels operating in the Gulf of Mexico are monitored by NMFS through the coastal logbook program. The program collects catch and effort data by fishing trip for vessels with permits to fish in a number of fisheries managed by the GMFMC. The coastal logbook program began in 1990 with the objective of a census of reef fish fishery permitted vessel activity, with the exception of Florida where a 20% sample of vessels was required to report. Beginning in 1993, the sampling in Florida was increased to require reports from all vessels permitted in the reef fish fishery.

3.1.1 Data Collection Methodology

For each fishing trip the logbook database includes a unique trip identifier, the landing date, fishing gear deployed, areas fished, number of days at sea, gear specific fishing effort (*e.g.*, longline: number of sets, number of hooks per set, length of the longline), species caught, and weight of the landings in pounds. Multiple areas and gears fished may be recorded for a single fishing trip. Data are filtered to remove records with missing effort data, clearly erroneous data (*e.g.*, more than 24 sets/day, longline lengths more than 25 miles), and trips that report fishing in both regions. Since coastal logbook data are trip-based, effort cannot be apportioned among areas when multiple areas are recorded in a single trip. Total effort reported to the coastal logbook program was compiled by the species targeted. Reef fish targeted trips were defined as trips by those vessels that did not have a commercial directed shark permit, or trips by vessels that did have a commercial directed shark permit but landed 2/3 by weight species other than sharks. The data were further stratified by region as defined by the Reef Fish Observer Program: eastern Gulf of Mexico and western Gulf of Mexico. The eastern region included statistical areas 1-10 and the western region included statistical areas 11-21 (Figure 1).

Three measures of effort were summarized for the reef fish fishery: number of trips, number of sets, and total hooks fished. Hook hours fished could not be used as a measure of fishing effort because of inconsistent reporting of the time spent fishing. In some cases, fishers reported hours fished per set, but other fishers reported total hours fished. In many cases, it was not clear which “hours of fishing” had been reported. Additionally, different start and end points are used to measure Average Soak Duration for SBLOP and RFOP. SBLOP calculates it from when the set ends to when the haul begins, whereas RFOP calculates it from when the first buoy is set to when the last buoy is retrieved.

3.1.2. Coverage Levels

All vessels with permits to land federally managed species (other than swordfish and tunas) in the Gulf of Mexico are required to report landings and effort information to the coastal logbook program.

3.1.3. Reported Effort

All reef fish effort (trips, sets, and total hooks fished) for both regions during 2013, as defined in section 3.1.1, reported to the coastal logbook program (less filtered data as defined above) was included in the totals provided in Table 1. Reported effort (trips, sets, and hooks fished) by region, target, and permit type are provided in Table 2.

3.1.4. Supplemental Discard Program

In August 2001, NMFS initiated a program to collect commercial fishing vessel discard data from Gulf of Mexico and US South Atlantic Federally managed commercial fisheries. A reporting form was developed that supplements the existing coastal logbook forms that are mandatory for those fisheries. Discard data from the SEFSC coastal fisheries discard logbook program have been routinely used to calculate the number discarded fish from commercial fishing vessels. For Gulf of Mexico stocks, however, observer reported discard data have been used for discard calculation (including discards of protected species) rather than the fisher reported discard logbook data. Observer data from the US South Atlantic are few and the discard logbook data are still used to inform stock assessments.

Data collection for the discard logbook program involves, each year, a 20% random sample of vessels with Gulf of Mexico Federal reef fish, snapper-grouper, king mackerel, Spanish mackerel, dolphin/wahoo, and shark permits. To ensure that the sample is representative of vessels with those Federal permits, the universe of permitted vessels is stratified by region and gear fished. A random sample (weighted by fishing effort reported in the previous year) is selected, without replacement, from each stratum. Fishing gear strata include hand line, bandit reel, trolling, bottom longline, trap, gillnet, and diving. The selected fishers are instructed to complete a supplemental discard form for every fishing trip they make. Trips with no discards are reported as such.

Reported data include the numbers of discards by species, estimated condition of the animal when released, reason for release (due to regulations or unmarketable/unwanted), and the fishing area where the animal was discarded. Two protected species interactions with bottom longline vessels in the Gulf of Mexico were reported to the supplemental discard program during 2013; one seagull and one brown pelican, both were reported dead.

3.2. Observer Programs

3.2.1. Background

The two mandatory SEFSC-based NMFS observer programs in the Gulf of Mexico that monitor the commercial reef fish sector are the Shark Bottom Longline Observer Program (SBLOP) and the Reef Fish Observer Program (RFOP). The SBLOP has been observing the shark-directed bottom longline fishery in the Atlantic Ocean and Gulf of Mexico since 1994 (Hale and Carlson 2007, Hale *et al.* 2007, Morgan *et al.* 2009, Hale *et al.* 2009, Hale *et al.* 2010). Currently 202 U.S. fishers are permitted to target sharks (excluding dogfish) in the Atlantic Ocean and Gulf of

Mexico, and an additional 251 fishers are permitted to land sharks incidentally. Amendments to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan, based on updated stock assessments, have eliminated the major directed shark fishery in the U.S. Atlantic and Gulf of Mexico (NMFS 2007). Amendment 22 to the GMFMC's Reef Fish Fishery Management Plan dictates mandatory observer coverage which is accomplished through the RFOP. In July 2006, NMFS, in collaboration with the commercial fishing industry and the GMFMC, implemented a mandatory observer program to characterize the commercial reef fishery operating in the U.S. Gulf of Mexico (Scott-Denton *et al.* 2010, Scott-Denton *et al.* 2011, Scott-Denton and Williams 2013). The fishery consists of approximately 821 federally permitted vessels (SERO, 2013). The primary gears used include bottom longline and vertical lines (bandit reel - electric or hydraulic; and hand lines). Although numerous reef fish species are retained, the predominant targets of these fisheries are groupers and snappers.

3.2.2. Data Collection Methodology

NMFS observers were placed on commercial reef fish vessels operating throughout the Gulf of Mexico based on random selection stratified by season, gear, and region. Seasonal categories (*i.e.*, quarters) for both observer programs were: 1) January – March, 2) April – June, 3) July – September, and 4) October – December. Regions for the purpose of this analysis, for both observer programs, were eastern Gulf (shrimp statistical zones 1-10) and western Gulf (shrimp statistical zones 11-21; Figure 1).

For the SBLOP, vessels possessing valid directed shark and reef fish permits were randomly selected for coverage, with a target coverage level of 4-6% based on previous years effort in the coastal fisheries logbook. Because of the overlap with vessels targeting reef fish and shark within the same trip and vessels possessing directed shark permits (Hale and Carlson 2007), observers boarded trips regardless of the indicated target species. In 2013, a lapse in funding resulted in observer coverage of the shark research fishery only; thus, no trips targeting reef fish were observed by SBLOP in 2013. This did not affect our ability to meet the target coverage level for the entire fishery.

In the RFOP, proportional sampling effort, based on coastal logbook data, among seasons and gears in the eastern and western Gulf of Mexico for all vessels with federal reef fish permits was recommended by NMFS in 2006, and used thereafter for vessel selection stratification purposes. From 2009 through 2011, increased coverage was directed toward the bottom longline fishery in the eastern Gulf of Mexico to monitor protected species. In 2012, increased coverage was directed toward the vertical line fishery, and in 2013 for the bottom longline fishery. Collectively in 2013, the primary gear types assessed included bottom longline and vertical line (bandit reel and hand line). Mandatory observer coverage for the reef fish fishery is currently approximately 5% of the total sea days reported in 2013 coastal logbook data.

For both programs, selection letters requiring observer coverage were issued to the permit holder via U.S. Certified Mail approximately one to two months prior to the upcoming fishing season. Once the permit holder received the selection letter, he or she was required to make contact with the observer coordinator and indicate intent to fish during the upcoming fishing

season. If the permit holder intended to fish, the observer coordinator deployed an observer to the port of departure. Vessels were required to have a current Commercial Fishing Vessel Safety Examination decal prior to the selection period for mandatory observer coverage.

Trip, set/haul, gear and fishing characteristics by program for the 2013 commercial reef fish season are depicted (Table 3). Effort by region (Table 4) and by region and season (Table 5) are given. Sea days and percent coverage levels are depicted in Table 6. Protected resources interactions are shown in Table 7.

3.2.3. T&C 5 Bottom Longline Component of the Gulf Reef Fish Fishery

The SBLOP did not observe any trips targeting reef fish in 2013. However, SBLOP observed 61 trips targeting sharks in 2013, down from 110 in 2012. This decline in coverage was due to a decrease in funding.

The RFOP observed 1,487,717 hooks (2,134 sets on 82 trips; Table 3) targeting shallow-water reef fish (mainly red grouper) or deepwater grouper/tilefish (mainly yellowedge grouper and tilefish) using bottom longline gear in the Gulf of Mexico in 2013. The length of the mainline for this gear ranged from 1.9 to 14.5 km with an average of 7.6 km. The bottom depth fished ranged from 34 to 393 m with an average of 92.8 m. Hooks set ranged from 60 to 1,512 hooks with an average of 699 hooks fished. Circle hooks were deployed on all sets with size 13/0 the dominant (60.2%). The average soak duration (the time from when the first buoy entered the water until the last buoy was hauled back) was 3.8 hr. Two loggerhead sea turtle interactions (1 loggerhead per 743,858.8 hooks) and two sea bird interactions were documented in the bottom longline component of the Gulf reef fish fishery in 2013 (Table 7). Table 8 provides a summary of takes, gear characteristics, capture and release conditions, and final disposition of sea turtles documented by the observer program.

3.2.4. T&C 6 Vertical Line Component of the Gulf Reef Fish Fishery

The RFOP observed 500.6 sea days (4,701 sets during 125 trips; Table 3) targeting shallow-water reef fish, mainly red grouper and snapper in the Gulf of Mexico in 2013. The bottom depth fished ranged from 4 to 303 m with an average of 42.7 m, and the number of hooks ranged from 1 to 380 hooks with an average of 25 hooks fished. Circle hooks were deployed on most (99.0%) sets with size 8/0 the dominant (40.6%). The average soak duration was 0.5 hr. No protected species interactions were observed in the vertical line component of the Gulf reef fish fishery in 2013.

3.2.5. Modified Buoy Gear of the Gulf Reef Fish Fishery

While not specifically addressed in the T&Cs of the 2011 Biological Opinion, modified buoy gear has been used in the Gulf reef fish fishery in recent years. The RFOP observed two trips that deployed modified buoy gear in 2013. Due to data confidentiality requirements, details about these trips cannot be presented. No protected species interactions were observed in the modified buoy gear component of the Gulf reef fish fishery in 2013.

3.2.6. T&Cs 8, 9, 10, 11 Documentation of Protected Species Interactions

Observers record information on the SEFSC sea turtle life history form or collect specified data for smalltooth sawfish, take photographs, and when possible, tag animals prior to release (T&C 8). In 2013, neither of the bycaught sea turtles was landed, so no tags were applied. A tissue sample for genetic analysis was obtained from one turtle while it was alongside the vessel (T&C 9) and sent to the NMFS SWFSC for archiving and analysis.

Observers collect data pertaining to vessel, gear, location, and biological information. For each set (the location of gear placement at a defined time), the type, number and construction material of the fishing gear were recorded (T&C 10). Latitude, longitude, depth, and environmental parameters including sea state and bottom type were recorded at the start of each set. The total time the gear remained in the water (soak or fishing time) was calculated. Fishery data were obtained from each set. Discarded and retained species were processed, recording length, weight, and condition when brought onboard, and if necessary, condition at release. Sightings or capture of sea turtles and other protected species were recorded in accordance with NMFS protocol (NMFS 2008), SEFSC observer program staff are notified when takes occur, and SERO is notified no later than 3 days after the conclusion of each trip (T&C 11).

3.3. T&C 13 Improvements in Quantitative Stock Assessment

NMFS has made progress towards the goal of improved quantitative stock assessment. We are developing a variety of quantitative assessment tools to evaluate the risks and benefits associated with various impact assessment approaches. This process will enable identification of the most sensitive assessment parameters, which can be useful when prioritizing research and data collection efforts.

3.4. T&C 15, 16 Fishing Gear Found Associated with Stranded Sea Turtles

STSSN participants collect fishing gear associated with stranded sea turtles and send it to Mr. Charles Bergmann (SEFSC) for identification. The "Fishing Gear Database" for the Gulf of Mexico and SE U.S. (Texas-North Carolina) is maintained and updated quarterly by staff at the SEFSC Pascagoula Laboratory. In 2013, 183 sea turtle strandings and incidental captures (179 in the Gulf of Mexico, 4 in the Atlantic) were reported with associated fishing gear. It is important to note that quarterly updates may not include all gear found in the previous quarter since there is a time lag for individual states submission of gear/data. A copy of the database including all 2013 data to date was submitted to SERO on July 22, 2014.

3.5. T&C 18 Annual Bycatch Report

Two sea turtles were observed taken in the randomly sampled portion of the bottom longline component of the Gulf reef fish fishery in 2013 (1 loggerhead per 743,858.8 hooks). This level of take was not high enough to exceed the rarity threshold of one take per 100,000 hooks, thus no estimate of sea turtle takes was calculated for the bottom longline component of the

fishery. No sea turtles were captured in the vertical line component of the fishery. Three-year running sea turtle take estimates are provided in Appendix A.

No sawfish or marine mammals were observed as bycatch in the Gulf reef fish fishery in 2013. Two sea birds were observed taken in the bottom longline component of the fishery. Like sea turtle takes, the frequency of these events is rare.

References

Hale, L.F. and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery, 2005-2006. NOAA Technical Memorandum NMFS-SEFSC-554, 28 p.

Hale, L.F., L.D. Hollensead, and J.K. Carlson. 2007. Characterization of the shark bottom longline fishery, 2007. NOAA Technical Memorandum NMFS-SEFSC-564, 25 p.

Hale, L.F., S.J.B. Gulak, and J.K. Carlson. 2009. Characterization of the shark bottom longline fishery, 2008. NOAA Technical Memorandum NMFS-SEFSC-586, 23 p.

Hale, L.F., S.J.B. Gulak, and J.K. Carlson. 2010. Characterization of the shark bottom longline fishery, 2009. NOAA Technical Memorandum NMFS-SEFSC-596, 25 p.

Hale, L.F., S.J.B. Gulak, A.M. Napier, and J.K. Carlson. 2011. Characterization of the shark bottom longline fishery, 2010. NOAA Technical Memorandum NMFS-SEFSC-611, 35 p.

Hale, L.F., S.J.B. Gulak, A.N. Mathers, and J.K. Carlson. 2012. Characterization of the shark and reeffish bottom longline fishery, 2011. NOAA Technical Memorandum NMFS-SEFSC-634, 27 p.

Gulak, S.J.B., M.P. Enzenauer, and J.K. Carlson. *2013*. Characterization of the shark and reef fish bottom longline fisheries: 2012. NOAA Technical Memorandum NMFS-SEFSC-652, 42 p.

Morgan, A., P. Cooper, T. Curtis, and G. Burgess. 2009. An overview of the United States East Coast Bottom Longline Shark Fishery, 1994-2003. Marine Fisheries Review, 71(1):23-28.

National Marine Fisheries Service. 2007. Amendment 2 to the Consolidated Atlantic Highly Migratory Species Fishery Management Plan. NOAA/NMFS, Office of Sustainable Fisheries, Highly Migratory Species Management Division, Silver Spring, MD. 726 p.

National Marine Fisheries Service. 2010. Annual report on the implementation of the terms and conditions of the 2009 Biological Opinion for the Gulf of Mexico reef fish fishery. 26p.

National Marine Fisheries Service. 2011. 2010 Annual report on the implementation of the terms and conditions of the 2009 Biological Opinion for the Gulf of Mexico reef fish fishery. 20p.

National Marine Fisheries Service. 2012. 2011 Annual report on the implementation of the terms and conditions of the 2009 Biological Opinion for the Gulf of Mexico reef fish fishery. 18p.

National Marine Fisheries Service. 2014. Annual report for 2012 on the implementation of the terms and conditions of the 2009 Biological Opinion for the Gulf of Mexico reef fish fishery. 19p.

National Marine Fisheries Service Southeast Fisheries Science Center. 2008. Sea turtle research techniques manual. NOAA Technical Memorandum NMFS-SEFSC-579, 92p.

National Marine Fisheries Service Southeast Fisheries Science Center. 2008, Revised 2010. Careful release protocols for sea turtle release with minimal injury. NOAA Technical Memorandum NMFS-SEFSC-580, 130p.

National Research Council. Assessment of Sea-Turtle Status and Trends: Integrating Demography and Abundance. Washington, DC: The National Academies Press, 2010.

Pennington, M. 1983. Efficient estimators of abundance for fish and plankton surveys. Biometrics, 39: 281-286.

Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, J. Pulver, R. Smith, and J. A. Williams. 2010. Observer Coverage of the U.S. Gulf of Mexico Reef Fish Fishery Data Summary.

Scott-Denton, E., P. Cryer, J. Gocke, M. Harrelson, J. Pulver, R. Smith, and J. A. Williams. 2011. Descriptions of the U.S. Gulf of Mexico reef fish bottom longline and vertical line fisheries based on observer data. Marine Fisheries Review 73(2).

Scott-Denton, E., and J.A. Williams. 2013. Observer coverage of the 2010-2011 Gulf of Mexico reef fish fishery. NOAA Technical Memorandum NMFS-SEFSC-646, 65 p.

Southeast Fisheries Science Center. 2008. Estimated takes of sea turtles in the bottom longline portion of the Gulf of Mexico reef fish fishery July 2006 through 2007 based on observer data. NMFS Southeast Fisheries Science Center Contribution PRD-07/08-15, September 2008, 21p.

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-08/09-07, March 2009, 23p.

Southeast Regional Office. 2013. Fishery permits.

Walters, C. 2003. Folly and fantasy in the analysis of spatial catch rate data. Canadian Journal of Fisheries and Aquatic Science, 60: 1433-1436.

Figure 1. Map of shrimp fishery statistical zones in the Gulf of Mexico.

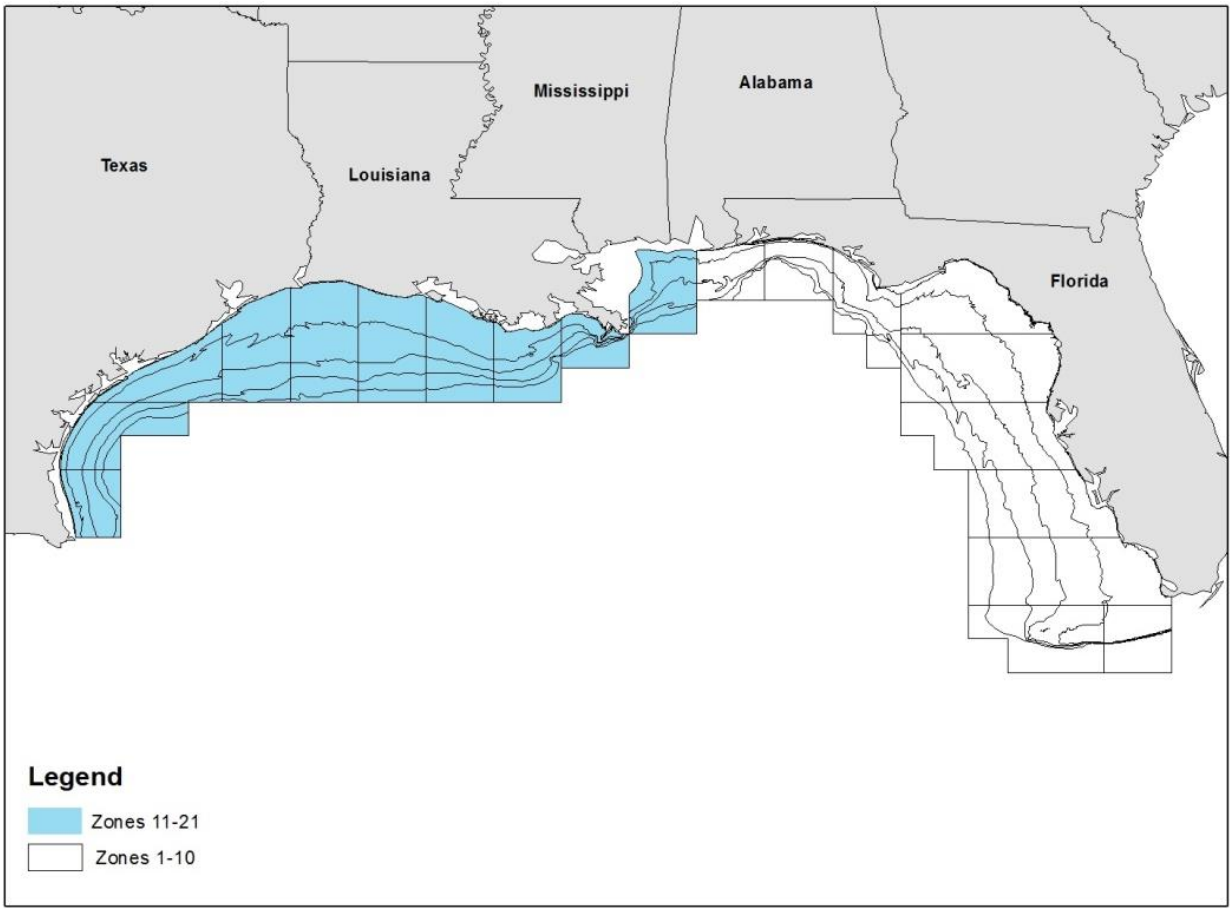

Table 1. Effort by region (combined statistical zones, East = 1-10, West = 11-21) reported to the coastal logbook program during 2013.

Effort Measure	Eastern Gulf	Western Gulf
Number of trips	650	455
Number of sets	16,899	2,414
Total hooks fished	12,442,997	1,738,420

Table 2. Detailed effort reported to the coastal logbook program during 2013 including all effort, subdivided by target group (as defined in section 3.1.1).

Region	Target[1]	Permit[2]	Trips	Sets	Total hooks
Eastern Gulf	reef fish	0	393	11,435	8,342,638
Eastern Gulf	reef fish	1	206	5,386	4,078,170
Eastern Gulf	shark	1	51	78	22,189
Eastern Gulf	mixed	1	NR	NR	NR
Western Gulf	reef fish	0	51	2,002	1,655,750
Western Gulf	reef fish	1	*	*	*
Western Gulf	shark	1	404	412	82,670
Western Gulf	mixed	1	NR	NR	NR

[1] reef fish – trips by vessels that did not have a commercial directed shark permit and trips by vessels that did have a commercial directed shark permit but landed 2/3 by weight species other than sharks;
shark – trips by vessels with directed shark permits that landed 2/3, by weight, sharks of any species;
mixed – trips by vessels with directed shark permits that did not land a 2/3 majority of either shark or reef fish species

[2] 0 – vessels without directed shark permits, 1 – vessels with directed shark permits

***** Data not presented due to data confidentiality requirements, combined with data from vessels without directed shark permits

NR – no reports to coastal logbook program

Table 3. Trip, set, and gear characteristics for all sets targeting reef fish species in the Gulf of Mexico in 2013 observed by the Reef Fish Observer Program.

	Bottom Longline	Vertical Line
Number of Trips	82	125
Trip Length (days)	1 – 18 ($\bar{x}$ = 10.8)	0 – 14 ($\bar{x}$ = 3.9)
Number of Vessels	41	93
Total Sets	2,134	4,701
Sea Days	923.5	500.6
Bottom Depth (m)	34.1 – 393.2 ($\bar{x}$ = 92.8)	3.7 – 302.7 ($\bar{x}$ = 42.7)
Mainline Length (km)	1.9 – 14.5 ($\bar{x}$ = 7.6)	-
Mainline Material	Cable (87.9%) Monofilament (12.1%)	Monofilament (79.1%) Cable (17.0%) Other (3.8%) Poly (0.1%)
Mainline Test (lbs)	700 – 5,000 ($\bar{x}$ = 1,775)	12 – 3,600 ($\bar{x}$ = 221.5)
Gangion Length (ft)	2.3 – 10.9 ($\bar{x}$ = 6.2)	-
Gangion Material	Monofilament (100%)	-
Distance Between Hooks (ft)	6.0 – 99.0 ($\bar{x}$ = 22.8)	-
Rod Mount	-	Fixed (76.6%) Portable (23.4%)
Reel Type	-	Electric (63.8%) Hand (26.3%) Hydraulic (9.9%)
Number of Hooks/Set	60 – 1,512 ($\bar{x}$ = 698.8)	1– 380 ($\bar{x}$ = 24.7)
Hook Brand	Mustad (87.5%) Eagle Claw (12.5%)	Mustad (97.9%) Eagle claw (1.4%) not recorded (0.3%) Owner (0.2%) Daiichi (0.2%)
Hook Shape	Circle (100%)	Circle (99.0%) Other (< 1%)
Hook Offset	Straight (61.8%) Offset (38.2%) - 10° (73.4%) - 5° (18.5%) - 15° (4.1%) - NR (4.0%)	Straight (68.4%) Offset (31.6%) - 10° (91.7%) - 5° (6.5%) - 15° (1.1%) - Other (<1%)
Hook Size	13/0 (60.2%) 14/0 (16.4%) 15/0 (13.7%) 11/0 (4.2%) 12/0 (2.3%) 10/0 (1.9%) Other (< 1%)	8/0 (40.6%) 13/0 (11.4%) 12/0 (11.3%) 3/0 (9.5%) 9/0 (7.9%) NR (6.4%) 10/0 (4.5%) 14/0 (4.1%) 15/0 (1.9%) Other (< 1%)
Total Hooks Set	1,487,717	115,935
Avg Soak Duration in hrs[1]	0.9– 72.9 ($\bar{x}$ = 3.8)	<0.1 – 8.5 ($\bar{x}$ = 0.5)
Total Hours Fished (sets)	8,008.4 (2,134)	2,263.700 (4,700)
Total Hook Hours	5,732,466.5	65,750.2

[1] Different start and end points are used to measure Average Soak Duration for SBLOP and RFOP. SBLOP calculates it from when the set ends to when the haul begins, whereas RFOP calculates it from when the first buoy is set to when the last buoy is retrieved.
NR – not recorded by observer

Table 4. Effort by region for all observed sets targeting reef fish species in the Gulf of Mexico Reef Fish Observer Program.

	Bottom Longline	Vertical Line
Eastern Gulf		
n	2,091[1]	4,328[2]
Hooks Set	1,448,229	97,010
Hours	7,781.8	1,979.9
Western Gulf		
n	43	373
Hooks Set	39,488	18,925
Hours	226.6	283.8

[1] Hooks set was not reported for 5 sets
[2] Hours fished was not reported for 1 set

Table 5. Observed reef fish effort (trips, sets, and hooks) for the Gulf of Mexico from the Reef Fish Observer Program by region, gear type, and season. Data were aggregated into two seasons (1 – January-June and 2 – July-December).

		Eastern Gulf		Western Gulf	
	Season	Bottom Longline	Vertical Line	Bottom Longline	Vertical Line
TRIPS	1	32.8	51.4	*	11.0
	2	46.2	48.9	*	13.7
SETS	1	842[1]	2,108[2]	*	247
	2	1,249[2]	2,220	*	126
HOOKS	1	572,595[1]	59,077	*	15,491
	2	875,634	37,933	*	3,434

[1] Includes 3 sets with no count of hooks set.
[2] Includes 2 sets with no count of hooks set.
* Data not presented due to data confidentiality requirements.

Table 6. Number of sea days for all gear types for Observer Program sets and industry in the Gulf of Mexico in 2013.

Gear Type	RFOP	Industry	Percent Coverage
Bottom Longline	903.5	7,004	12.9%
Vertical Line	500.6	20,858	2.4%
Total	1,404.1	27,862	5.0%

Table 7. Observed protected species interactions for sets targeting reef fish species in the Gulf of Mexico in 2013.

	Bottom Longline	Vertical Line
Sea Turtles	2	0
Marine Mammals	0	0
Sea Birds	2	0

Table 8. Summary of sea turtle takes observed in the Gulf of Mexico reef fish fishery in 2013. Seasons = 1 – Jan-Mar, 2 – Apr-Jun, 3 – Jul-Sep, 4 – Oct-Dec.

	Turtle 1	Turtle 2
Species	Loggerhead	Loggerhead
Observer Program	RFOP	RFOP
Gear	Bottom longline	Bottom longline
Season	2	4
Depth (ft)	257	174
Number of Hooks	1,000	1,000
Hook Type	Circle	Circle
Hook Size	13/0	13/0
Offset (°)	5	0
Bait	Cut herring	Assorted fish
Capture Condition	Alive, injured	Alive, injured
Final Disposition	Released alive	Released alive
Hook Location	Beak internal, lower jaw	Shoulder
Hook Removed	No	Yes
Entangled Capture	No	Yes
Entangled Released	No	No
Line Left (ft)	0.0	0.0
Estimated Carapace Length (ft)	3.5	3.0
Curved Carapace Length (cm)	-	-
Injury Category Row	I	I
Release Condition Column	C	D*

Injury Category Row:

I: hooked externally with or without entanglement (this category now includes all rhamphotheca (beak) hooking locations)

Release Condition Column:

C: released with hook or with hook and with trailing line < half the length of the carapace

D*: all gear removed by observer, not vessel crew

Appendix A

Extrapolated Total Takes of Loggerhead Sea Turtles in the Eastern Gulf of Mexico in the Bottom Longline Portion of the Reef Fish Fishery.

T&C 18 specifies that the Annual Report on the Implementation of the Terms and Conditions of the 2009 Biological Opinion for the Gulf of Mexico Reef Fish Fishery include bycatch and catch per unit effort (CPUE) estimates for periods in which the take level was high enough to exceed the rarity threshold. While not required, since the take level did not exceed the rarity threshold, 1 take per 100,000 hooks, extrapolations of bycatch estimates using methods employed in previous reports were conducted (Table A1), and as stated in the 2008 and 2009 reports, these 2013 extrapolated estimates are based upon sparse data sets (*i.e.*, two sea turtle takes) and should not be assumed to be reasonable without potentially invoking large assumptions regarding unobserved events. The RFOP sampled the entire bottom longline fishery and the SBLOP sampled the portion of the fishery that also had directed shark permits, therefore relative weightings usually were needed (in prior years) to produce a bycatch estimate for the entire fishery, but were not possible for this estimate because no samples were observed by the SBLOP in 2013. Weightings would be determined by approximated logbook effort (in sets) by the proportion of the fishery that either the RFOP or the SBLOP were presumed to have selected from. For 2013, it is not possible to assign estimated relative weightings, therefore the RFOP based estimate is all that is presented and is assumed to represent an appropriate sample of the entire bottom longline portion of the Reef Fish fishery.

Table A1. Extrapolated total takes and catch per unit effort (CPUE, takes per one thousand hooks) of loggerhead sea turtles in the Eastern Gulf of Mexico bottom longline component of the reef fish fishery based on observations by the Reef Fish Observer Program for 2013.

Observer Program	CPUE	Takes	95% CI	CV
RFOP	0.00096	11.9	3.4 - 41.4	0.70

The 2011 Biological Opinion of the Gulf of Mexico reef fish fishery requires SEFSC to produce a three-year running sea turtle take estimate for each component of the fishery every year starting after 2012. The number of observed takes did not exceed the rarity threshold (1 take per 100,000 hooks) in any year from 2009 through 2013 for the bottom longline component of the fishery, so no estimates of take were required. However, since take estimates were computed and presented in the 2009 through 2012 reports, they have been consolidated and presented below.

Year	Observer Program	Estimated Takes*	95% CI	CV
2010	SBLOP, RFOP	22.5	6.6 – 76.1	0.69
2011	SBLOP, RFOP	30.8	6.8 – 139.5	0.90
2012	SBLOP, RFOP	12.5	2.3 – 68.6	1.06
Three-year running total		65.8		
Anticipated Triennial Takes (loggerheads)		644		

* Weighted sum of Stratified Estimates

Year	Observer Program	Estimated Takes*	95% CI	CV
2011	SBLOP, RFOP	30.8	6.8 – 139.5	0.90
2012	SBLOP, RFOP	12.5	2.3 – 68.6	1.06
2013	RFOP	11.9	3.4 - 41.4	0.70
Three-year running total		55.3		
Anticipated Triennial Takes (loggerheads)		623		

* Weighted sum of Stratified Estimates (2011, 2012); Extrapolated Takes (2013)

Observed sea turtle takes in the vertical line component of the Gulf of Mexico reef fish fishery occurred only in 2012 for the years 2009 through 2013.

Year	Observer Program	Estimated Takes	95% CI	CV
2010		0		
2011		0		
2012	RFOP	81.2	22.3 – 296.1	0.71
Three-year running total		81.2		
Anticipated Triennial Takes (loggerheads)		77		