Catch Characterization and Discards within the Snapper Grouper Vertical Hook-and-Line Fishery of the South Atlantic United States

Photo by Phillip Antman

Final Report

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Final Report

I. Project Title: Catch Characterization and Discards within the Snapper Grouper Vertical Hook-and-Line Fishery of the South Atlantic United States

Organization: Gulf and South Atlantic Fisheries Foundation, Inc.

Cooperative Agreement No: NA06NMF4540059 (GSAFFI #99)

Amount of Award: $394,252

Award Period: June 1, 2006 – July 31, 2008

II. Abstract:

The purpose of this research was to characterize the catch and discards within the snapper-grouper vertical hook-and-line fishery of the South Atlantic through the implementation of a pilot observer program. Observers were placed onboard vessels to collect a variety of data quantifying the participation, gear, effort, catch, and discards within the fishery. A total of 200 sea days were logged with 1698 sets on board 24 different vessels from North Carolina, South Carolina, Georgia and Florida's east coast. The data collected during this research was not to form a standalone dataset, but to augment currently available datasets. As such, the data analyses is descriptive and includes, but is not limited to: number of trips sampled, number of vessels sampled, average number of sets per station, species specific CPUE, species specific length-frequency distribution, mean depth per trip and station, the ratio of retained vs. discarded catch, and distribution of effort.

III. Executive Summary

In 2006, the Foundation was funded to conduct a pilot study to characterize the catch and fate of discards within the Snapper Grouper vertical hook-and-line fishery of the South Atlantic (NA06NMF4540059). The project was highly successful with cooperation of the snapper grouper fleet throughout the South Atlantic with a total of 200 sea days logged with 1698 sets on board 24 different vessels from North Carolina, South Carolina, Georgia and Florida's east coast. Analysis of catch and discard fate began in the Fall of 2007 and a presentation was made to the South Atlantic Fishery Management Council at their June 2008 meeting. In addition, data from the project were reviewed during the latest SEDAR 17 (SEDAR 2008).

Catch characterization trips were completed in all four South Atlantic states with eight (8) trips in NC, ten (10) in SC, six (6) in GA and four (4) in FL. Trip lengths ranged from 2 to 13 days with an average of 7 days per trip overall. The number of sets per trip ranged from 14 to 142 with an overall average of 61 sets per trip. Trip length varied with vessels from North Carolina making shorter day trips averaging 4 days in length, while

vessels in the three other South Atlantic states averaging longer trips closer to the overall average of 7 days.

The dataset created during the performance of this award was not intended to be considered a standalone, but meant to augment the existing datasets and assist scientists in the development of formal stock assessments for the snapper-grouper complex. As a result, the majority of data analyses for this project will be descriptive and include, but are not limited to: number of trips sampled, number of vessels sampled, average number of sets per station, species specific CPUE, species specific length-frequency distribution, mean depth per trip and station, the ratio of retained vs. discarded catch, and distribution of effort. Data collected for this project have already been reviewed during the latest SEDAR 17 (SEDAR 2008) and will likely be included in updates to the vermilion snapper and other assessments.

IV. Purpose

Although there are sustained data collection programs (fishery dependent) within the South Atlantic United States, these programs are limited in the types of data they collect (landings data via trip tickets and dealer invoices; length frequency data via port agents, etc.). Although data generated by fishery independent programs are drastically needed for stock assessments, funding has limited spatiotemporal coverage within the South Atlantic and raised criticism. Therefore, the need for more fishery dependent data collection is crucial to the enhancement of stock assessment data. The purpose of this research was to characterize the catch and discards within the snapper-grouper vertical hook-and-line fishery of the South Atlantic through the implementation of a pilot observer program. The data collected during this research was not to form a standalone dataset, but to augment currently available datasets.

A. Description of Problem

Stock assessments are a critical tool for evaluating and monitoring the status of fish stocks. Like all models, stock assessments have an associated level of uncertainty resulting from the use of inaccurate catch statistics, natural, environmental, and anthropogenic variability, and nuances and assumptions associated with individual model types (NMFS 1999). This uncertainty (broad confidence intervals and biological reference points) was evident following the assessments of South Atlantic vermilion snapper stocks (SAFMC 2006).

The snapper-grouper unit is comprised of 73 different species, including fishes within the *Lutjanidae, Serranidae, Malacanthidae, Carangidae, Sparidae* families (SAFMC 2006). Although many snapper-grouper species exhibit spawning migration patterns (Reilinger 1999; Robins and Ray 1986), snappers and large groupers species typically display localized movement patterns, thus making these economically important species prone to localized fishing pressures.

The snapper-grouper management unit within the South Atlantic United States is managed by the South Atlantic Fishery Management Council under the snapper-grouper Fishery Management Plan, a multi-species plan. The first Fishery Management Plan (FMP) for the snapper-grouper fishery of the South Atlantic Region was prepared by the South Atlantic Council in 1983 (SAFMC 2006). Since the drafting and implementation of the original FMP, subsequent amendments have increased size limits, decreased the total allowable catch, limited commercial fishing gear, required logbooks, and limited access to prevent overfishing and help rebuild stocks (SAFMC 2006). Unfortunately, some stocks within the snapper-grouper complex are still considered overfished and overfishing is occurring. As a result, the Council reduced the quotas for several species (SAFMC 2006) and is considering further harvest restrictions (SAFMC 2007).

This information has troubled commercial snapper-grouper fishermen within the South Atlantic. Many of the fishermen participating in the snapper-grouper fishery were economically dependent on red porgy stocks. Based on the results of several stock assessments, successive iterations of the snapper-grouper FMP resulted in more stringent regulations regarding red porgy harvest. Finally, the fishery was closed (SAFMC 2006). This resulted in a redirection of commercial fishing effort to other fisheries within the snapper-grouper complex. With data suggesting populations of several snapper-grouper stocks still in decline, many fishermen were concerned that the regulations governing the red porgy stock would be implemented within other species specific fisheries, thereby decimating the snapper-grouper commercial fishery within the South Atlantic. In contrast to what has been reported in many of the snapper-grouper stock assessments (particularly black sea bass and vermilion snapper), commercial fishermen have expressed that catches are larger than historic averages and that many large fish remain within the fishery and therefore are signs that indicate healthy stocks. Because stock assessments take into many other factors, the Council based their decision on the peer reviewed stock assessment model and reduced quotas for several species with Amendment 13C (SAFMC 2006).

Although there are sustained data collection programs (fishery dependent) within the South Atlantic United States, these programs are limited in the types of data they collect (landings data via trip tickets and dealer invoices; length frequency data via port agents, etc.). Although data generated by the fishery dependent programs are drastically needed for stock assessments, funding has limited spatiotemporal coverage within the South Atlantic and raised criticism. Additionally, we are unaware of any on-going fishery dependent data being collected within the snapper-grouper fishery of the South Atlantic that quantifies bycatch and discard fate.[1] Although logbooks can report fishery dependent catches, and to a limited extent discards, these data cannot be independently verified, have been criticized as underreported, and only gather a limited amount of data needed by scientists (Lewison et al. 2004). As a result, the South Atlantic Sustainable Fisheries Association, Inc. (SASFA), an industry group comprised of commercial snapper-grouper fishermen, asked the Gulf & South Atlantic Fisheries Foundation, Inc.

[1] Perot Systems implemented a limited one year program to test electronic logbooks on 7 snapper grouper vessels in the South Atlantic (Perot 2006).

(Foundation) to conduct the observer based program within the snapper-grouper fishery to increase the universe of fishery dependent data available to stock assessment scientists.

B. Objectives

1. Implement a pilot observer program within the snapper-grouper vertical hook-and-line fishery of the South Atlantic United States;

2. Contract and train fishery observers to collect data to quantify total catch, effort, and discards (including fate) within the fishery; and

3. With assistance of the South Atlantic Sustainable Fisheries Association, Inc., actively solicit the participation of cooperating vessels to ensure a random sample of vessels is included in the study, and disseminate the results of data collected during the pilot program.

V. Approach

A. Description of Work Performed

The Foundation's South Atlantic Regional, Observer/Vessel, and Industry Coordinators solicited the cooperation of fishing vessels and captains willing to participate in the observer program in the four South Atlantic states—Florida, Georgia, South Carolina and North Carolina. Only vessels with valid snapper-grouper permits (Permit 1 only, unlimited permit) exclusively fishing bandit reels[2], were asked to participate in the program. Vessel selection was non-random (e.g., voluntary participation solicited by Coordinators), all efforts were made to increase the total number of vessels cooperating in the project, and the universe of vessels to which an observer was assigned. Random vessel selection was attempted initially under the pilot program, but it quickly became obvious because the list of cooperating vessels grew over time that each vessel did not have the same probability of being selected. Furthermore, to efficiently utilize observer and observer coordinator time, we focused on ensuring adequate coverage of all areas and as many different vessels as possible. Cooperating vessels carrying an observer were asked to fish under "normal" conditions and were not instructed on when, where, or how to fish.

Because crew size is dependent upon the number of bandit reels installed on the vessel, one crew member may have been displaced to allow space for the fishery observer during a fishing trip. The Foundation made funds available to cooperating fishing vessels to cover or offset the costs associated with the displacement of the crewmember (e.g., equivalent daily catch) and the materials (food) associated with the performance of this project. Cooperating fishing vessels were compensated $500/day for each day an

[2] Bandit reels are the common vertical hook and line gear used in many fisheries in the South Atlantic Snapper Grouper and Gulf of Mexico Reef Fish fisheries. See Appendix A for a diagram depicting the gear.

observer was aboard a vessel. Additionally, vessel liability insurance was secured and funded by the Foundation to protect the vessel in the event of a catastrophic incident resulting in injury.

Permits

All state scientific collection permits (FL, GA, SC, and NC) were obtained and were in force over the duration of this project. Additionally, the Foundation was granted an Exempted Fishing Permit through the NMFS to allow the collection and permanent retention of 500 undersized, out-of-season, and/or illegal fish. No fish were collected during the pilot project.

Fishery Observers

All contracted fishery observers underwent specific and detailed training prior to their deployment. It was the responsibility of the Observer/Vessel Coordinator to schedule and train all fishery observers. Observer training incorporated all administrative and programmatic procedures necessary to conduct the proposed research and included (but was not limited to): overview of the data collection protocols, review and identification of all fauna harvested during hook-and-line fishing, handling of sea turtles, description and measurements of fishing gear, and best practices while aboard a commercial fishing vessel (classroom and at-sea education). In addition, all observers and the Observer/Vessel Coordinator underwent marine safety training that outlined procedures on how to respond properly and promptly to a variety of situations that could be encountered during fishing operations (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer was also required to complete a First-Aid and CPR course. At the conclusion of observer training, individual observers were outfitted with the necessary sampling (baskets, fish boards, etc.) and safety (personal EPIRBs, lifejackets, etc.) gears, and certified by the NMFS. Observers were responsible for collecting and verifying all data collected during fishing operations.

Contracted Observers made two training trips aboard the Industry Coordinator Captain Mark Marhefka's vessel to familiarize them with the data collection protocol. This included extensive training in protected resources (e.g., handling procedures and species identification) and an offshore trip to familiarize observers with data collection methods. After training trips, the Observer Coordinator debriefed observers and discussed any deficiencies in data recording. After debriefing, the Observer Coordinator confirmed observers were prepared for data collection at sea. At-Sea Safety training was provided to the Observers and the Observer Coordinator.

Standardized Observer Collection Procedures

Prior to the collection of catch data, the observer completed a vessel characterization/trip report form that outlined the specifics of the vessel, gear used, and dates fished. This included information such as vessel name, vessel length, vessel identification number, year of construction, hull material, gross tonnage, horsepower and number of engines, crew size (number of individuals fishing), number of bandit reels and position of each,

means of line retrieval (manual, electric, hydraulic), vessel owner's name and address, captain's name and address, trip dates (departure and return), number of at-sea days, port of departure, and home port. These are standardized forms created as part of the protocol used by the National Marine Fisheries Service in their Observer Manual for the Reef Fish Observer Program in the Gulf of Mexico. All data collected were gathered using this protocol.

Each of the bandit reel stations starting with the forward starboard side and continuing clockwise were numbered. These remained constant for the entirety of the fishing trip. The observer then filled out a gear specification form for each type of rig fished, which included: means of line retrieval (manual, electric, hydraulic) mainline strength, leader length and strength, the number of hooks per rig, type of hook used (e.g. stainless steel circle hook, J-hook, etc.), and a often a diagram of the rig.

Station sheets were filled out to record information on the time spent on station (measured from the time the first rig is set to the last rig retrieved). Latitude and longitude of station, structure fished, number of sets fished, number of sets sampled, number of hooks fished, number of hooks sampled, sea state, line retrieval speed (ft/s), depth fished and presence of predators.

Catch characterization forms were used to record the total catch brought aboard the vessel and general information regarding fishing practices, including: set number, bait type, species identification (genus and species), length of all fish caught (TL, FL, etc., measured in mm), retention or discard of individuals. Additionally, the condition of snapper when brought onboard were categorized as follows: Live – normal appearance; Live – stomach protruding; Live – eyes protruding; Live – combination of stomach and eyes protruding; Dead on Arrival; Not Determined. An extra column on the datasheet recorded fate of individual fish as: Fish Kept; Fish Kept as Bait; Discarded Alive or Discarded Dead. Also a note was made if a fish was vented (by puncturing the gas bladder) prior to being discarded.

Solicitation of Participating Vessels

Following observer training, the Observer/ Vessel Coordinator and Regional Coordinator began soliciting participation in the project. The Observer/ Vessel Coordinator began visits with vessel owners in the fishery in North Carolina, South Carolina, Georgia and Florida, during which time program objectives were outlined. Once an individual agreed to participate a "master list" of the participating vessels was compiled and updated when new vessels were added. The final tally of those who agreed to participate with the Foundation in this cooperative research was 37 vessel owners who were included on the Exempted Fishing Permit.

The Observer/Vessel Coordinator would randomly select vessels to take part initially; however, the process was not entirely random, as not all vessels had the same probability of being chosen as new vessels are added periodically. Prior to an observer trip, vessels were chosen based upon a randomly generated list, if a vessel was not able to participate

during the selected timeframe, the next vessel on the list was chosen. This was continued until a participating vessel was able to take an observer on board for a catch characterization trip. Observers were instructed to inform the Foundation and Observer/Vessel Coordinator by faxing an observer trip form to the Foundation office prior to departure.

Data Review, Entry and Analysis –

At the conclusion of a fishing trip, the fishery observer thoroughly reviewed all data sheets and verified that all data are legible and accurate. The Observer/Vessel Coordinator debriefed the observer and verified that all data sheets are legible and accurately/completely filled out. After the Observer/Vessel Coordinator thoroughly reviewed the data, he then made copies of the original data. He kept all photocopies and forwarded the original data to the contracted Data Manager. The Data Manager then reviewed the data and entered it into the Reef Fish database located in the NMFS Galveston Lab. After all data were entered and backed-up, the data (both electronic and hard copies) were archived at the Foundation's office in Tampa, FL where it is available for use by interested parties.

C. Project Management

While the Foundation took the lead in project management, several other individuals played essential roles in the success of this research. They are listed below and we would like to thank them for their participation and hard work.

Mr. Lindsey Parker, South Atlantic Regional Coordinator, University of Georgia Marine Extension

Mr.Daniel Parshley, Observer/Vessel Coordinator

Mr. Phil Diller, Data Manager

LGL Ecological Research Associates, Dr. Scott Raborn, Data Analyst

Fishery Observers

Mr. Frank Helies
Mr. Phillip Antman

Mr. Mark Marhefka, Industry Coordinator; Commercial Fisherman; Interim Director-South Atlantic Sustainable Fisheries Association, Inc.

Dr. Mike Prager, NMFS Cooperator, Beaufort Laboratory

The Foundation's Executive Director, Ms. Judy Jamison, has ultimate responsibility for all Foundation administrative and programmatic activities, with oversight by the Foundation's Board of Trustees. She ensures timely progress of activities to meet project objectives and confirms compliance of all activities with NOAA/NMFS.

The Foundation's Program Director, Dr. Michael Jepson, has overall responsibility for all technical aspects of Foundation projects and coordinates performance activities of all project personnel, including contractors. He confirms and evaluates the effectiveness of projects and subcontracts and ascertains timeframe and funding limitations for the project. Should alterations to the described experimental design or data collection protocols be necessary, he confirms that all data are collected in a scientifically rigorous manner to ensure the usefulness of all collected data. Additionally, he coordinates all analytical efforts, prepares all progress and final reports concerning project performance, and drafts the Foundation's quarterly newsletter.

The Grant/Contracts Specialist, Ms. Charlotte Irsch, is responsible for maintaining general financial accounting of all Foundation funds including all Cooperative Agreements and contracts, as well as communicating with NOAA Grants Management personnel, and assisting auditors in their reviews. She conducts/documents internal and program (single and desk) audits, prepares backup documentation for fiscal audits, and drafts award extension requests (if applicable). Ms. Irsch provides the Executive and Program Directors with projected budgets concerning program performance and ensures that these budgets adhere to the proposed project budget. Finally, she prepares the annual administrative budget, NOAA Financial Reports, and confirms compliance of all activities with NOAA/NMFS and OMB guidelines.

The Program Specialist, Ms. Gwen Hughes, is responsible for tracking programmatic activities, securing federal and state collection and experimental permits, exempted fishing permits, monitoring funding and distribution of funds. She is also responsible for generating supporting documentation to assist in any and all programmatic audits. Ms. Hughes is responsible for the coordination of all program related workshops and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all contracts, subcontracts, agreements and amendments. Additionally, she is responsible for maintaining vessel insurance and securing workers compensation certificates on all cooperators, if applicable.

VI. Findings

A. Accomplishments and Findings

The dataset created during the performance of this award was not intended to be a standalone dataset, but is meant to augment the existing reef fish database at the NMFS Galveston Lab and assist scientists in the development of formal stock assessments for the snapper-grouper complex. As a result, the majority of data analyses for this project will be descriptive and include, but is not limited to: number of trips sampled, number of vessels sampled, average number of sets per station, species specific CPUE, species specific length-frequency distribution, mean depth per trip and station, the ratio of retained vs. discarded catch, and distribution of effort.

The project was extremely successful with the cooperation of the snapper grouper fleet throughout the South Atlantic with a total of 200 sea days logged with 1698 sets on board vessels from North Carolina, South Carolina, Georgia and Florida's east coast. A total of 28 catch characterization trips were completed over the duration of this project. Catch characterization trips were completed in all four South Atlantic states with eight (8) trips in NC, ten (10) in SC, six (6) in GA and four (4) in FL. Trip lengths ranged from 2 to 13 days with an average of 7 days per trip overall. The number of sets per trip ranged from 14 to 142 with an overall average of 61 sets per trip. Trip length varied with vessels from North Carolina making shorter day trips averaging 4 days in length, while vessels in the three other South Atlantic states averaging longer trips closer to the overall average of 7 days.

According to the South Atlantic Fishery Management Council's most recent management plan (SAFMC 2008), the number of snapper grouper trips by vessels in the states of NC, SC, GA and northern Florida for 2006 was 4,317 or 28% of all snapper grouper trips. If we extrapolate our results to the overall snapper grouper trips we sampled less than 1% of trips that may have been taken in 2007 if they were comparable to the trips taken in 2006 in this region.

Statistical Methods

The following tables represent a brief summary of the data collected over the duration of this project. The analysis was conducted by Dr. Scott Raborn of LGL Ecological Research Associates for the Foundation. Dr. Raborn presented results to the South Atlantic Fishery Management Council at their June 2008 meeting in Orlando, Florida.

Effort was reported as hook hours (HH) and the methodology is described in detail after Table 3. For the five most frequently caught bycatch species, CPUE was averaged by quarter of the year (e.g., Jan-Mar = Quarter 1) and statistical zone. Zero catches were included for sets when nothing was caught. As a result, CPUE distributions were dominated by zeroes in addition to being positively skewed. Rather than approximate these distributions, we estimated nonparametric bootstrapped confidence intervals (as per Sokal and Rohlf 1995) for the quarter-statistical zone averages by sampling from the original data with replacement. For each species-quarter-statistical zone combination, one thousand permuted averages each with a sample size equal to the original sample were generated. Then, the 2.5% and 97.5% quantiles of the bootstrapped distribution were identified to represent the low and high 95% confidence limits around the original sample's average.

Either total length or fork length was recorded for individuals from randomly selected reels. As minimum length regulations are given in total length, fork lengths had to be converted to total lengths with species specific equations taken from the literature (Table 1). We then summarized the percent of individuals below the minimum length regulation for all fates of catch (kept, kept for bait, and discarded) and generated length frequency distributions for the most frequent bycatch species.

Table 1. Models for converting fork length (FL) to total length (TL) for selected species Units are indicated in parentheses after each variable.

Species	Total length-fork length equation	Reference
Red snapper	TL(*in*) = 0.1729 + FL (*in*)*1.059	Schirripa and Legault (1999)
Scamp [a]	TL(*mm*) = 7.111 + FL (*mm*)*1.134	
Red porgy	TL(*mm*) = 7.111 + FL (*mm*)*1.134	Potts and Manooch (2002)
Vermilion snapper	TL(*mm*) = -0.254 + FL (*mm*)*1.115	Zhao et al. (1997)

[a] Relationship was assumed equal to that for red porgy.

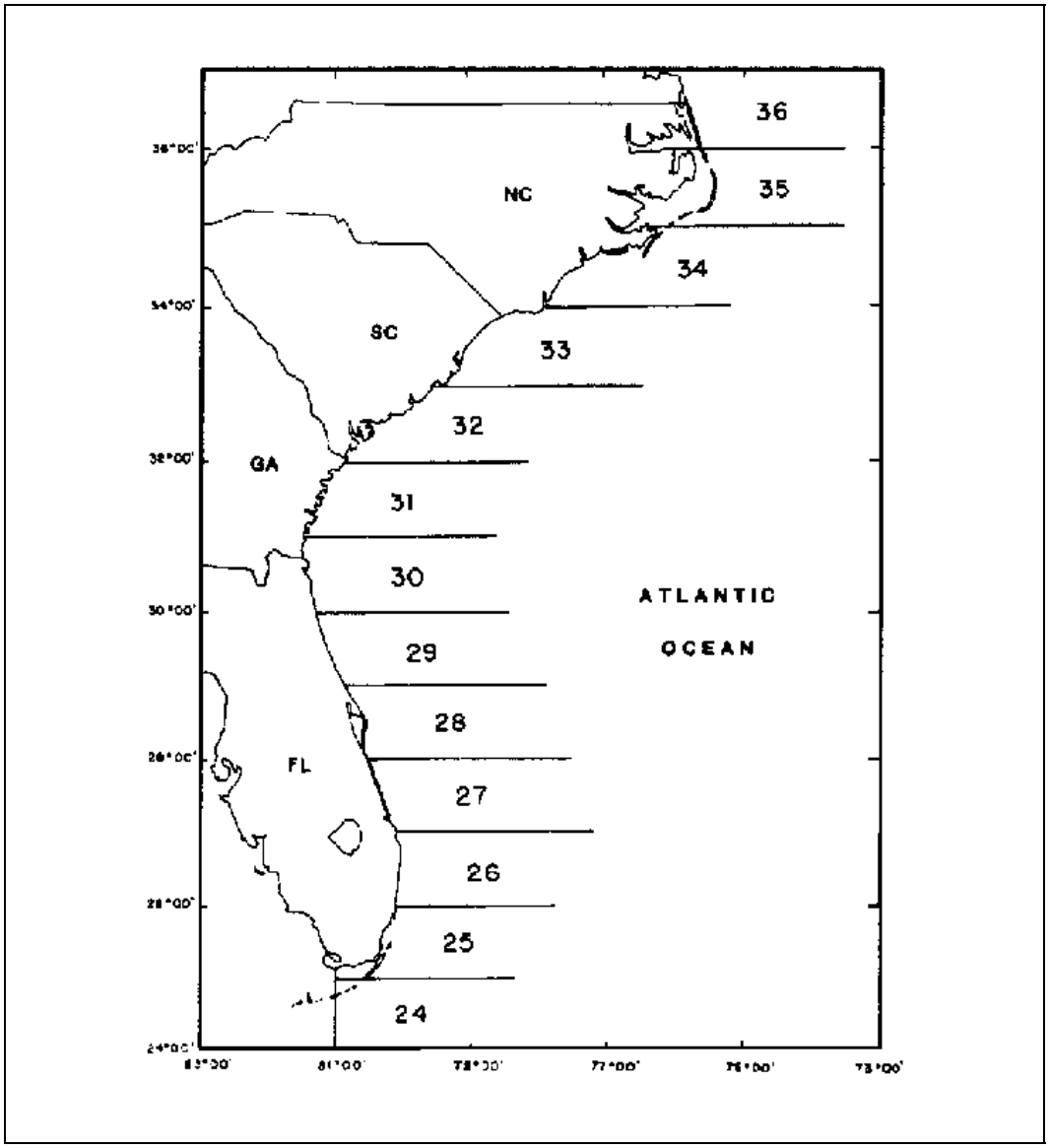


Figure 1. National Marine Fisheries Service South Atlantic Statistical Zone Map.

Figure 1 (above) illustrates the statistical zones designated by the National Marine Fisheries Service for the South Atlantic region. The following table (Table 2) provides the number of trips and sets observed by statistical zone.

Table 2. Number of trips and sets (cell values) observed in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

		Statistical zone					
Quarter	Trip number	30	31	32	33	34	Total
1	1			33			33
	2				25		26
	3			78	1		79
	4		26				26
	5	18	20				38
	6			51			51
	7				5	9	14
	8			66			66
	9			97	2		99
	10				12	9	21
	11	57	12		1		70
	SubTotal	75	58	399	47	18	523
2	12				68		68
	13			28	34		62
	14		14	51			65
	15	113					113
	16				19		19
	17				78		78
	18	24	44				68
	19				46		46
	SubTotal	137	58	79	245	0	519
3	20			71			71
	21				38		39
	22				44		44
	23			64	80		144
	24	34	33				67
	25	64					64
	SubTotal	98	33	135	163	0	429
4	26	71					71
	27	12	2				14
	28	65	3				68
	SubTotal	148	5	0	0	0	153
Total		458	154	613	453	18	1698

Table 3. Number of reels observed in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

		Statistical zone				
Quarter	Variable	30	31	32	33	34
1	Mean reels per set	32	31	16	28	16
	Total reels	2,370	1,810	6,419	1,291	294
	% sampled	73%	78%	86%	93%	97%
2	Mean reels per set	15	15	19	18	
	Total reels	2,083	875	1,488	4,476	
	% sampled	100%	99%	97%	96%	
3	Mean reels per set	40	35	13	13	
	Total reels	3,914	1,146	1,698	2,132	
	% sampled	67%	84%	98%	97%	
4	Mean reels per set	46	37			
	Total reels	6,735	184			
	% sampled	55%	75%			

In the above Table 3 the number of reels observed over the duration of the project is provided by statistical zone and quarter. Quarter 2 had the lowest mean number of reels set while statistical zones 30 and 31 were observed throughout all quarters.

It is difficult to calculate the actual hours fished as the data collected does not allow for an accurate account for the exact time a hook spends in the water however, a method was developed to calculate that time frame as close as possible for a measure of catch per unit of effort (CPUE). The method used to estimate hook hours (HH) was as follows:

(1) $$HH = \frac{FT}{TS} \times HS$$

(2) $$TS = \frac{SS}{RS}$$

where, FT=total fishing time (or the difference between the time fishing ended and started at a station), TS=number of times during the FT the reels were set, SS=sets sampled, RS=number of reels being sampled, and HS=total number of hooks sampled at a station (note the same hook was usually sampled more than once per station owing to the multiple sets). A summary of hook hours by quarter and statistical zone is provided in Table 4. Statistical zone 32, which is off the southern South Carolina coast, had the highest percentage of effort with 1,632 hook hours. The highest number of hook hours was found during the first quarter also. Statistical zone 34, just off the southern coast of North Carolina, had the lowest number of hook hours sampled and was only sampled during Quarter 1.

Table 4. Number of hook hours observed in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

		Statistical zone					
Quarter	Variable	30	31	32	33	34	Total
1	HH	474	552	1,631	124	52	2,833
	% effort	6%	7%	22%	2%	1%	38%
2	HH	630	361	372	840		2,204
	% effort	8%	5%	5%	11%		29%
3	HH	469	165	568	483		1,686
	% effort	6%	2%	8%	6%		23%
4	HH	801	20				821
	% effort	11%	0%				11%
	Total HH	2,374	1,099	2,572	1,447	52	7,545
	Total % effort	31%	15%	35%	19%	1%	100%

The percentage of bycatch and kept catch are provided in Table 5 by statistical zone and the quarter fished. The overall percent of bycatch was 27% with the lowest percentage of bycatch coming from the more northerly statistical zones. Those statistical zones also had fewer trips and were not sampled during all quarters.

Table 5. Mean kept catch (includes bait) and bycatch (units = number of individuals per hook hour) of all species observed in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

		Statistical zone					
Quarter	Variable	30	31	32	33	34	Overall mean
1	Kept	1.90	1.24	1.45	3.99	1.72	1.69
	Bycatch	1.26	0.78	0.55	2.25	0.41	0.79
	% bycatch	38%	34%	28%	28%	15%	29%
2	Kept	1.19	1.36	1.11	2.07		1.61
	Bycatch	0.76	0.50	1.21	0.62		0.73
	% bycatch	39%	27%	53%	24%		32%
3	Kept	2.95	2.66	0.71	1.57		1.70
	Bycatch	0.75	0.78	0.20	0.09		0.33
	% bycatch	21%	27%	22%	10%		18%
4	Kept	3.11	2.95				3.10
	Bycatch	0.73	0.29				0.72
	% bycatch	20%	17%				19%
	Overall mean kept	2.31	1.65	1.24	2.09	1.72	1.80
	Overall mean bycatch	0.83	0.66	0.56	0.60	0.41	0.65
	Overall % bycatch	28%	30%	30%	20%	15%	27%

The overall mean depth fished was 149 feet with the highest mean depth fished in quarter 3 as shown in Table 6. The lowest mean depth was found in statistical zone 30 which is situated near the Florida-Georgia border.

Table 6. Mean depth (feet) fished by quarter and statistical zone for the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

	Statistical zone					
Quarter	30	31	32	33	34	Overall mean depth
1	137	153	153	101	122	146
2	134	178	195	124		144
3	143	164	184	166		166
4	137	106				136
Overall mean depth	137	163	165	137	122	149

The highest overall mean CPUE for kept fish was 0.7 fish per hour for Vermilion snapper (see Table 7). Following vermilion snapper was red porgy, gray triggerfish and red grouper. As mentioned earlier, this measure of CPUE may be low considering the that the time between line retrieval and other factors cannot be accounted for.

Table 7. Overall mean CPUE (individuals per hook hour) of kept fish (includes fish kept for bait) from the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

Species	Mean CPUE	Species	Mean CPUE
Snapper, Vermilion	0.710	Grouper, Black	0.002
Porgy, Red	0.219	Dolphin	0.001
Triggerfish, Gray	0.198	Sailor's Choice	0.001
Grouper, Red	0.148	Mackerel, King	0.001
Scamp	0.128	Snapper, Gray	0.001
Grunt, White	0.075	Runner, Blue	0.001
Jack, Almaco	0.046	Triggerfish/Filefish (Family)	0.001
Gag	0.037	Tilefish, Blueline	0.001
Porgy, Knobbed	0.026	Bonito	0.001
Seabass, Black	0.026	Snapper, Glasseye	0.001
Hind, Speckled	0.019	Grouper, Warsaw	0.001
Hind, Rock	0.013	Bluefish	0.001
Amberjack, Greater	0.013	Porgy, Silver	0.001
Grouper, Snowy	0.012	Barracuda, Great	< 0.001
Tomtate	0.011	Filefish, Unicorn	< 0.001
Snapper, Red	0.009	Shark, Spinner	< 0.001
Triggerfish, Queen	0.009	Bigeye	< 0.001
Tilefish, Sand	0.008	Cobia, Ling	< 0.001
Hind, Red (Strawberry Grouper)	0.008	Hogfish, Spotfin	< 0.001
Rudderfish, Banded	0.007	Pinfish	< 0.001

Pigfish	0.006	Moray, Spotted	< 0.001
Shark, Atlantic Sharpnose	0.005	Sea Bass (Genus)	< 0.001
Seabass, Bank	0.004	Porgy (Genus)	< 0.001
Porgy, Whitebone	0.004	Shark, Blacktip	< 0.001
Perch, Sand	0.003	Snapper (Genus)	< 0.001
Grouper, Yellowfin	0.003	Dogfish, Spiny	< 0.001
Snapper, Yellowtail	0.003	Bigeye, Short	< 0.001
Grouper, Yellowmouth	0.003	Lobster, Caribbean Spiny	< 0.001
Squirrelfish	0.003	Atlantic bonito	< 0.001
Perch, Dwarf Sand	0.003	Scorpionfish, Spinycheek	< 0.001
Snapper, Mutton	0.003	Toadfish, Leopard	< 0.001
Grouper, Yellowedge	0.003	Snapper, Cubera	< 0.001
Snapper, Blackfin	0.002	Sharksucker	< 0.001
Pinfish, Spottail	0.002	Porgy, Grass	< 0.001
Creole-Fish	0.002	Margate, Black	< 0.001
Amberjack, Lesser	0.002	Margate	< 0.001
Hogfish	0.002		
Snapper, Silk	0.002		

The species of bycatch with the highest mean overall CPUE was red porgy with 0.176 individuals per hook hour according to Table 8. Vermilion snapper, Atlantic sharpnose shark, scamp, and red snapper followed respectively.

Table 8. Overall mean CPUE (individuals per hook hour) of bycatch from the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

Species	Mean CPUE	Species	Mean CPUE
Porgy, Red	0.176	Soapfish, Spotted	< 0.001
Snapper, Vermilion	0.117	Shark, Spinner	< 0.001
Shark, Atlantic Sharpnose	0.067	Shark, Sandbar	< 0.001
Scamp	0.065	Barracuda, Great	< 0.001
Snapper, Red	0.060	Scorpionfish, Spotted	< 0.001
Seabass, Black	0.020	Soldierfish, Blackbar	< 0.001
Hind, Speckled	0.018	Jack (Genus)	< 0.001
Amberjack, Greater	0.013	Shark, Great Hammerhead	< 0.001
Tomtate	0.012	Mackerel, King	< 0.001
Squirrelfish	0.009	Lionfish, Banded	< 0.001
Grouper, Red	0.008	Stingray, Southern	< 0.001
Moray, Spotted	0.007	Grouper, Goliath (Jewfish)	< 0.001
Pinfish, Spottail	0.007	Pigfish	< 0.001
Gag	0.006	Wrasse, Painted	< 0.001
Dogfish, Spiny	0.006	Toadfish, Leopard	< 0.001
Perch, Sand	0.005	Grouper, Black	< 0.001
Sharksucker	0.004	Moray, Purplemouth	< 0.001

Shark, Smooth Dogfish	0.004	Searobin, Horned	< 0.001
Jack, Almaco	0.004	Grunt (Family)	< 0.001
Perch, Dwarf Sand	0.004	Snapper, Blackfin	< 0.001
Tilefish, Sand	0.004	Snapper, Yellowtail	< 0.001
Amberjack, Lesser	0.003	Margate	< 0.001
Seabass, Bank	0.003	Gurnard, Flying	< 0.001
Shark, Tiger	0.003	Scorpionfish, Spinycheek	< 0.001
Triggerfish, Gray	0.002	Sharks, Ground (Order)	< 0.001
Rudderfish, Banded	0.002	Tattler	< 0.001
Grunt, White	0.002	Shark, Hammerhead (Genus)	< 0.001
Moray, Reticulate	0.002	Stingray (Genus)	< 0.001
Shark, Nurse	0.002	Wrasse (Genus)	< 0.001
Grouper, Yellowmouth	0.001	Pinfish	< 0.001
Sharks Grouped	0.001	Porgy, Grass	< 0.001
Sharksucker, White Fin	0.001	Snapper, Mutton	< 0.001
Porgy, Knobbed	0.001	Porgy, Silver	< 0.001
Bigeye	0.001	Angelfish, Blue	< 0.001
Shark, Blacktip	0.001	Stingray, Atlantic	< 0.001
Grouper, Warsaw	0.001	Cobia, Ling	< 0.001
Grouper, Snowy	0.001	Hake, Carolina	< 0.001
Shark, Dusky	0.001	Moray, Blackedge	< 0.001
Remora	< 0.001		

Similar to Table 8, in terms of mean percentage of total catch discarded, red porgy had the highest percentage followed by vermilion snapper, Atlantic sharpnose shark, scamp, and red snapper according to Table 9.

Table 9. Overall mean percent of total catch (individuals) discarded as bycatch from the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

Species	% of total catch	Species	% of total catch
Porgy, Red	6.694	Shark, Sandbar	0.034
Shark, Atlantic Sharpnose	3.840	Bigeye	0.025
Scamp	3.390	Shark, Spinner	0.022
Snapper, Vermilion	2.565	Remora	0.018
Snapper, Red	1.833	Wrasse, Painted	0.017
Hind, Speckled	1.164	Shark, Great Hammerhead	0.017
Amberjack, Greater	0.833	Barracuda, Great	0.016
Moray, Spotted	0.701	Toadfish, Leopard	0.016
Sharksucker	0.471	Mackerel, King	0.014
Squirrelfish	0.438	Stingray, Southern	0.014
Seabass, Black	0.431	Scorpionfish, Spotted	0.012

Tomtate	0.410	Searobin, Horned	0.011
Gag	0.390	Pigfish	0.011
Dogfish, Spiny	0.389	Tattler	0.011
Grouper, Red	0.363	Moray, Purplemouth	0.009
Perch, Dwarf Sand	0.265	Grouper, Goliath (Jewfish)	0.008
Shark, Tiger	0.216	Porgy, Grass	0.008
Shark, Nurse	0.177	Jack (Genus)	0.006
Tilefish, Sand	0.156	Shark, Hammerhead (Genus)	0.006
Pinfish, Spottail	0.147	Scorpionfish, Spinycheek	0.006
Seabass, Bank	0.140	Stingray, Atlantic	0.005
Grouper, Snowy	0.135	Grunt (Family)	0.005
Jack, Almaco	0.132	Soldierfish, Blackbar	0.005
Rudderfish, Banded	0.117	Grouper, Black	0.004
Shark, Blacktip	0.115	Margate	0.004
Moray, Reticulate	0.086	Snapper, Blackfin	0.003
Amberjack, Lesser	0.077	Snapper, Yellowtail	0.003
Grouper, Yellowmouth	0.072	Wrasse (Genus)	0.003
Porgy, Knobbed	0.071	Stingray (Genus)	0.003
Lionfish, Banded	0.071	Hake, Carolina	0.003
Shark, Dusky	0.069	Snapper, Mutton	0.002
Triggerfish, Gray	0.066	Gurnard, Flying	0.002
Sharks Grouped	0.066	Sharks, Ground (Order)	0.002
Sharksucker, White Fin	0.062	Porgy, Silver	0.002
Grouper, Warsaw	0.058	Angelfish, Blue	0.001
Perch, Sand	0.049	Pinfish	0.001
Grunt, White	0.046	Cobia, Ling	0.001
Soapfish, Spotted	0.036	Moray, Blackedge	0.001
Shark, Smooth Dogfish	0.035		

The CPUE for fish released alive for the top five most frequently caught species of bycatch is provided in Table 10. The mean and 95% bootstrapped confidence limits (percentile method) are reported as Lower Confidence Level (LCL) and Upper Confidence Limit (UCL) for each mean. Vermilion snapper had the highest CPUE during Quarter 1 in Statistical Zone 33. Red Porgy followed with the next highest CPUE in Quarter 2 in Statistical Zone 32.

Table 10. CPUE (individuals per hook hour) for the top five most frequently caught bycatch species released alive.

Quarter	Statistical zone	Metric	Red Porgy	Scamp	Shark, Atlantic Sharpnose	Snapper, Red	Snapper, Vermilion
1	30	LCL	0.208	0.000	0.000	0.009	0.308
		Mean	0.460	0.006	0.005	0.096	0.476
		UCL	0.783	0.015	0.014	0.251	0.661
	31	LCL	0.137	0.008	0.000	0.096	0.035
		Mean	0.237	0.024	0.002	0.252	0.090
		UCL	0.363	0.045	0.006	0.437	0.170
	32	LCL	0.119	0.090	0.013	0.000	0.006
		Mean	0.160	0.113	0.026	0.001	0.015
		UCL	0.205	0.137	0.042	0.004	0.027
	33	LCL	0.204	0.014	0.000	0.000	0.544
		Mean	0.372	0.074	0.000	0.000	1.132
		UCL	0.574	0.152	0.000	0.000	1.872
	34	LCL	0.000	0.000	0.000	0.000	0.000
		Mean	0.000	0.009	0.238	0.000	0.000
		UCL	0.000	0.028	0.714	0.000	0.000
2	30	LCL	0.094	0.000	0.133	0.129	0.002
		Mean	0.152	0.004	0.214	0.291	0.010
		UCL	0.216	0.009	0.299	0.506	0.021
	31	LCL	0.062	0.010	0.004	0.046	0.000
		Mean	0.198	0.027	0.030	0.145	0.000
		UCL	0.371	0.049	0.069	0.268	0.000
	32	LCL	0.483	0.143	0.018	0.000	0.009
		Mean	0.685	0.214	0.049	0.065	0.049
		UCL	0.908	0.292	0.085	0.182	0.101
	33	LCL	0.115	0.064	0.133	0.000	0.000
		Mean	0.162	0.115	0.195	0.000	0.003
		UCL	0.218	0.183	0.272	0.000	0.008
3	30	LCL	0.063	0.000	0.023	0.088	0.087
		Mean	0.124	0.002	0.092	0.210	0.204
		UCL	0.190	0.006	0.185	0.372	0.345
	31	LCL	0.092	0.000	0.000	0.032	0.075
		Mean	0.331	0.000	0.000	0.143	0.147
		UCL	0.592	0.000	0.000	0.329	0.226
	32	LCL	0.000	0.045	0.001	0.000	0.000
		Mean	0.003	0.082	0.010	0.000	0.000
		UCL	0.007	0.135	0.024	0.000	0.000
	33	LCL	0.004	0.000	0.000	0.000	0.000
		Mean	0.015	0.005	0.010	0.000	0.004
		UCL	0.030	0.012	0.028	0.000	0.011
4	30	LCL	0.208	0.000	0.000	0.009	0.308
		Mean	0.460	0.006	0.005	0.096	0.476
		UCL	0.783	0.015	0.014	0.251	0.661
	31	LCL	0.137	0.008	0.000	0.096	0.035
		Mean	0.237	0.024	0.002	0.252	0.090
		UCL	0.363	0.045	0.006	0.437	0.170

For those species retained as bait, Table 11 (below) indicates that red porgy and vermilion snapper were the dominant species retained as bait throughout all quarters and statistical zones. On some fishing trips, Atlantic sharpnose shark and Scamp were kept for bait.

Table 11. CPUE (individuals per hook hour) of fish retained for bait for the top five most frequently caught bycatch species.

Quarter	Statistical zone	Metric	Red Porgy	Scamp	Shark, Atlantic Sharpnose	Snapper, Red	Snapper, Vermillion
1	30	LCL	0.008	0.000	0.000	0.000	0.005
		Mean	0.035	0.000	0.000	0.000	0.018
		UCL	0.073	0.000	0.000	0.000	0.034
	31	LCL	0.002	0.000	0.000	0.000	0.000
		Mean	0.009	0.000	0.000	0.000	0.006
		UCL	0.018	0.000	0.000	0.000	0.016
	32	LCL	0.221	0.000	0.000	0.000	0.009
		Mean	0.290	0.001	0.005	0.000	0.027
		UCL	0.373	0.002	0.010	0.000	0.049
	33	LCL	0.000	0.000	0.000	0.000	0.000
		Mean	0.012	0.000	0.009	0.000	0.021
		UCL	0.036	0.000	0.027	0.000	0.071
	34	LCL	0.000	0.000	0.000	0.000	0.000
		Mean	0.000	0.000	0.015	0.000	0.000
		UCL	0.000	0.000	0.046	0.000	0.000
2	30	LCL	0.041	0.000	0.000	0.000	0.028
		Mean	0.079	0.000	0.000	0.000	0.066
		UCL	0.125	0.000	0.000	0.000	0.114
	31	LCL	0.065	0.000	0.000	0.000	0.004
		Mean	0.123	0.000	0.000	0.000	0.037
		UCL	0.184	0.000	0.000	0.000	0.076
	32	LCL	0.050	0.000	0.000	0.000	0.000
		Mean	0.101	0.004	0.000	0.000	0.005
		UCL	0.167	0.012	0.000	0.000	0.012
	33	LCL	0.088	0.000	0.000	0.000	0.006
		Mean	0.128	0.000	0.004	0.000	0.024
		UCL	0.171	0.000	0.009	0.000	0.046
3	30	LCL	0.015	0.000	0.000	0.000	0.048
		Mean	0.065	0.000	0.000	0.000	0.162
		UCL	0.139	0.000	0.000	0.000	0.343
	31	LCL	0.000	0.000	0.000	0.000	0.034
		Mean	0.011	0.000	0.000	0.000	0.093
		UCL	0.034	0.000	0.000	0.000	0.166
	32	LCL	0.053	0.015	0.000	0.000	0.000
		Mean	0.109	0.032	0.000	0.000	0.005
		UCL	0.182	0.057	0.000	0.000	0.012
	33	LCL	0.074	0.000	0.000	0.000	0.000

		Mean	0.134	0.000	0.016	0.000	0.001
		UCL	0.217	0.000	0.047	0.000	0.004
4	30	LCL	0.008	0.000	0.000	0.000	0.005
		Mean	0.035	0.000	0.000	0.000	0.018
		UCL	0.073	0.000	0.000	0.000	0.034
	31	LCL	0.002	0.000	0.000	0.000	0.000
		Mean	0.009	0.000	0.000	0.000	0.006
		UCL	0.018	0.000	0.000	0.000	0.016

Of those top species kept for sale in Table 12, vermilion snapper was by far the most common kept species in all quarters and statistical zones with red porgy and scamp next. Some red snapper were also kept, while Atlantic sharpnose were rarely kept

Table 12. CPUE (individuals per hook hour) of fish kept for sale for the top five most frequently caught bycatch.

Quarter	Statistical zone	Metric	Red Porgy	Scamp	Shark, Atlantic Sharpnose	Snapper, Red	Snapper, Vermillion
1	30	LCL	0.002	0.025	0.000	0.002	0.917
		Mean	0.050	0.060	0.000	0.016	1.262
		UCL	0.126	0.105	0.000	0.035	1.675
	31	LCL	0.001	0.073	0.000	0.000	0.278
		Mean	0.008	0.112	0.000	0.003	0.513
		UCL	0.018	0.154	0.000	0.008	0.769
	32	LCL	0.014	0.103	0.001	0.000	0.093
		Mean	0.027	0.128	0.004	0.001	0.167
		UCL	0.045	0.155	0.009	0.002	0.247
	33	LCL	0.000	0.025	0.000	0.000	1.260
		Mean	0.097	0.071	0.000	0.000	2.177
		UCL	0.214	0.132	0.000	0.000	3.173
	34	LCL	0.000	0.000	0.000	0.000	0.000
		Mean	0.000	0.050	0.000	0.000	0.396
		UCL	0.000	0.121	0.000	0.000	1.176
2	30	LCL	0.076	0.031	0.000	0.006	0.305
		Mean	0.160	0.064	0.000	0.022	0.486
		UCL	0.263	0.101	0.000	0.040	0.675
	31	LCL	0.069	0.078	0.000	0.001	0.038
		Mean	0.191	0.128	0.000	0.012	0.447
		UCL	0.352	0.189	0.000	0.027	1.069
	32	LCL	0.000	0.214	0.000	0.000	0.144
		Mean	0.002	0.311	0.004	0.007	0.435
		UCL	0.007	0.414	0.012	0.016	0.766
	33	LCL	0.079	0.126	0.000	0.000	0.270
		Mean	0.127	0.181	0.000	0.000	0.467
		UCL	0.187	0.245	0.000	0.000	0.715
3	30	LCL	0.155	0.035	0.000	0.021	1.094
		Mean	0.281	0.076	0.000	0.066	1.501
		UCL	0.422	0.132	0.000	0.123	1.913
	31	LCL	0.044	0.012	0.000	0.000	1.165

		Mean	0.104	0.043	0.000	0.044	1.825
		UCL	0.181	0.077	0.000	0.104	2.565
	32	LCL	0.012	0.227	0.000	0.000	0.000
		Mean	0.028	0.287	0.000	0.000	0.000
		UCL	0.049	0.354	0.000	0.000	0.000
	33	LCL	0.025	0.036	0.000	0.000	0.197
		Mean	0.060	0.064	0.000	0.000	0.399
		UCL	0.116	0.101	0.000	0.000	0.628
4	30	LCL	0.002	0.025	0.000	0.002	0.917
		Mean	0.050	0.060	0.000	0.016	1.262
		UCL	0.126	0.105	0.000	0.035	1.675
	31	LCL	0.001	0.073	0.000	0.000	0.278
		Mean	0.008	0.112	0.000	0.003	0.513
		UCL	0.018	0.154	0.000	0.008	0.769

Table 13 lists the proportion (± ½ of the 95% confidence interval) of fish that were less than the minimum length regulation for four of the top five most frequent bycatch species caught in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007. The Atlantic sharpnose shark was the second of the top five most abundant species in the bycatch, but no minimum length regulation was in effect.

Table 13. Proportion of fish that were less than the minimum regulation length for four of the top five most frequently caught bycatch species.

Species (minimum length regulation)	Bycatch	Kept (bait)	Kept
Red snapper (20 in)	0.977 (±0.026)		0.075 (±0.063)
Scamp (20 in)	0.626 (±0.046)	0.464 (±0.188)	0.019 (±0.009)
Red porgy (14 in)	0.355 (±0.043)	0.562 (±0.046)	0.023 (±0.013)
Vermilion snapper (12 in)	0.866 (±0.039)	0.763 (±0.085)	0.005 (±0.002)

The condition of the sampled catch is provided in Table 14 with a large percentage of fish being landed in a normal condition for most species. The data suggest that red snapper and scamp are more likely to be landed with stomachs protruding than other species.

Table 14. Condition frequencies of sampled catch when brought on board observed vessels in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

Species	Normal	Stomach protruding	Eyes protruding	Both stomach and eyes protruding	Dead on arrival	n
Red snapper	61%	38%	<1%	<1%	0%	403
Scamp	69%	28%	1%	2%	0%	1567
Red porgy	97%	3%	<1%	0%	<1%	2612
Atlantic sharpnose shark	100%	<1%	0%	0%	0%	321
Vermilion snapper	98%	2%	<1%	0%	<1%	8344

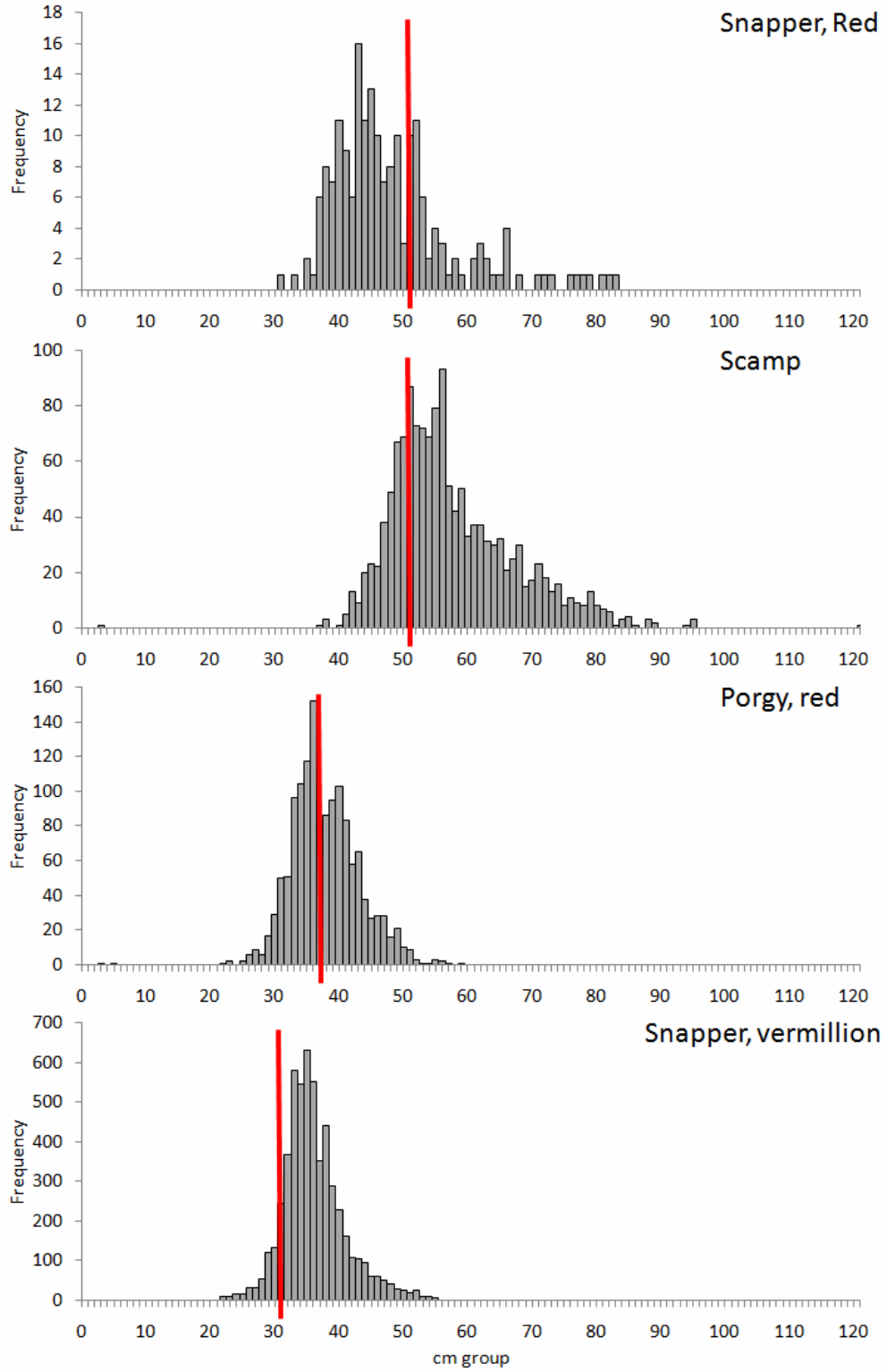


Figure 2. Length frequencies of four of the top five most frequent bycatch species caught in the snapper-grouper commercial hook and line fishery in the South Atlantic during 2007.

The Atlantic sharpnose shark was the second of the top five most abundant species in the bycatch listed in Figure 2, but no minimum length regulation was in effect. The red vertical bars represent the minimum length regulation.

B. Problems Encountered

The Foundation made several efforts to solicit participation in Central Florida and the Florida Keys, yet participation in those areas was lacking. One reason for the lack of participation in the state is the shortage of bandit reel vessels on Florida's east coast. Reconnaissance along the central east coast by the Observer/Vessel Coordinator revealed few vertical hook and line vessels and/or docks from which to solicit participation. In northern Florida many of the snapper grouper fishermen dive and do not use vertical lines. Several attempts to solicit participation from fishermen in the Florida Keys through contacts with associations and other key individuals produced only a couple of leads which never materialized.

As with many coastal areas, it is becoming more difficult for working waterfronts to survive with such intense pressure from coastal development and Florida's east coast has seen its share of coastal development over the years. Tourism, recreation and seasonal residents have dominated the market for waterfront property in the state for many years and continue to do so. Commercial working waterfronts have seen a steady decline and are still disappearing.

The Foundation submitted and received a one-year no-cost extension to ensure sufficient time to collect and analyze the data. Because of changes to the reef fish protocol, there were modifications to the datasheets that needed to be converted by the Observer Coordinator after discussions with the Program Director and NMFS personnel. A conversion table was created by the Observer Coordinator and submitted to the Data Analyst who was able to convert the data which needed revisions. Several turtle sightings were made by the observers during this project. In a review of the data sheets it was noted that turtle forms had not been included in the original datasets. The Observer/Vessel Coordinator reviewed all datasets and completed the necessary forms for turtle sightings. These forms were then mailed to the NMFS Galveston Lab where they were entered into the database. Observers were notified to fill out turtle forms for any turtle sightings in addition to any turtle captures.

Near the end of the project planning phase, the National Marine Fisheries Service added an additional requirement that all vessels participating would be required to provide a copy of the current fishing vessel Coast Guard documentation and Snapper/Grouper Permit, be screened by the NMFS, and approved for inclusion under the Exempt Fishing Permit (EFP) to participate in the program. Since these documents are required to be kept on the vessel by law, this required the vessel owner or captain to remove the documents, make copies, send the documentation to the Foundation via fax or mail, and return boat documents to the vessel prior to departure. In some remote areas fax machines are sometimes hard to come by therefore requiring captains to travel long distances to fax their forms. The Vessel Coordinator noted on several occasions that

some captains were reluctant to allow the documents to leave the vessel. As a result there were a few delays in project implementation as NMFS processed the documents and provided approval. Some time later in the project, inclusion of the boat owner's date of birth was an additional requirement. In the initial phases of project planning, these requirements were not anticipated, nor were the time to contact, obtain, and process the documents. Significant time and effort was directed towards fulfilling the added requirements of the NMFS.

The Vertical Line Fishery data collection protocols and gear forms were developed from previously used studies designed to describe the shrimp fishery and to be compatible with the NMFS data base. Therefore, units of measurement and data fields were not always compatible with the scope of information needed to fully describe the Vertical Line Fishery. Changes were made to gather sufficient information about the fishery and equipment to allow future scientific endeavors to reproduce the equipment and condition under which data was gathered during this study, and produce data under a scientific design that is reproducible and comparable.

Numerous deficiencies were identified with the gear form developed for the project, which included the lack of fields for critical component of the Vertical Line fishing rig, and an insufficient number of fields to record the number of lines of the main line. To overcome these deficiencies, the observers were asked to do detailed drawings of the fishing gear (see Appendix A) after the main line early in observing efforts to better describe Vertical Line Fishery gear.

Beginning with the dockside familiarization of project gear and data collection instruments, weighing fish was found to be challenging. Vertical Line boats do not have a readily available attachment point for the spring scale. Furthermore, it was very difficult to find an attachment point that would not be an at sea hazard. During the initial stages of the project, attempts were made to weigh fish. Observers noted that at sea conditions made it difficult at best to obtain meaningful data, and fish weighing efforts interfered with the ability to track effort, species caught, condition, and fate. In an effort to meet project priorities of effort, species caught, condition, and fate, fish measurements were obtained because there is sufficient data and tables available to extrapolate weight from accurate length measurements.

C. Additional Work Needed

The Foundation was awarded a second year of funding in 2008, however, the budget was reduced to half of the funding for the pilot study and therefore the number of sea days were reduced to half of what were completed in this research. Collection of discard rates was a priority research item identified in recent stock assessments (SEDAR 17 2008). In fact, fishery dependent observer data collection was identified as a crucial program for collecting important information on discards and other characteristics and recommended to be continued and expanded throughout the South Atlantic (SEDAR 17). As the South Atlantic Fishery Management Council has finalized regulatory measures for snapper grouper species through Amendment 13c (Federal Register 2006) and because they are

considering further reductions for vermilion snapper and other species (SAFMC 2007; SAFMC 2008), it becomes critical that stock assessments contain the best possible data. This research can and will provide important data for upcoming stock assessments and therefore should be continued.

Figure 3. Observer with large warsaw grouper.

Because participation in Florida was sparse, with none in the Keys, a special project to characterize the Vertical Line fishery in that region seems reasonable. The distance to travel to the Keys is an obstacle to conducting this type of research throughout the region and therefore may suggest the need for a separate study.

Furthermore, observers contracted for this research have demonstrated a keen ability to collect data beyond the normal information necessary for catch characterization (see Appendix A). Detailed observation of vessel day-to-day activity and vessel layout could be an important source of information for social scientists interested in the at sea daily life of fishermen and the impacts of regulation on that behavior. Note-taking by observers trained to study that behavior could be beneficial in future research.

VII. Evaluation

A. Achievement of Goals and Objectives

The goals and objectives of the Foundation pilot study were to characterize the catch and fate of discards within the Snapper Grouper vertical hook-and-line fishery of the South Atlantic. The project was highly successful with cooperation of the snapper grouper fleet throughout the South Atlantic placing observers on board over 28 different commercial fishing vessels and accumulating 200 observed sea days. Data collected for this project have already been reviewed during the latest SEDAR 17 (SEDAR 2008) and will likely be included in updates to the vermilion snapper assessments.

B. Dissemination of Project Results.

Information and results of this project were disseminated through a public presentation convened in conjunction with a South Atlantic Fishery Management Council meeting (June 2008). By coordinating the public presentation in conjunction with the Council Meeting, we maximized participation by commercial fishermen, fishery managers, and the concerned public. This public presentation highlighted the data collection methods for the project and the results derived from the analyses, with implications for data use during stock assessment.

Figure 4. Back deck of vertical line vessel.

Summary reports of the project's findings were also published as part of the "Foundation Project Update" sections of the "Gulf and South Atlantic News", the quarterly publication of the Gulf & South Atlantic Fisheries Foundation, Inc. This newsletter is distributed to over 300 organizations and individuals throughout the region. An electronic version of this newsletter (PDF) is also included in the regular updates to the Foundation's website (www.gulfsouthfoundation.org).

Copies of this project's final report will be published and distributed to various federal and state fishery agencies, university extension/Sea Grant offices, and industry associations. In addition, PDF copies of the final report will be made available for download from the Foundation's website.

VIII. References

Boardman, C. and D. Weiler. 1979. Aspects of the life history of three deepwater snapper around Puerto Rico. Gulf & Caribbean Fisheries Institute. 32:158-172.

Cuellar, N., G.R. Sedberry, and D.M. Wyanski. 1996. Reproductive seasonality, maturation, fecundity, and spawning frequency of the vermilion snapper, *Rhomboplites aurorubens*, off the southeastern United States. Fishery Bulletin. 94:635-653.

Federal Register. 2006. 71(183):55096-55106. September 21, 2006. Government Printing Office. Washington, D.C.

Gitschlag, G.R. and M.L. Renaud. 1994. Field experiments on survival rates of caged and released red snapper. North American Journal of Fisheries Management. 14:131-136.

Lewison, R.L., L.B. Crowder, A.J. Read, and S.A. Freeman. 2004. Understanding impacts of fisheries bycatch on marine megafauna. Trends in Ecology and Evolution. 19(11):589-604.

Loyd, T. 2001. Logit Modeling and Logistic Regression: Aphids, Ants, and Plants. Capter 11, in Design and Analysis of Ecological Experiments. S.M. Scheiner and J. Gurevitch (eds.). Oxford University Press. New York, New York.

MRAG Americas. 1999. NMFS response to the 1997 peer review of red snapper (Lutjanus campechanus) research and management in the Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, FL. 146.

National Marine Fisheries Service (NMFS). 1999. Ecosystem-based fishery management. A report to Congress by the Ecosystems Principles Advisory Panel. U.S. Department of Commerce, Silver Spring, M.D.

National Oceanic and Atmospheric Administration (NOAA). 2004. Evaluating bycatch: A national approach to standardized bycatch monitoring programs. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-F/SPO-66. October, 2004. 108p.

Perot Systems. 2006. Assessing the Use of Electronic Logbook Reporting For the South Atlantic Snapper Grouper Fishery.

Potts, J. C. and C. S. Manooch III. 2002. Estimated ages of red porgy (Pagrus pagrus) from fishery-dependent and fishery-independent data and a comparison of growth parameters. Fishery Bulletin 100:81-89.

Rielinger, D.M. 1999. Spawning Aggregations in the Gulf of Mexico, South Atlantic and Carribbean: A Source Document for Fishers Management. February.

Robins, C.R. and G.C. Ray. A field guide to Atlantic coast fishes of North America. Haughton Mifflin Co. Boston, MA. 354p.

SEDAR. 2007. Report of Stock Assessment. Vermilion Snapper. SEDAR Update Process #3. Assessment Workshop of April 2-4, 2007. NOAA Center for Coastal Fisheries and Habitat Research Beaufort, North Carolina

SEDAR. 2008. Report of Stock Assessment. Vermilion Snapper. SEDAR 17. Data Workshop of May 19-23, 2008. South Atlantic Fishery Management Council, Charleston, SC.

Scheiner, S.M. and J. Gurevitch. 2001. Design and Analysis of Ecological Experiments. Oxford University Press. New York, New York.

Schirripa, M. J., and C. M. Legault. 1999. Status of the red snapper in U.S. waters of the Gulf of Mexico updated through 1998. Sustainable Fisheries Division Contribution: SFD-99/00-75. Southeast Fisheries Science Center, Miami, Florida.

Sokal, R. R. and F. J. Rohlf. 1995. Biometry, 3rd edition. W. H. Freeman and Company. New York.

South Atlantic Fishery Management Council (SAFMC). 2006. Amendment 13C to the fishery management plan for the snapper grouper fishery of the South Atlantic region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201 North Charleston, SC 29405.

South Atlantic Fishery Management Council (SAFMC). 2007. Amendment 15 to the fishery management plan for the snapper grouper fishery of the South Atlantic region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201 North Charleston, SC 29405.

South Atlantic Fishery Management Council (SAFMC). 2008. Amendment 16 to the fishery management plan for the snapper grouper fishery of the South Atlantic region. South Atlantic Fishery Management Council, 4055 Faber Place Drive, Suite 201 North Charleston, SC 29405.

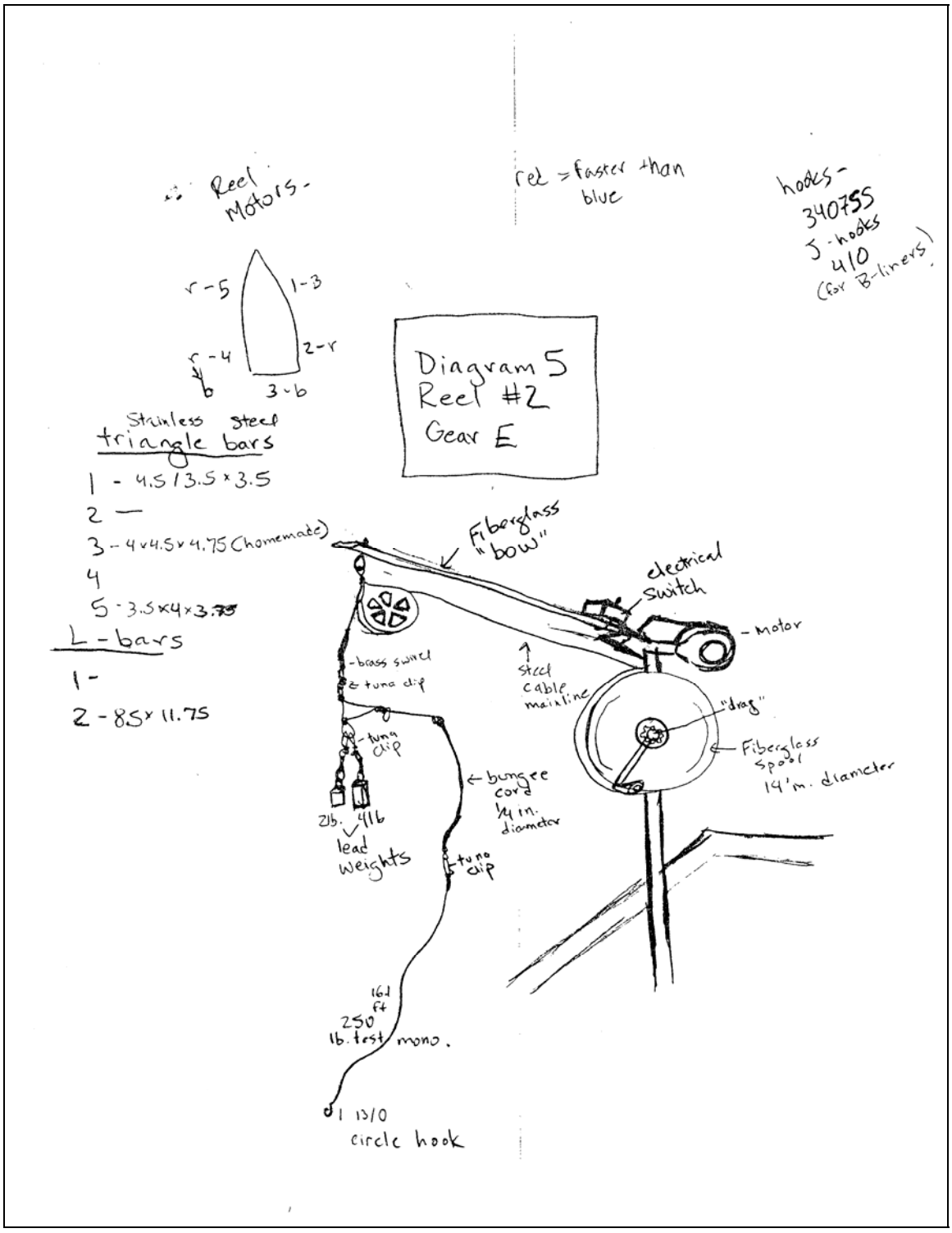
Zhao, B., J. C. McGovern, and P. J. Harris. 1997. Age, growth, and temporal change in size at age of the vermilion snapper from the South Atlantic Bight. Transactions of the American Fisheries Society 126:181-193.

Appendix A

Diagrams of Vertical Line Reels

Drawings by

Foundation Observer Philip Antman


Reel Motors -
red = faster than blue
hooks -
340755
J-hooks
4/0
(for B-liners)
r-5
1-3
r-4
2-r
3-b
Stainless steel
triangle bars
1 - 4.5 / 3.5 x 3.5
2 —
3 - 4 x 4.5 x 4.75 (homemade)
4
5 - 3.5 x 4 x 3.75
L-bars
1 -
2 - 8.5 x 11.75
Diagram 5
Reel #2
Gear E
Fiberglass "bow"
electrical switch
motor
brass swivel & tuna clip
steel cable mainline
"drag"
tuna clip
Fiberglass spool
14" m. diameter
bungee cord
1/4 in. diameter
2lb. 4lb
lead weights
tuna clip
160 ft
250 lb. test mono.
1 13/0
circle hook

Reel Motors -

red = faster than blue

hooks -
340755
J-hooks
4/0
(for B-liners)

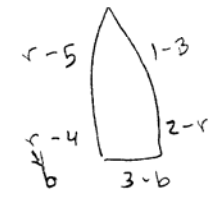


Diagram 3
Reel #1
Gear C

Stainless steel
triangle bars

1 - 4.5 / 3.5 x 3.5

2 —

3 - 4 x 4.5 x 4.75 (homemade)

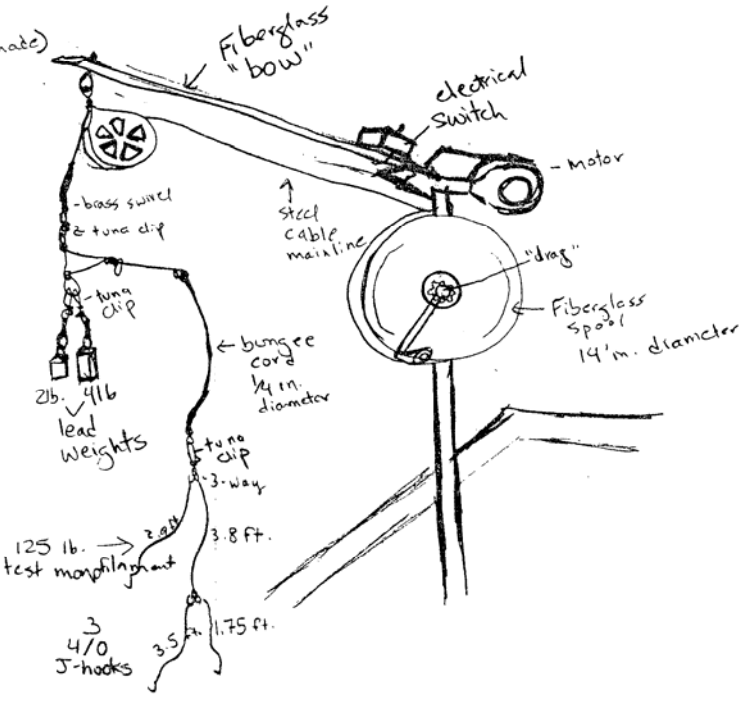
4

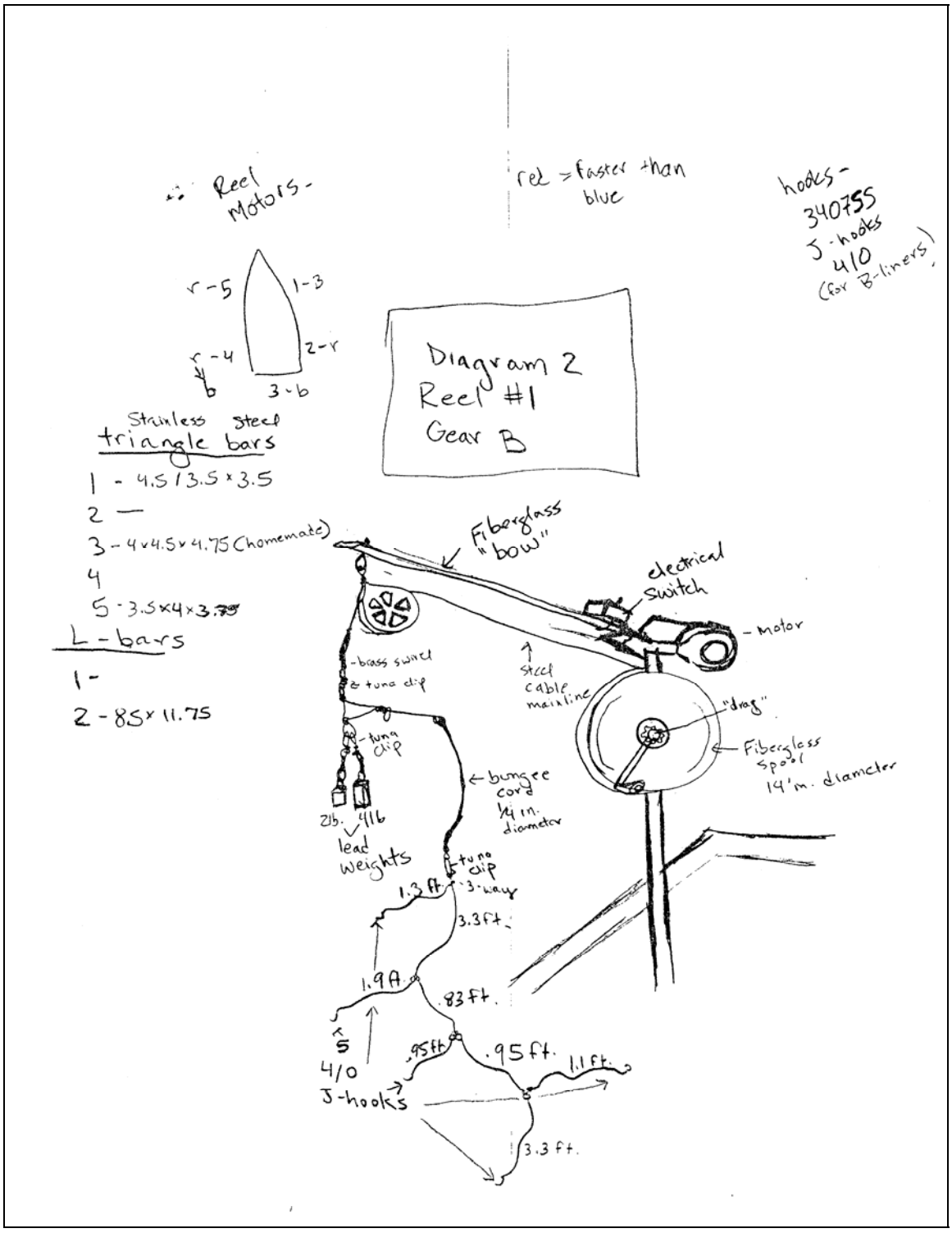
5 - 3.5 x 4 x 3.75

L - bars

1 -

2 - 8.5 x 11.75




Reel Motors -
r-5
1-3
r-4
2-r
3-b
Stainless steel triangle bars
1 - 4.5 / 3.5 x 3.5
2 —
3 - 4 x 4.5 x 4.75 (homemade)
4
5 - 3.5 x 4 x 3.75
L-bars
1 -
2 - 85 x 11.75
red = faster than blue
hooks -
340755
J-hooks
4/0
(for B-liners)
Diagram 2
Reel #1
Gear B
Fiberglass "bow"
electrical switch
motor
brass swivel & tuna clip
steel cable mainline
"drag"
tuna clip
bungee cord 1/4 in. diameter
Fiberglass spool 14 in. diameter
2lb. 4lb lead weights
tuna clip 3-way
1.3 ft.
3.3 ft.
1.9 ft.
.83 ft.
5
4/0 J-hooks
.95 ft.
.95 ft.
1.1 ft.
3.3 ft.

Reel Motors -

red = faster than blue

hooks -
340755
J-hooks
4/0
(for B-liners)

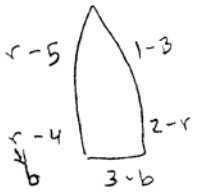


Diagram 1
Reel #1
Gear A

Stainless steel
triangle bars

1 - 4.5 / 3.5 x 3.5
2 —
3 - 4 x 4.5 x 4.75 (homemade)
4
5 - 3.5 x 4 x 3.~~75~~

L - bars

1 -
2 - 8.5 x 11.75