UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
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F/SER24:SB

MAY 25 2011

Mr. Robert Mahood
South Atlantic Fishery Management Council
One Southpark Circle
Suite 306
Charleston, South Carolina 29407-4699

Dear Mr. Mahood:

NOAA's National Marine Fisheries Service requests the South Atlantic Fishery Management Council review the enclosed Exempted Fishing Permit (EFP) application at the June 2011 meeting. The EFP proposal was submitted by the Gulf and South Atlantic Fisheries Foundation, Inc. (Foundation). The described research is part of three ongoing Cooperative Agreements (No. NA08NMF4330406, No. NA09NMF4540135, and No. NA10NMF4540108), plus two pending Cooperative Research Program projects awarded to the Foundation by NOAA Fisheries Service. The research is intended to involve commercial fishermen in the collection of fundamental fisheries information. Resource collection efforts support the development and evaluation of fisheries management and regulatory options. The EFP, if approved by both the Gulf of Mexico and South Atlantic Councils, would allow Foundation observers aboard commercial shrimp vessels to retain as many as 500 specimens of federally-managed finfishes outside of the allowable harvest. The EFP would exempt Foundation observers from bag limits, size limits, quotas, seasonal restrictions, and gear authorizations contained in 50 CFR Part 622 when possessing Council-managed species as part of scientific research activities during the period from August 1, 2011, through December 31, 2013. Retention may be needed for extended onboard examination, later shoreside analyses or identification, or as documentation of quality assurance in the data collection process.

The goal of the research is to provide additional information on the catch, bycatch, discards, and the ability to reduce such bycatch and discards in the southeastern shrimp fishery. This information would improve catch and effort data in the shrimp fishery, as well as improve information used in stock assessments for a wide variety of federally-managed finfish that are important to both recreational and commercial fishing interests.

Sincerely,

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

#105

FORM CD-450 (REV 10/98) U. S. DEPARTMENT OF COMMERCE **FINANCIAL ASSISTANCE AWARD**	[X] GRANT [ ] COOPERATIVE AGREEMENT ACCOUNTING CODE
RECIPIENT NAME Gulf and South Atlantic Fisheries Foundation, Inc.	AWARD NUMBER NA08NMF4330406
STREET ADDRESS 5401 W. Kennedy Blvd., Suite 740	FEDERAL SHARE OF COST $ 289,659.00
CITY, STATE, ZIP CODE Tampa FL 33609-2447	RECIPIENT SHARE OF COST $ 0.00
AWARD PERIOD 07/01/2008-06/30/2009	TOTAL ESTIMATED COST $ 289,659.00

AUTHORITY
15 U.S.C. 713 c-3(d)

CFDA NO. AND PROJECT TITLE
11.433 Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

This Award approved by the Grants Officer is issued in triplicate and constitute an obligation of Federal funding. By signing the three documents, the Recipient agrees to comply with the Award provisions checked below and attached. Upon acceptance by the Recipient, two signed Award documents shall be returned to the Grants Officer and the third document shall be retained by the Recipient. If not signed and returned without modification by the Recipient within 30 days of receipt, the Grants Officer may unilaterally terminate this Award.

[X] Department of Commerce Financial Assistance Standard Terms and Conditions

[X] Special Award Conditions (Attachment B)

[X] Line Item Budget (Attachment A)

[X] 15 CFR Part 14, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, Other Non-Profit, and Commercial Organizations

[ ] 15 CFR Part 24, Uniform Administrative Requirements for Grants and Agreements to State and Local Governments

[ ] OMB Circular A-21, Cost Principles for Educational Institutions

[ ] OMB Circular A-87, Cost Principles for State, Local, and Indian Tribal Governments

[X] OMB Circular A-122, Cost Principles for Nonprofit Organizations

[ ] 48 CFR Part 31, Contract Cost Principles and Procedures

[X] OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations

[X] Other(s) Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements, 69 FR 78389 (December 30, 2004). FRN Vol. 73, No. 28, page 7696 dated 02/11/08; FRN Vol. 72 pages 36244-36274, dated 07/02/07

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER Vivian Smith	TITLE Grants Officer	DATE 05/27/2008
TYPE NAME AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL Judy Jamison	TITLE	DATE 07/11/2008

Revised

MARFIN PROJECT SUMMARY

Project Title: Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

Project Status/Duration: July 1, 2008 – June 30, 2009 New __X__ Cont'd _____ Project Period: 12 Months

Name, Address, and Telephone Number of Applicant:
Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, FL 33609-2447
(813) 286-8390

Principle Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison; Over 27 years administrative and grants management experience.
Dr. Michael Jepson; Over 20 years experience in social impact assessment and grants management.

Project Objectives:

(1) Solicit and test new and/or promising BRDs that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts; (2) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic; (3) Calculate reduction rates achieved for each BRD tested to include total shrimp, finfish, and total bycatch, and estimate red snapper fishing mortality (F); and (4) Increase the shrimp industry's participation in BRD research and development to enhance awareness and involvement in fisheries management.

Specific Priority(ies) in Solicitation to Which Project Reponds:

1. Bycatch, **a.** Shrimp Trawl Fisheries, **(2)** Identification, development, and evaluation of gear, non-gear, and tactical fishing options to reduce bycatch.

Summary of Work:

The object of this project is to field test 3 new or promising bycatch reduction devices (BRDs) for certification following the NMFS BRD Certification Testing Protocol for the Gulf of Mexico and South Atlantic. Devices will be field tested aboard commercial fishing vessels with onboard observers collecting data outlined within the Testing Protocols. Collected data will be analyzed to identify the reduction in fishing mortality achieved by BRDs. To increase industry's involvement in the process of BRD research and development, the Foundation will solicit industry designed BRDs, contribute funds for industry BRD development, and reimburse the travel of industry members to Panama City to observe underwater hydrodynamic performance tests of fishing gear.

Project Funding:		
	Federal	$289,659
	Non-Federal	$ 0
	Total	**$289,659**

Revised

Project Statement

Project Title:

Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

Project Goals and Objectives:

1.) Solicit and test new and/or promising BRDs that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts;

2.) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic;

3.) Calculate reduction rates achieved for each BRD tested to include total shrimp, finfish, and total bycatch, and estimate red snapper fishing mortality (F); and

4.) Increase the shrimp industry's participation in BRD research and development to enhance fisheries management awareness and involvement.

Identification of Problem and Need for Government Assistance:

The otter trawl revolutionized the commercial fishing industry by allowing fishermen to increase their catch-per-unit-effort (CPUE). A significant disadvantage to this gear is that it is non-selective with respect to catch. While fishermen direct their efforts at harvesting targeted species, other marine species are harvested as bycatch. Finfish bycatch is a contentious issue facing commercial fisheries worldwide and is defined as the discarded catch of a living marine resource, plus the retained incidental catch and unobserved mortality of a marine resource due to a direct encounter with fishing gear (NOAA 1998).

Commercial shrimp fishermen of the southeastern United States have historically altered their fishing strategies and/or gear to reduce the harvest of non-target species. This has occurred through the use of increased mesh sizes to allow the escapement of small organisms and the integration of the "fisheye" and "cannonball shooter" (precursor to the TED) bycatch reduction devices (BRDs) into trawl net designs (Aparicio 1999). These gear designs were integrated into trawl nets prior to the implementation of national and regional bycatch regulations.

Although fishermen have voluntarily made efforts to reduce the quantity and composition of incidental harvest, bycatch mortality is thought to contribute largely to the overall fishing mortality of finfish species. Stock assessments for red snapper (*Lutjanus campechanus*), weakfish (*Cynoscion regalis*), and Spanish mackerel (*Scomberomorus maculatus*) stocks indicated that incidental harvest by southeastern U.S. shrimp trawlers was a factor affecting fish populations (e.g., overfished). This information led to the implementation of BRD regulations for shrimp trawls operating in the Gulf of Mexico and South Atlantic EEZ (Federal Register 1997, 1998, 2004).

Currently, five BRDs are certified for use in portions of the Gulf of Mexico and/or South Atlantic. These devices are the Gulf fisheye, fisheye, expanded mesh, extended funnel, and Jones-Davis. Most commercial shrimp fishermen have integrated the fisheye or Gulf fisheye into trawl nets due to the low cost and simplicity of these devices.

For a BRD to become certified, it must undergo certification tests outlined within regional NMFS Bycatch Reduction Device Testing Protocol Manuals (Manuals). These Manuals specify a reduction in fishing mortality (F) for certain target species (e.g., red snapper, F = 44%; weakfish, F = 50%, and Spanish mackerel, F = 50%) or an overall reduction in bycatch (measured in % weight). Target species were selected based on stock status (overfished), the extent to which the shrimp fishery impacted their populations, and the rebuilding strategies set forth for these species by the Regional Councils and NMFS.

Since the finalization of the Manuals, Spanish mackerel and weakfish populations within the South Atlantic are no longer overfished. With the reauthorization of the Magnuson-Stevens Act and the implementation of National Standard Number 9, bycatch, in all forms, must be minimized "to the extent practicable". This has resulted in the South Atlantic Fisheries Management Council submitting an amendment to their Protocol to utilize a 30% finfish bycatch reduction as the sole criteria for BRD certification, in addition to transferring future responsibility for BRD certification to NMFS (Federal Register, 2005). Because BRDs currently certified for use within the federal EEZ are achieving the finfish reduction rates required by the South Atlantic Council and NMFS, there has been little work focused on certifying new gear within the South Atlantic.

Bycatch issues within the Gulf of Mexico are more complex due to the continued overfished status of the red snapper stock. The NMFS Pascagoula Laboratory, under the auspices of the 1998 Red Snapper Initiative, conducted reevaluation studies on currently certified BRDs within the Gulf of Mexico shrimp fishery. The conclusions derived from this study indicated that the red snapper reduction achieved by the Gulf fisheye was lower than the finfish reduction originally used to certify this device (Foster 2004). Further analysis on the configuration of fishing gear revealed that the codend retrieval system (elephant ear) can obstruct the BRD opening and negatively affect finfish escapement (Foster 2004). This information led to an amendment of the BRD regulations and disallowed the placement of the fisheye and Gulf fisheye BRDs in an area obstructed by the elephant ear (Federal Register 1999).

BRD reevaluation efforts continued after the conclusion of the 1998 Red Snapper Initiative. From 2001-2003, onboard observers were contracted by NMFS and the Foundation to collect CPUE data aboard commercial fishing vessels operating within the Gulf of Mexico. A total of 4,089 tows were conducted with the cooperation of 32 commercial fishing vessels. Of these tows, 2,202 tows met the criteria for certification analysis. These criteria included (1) all paired tows with a functional BRD in the experimental net and a disabled BRD (or no BRD) in the control net, and (2) all successful tows (i.e., problem free; z-tows) with at least one red snapper present in one net. It is important to note that these criteria are not explicitly listed within the Manuals and that this is an alternate analysis.

Results from the 2001-2003 studies indicated that the red snapper F-mortality reduction achieved by the Gulf Fisheye was drastically lower (F = 11.7%) than that of the 1998 study and the original data used to certify the device (Foster 2004). Also, performance of the Gulf Fisheye was highly variable among vessels, but under no circumstance was the 44% reduction in red snapper fishing mortality achieved (Foster 2004). Results also indicated that the Gulf Fisheye achieved a higher finfish reduction when placed closer to the tie rings or during net retrieval; a time in which shrimp loss can also be magnified. Due to the economic incentive of maintaining shrimp catch, it has been speculated that adaptations in fishing techniques used to increase shrimp retention (i.e., haul back speed, towing speed, codend funnels, etc.) are also reducing the effectiveness of the fisheye and Gulf Fisheye BRDs. Gallaway and Cole (1999) have also published results suggesting that the Gulf fisheye BRD does not produce mortality reductions necessary to rebuild the red snapper stock. The results of these studies are of great concern to commercial shrimp fishermen since decertification of the Gulf fisheye BRDs is likely, thus mandating the use of other, more expensive and complex devices currently certified. Furthermore, the recent Amendment 27/15 to the Reef fish and Shrimp management plans establishes a target reduction rate for juvenile red snapper mortality within the Gulf shrimp fishery of 74% from baseline years of 2001-2003.

Although a portion of this reduction is realized from reductions in effort from both hurricanes and global market forces, there will be a need for new viable bycatch reduction devices to meet target goals. To facilitate the certification of new gears, the Gulf of Mexico Fishery Management Council, like the South Atlantic Council, has submitted a regulatory amendment to revise BRD criterion to a 30% overall reduction of finfish bycatch into amended/revised BRD Certification Protocols. While, these protocols are anticipated in the near future, they have not been finalized by NOAA/NMFS at this time.

Decertification of the Gulf Fisheye BRD would create confusion within the shrimp fishing community likely equal to that experienced during the development and regulation of TEDs. The successful completion of this project would likely result in the certification of new, operationally simple bycatch reduction devices within the southeastern U.S. shrimp trawl fisheries. Additionally, this project will address several national priorities set forth by the Magnuson-Stevens Act, priorities outlined within FY-2007 MARFIN solicitation (e.g. Section 1. Bycatch; a.. Shrimp Trawl Fisheries; (2.) Identification, development, and evaluation of gear, non-gear, and tactical fishing options to reduce bycatch), and those outlined within the Cooperative Bycatch Plan for the Southeast. U.S. fisheries resources and marine ecosystems are a public commodity and, as such, are managed by the United States Government. The research outlined within this proposal has the potential of impacting the commercial fishing industry, state and federal fisheries management agencies, seafood consumers, recreational anglers and the public-at-large. Given the extent of the benefits gained from this project by interest groups, it is fair and reasonable to ask for federal assistance to conduct this study.

Project Impacts/Results or Benefits Expected:

The Gulf & South Atlantic Fisheries Foundation, Inc (Foundation) has been instrumental in BRD research and development (Branstetter 1997; GSAFFI 2002; GSAFFI 1995; Hoar *et al.* 1992; Jamir 2001; Jamir 1999; Medici 2004). Serving as the only regional research and development organization aimed at assisting the commercial fishing industries of the Gulf of Mexico and South Atlantic, the Foundation has developed a high level of credibility among the commercial shrimp fishing industry. By allowing the Foundation to continue their research and development efforts to reduce bycatch within the shrimp trawl fisheries, commercial fishermen will become actively involved in BRD research and development and will be more trustworthy of the data generated aboard their vessels and would be more accepting of those devices tested (e.g., fishermen will be more willing to utilize a device they helped certify). With greater industry "buy-in" achieved through the use of a device they help certify, the greater the impact in reducing bycatch within the fishery.

The expected benefits and impacts of this proposed research can be divided into at least two separate categories, (1) resource user impacts, and (2) biological impacts. When considering the current state of the shrimp trawl fishery, revenue is a concern. An influx of foreign, pond-raised imports has drastically reduced the price of shrimp since its zenith in 2000. Shrimp prices, in combination with increased management restrictions, the affects of hurricanes, and fuel prices, have drastically reduced effort within the fishery (commercial fishermen, Foundation Coordinator, and NOAA Fisheries/NMFS staff). This project has the ability to increase the gross revenue of an individual shrimp fishing business by increasing product quality and reducing the resources (fuel and labor) necessary to harvest the product.

Shrimp quality has been a concern since antidumping petitions were filed by the Southern Shrimp Alliance in recent years. Due to reduced labor, land, and environmental costs associated with the production of foreign, pond-raised product, the visual quality of the product being imported into the U.S. is superior to that of the domestic wild-harvest product. Although culinary presentation is a major factor affecting the price and demand for a seafood product, so is taste. One way in which pond-raised product cannot contend with domestic product is taste – domestic product is highly sought after by chefs and restaurateurs (Miget *et al.* 2004). An increased amount of bycatch associated with shrimp trawl fishing

has a negative impact on the quality of a shrimp and can result in uropod breakage (e.g., the shrimp being 'smashed' by the total catch within the trawl condend). Increased bycatch also extends product cull time. Shortening cull time would allow the crew to take preventative measures against spoilage, thus increasing shelf life of the product. An increased product quality associated with a decrease in bycatch, combined with the taste of domestic, wild-caught product, could generate greater revenue for shrimp fishermen.

Revenues could also be increased by decreasing the amount of fuel needed to harvest shrimp. During shrimp trawling operations, the codend accumulates a greater quantity of catch over time (both target and non-target species). Greater amounts of bycatch within the condend increases the size and weight of the trawl net, thus necessitating more power needed to drag the trawl nets, e.g., an increase in fuel consumption. By reducing the quantity of bycatch caught within the shrimp trawl, the size and weight of the codend is reduced and allows the vessel to trawl at lower RPMs. Decreased fuel consumption reduces the price associated with the harvest of the product thereby increasing revenues for the captain, crew, and small business.

Biological impacts associated with the reduction of bycatch are also beneficial. With the national programmatic goal of reducing finfish bycatch mortality, an increase in the number of certified BRDs will create a significant positive impact on faunal assemblages with cascading effects within both a top-down and bottom-up controlled ecosystem. These effects have been studied within primary literature and have direct and indirect impacts on population and foodweb dynamics (Goni 1998). Successful completion of this project will also add to the overall success of the national bycatch reduction program. The mortality reduction achieved by newly certified BRDs will allow Federal and State fishery management agencies to enhance finfish populations, especially those potentially impacted by shrimp trawl fishing.

Project results also have the potential of impacting global fisheries. Cooperative research conducted by the Foundation, the southeastern shrimp fisheries, and NMFS has lead to international efforts to reduce sea turtle mortality. As of August 31, 2004, turtle excluder devices are compulsory for all foreign, wild-harvest shrimp fishing fleets wanting to import shrimp into the US market. Non-compliance with this regulation can result in an embargo of the foreign-harvested product. Since bycatch is a contentious issue worldwide, the same import regulations could be imposed for the reduction of finfish bycatch. The continued efforts of Southeastern shrimp fishermen to refine and design BRDs will assist in the global problem of incidental bycatch and define the U.S. shrimp fleet as international innovators in fishing gear technology.

Current BRD programs are relatively strong on the technology component, but weak in the area of communication/technology transfer strategy. Development of the latter becomes easier as industry leaders and innovators get involved in the BRD certification process. The benefits that accrue as a result of the direct cooperation and contribution of numerous fishermen in this project are important as they give the members of the fishing industry the opportunity to take ownership of research that may lead to the development of certified BRDs or fishery management strategies. Industry involvement will also serve as a conduit to integrate other fishermen into the management process. Many commercial fishermen are unaware of how, when and where fisheries related research is conducted. This project will help acclimate fishermen to the management process and make the necessary connections (either through the Foundation, Councils, or NMFS) to stay active in the process.

Participation by Persons or Groups Other Than the Applicant:

A project of this magnitude requires the cooperation and active participation of many organizations and individuals with close management by those experienced in federal grants administration. The Foundation has chosen to contract with several persons in conjunction with this project. These essential personnel needed to complete project objects are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (Texas A&M University Sea Grant)

Mr. Lindsey Parker, South Atlantic Regional Coordinator (Georgia Marine Extension)

Mr. Russell O'Brien, Observer/Vessel Coordinator

Mr. Phil Diller, Data Manager

Dr. Benny Gallaway (LGL Ecological Research Associates) and Staff, Data Analyst

2 Fishery Observers (To be contracted from those below or TBA)

Mr. Robert Timmeney
Mr. Konstantin Kopylov
Mr. Michael Gordon
Mr. J.L. Wiswell
Mr. Frank Helies

The above individuals have been associated with other, similar, Foundation research programs and projects. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective.

Through years of experience, the Foundation has found that working closely with local Sea Grant – Marine Extension Service personnel (Mr. Graham & Mr. Parker), who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen. The Regional Coordinator and the Observer/Vessel Coordinator will act as a liaison between the Foundation and vessel owners, relaying information about the project goals and securing vessel participation.

The Observer/Vessel Coordinator will assist the Foundation Program Director and Regional Coordinator in their day-to-day activities and will coordinate all field efforts through constant communication with Foundation staff and contractors. The Observer/Vessel Coordinator will recruit and train all observers and coordinate field sampling efforts. He will also contact and establish a good working relationship with various cooperating vessel owners, captains and crew, and provide this information to fishery observers. Prior to the deployment of a fishery observer, the Observer/Vessel Coordinator will review with each observer all established protocols on how and what data to collect while onboard a participating vessel. He will also provide all necessary sampling and safety equipment and is responsible for reviewing all data for completeness prior to data entry.

Only observers that have undergone NMFS certification training will be contracted by the Foundation. This training will include safety training, onboard practices to avoid interference with the participating vessel captain and crew, turtle handling, sampling, and tagging, data collection protocols (both classroom and at-sea training), and administrative protocols. It is the job of the fishery observers to collect all data from the experimental and control nets, ensure that all experimental gear is fished optimally (i.e., highly tuned nets), and proof all collected data for completeness and accuracy before being debriefed by the Foundation Observer/Vessel Coordinator. The Foundation currently has five contracted observers working on complementary projects. Because the above listed individuals possess the skills needed to fulfill the position and have proved themselves under field conditions during other Foundation projects, the contracted observer positions will be offered to these individuals. If additional observers are needed

to collect data and conduct experimental tests, observers will be solicited from other complementary Foundation projects or through job advertisements.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the NMFS Galveston Laboratory and Foundation's Office. The Data Manager is responsible for checking and transferring all raw data into a manageable computer database for data archive. Once the data are ready, they will then be forwarded to the Data Analyst (LGL Ecological Research Associates, Inc.) and Foundation Program Director.

The contracted Data Analyst will conduct all statistical tests on observer-collected data with overview and direction from the Foundation's Program Director. Statistical tests will be varied and are listed below. The overall objective of the Data Analyst is to compute the reduction rates (shrimp, finfish, red snapper, and total catch) achieved by experimental BRDs. The Foundation will rely on the analytical and scientific skills of the Data Analyst to assist in any ancillary statistical tests (i.e., spatiotemporal reduction rates achieved by experimental BRDs, etc.) that could be completed during the performance of this award. The NMFS Galveston Database Administrator will work closely with the Foundation's contracted Data Analyst and Program Director in this regard.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico and South Atlantic regions. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results generated from this research and will be more willing to assist in future research.

The Foundation has historically worked cooperatively with staff and personnel at the NMFS Harvesting Systems and Engineering Division (Pascagoula Laboratory, Pascagoula, MS) to assist in the identification, pre-screening, modification, certification validation, and underwater hydrodynamic testing of various experimental BRDs. We propose to extend this cooperative participation during the award and will include NMFS personnel on the Gear Review Panel and provide regular and frequent updates to allow for the close monitoring of this project.

Project Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Dr. Michael Jepson, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Ms. Catherine Bowker, Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 20% of their time over the course of the 12 month project period in the performance of this award. This percentage is similar (if not reduced) when compared to the overhead ('indirect rate') of academic institutions. A

project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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 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 experimentally 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 fiscal 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 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 required for experimental testing, and individual scientific collection permits for contracted observers. 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 (Gear Review Panel) and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all subcontracts and amendments. Additionally, she is responsible for maintaining vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant, Ms. Catherine Bowker, is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Monitoring of Project Performance:

Given the current controversies and conflicts among various interest groups related to the programmatic concepts outlined here, there is a possibility that one (or more) of these groups will question the validity of the Foundation's findings. For internally conducted studies, Principal Investigators (PIs) will regularly communicate with observers and Foundation Coordinator concerning fieldwork. PIs also review data for completeness and accuracy, and the Program Director will monitor the data management procedure to ensure that all data analyses meet objectives outlined within the proposal. The quality of the data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of and critically review interim and final project reports. This program will be conducted as an award from the NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and a NMFS Technical Monitor. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and peer review consultants will discuss data, data analyses, and data interpretation. Only after the analyses have undergone rigorous evaluation will the final report be accepted and printed.

Statement of Work:

Applicant:

Gulf & South Atlantic Fisheries Foundation, Inc.
Ms. Judy Jamison, Executive Director

Proposed Budget Period:

July 1, 2008 – June 30, 2009

Title of Proposal:

Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

Objectives and Procedures:

This research proposal addresses activities within a budget period of July 1, 2008 through June 30, 2009. Throughout this period, the Foundation will provide support for the continued development and field certification of new and promising industry-generated BRD prototypes.

Pre-Certification Activities:

Foundation will solicit BRD designs and/or prototypes from the shrimp industry, net designers/fishing gear construction shops, NMFS (Pascagoula Laboratory) fishing gear experts, and various Sea Grant/Marine Extension fishing technologists. For those devices that show the greatest potential of reducing finfish bycatch, limited funds will be made available to the developer to allow construction and or modification of the device.

Previous field testing efforts conducted by the Foundation have revealed that certain BRD designs show greater potential than others at reducing finfish bycatch (Cooperative Agreement No.'s NA17FF2009 and NA87FM0221). These gears include the C.J. Kiffe and the Double Opposed Fisheye. Although these devices were tested during previous field efforts, variance between tows and trips was large. To reduce variance, additional data are necessary. These devices will be considered for evaluation. Additionally, the participation of industry at NMFS annual hydrodynamic tests and conversations with NMFS personnel have revealed other devices that may considered for review. These devices include mixed

mesh nets (trawl nets with 2"-4" top panels and standard mesh floor and wings), T-90 codends (large mesh turned 90°), the Coulon TED/BRD, and 2" bar spacing for TEDs.

Other industry designs will also be solicited to increase the pool of devices reviewed. The Foundation has initiated conversation with industry under a complementary project (Coop. Agree. No. NA04NMF4540112) and these devices will also be considered.

Criteria for Vessel Selection and Vessel Compensation:

After the three experimental devices are identified, Foundation staff and Regional Coordinator will seek fishing vessels and captains willing to participate in the field testing of these experimental bycatch reduction devices. Although vessel selection will be non-random, all efforts will be made to utilize vessels whose captain and crew are attentive to their gear. This will ensure that a greater number of tows conducted are "problem free" and thus usable in any and all analyses. The Foundation will make available to cooperating fishing vessels funds that will cover or offset the costs of materials, labor, and shrimp loss associated with the development and evaluation of experimental BRDs. Fishing vessel owners who agree to cooperate in this project will be compensated $350/day while testing the device and $50/day when cruising to and from fishing grounds or no tow days.

Observer Training, Permits, and Insurance:

All contracted fishery observers will have undergone specific and detailed training prior to their deployment on any commercial fishing vessel. It is the responsibility of the Observer/Vessel Coordinator to schedule and train all fishery observers. Training details all administrative and programmatic procedures necessary to conduct the proposed research listed below. This includes (but is not limited to): overview of the data collection protocols outlined within the Manuals, review and identification of all fauna harvested during shrimp trawling efforts (classroom and at-sea education), identification of sea turtles and proper handling/tagging procedures, description of fishing gear, and best practices while aboard a commercial fishing vessel. In addition, all observers and the Observer/Vessel Coordinator will undergo marine safety training that outlines the procedures on how to respond properly to a variety of situations that could be encountered during experimental tests (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer will also be certified in first-aid and CPR. Due to changes in NMFS policies regarding the certification of fishery observers, each observer will undergo extensive turtle training that outlines methods for the collection of biopsy samples and the tagging of individual turtles (flipper tags, PIT tags, etc.), however, observers will only be required to tag turtles with flipper tags. At the conclusion of observer training, individual observers are certified by NMFS (per Elizabeth Scott-Denton, NMFS Galveston Laboratory).

The Foundation will secure all special permits required to test experimental BRDs onboard a commercial shrimp fishing vessel. These permits include a Letter of Authorization from the NMFS-Southeast Regional Office allowing the testing of experimental devices within the federal EEZ, any and all necessary permits required to conduct experimental tests in state waters.

Vessel liability insurance will be secured and funded by the Foundation prior to any observer being placed onboard a participating vessel. Insurance protects the vessel owners in the event of a catastrophic incident resulting in the injury of a fishery observer.

Field Data Collection:

The Foundation will work cooperatively with commercial shrimp fishing vessels to ensure that all tests are conducted according to protocols and guidelines outlined in the following documents:

1.) "Shrimp Trawl Bycatch Research Requirements". November 1991. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Miami) and Southeast Regional Office (St. Petersburg).

2.) "A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries". August 1992. Published by the Gulf & South Atlantic Fisheries Foundation, Inc. with support of NOAA/NMFS under Cooperative Agreements NA17FF0233-01 and NA17FD0103-01.

3.) "Shrimp Trawl Bycatch Characterization Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Galveston).

4.) "Evaluation of Bycatch Reduction Devices Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS Southeast Fisheries Science Center (Galveston).

5.) "Bycatch Reduction Device Testing Protocol Manual". March 1997. Published by the South Atlantic Fishery Management Council.

6.) "Bycatch Reduction Device Testing Protocol Manual". February 2000. Published by NOAA/NMFS Southeast Regional Office and equivalent protocol for the Gulf of Mexico Fishery Management Council.

Extensive descriptions of the sampling protocols are contained in the above documents, and the reader is referred to them for such detail, especially the latest official NMFS/Regional Fishery Management Councils' approved protocol (e.g., finfish reduction as the sole criteria for BRD certification). Additional changes that NMFS might develop, will be followed accordingly (especially regarding the inclusion of new certification criteria under review by the Gulf and South Atlantic Councils). Under the current guidelines, all BRDs are subjected to a 4-step testing process. It is assumed, for the purpose of this research project, that the burden of steps one and two will be placed on industry. The scope of work contained within this proposal will focus on step three only, the Operational Testing Phase:

1.) Prototype Development – Developer designs a BRD and makes initial limited field tests recording bycatch and shrimp CPUE data.

2.) Proof of Concept – The prototype is installed on a research or commercial vessel and the standard sampling protocols are followed to collect data on bycatch reduction and shrimp retention for a minimum of 20 tows.

3.) Operational Testing – The BRD is installed in nets aboard commercial fishing vessels throughout the southeast U.S. The BRD is evaluated under normal working conditions with an observer collecting data on bycatch reduction and shrimp retention according to standard sampling protocols. The observer also documents any comments and suggestions of the captain concerning the gear's efficiency and/or necessary modifications

4.) Industry Evaluation – The BRD is distributed to selected commercial fishing vessels throughout the southeast U.S. to be employed during normal fishing activities. The captain is required to collect data concerning bycatch reduction and shrimp retention, and is requested to provide comments and suggestions concerning its acceptability and/or necessary modifications.

Utilizing data collected during the NMFS 1998 Red Snapper Initiative, approximately 68% of all tows conducted were sampled. The remaining 32% of the tows remained un-sampled due to gear (fouled gear, torn nets, etc.) and non-gear (weather, lost nets, etc.) related events. A lower number of tows were sampled during a similar project conducted by the Foundation (Cooperative Agreement No. NA17FF2009), on the order of 28% of all tows were sampled. The remaining 72% of the tows were un-sampled due to gear and non-gear related events. Upon receiving comments from the NMFS Technical Monitor, the Foundation conducted a *post hoc* analysis of the project, including experimental design and data collection procedures, to help illuminate any discrepancies between Foundation and NMFS collected data. Differences in spatiotemporal sampling likely account for a portion of the observed differences between the two studies.

All observers (Foundation and NMFS) are trained to only sample tows that are free of problems, both gear and non-gear related. We believe that the definition of a "problem-free" tow is subjective and that a wide degree of variance is associated with what is or is not perceived as a problem-free tow. The most common problem resulting in an un-sampled tow is the fouling of the tickler chain (Personal communication, Mr. Russell O'Brien). During training, Foundation contracted observers are instructed that any fouling of the tickler chain can result in a problem tow; this would include any material hanging from the chain (seaweed, a short shot of line, wire, etc.). This discerning data collection, or the perception of what is considered to be a problem tow, probably leads to the observed difference between sampling rates. We propose to alleviate this problem by having on-going communication with NMFS personnel prior to deploying observers aboard vessels. These discussions will revolve around what constitutes a problem tow and what techniques are used to collect field data. Any discrepancies found to exist will be identified and sampling techniques altered (on the part of NMFS or the Foundation) to allow the collection of consistent, quality data.

Assuming a 28% success rate for sampled tows, that the average shrimp fishing trip lasts 30 days, and that 3 tows are conducted per day, it would take 1.5 trips per device to collect the necessary number of tows needed to certify an experimental device (minimum of 30 tows; 30 days/trip x 3 tows/day x 1.5 trips/BRD = 135 tows/BRD; 135 tows/BRD x 28% of tows are sampled = 37.5 sampled tows). Although these assumptions are variable based upon geography and time of year, these figures provide a reasonable and average estimate of the fishing effort of the Gulf of Mexico shrimp fishing fleet. Therefore, ~150 at-sea days of observer coverage are needed to accurately sample 3 experimental devices (3 BRDs x 1.5 Trips/BRD x 30 days/trip = 135 days or ~150 at-sea days). We also anticipate that 10 cruising days are needed for vessels to travel to and from fishing grounds (2 days per trip). For each tow sampled, the contracted observer will gather a detailed set of information concerning gear configuration, location, time, and catch in accordance with the Regional Council/NMFS BRD Certification Testing Protocol Manuals. Although bycatch is a contentious issue for most U.S. commercial and recreational fisheries, due to the possible decertification of the Gulf Fisheye BRD within the Gulf of Mexico, the scope of the work outlined within this proposal will focus efforts on certifying experimental BRDs within the Gulf of Mexico shrimp fishery with minimal effort in the South Atlantic.

Participating commercial shrimp fishing vessels will tow identical trawl nets. Before any data are collected for experimental purposes, a maximum of 20 tuning tows will be conducted. This will ensure that no net or side bias exists. A minimum sample size of 30 successful tows per tests is required. However, additional tows may be necessary for sufficient statistical power. All tows must be no less than 2 hours and no more than 8 hours in duration. Only the outside trawl nets on a quad-rigged vessel will be used for experimental tests. The experimental BRD will be switched every 4-6 tows between the two outermost trawl positions and all efforts will be made to gain an equal number of tows from each side of the vessel.

The total catch of the control and experimental nets will be weighed separately. A '1-basket' (approximately 30 kg) sample (a standard NMFS sampling protocol aboard vessels) from both the control (without BRD) and experimental (with BRD) net will be collected. A predefined set of species (finfish and invertebrates) within these samples will be identified, counted, weighted as a species lot, and individuals of selected species will be randomly chosen and measured. The total number of tows to be sampled per trip will depend upon the fishing activity of the vessel and the logistics of sorting the catch aboard a fishing vessel. (i.e., one sample may not be completed before the next sample is brought aboard, thus the next tow is not sampled). All data will be collected and recorded on OMB approved datasheets to allow for consistent data collection between NMFS and Foundation observers.

All efforts will be made to make the cooperating vessel captain and crew aware of the data collected by fishery observers. At the end of each tow or, at the least, the end of each day, the contracted observer will explain the collected data to the vessel captain and crew and have all data sheets signed by the vessel captain.

Data Entry:

The Foundation will handle all data processing and analysis for this project. Upon completion of an experimental fishing trip, the observer and cooperating vessel captain will verify the accuracy/completeness of all data by signature. Observers will then be debriefed by the Foundation's Observer/Vessel Coordinator and data reviewed for accuracy and completeness. All raw data will then be photocopied; originals will be forwarded to the Data Manager and the copies will be filed by the Observer/Vessel Coordinator. Copies of all raw data, and any completed analyses of those data, will be made available to each BRD prototype originator.

The Foundation's contracted Data Manager will review and archive all data at the Foundation and in the NMFS Galveston Laboratory database system (as part of the overall bycatch program dataset). The Foundation's standardized data management procedure has been modified to accommodate NMFS' adoption of the database management system. Under this system, once the data files are entered by the Data Manager and verified as correct, the data are then archived in a pooled, multi-organizational dataset at the NMFS Galveston Laboratory. All archived data are available for download to Foundation personnel and contracted Data Analyst for final analysis/interpretation. After the Data Manager completes the archive of data, all raw data will be sent to the Foundation's office for storage.

Data Processing and Analysis:

Methodologies for a standardized data analysis are outlined within the Manuals and publications listed above. These protocols have recently been questioned due to the severe data truncation that results through a strict interpretation, e.g., tow times having to be within +/- 10% of an average tow time, and a minimum capture of 5 red snapper in either the control or experimental net. Therefore, we propose a series of analyses.

A modified t-test will be used to determine the bycatch reduction performance of candidate BRDs. Species number and weight for the entire tow of the designated sample nets will be extrapolated using the ratio of the sample weight (or number) vs. the total net weight:

$$\text{Equation 1:} \quad \frac{(\text{Sample Species Weight}) \times (\text{Total Net Weight})}{\text{Total Sample Weight}} = \text{Extrapolated Species Weight}$$

These extrapolated values will then be converted into catch-per-unit-effort (CPUE) based on the hours towed:

Equation 2: $\frac{\text{(Extrapolated Species Weight)}}{\text{(Tow Time in Hours)}} = \text{Catch Per Hour}$

These CPUE values will be compared between the "control" and "experimental" net for shrimp retention, total biomass reduction, finfish reductions, and red snapper reduction. Total biomass reduction will be calculated as:

Equation 3: [(BRD Net Weight) ÷ (Control Net Weight) – 1] x 100% = Percent Reduction

For the various species, reductions will be calculated by:

1. Extrapolation using Equation 1, the total weight (or number) of species taken in both the control and BRD net based on the weight (or number) of that species present in the sample tow;

2. Generating a CPUE using Equation 2;

3. Generating a mean trip CPUE (or other unit of measure) for both the Control and BRD net, and;

4. Calculating an overall percent reduction in the BRD net based on these means using the format of Equation 3.

Only tows with at least 5 red snapper in the control or experimental net and within +/- 10% of an average tow time will be analyzed. The CPUE means will be tested for significant difference ($p<0.05$) through the use of paired t-tests according to the following hypotheses:

$$H_o: \mu_{control} - \mu_{BRD} = 0$$
$$H_a: \mu_{control} - \mu_{BRD} \neq 0$$

To illuminate the reduction in red snapper fishing morality achieved by experimental BRDs on a per trip and per gear basis, we will use the following equation:

Equation 4: (0.3)(% Reduction Age-0 Fish)+(0.7)(% Reduction Age-1 Fish)= F-Mortality[1]

This equation is consistent with methodologies used by NMFS to compute the reduction in red snapper F-mortality achieved by BRDs (Foster 2004). We define age-0 fish to be <130mm, and age-1 fish to be >130mm, but no larger than 300mm.

Although the standardized analysis listed within the Manuals (and above) was agreed upon to alleviate the weighting of any outliers within the data, it severely truncates the data used in the final analysis due to a lack of red snapper being caught in either the control or experimental nets, or tow times being outside the +/- 10% average. Therefore we also propose to analyze all collected data according to the analysis contained within a paper presented at the SEDAR-7 Data Assessment workshop (Foster 2004). This analysis utilized the Manuals as a guidance document and allows for leeway during analysis. The analysis is standardized (e.g., the computation of CPUE and percent reduction is the same as listed above), but the criteria used to select data to include in the analysis is slightly modified and allows the use of all tows with one or more red snapper in either the control or experimental net as long as the tow duration is between 2 and 8 hours.

[1] Staff will verify these mortality rates are considered the most current and update accordingly as dictated by recent SEDAR.

When all datasets have been archived and analyzed, they will be reported in an aggregate summary where comparisons between and among the various BRDs can be more readily interpreted. Should the need arise, these results will be provided to appropriate fishery management agencies and organizations for certification. All data analyses will be conducted by Dr. Benny Gallaway and the staff of LGL Ecological Research Associates, Inc. with oversight and comment by the Foundation's Program Director and Regional Coordinator.

Efforts to Increase Industry Participation:

The Harvesting Systems and Engineering Division of the NMFS Pascagoula Laboratory annually conducts hydrodynamic evaluations of commercial fishing gear. The purpose of these evaluations is multifaceted, but one objective is to increase the number of industry-designed gears certified for use within the commercial shrimp fisheries of the southeastern U.S. The Foundation and NMFS actively solicit industry members for new and innovative TED and bycatch reduction device (BRD) designs they believe will enhance the efficiency of commercial shrimp fishing operations while still allowing bycatch to escape shrimp trawl nets.

Gear submitted for hydrodynamic testing is brought to Panama City, FL, evaluated and recorded *in situ* by NOAA divers. Upon completion of individual gear tests, a video recording of the gear is mailed to the industry designer and allows the designer to assess and modify the gear if necessary. Due to funding limitations, gear designers are often absent during hydrodynamic tests and immediate feedback is impossible. Thus, if gear modifications are needed, the modified gear must be resubmitted and tested during subsequent years. This process is time consuming and slows development and possible certification of BRDs.

To assist in the research and development of BRD designs and to increase the commercial shrimp industry's participation in cooperative research, funds will be made available for three fishermen to attend hydrodynamic evaluations in Panama City, FL. Fishermen will be solicited by Foundation Regional Coordinator to design and build new and innovative bycatch reduction devices. Fishermen will be compensated for time and labor and all materials needed to produce experimental devices and all participating fishermen will accompany their respective gear designs to Panama City and observe any and all tests that occur. By having the gear designer present during hydrodynamic tests, gear modification can occur in the field, expediting the assessment, modification, and certification of industry designed devices.

Information Dissemination:

Summary reports of the project's findings will be published as part of the "Foundation Project Update" section 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). Dr. Jepson will also provide summary results at a variety of advisory panel meetings and other venues while conducting Foundation business.

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.

Applicant's Administrative Office:

Ms. Judy Jamison
Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 West Kennedy Blvd.
Tampa, FL 33609-2447
Phone: (813) 286-8390
Fax: (813) 286-8261

Project Personnel and Responsibilities

Principal Investigators:

Ms. Judy Jamison, Executive Director
Dr. Michael Jepson, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Ms. Catherine Bowker, Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 20% of their time over the course of the 12 month project period in the performance of this award. This percentage is similar (if not reduced) when compared to the overhead ('indirect rate') of academic institutions. A project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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 experimentally 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 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 required for experimental testing, and individual scientific collection permits for contracted observers. 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 (Gear Review Panel) and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all contracts and amendments. Additionally, she is responsible for maintaining vessel insurance and verifies that all cooperators are maintaining worker's compensation on their employees, if applicable.

The Administrative Assistant, Ms. Catherine Bowker, is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Contracted Personnel:

The Foundation has chosen to sole-source contracts with several persons in conjunction with this project. The essential personnel needed to complete this project are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (Texas A&M University Sea Grant)

Mr. Lindsey Parker, South Atlantic Regional Coordinator (Georgia Marine Extension)

Mr. Russell O'Brien, Observer/Vessel Coordinator

Mr. Phil Diller, Data Manager

Dr. Benny Gallaway (LGL Ecological Research Associates) and Staff, Data Analyst

2 Fishery Observers (To be contracted from those below or TBA)

Mr. Robert Timmeney
Mr. Konstantin Kopylov
Mr. Michael Gordon
Mr. J.L. Wiswell
Mr. Frank Helies

The above individuals have been associated with other, similar, Foundation research programs and projects. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective.

Through years of experience, the Foundation has found that working closely with local Sea Grant – Marine Extension Service personnel (Mr. Graham and Mr. Parker), who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen. The Regional Coordinator and the Observer/Vessel Coordinator will act as a liaison between the Foundation and vessel owners, relaying information about the project goals and securing vessel participation.

The Observer/Vessel Coordinator will assist the Program Director and Regional Coordinator in their day-to-day activities and will coordinate all field efforts through constant communication with Foundation staff and contractors. The Observer/Vessel Coordinator will recruit and train all observers and coordinate field sampling efforts. He will also contact and establish a good working relationship with various cooperating vessel owners, captains and crew, and provide this information to fishery observers. Prior to the deployment of a fishery observer, the Observer/Vessel Coordinator will review with each observer all established protocols on how and what data to collect while onboard a participating vessel. He will also provide all necessary sampling and safety equipment and is responsible for reviewing all data for completeness prior to data entry.

Only observers that have undergone NMFS certification training will be contracted by the Foundation. This training will include safety training, onboard practices to avoid interference with the participating vessel captain and crew, data collection protocols (both classroom and at-sea training), and administrative protocols. It is the job of the fishery observers to collect all data from the experimental and control nets, ensure that all experimental gear is fished optimally (i.e., highly tuned nets), and proof all collected data for completeness and accuracy before being debriefed by the Foundation Observer/Vessel Coordinator. The Foundation currently has three contracted observers working on complementary projects, however, these observers may not remain under contract with the Foundation. If additional observers are needed to collect data and conduct experimental tests, observers will be solicited from other complementary Foundation projects or through job advertisements.

Observer collected data for this project will be electronically entered and archived, at both the NMFS Galveston Laboratory and Foundation Office, by a Foundation contracted Data Manager. The Data Manager is responsible for checking and transferring all raw data into a manageable computer database for data archive. Once the data are ready, they will then be forwarded to the Data Analyst and Foundation Program Director.

The contracted Data Analyst will conduct all statistical tests on observer-collected data with overview and direction from the Foundation's Program Director. Statistical tests will be varied and are listed below. The overall objective of the Data Analyst is to compute the reduction rates (shrimp, finfish, red snapper, and total catch) achieved by experimental BRDs. The Foundation will rely on the analytical and scientific skills of the Data Analyst to assist in any ancillary statistical tests (i.e., spatiotemporal reduction rates achieved by experimental BRDs, etc.) that could be completed during the performance of this award. The NMFS Galveston Database Administrator will work closely with the Foundation's contracted Data Analyst and Program Director in this regard.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico and South Atlantic regions. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results generated from this research and will be more willing to assist in future research.

The Foundation has historically worked cooperatively with staff and personnel at the NMFS Harvesting Systems and Engineering Division (Pascagoula, MS) to assist in the identification, pre-screening, modification, certification validation, and underwater hydrodynamic testing of various experimental BRDs. We propose to extend this cooperative participation during the award and will include NMFS personnel on the Gear Review Panel and provide regular and frequent updates to allow for the close monitoring of this project.

Milestone Table:

Project Activities (Start Date 6/1/08)	2008							2009							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities/Contract Negotiations	xx														
Project Coordination/Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Periodic Planning and Evaluation Meetings	xx	xx													
Training of Observers	xx	xx													
Organize Gear Review Panel Meeting	xx														
Gear Review Panel Meetings		xx													
Finalize GRP Recommendations/ Selection of BRDs for Testing		xx	xx												
Permit Applications & LOAs	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Selection of Participating Vessels		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx				
Experimental Tests		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Evaluation of Test Results							xx	xx	xx	xx	xx	xx			
Hydrodynamic Tests	xx	xx													
Project Closeout & Final Report Preparation													xx	xx	xx
Final Report Submission															xx

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#109

FORM CD-450
(REV 01/09)

U. S. DEPARTMENT OF COMMERCE

FINANCIAL ASSISTANCE AWARD

☐ GRANT ☒ COOPERATIVE AGREEMENT

AWARD NUMBER
NA09NMF4540135

RECIPIENT NAME: Gulf and South Atlantic Fisheries Foundation, Inc.	
STREET ADDRESS: 5401 W. Kennedy Blvd., Suite 740	FEDERAL SHARE OF COST: $384,150.00
CITY, STATE, ZIP CODE: Tampa FL 33609-2447	RECIPIENT SHARE OF COST: $0.00
AWARD PERIOD: 08/01/2009-07/31/2010	TOTAL ESTIMATED COST: $384,150.00
AUTHORITY: 16 U.S.C. 661; 16 U.S.C. 742(f)	

CFDA NO. AND PROJECT TITLE
11.454 Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

This award offer approved by the Grants Officer constitutes an obligation of Federal funding. By accepting this award offer, the Recipient agrees to comply with the award Terms and Conditions checked below. If this was a paper issued award offer, please send two signed documents to the Grants Officer and retain one set of signed award documents for your files. If this award offer is not accepted without modification within 30 days of receipt, the Grants Officer may unilaterally withdraw this award offer and de-obligate the funds.

- ☐ Department of Commerce Financial Assistance Standard Terms and Conditions
- ☒ Government Wide Research Terms and Conditions
- ☒ Bureau Specific Administrative Standard Award Conditions
- ☒ Award Specific Special Award Conditions
- ☒ Line Item Budget
- ☒ 15 CFR Part 14, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, Other Non-Profit, and Commercial Organizations
- ☐ 15 CFR Part 24, Uniform Administrative Requirements for Grants and Agreements to States and Local Governments
- ☐ OMB Circular A-21, Cost Principles for Educational Institutions
- ☐ OMB Circular A-87, Cost Principles for State, Local, and Indian Tribal Governments
- ☒ OMB Circular A-122, Cost Principles for Non-Profit Organizations
- ☐ 48 CFR Part 31, Contract Cost Principles and Procedures
- ☒ OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations
- ☒ Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements
  REF: 73 FR 7696 (February 11, 2008).
- ☒ Other(s)
  73 FR 40052 (07/11/08)

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER	TITLE	DATE
Alan Conway	Grants Officer	06/15/2009
TYPE NAME AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL	TITLE	DATE
Judy Jamison		07/22/2009

COOPERATIVE RESEARCH PROJECT SUMMARY

Project Title: Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

Project Status/Duration: June 1, 2009 – May 31, 2010 New __X__ Cont'd _____ Project Period: 12 Months

Name, Address, and Telephone Number of Applicant:
Gulf & South Atlantic Fisheries Foundation, Inc.
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Tampa, FL 33609-2447
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Principal Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison; Over 28 years administrative and grants management experience.
Dr. Michael Jepson; Over 21 years experience in social impact assessment and grants management.

Project Objectives:

(1) Complement the current ELB study with onboard observers to collect data on fishing effort, red snapper bycatch, and shrimp landings within the Gulf of Mexico; (2) Analyze all observer collected data to further ensure that ELB landings estimates are accurate and defensible; and (3) Determine the spatiotemporal abundance of juvenile red snapper, compute a total mortality (Z) estimate for shrimp-trawl red snapper bycatch, and conduct a formal cohort analysis (VPA) on all observer collected red snapper data; 4) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf shrimp fishery.

Specific Priority(ies) in Solicitation to Which Project Responds:

1. Finfish, **a.** Characterize the total catch (from all fleets affecting the stocks), including catch composition and disposition of catch. **(2)** Investigations are needed to determine more efficient methods to record effort accurately on a real-time basis during fishing operations; **(4)** Projects are needed to utilize fully scientific observers on-board vessels as a means of collecting detailed catch, effort and disposition data.

4. Commercial Shrimp Harvest, Quantification of Effort: Research is needed to improve shrimp effort data.

Summary of Work:

The dynamics of the red snapper fishery are complex and various user groups are thought to impact the stock. As such, disagreement has existed regarding the mortality, age composition, and monthly distribution of juvenile trawl-caught red snapper. Furthermore, recent assessments of blacknose shark suggest significant mortality from bycatch in the Gulf shrimp fishery. To alleviate this confusion, the Foundation proposes the continuation of a program to augment a currently funded ELB project with fishery observers. The current program (funded through Coop. Agree. No. NA05NMF4540044) has expended its compliment of sea-days. To allow for the continued gathering of observer collected data aboard vessels that have an ELB, additional at-sea days are necessary. As before, fishery observers will be placed aboard shrimp trawl vessels that have been randomly selected and have an ELB installed. Observers will collect data on total penaeid shrimp and red snapper catch and small coastal shark (i.e., no sub-samples will be taken). Data collected during this project will be used to update the formal cohort analysis (VPA) and compute mortality estimates for all Foundation collected red snapper bycatch data (both past and present). Results will be used to validate ELB landings estimates by region (statistical zone), quantify red snapper and small coastal shark bycatch rates, and to assist fisheries managers in the assessment of the both stocks.

Project Funding:		
	Federal	$384,150
	Non-Federal	$ 0
	Total	**$384,150**

Project Title:

Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

Applicants Name:

Gulf & South Atlantic Fisheries Foundation, Inc.
Judy Jamison, Executive Director

Proposed Budget period:

June 1, 2009 – May 31, 2010

Introduction:

The Gulf and South Atlantic Fisheries Foundation is currently conducting research to augment the collection of data through the use of electronic logbooks with observers in the Gulf of Mexico Shrimp Fishery through Cooperative Agreement No.NA05NMF4540044 which ends in December 2008. This proposal is to continue that project which has produced important results with regard to the red snapper stock assessment (Gazey et al. {In Press} 2008). Of significance, is the estimated natural mortality of age-0 fish obtained from this research that is almost double of that used in the recent SEDAR 7. These results are awaiting peer review; nevertheless, the results underscore the need for increased data collection for red snapper and other species. This is especially true for small coastal sharks which are currently undergoing management review. Recent information suggests that blacknose shark (*Carcharhinus acronotus*) is overfished and that there is substantial bycatch in the Gulf shrimp fishery (NMFS, 2007b). Some of these figures are disputed and will be addressed by this research through the collection of information on the bycatch of small coastal sharks. Furthermore, results from a recent review of historic BRD data under MARFIN Award NA07NMF4330125 which includes data from Foundation projects should have important implications regarding BRD testing protocols. The following discussion provides a background for this research and previous efforts to collect data through the use of electronic logbooks in the Gulf shrimp fishery. The preliminary results of the Foundation research are also discussed.

Fish stocks with commercial and recreational value are typically managed via the regulation of fishing mortality to maintain a sustainable harvest (Hilborn and Walters 1992). Because the red snapper (*Lutjanus campechanus*) stock of the Gulf of Mexico is classified as overfished, the National Marine Fisheries Service (NMFS/NOAA Fisheries) has regulated the directed (commercial and recreational) red snapper fisheries to reduce mortality of large fish (size and trip limits, closed seasons, etc.). To reduce the fishing mortality of small juvenile fish, the NMFS has also regulated the shrimp trawl fishery of the Gulf of Mexico; a fishery that is thought to bottleneck adult populations. Disagreement has existed regarding the magnitude, age composition, and monthly distribution of shrimp trawl red snapper bycatch in time and space (Goodyear 1995; Schirripa and Legault 1997, 1999; Gallaway *et al.* 1998; Gallaway and Cole

1999; Ortiz *et al.* 2000). However, better and more complete observer data have provided the basis for reaching agreement (e.g., NMFS 2004).

Estimates of red snapper bycatch are directly dependent upon estimates of shrimp fishing effort. Historically, port agents have collected shrimp landings and value data from dealer records. Fishing effort data are collected by port agents through detailed interviews with fishing vessel captains and/or crew. Interview data provides resolution on shrimp fishing effort at the trip level. Due to the large number of shrimp fishing trips occurring within the Gulf of Mexico, a comprehensive survey of the shrimp fleet is not feasible and subsampling occurs. Monthly, port agents visit all shrimp dealers within their region and collect landings information for individual fishing trips. Port agents then subsample these trips by randomly selecting interviewees to obtain further information regarding effort and catch location (Nance 2004).

NMFS, historically, has not directly measured shrimp fishing effort, catch, or length-frequency data on commercial shrimp trawl red snapper bycatch. These estimates are derived through indirect approaches or modeling, thus adding to the contention of the red snapper bycatch issue. Inaccuracies in trip interviews, time fished, or reported catch data can result in skewed fishing effort calculations (Nance 2004) and biases in the assessment of the red snapper stock (NMFS 2004).

At least three possible solutions exist to resolve the current inaccuracies inherent with shrimp fishing effort data: 1) Have the fishing vessel captain maintain a tow-by-tow paper logbook; 2) Place observers on fishing vessels to maintain paper logbooks; or 3) Utilize electronic logbooks (ELB) to record the time, date, and location of fishing activities. Each of these three solutions has associated advantages and disadvantages.

Commercial fishermen are typically wary of collecting data for use by fisheries managers and are sometimes concerned that the collected data will be used against them to implement further management regulations. Asking, or mandating, fishermen to collect fishing effort data would be the most inexpensive option, but such data may be unreliable, necessitating the use of other data collection methods.

Placing observers on fishing vessels would be the optimal method to collect fishing effort data. Observers are unbiased with regard to effort data collection and can further augment the collection of data by recording the abundance and length-frequency of shrimp trawl red snapper bycatch. The overwhelming disadvantage to utilizing observers in a multi-year program, covering at least a significant portion of the shrimp fishing fleet, would be expensive (on the order of tens of millions of dollars).

The advantages of implementing an ELB system are that the device is passive, small, and it accurately and autonomously records data. Shortcomings of the ELB system include a lack of ancillary data collection and the price of the device will, most likely, be passed on to fishermen. The most appropriate and effective resolution to estimate fishing effort and bycatch would be to combine all, or part, of these solutions.

In 1998, the U.S. Congress appropriated funds to the Gulf and South Atlantic Fisheries Foundation, Inc. (Foundation) to conduct a three-year research study to enable the fishing industry to evaluate and address fishery management issues including the estimation of shrimp fishing effort and bycatch. A portion of these funds were granted to LGL Ecological Research Associates, Inc. (LGL) to allow the research and development of an electronic logbook to directly measure shrimp fishing effort thereby reducing the dependence on modeling to provide better estimates of shrimp fishing effort and red snapper bycatch. Over the course of LGL's 3 year pilot study, ELB systems were developed and placed onboard commercial shrimp fishing vessels to collect fishing effort data (see below).

To augment the data collection, both paper logbooks and observers were utilized to collect shrimp landings and red snapper bycatch data on a tow-by-tow basis. Results from this study indicated that the ELB system accurately estimated the fishing practices of a vessel on a per trip basis (see below) and that individual tows could be identified. Combining the ELB data with paper logbooks and observer collected landings data, it was demonstrated that total vessel landings (on a per trip basis) could be divided accurately on a tow-by-tow basis and allocated to specific statistical zones. Of the 135 trips where ELBs recorded effort data, port agents collected data on 62 of these trips. A comparison of the ELB and port agent data allowed for a direct comparison of fishing effort estimation methodologies (i.e. NMFS/State port agent data vs. ELB data). This analysis indicated that a directional bias exists and that port agent data overestimated effort in midshore regions (areas abundant in juvenile red snapper; between 10-30 fathoms) while underestimating effort in offshore and nearshore regions (areas where juvenile red snapper abundance is low; 30+ fathoms and 0-10 fathoms, respectively). These studies proved that an ELB system was accurate at recording shrimp-trawl fishing effort and estimating and allocating landings data (Gallaway 2001, 2003a, and 2003b).

Based upon the results derived from the above-mentioned studies and recommendations made by the SEDAR-7 Shrimp Fleet Bycatch Working Group (NMFS 2004), LGL was granted money by the NMFS to further expand the ELB program within the shrimp fishery in the Gulf of Mexico. The project, entitled "Estimation of Shrimp Fishing Effort in the Gulf of Mexico: Phase 1 and Phase 2 Implementation," was designed to capture accurate estimates of shrimp-trawl fishing effort from the construction and installation of 150 ELBs on a random and representative sample of the shrimp fishing fleet operating in the Northern Gulf of Mexico. To date, there have been approximately 450 ELBs placed aboard Gulf shrimp fishing vessels. Although the data collected during the ELB study will be invaluable to fishermen and fisheries managers in resolving effort related questions, no red snapper bycatch and shrimp landings data are collected. To continue to augment this study and make the results more robust, the Gulf & South Atlantic Fisheries Foundation, Inc. proposes to continue this program for another year. Importantly, this will increase the data available to verify models used by scientists to compute red snapper bycatch levels within the fishery.

The results of the most recent SEDAR 7 stock assessment indicate that shrimp trawl bycatch is still a source of fishing mortality for the red snapper stock within the Gulf of Mexico. Because an accurate estimate of red snapper shrimp trawl bycatch within the Gulf of Mexico is not fully known that information will be enhanced with fishery observers placed aboard vessels with ELBs.

The most recent stock assessment for small coastal sharks, SEDAR 13 suggests that blacknose shark are overfished and that overfishing is occurring, but there are some concerns about certain aspects of the assessment as evidenced by this quote: "However, because of uncertainties in indices, catches and life history parameters, the status of blacknose shark could change substantially in the next assessment in an unpredictable direction" (NMFS, 2007b: 2). One of those concerns is the extent of blacknose shark bycatch in the Gulf shrimp fishery. Including small coastal shark in the data collection protocol will enhance the assessment data regarding these species.

More specifically, this project aims to:

1) Complement the current ELB study with onboard observers to collect data on fishing effort, red snapper bycatch, and shrimp landings within the Gulf of Mexico;

2) Analyze all observer collected data to further ensure that ELB landings estimates are accurate and defensible;

3) Determine the spatiotemporal abundance of juvenile red snapper, compute a total mortality (Z) estimate for shrimp-trawl red snapper bycatch, and conduct a formal cohort analysis (VPA) on all observer collected red snapper data; and

4) Provide improved data collection on the extent of bycatch of small coastal sharks.

Materials and Methods:

ELB Description:

Hardware:

The LGL Electronic Logbook was developed to track the fishing effort of shrimp trawlers operating within the Northern Gulf of Mexico. The ELB system is currently in version 4.0 and each version has increased the systems functionality. Data formats and software have been altered to complement the ELB system and allow for all data formats to be read. A brief description of each ELB version is discussed below.

Version 1.0-1.6 – This is the original version of the LGL ELB and the only version which has been used within the Gulf of Mexico shrimp fishery. Hardware engineering was based upon the Parallax Basic Stamp II™ microprocessor, and utilized the Microchip PIC16C57 microcontroller. The Basic Stamp II is programmed in PBASIC, a language based on a subset of the BASIC computer language. This ELB version included two external EEPROM memory chips (non-volatile Microchip 24LC256) which were mounted on the same printed circuit board as the microprocessor. To receive positional data, the circuit board was connected to a Garmin Trac-Pac-35 OEM Global Positioning System unit. Versions 1.0-1.4 recorded data in a 10 byte encoded record; versions after 1.4 compressed data to 8 byte records allowing 4,096 observations to be recorded per memory chip. Increasing data compression allowed slightly more than 56

days of memory to be stored. A more complete description of the device, data collected, and results have been published in peer reviewed literature (Gallaway *et al.* 2003a and 2003b; Cole *et al.* 2002) and the reader is directed to these publications for further information.

Version 2.0 – This version modified the unit by removing the EEPROM memory chips from the main printed circuit board and replacing them with an external memory board capable of holding eight 24LC256 memory chips. This change increased the observation period from approximately 56 days to over 227 days of records; and more importantly, made the memory box serviceable by the vessel's personnel. In the event that memory was full, the vessel Captain could disconnect the full memory module and replace with new memory; thus drastically reducing the cost of unit maintenance. The most difficult and costly part of installing an ELB is intercepting the vessel in a port where the service person can access it. In theory, this version of the ELB would mean that a vessel would only need to be intercepted once (for initial installation of the unit); after which the Captain could remove and replace the memory modules as appropriate.

Version 3.0 – Version 3.0 of the ELB changed the microprocessor from the Parallax Basic Stamp II to a single board Parallax Javelin Stamp computer. This feature allowed the ELB to be programmed with a subset of Sun MicroSystem's Java programming language (a more robust programming language) and increased processing speed. As part of the programming changes, the encoded data record were reduced to 7 bytes with no loss of data precision. This change increased the observation period to an excess of 260 days. Further programming changes extended the observation period by not recording positional data if the vessel was stationary for 24 hours (e.g., tied up or at anchor). Observation periods were extended to >365 days.

Version 4.0 – This most recent version of the ELB incorporates major revisions in both hardware and software. The Parallax Javelin Stamp processor was upgraded to the Systronics JStamp and increased processing speeds and RAM availability 30 and 14 times, respectively, than that of the Javelin. This conversion only increased unit price by $10. Additionally, STMicroelectronics has released a new 512 kb EEPROM memory chip (M24512-B) compatible with the 24LC256 pin layout allowing observation periods to exceed 520 days. Although it is expected that data will be on a semiannual basis, this version would allow a vessel to be late in returning memory modules with no data being lost.

The most significant improvement in Version 4.0 is the inclusion of point-in-polygon calculation capabilities. This program, which runs at the same time as the data collection program, can warn the vessel Captain when he is approaching a designated area, and provides a different warning when he actually enters the area. This allows the unit to be preprogrammed with areas (polygons) that are to be avoided, for regulatory reasons (MPA's or closed areas) or because they contain reefs or other trawl hangs.

Software:

The original software consisted of programs written in PBASIC which were loaded into the ELB, and programs written in C++ which were used to analyze the data collected. The software

described below has since evolved along with the ELB hardware. The following descriptions for the original software are provided to show the basic functions of the ELB software.

PBASIC Programs – PBASIC programs are loaded into the microprocessor and allow it to test and reset the ELB system, collect and store data, or export previously collected data for use in other programs. Only one program can be held in the microprocessor's non-volatile memory at a time. The program in memory is run from the beginning each time the unit powers up or the reset circuit is activated. The system test program turns the GPS unit on, captures the transmitted SACII sentences, and displays them on the host PC. This program also tests the GPS for satellite coverage to ensure an accurate position. After accurate positional data is received, the system reset program is run to set a unique identifier number for the ELB system, erase previous memory locations, and set the memory index to the start.

The data collection and storage program runs continuously when in the field. In the event of a loss of power, or activiation of the reset circuit, the unit restarts the program where it last left off. The GPS unit is activated once every 10 minutes, keeping it on until it receives an accurate position fix (usually within 30 seconds). Once an accurate position is fixed, the program then turns the unit off, reformats the position and time data into an efficient 8 byte format, and writes the data to non-volatile external EEPROM memory. Upon completion of a fishing trip, the export program is loaded and executed. The program pauses for 30 seconds while the host PC activates a C++ program and uploads all data to the host PC memory.

C++ Program – ELB_Analysis, a C++ program written to run under Windows 95 and Windows 98, allows the user to select an electronic logbook data file to analyze, select the version of the program used to store the data, run the analysis and the summarization programs, and save the results. The resulting files are comma-separated ASCII files which include positional data that can be loaded directly into ArcView. The tracking file provides all positional information collected by the logbook, along with an interpretation of activity for each position. The logbook estimate file shows each ELB-detected tow including positional data and total tow time.

Activity at each position is inferred from the vessel's calculated speed which is approximated in three steps using "flat map" calculation techniques – a method that provides the required precision when working with closely located geographic points: 1) Latitude and longitude line lengths between observations are calculated in decimal degrees of longitude and latitude; 2) The line lengths are converted to kilometers using 111.18 km per degree of Latitude and 98.0052 km per degree of longitude; and, 3) The direct distance between the observation points, calculated in km using Euclidean geometry, is divided by the time between observations.

Using the calculated speed, activity is assigned in accordance with the following table:

Speed Range (Knots)	Activity Code	Activity Description
< 1.0	H	On Hook – Stopped
$\geq 1.0 < 2.0$	h	Buffer b/t Stopped & Trawling
$\geq 2.0 < 3.8$	T	Trawling
$\geq 3.8 < 5.0$	s	Buffer b/t Trawling &

		Steaming
≥ 5.0	S	Steaming

The tow summary function of the *ELB_Analysis* program estimates tows by relating the activity code associated with each location to the other activity codes from previous and following locations. Because the "H" and "h" activity codes can mask either slowing down during a trawl or turning, the program requires four "H" codes between two "T" codes to terminate a tow, while it only requires two "S" codes to terminate a tow. In either case, the time attributed to the codes that result in tow termination is not included in the total tow time.

All information collected by ELB systems are in a proprietary format that ensures the confidentiality of the data. Only LGL Ecological Research Associates, Inc. staff and the cooperating vessels will have access to the raw effort data.

Identification of Trips for ELB Datasets

Since NMFS records landings at the end of each trip, ELB vessel datasets (which can cover many trips) must be analyzed to identify the beginning and end of each separate trip. The LGL C++ program *elb-trip-calc* performs this analysis for each of the ELB datasets (one dataset is created each time a box is serviced). The program reads the location data from the first records (the location when the box is installed) and creates a rectangle 2.22 km tall by 1.97 km wide with the original location point in the center. The program then tests each record in the dataset until the vessel leaves the rectangle, at which time the program records the trip start date.

After the vessel has left the rectangle, each record is reviewed until the vessel returns to the rectangle, at which time the trip end date is recorded. This is repeated for all records in the ELB dataset.

Vessel Selection and Effort Calculation

Any permitted vessel with landings from a trimester in the previous year is used as the universe of commercial fishing vessels for sample selection. Within each time period (e.g., trimester), the landings by vessel are ordered from high to low, and this list is divided into quartiles. The ratio of summed landings for each quartile to the total landings observed for that time period constitutes the proportion of the sample to be drawn from that quartile. These selections will be made independent of the port from which the vessel operates.

The basic equation used to estimate effort in each defined time/space cell is:

$$\text{Effort} = \sum Landings_{\text{cell}} / CPUE_{\text{cell}}$$

ELB data are retrieved from each vessel and summarized by trawl tow (described in Gallaway *et al.* 2003a), and combined into a sample dataset. These data are analyzed to associate a trip completion date with each tow record. A NMFS landing data file is acquired and reduced to records that match vessel number and trip completion dates in the ELB data set. These data are also summarized into a dataset containing the vessel's trip information, along with pounds

landed. For observer collected red snapper bycatch data, effort will be calculated on a per month basis.

The spatial cells used in the analysis are created in ArcView (shapefile) and joined to the ELB starting point data to add location data to each tow record. The resulting data are then combined with the NMFS trip total landings data and each tow record is assigned landings based on the percent effort for the trip multiplied by the total landings associated with the trip (described in Gallaway *et al.* 2003a).

Current Field Program and Expected Completion:

The Foundation is currently augmenting the ongoing LGL effort program through a complementary award (Coop. Agree. No. NA05NMF4540044) which ends September 2008. A total of 17 trips with observers on board have been conducted aboard selected commercial fishing vessels originating out of ports from Texas to Florida for a total of 375 sea days. The results of this most recent research have been reported in a manuscript recently accepted for publication (Gazey et al. In Press 2008). A length-based, age-structured model was developed using length frequency data collected by observers of the Gulf of Mexico penaeid shrimp fishery from 1999 to 2006. The model results indicate that the age-0 red snapper fraction of the shrimp trawl bycatch in the first and third trimesters exceeds 90% and during the second trimester, the bycatch is more evenly split between age-0 (48%) and age-1 (52%) red snapper. The growth data suggest age-0 and age-1 fish form an opaque annulus in winter which is consistent with results found for older fish. The total mortality estimates for age-0 and age-1 red snapper were about 2.5 and 1.8, respectively. The natural mortality rate for age-0 red snapper based on this study is approximately double the value used in the last red snapper stock assessment. The evidence for the model with density dependence over the model with density independent mortality is overwhelming. Therefore, continuation of this project is essential as the continued need for data to enhance stock assessments is vital.

Observer Coverage:

Catch data will be collected by Foundation contracted observers placed onboard selected commercial shrimp fishing vessels that have an ELB installed. Observers contracted by the Foundation will have received a NMFS certificate of training prior to being deployed aboard a fishing vessel. This training will detail gear specifications, sampling protocols, data collection and documentation required by each observer and include turtle training at the NMFS Miami Lab. Training will allow for data consistency and standardization between Foundation and NMFS datasets and facilitate data analysis by interested parties (i.e., Foundation contracted Data Analyst and stock assessment scientists). Upon the successful completion of training, if necessary, vessels will be solicited to allow the placement of fishery observers to collect shrimp landings and red snapper bycatch data.

Observers will be hired/contracted by the Foundation to collect data and will record the weight (heads-on or heads-off) of all Penaeid shrimp regardless of the quantity harvested (e.g., no sub-samples will be taken). All incidentally harvested red snapper will be enumerated, weighed, and measured to produce accurate abundance and size-frequency estimates. Efforts will be taken to

sort, weigh, size, and record all red snapper from individual nets. In the event that individual net sorting becomes impractical, observers will sort, weigh, and size red snapper taken from all nets combined (i.e., catch from all fished nets will be combined and red snapper separated). All small coastal sharks will be enumerated, weighed, and measured from each net also. All turtles incidentally taken during experimental tows will be handled, measured, and flipper tagged according to established NMFS protocols.

We project 350 at-sea days are needed to adequately sample the vessels cooperating in the ELB program within the Gulf of Mexico. To the extent practicable at-sea days will be stratified by yearly trimester and proportionally allocated to each trimester based on fishing effort (e.g., more sea days will be allocated to the summer trimester due to the increased fishing activity during this time). It is at the discretion of the Foundation Regional/Field Coordinators and PIs to change the at-sea day allocation. If a redistribution of at-sea days is needed, efforts will be taken to ensure that this redistribution is performed in a scientifically rigorous manor and validated through communication with industry, NMFS, and LGL Cooperators.

Analysis of Observer Collected Red Snapper Data:

To better estimate the impact that the commercial shrimp fishing industry has on the red snapper population, a virtual population analysis (VPA; e.g., "cohort analysis") will be conducted on all observer collected red snapper bycatch data to update the cohort analysis with the most recent data. VPA's are used by fisheries managers to calculate stock size based on catches with no underlying statistical assumptions (Hilborn and Walters 1992). Once year-class stock size is known, cohort selectivity and vulnerability can be estimated.

Age-0 and age-1fish comprise the bulk (~99%) of red snapper shrimp trawl bycatch. To better define red snapper cohorts, all fish below 130 mm will be considered age-0 fish and all fish less than 300 mm that are not age-0 will be counted as age-1. Due to the continuous fishing practices (in time and space; with some time/area exceptions) of the shrimp fleet, the VPA must rely on natural mortality and population estimates for both age-0 and -1 fish. As such, mortality and population estimates derived from the most recent SEDAR-7 (Red Snapper) Assessment/Review Workshop will be utilized. This will ensure the robustness of the estimates used for, and results derived from, the analyses (i.e., all estimates will have undergone extensive peer review prior to analysis).

To compute a total mortality (Z) estimate for age-0 and -1 red snapper, catch-per-unit-effort (CPUE) data by length and month will enable the relative abundance of year classes over time to be computed. CPUE will be converted to the number of fish caught per net per 10,000 hours. Effort will be multiplied by the CPUE values to approximate bycatch by age, month, and region (e.g., statistical zone). From these data, survival can be estimated and total mortality (Z) calculated. All efforts will be made to compute a Z estimate from all Foundation datasets, both past and present.

Information Dissemination:

Cooperating fishing vessel owners will be provided with regular updates and a copy of the Foundation's analysis results and project final report. Summary reports of the project's findings will also be published as parts of the "Foundation Project Update" section 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.

Expected Results and Discussion:

The dynamics of the red snapper fishery are complex and various interest groups (recreational, head boat, charter boat, direct and indirect commercial fisheries, and the shrimp trawl fishery) are thought to impact the stock. In previous stock assessments, shrimp trawl bycatch was thought to bottleneck adult populations. Through previous efforts funded by the Foundation, shrimp trawl effort was found to be directionally biased, thus skewing shrimp trawl red snapper bycatch estimates. The continuation of the Foundation's ELB program will help to alleviate some of the confusion regarding shrimp trawl fishing effort and the F-mortality directly attributable to the shrimp trawl fishery operating in the Gulf of Mexico.

By augmenting LGL's current ELB research with onboard observers, red snapper bycatch and landings data will be collected as before. Landings data will be used to verify models used by scientists to allocate landings and effort on a trip-by-trip basis. Previous publications have shown that the ELBs can accurately predict landings on a tow-by-tow level (Gallaway *et al.* 2001). The SEDAR Shrimp Fishing Effort Working Group brought up concerns regarding these estimations. Specifically, more data were needed to validate the accuracy of the ELB landings model. If the landings model is validated and found to accurately assess shrimp landings on a tow-by-tow scale (versus the current trip-by-trip scale used by NMFS), the ELB landings information could be used by fisheries managers to accurately assign landings data to individual statistical cells.

Shrimp trawl bycatch data and the respective analyses have already illuminated the magnitude, composition, and mortality of juvenile red snapper. Results thus far indicate that age-0 red snapper are found to constitute the majority of red snapper shrimp trawl bycatch. This has important implications for the impact that the shrimp trawl fishery has on the red snapper stock which could be negligible or reduced from previous estimates. Although the dataset generated from this study cannot be considered "standalone", these data will significantly increase the current database of shrimp trawl red snapper bycatch data and constitute "the best available". These data will also be valuable to scientists assessing the impact that shrimp trawling has on the red snapper stock of the Gulf of Mexico.

Justification for Federal Support:

This project addresses a national priority regarding conservation and management of marine resources. Through National Standard 9 of the Magnuson-Stevens Conservation and Management Act (MS-FCMA) [16 U.S.C. 1826c, 1851], i.e., "*Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*" Bycatch reduction remains a critical and high priority issue. Therefore, the impact that the shrimp fishery has on the red snapper stock serves to enhance national conservation goals set forth by the U.S. Congress. Additionally, because fisheries resources are a public commodity and various user groups (commercial fishermen, head and charter boat fishermen, recreational anglers, the commercial shrimp industry, the public-at-large, and federal and state fisheries management agencies) have a stake in the conservation of this marine resource, it is fair and reasonable to ask for Federal assistance.

Project Management:

Project Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Dr. Michael Jepson, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 20% of their time over the course of the 12 month project period in the performance of this award. This percentage is similar (if not reduced) when compared to the overhead ('indirect rate') of academic institutions. A project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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 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 experimentally 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 fiscal 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 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 required for experimental testing, and individual scientific collection permits for contracted observers. 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 meetings and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all subcontracts and amendments. Additionally, she is responsible for maintaining vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, and newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Participation by Others than Applicant:

To be successful, a project of this magnitude and importance requires the cooperation and active participation of many organizations and individuals. Most of these individuals have been associated with other similar Foundation research projects and programs since 1993. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective.

The Foundation has chosen to sole source contract with several persons in conjunction with this project, while leaving some positions open to competition. These essential personnel are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator
(Texas A&M University Sea Grant)

Mr. Russell O'Brien, Observer/Vessel Coordinator
(Independent Contractor)

Mr. Phil Diller, Data Manager
(Independent Contractor)

LGL Ecological Research Associates, Inc.
Dr. Benny Gallaway, Data Analyst
Mr. John Cole, Data Analyst
Mr. Bill Gazey, Data Analyst

Contracted Fishery Observers (Selected from the list of individuals below)
Mr. Bob Timmeney
Mr. Konstantin Kopylov
Mr. J.L. Wiswell
Mr. Frank Helies

Through years of experience, the Foundation has found that working closely with the local Sea Grant – Marine Extension Service personnel who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen. As such, the Gulf of Mexico Regional Coordinator, with assistance from the Observer/Vessel Coordinator, will (1) act as liaison between the Foundation and vessel owners, relaying information about the goals of the project and securing vessel participation in the project; (2) review, with the Data Analyst and Program Director, incoming data for completeness and accuracy; and (3) monitor observer performance.

The Observer/Vessel Coordinator will assist the Foundation's Program Director and Regional Coordinator in their day-to-day activities, with all activities coordinated through continual communication with Foundation staff. The Vessel/Observer Coordinator will also recruit, train and coordinate fishery observers in the field. He will also contact and establish a good working relationship with various cooperating vessel owners and captains, and provide this information to the observers.

Only observers that have undergone rigorous NMFS certification training will be contracted by the Foundation. It is the job of the onboard observers to collect all landings and red snapper bycatch data and proof all collected data for completeness and accuracy before forwarding to the Observer/Vessel Coordinator. The Foundation has contracted observers working on related projects. Because these individuals possess the skills needed to fulfill the position and have proven themselves under field conditions, the contracted observer positions will first be offered to these individuals. If additional observers are needed to collect data, a competitive solicitation process will be conducted by the Foundation.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico region. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and

allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results produced from this research and will be more willing to assist in future research.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the Foundation and NMFS Galveston Laboratory. The Data Manager is responsible for checking and transferring all the collected raw data into a manageable computer database for analysis and data archive at the Foundation's office and the NMFS Galveston Laboratory. Once the data have been reviewed and entered, they will then be forwarded to the Data Analyst and Foundation Program Director.

Dr. Benny Gallaway, of LGL Ecological Research Associates, Inc., will work closely with the Foundation's Coordinators and Program Director with this project. Dr. Gallaway has traveled the region presenting the results of previously conducted effort studies to increase the awareness of the project and randomness of ELB placement. In addition, Dr. Gallaway and LGL staff/contractors (including Mr. Bill Gazey and Mr. John Cole) will be conducting all data analyses on landings and red snapper bycatch data.

Industry and NOAA Fisheries Cooperators:

Mr. John Williams, Southern Shrimp Alliance
Ms Wilma Anderson, Texas Shrimp Association

Dr. Jim Nance, NOAA Fisheries Galveston Laboratory

Direct industry participation is needed for the proposed work. Mr. John Williams, representing the Southern Shrimp Alliance and Ms. Wilma Anderson of the Texas Shrimp Association, will work with Foundation Coordinators and Dr. Gallaway to increase awareness of this project and solicit industry's support. Both Ms. Anderson and Mr. Williams have been active in the shrimp industry and related research for many years. Their contacts within the commercial fishing community will be of paramount importance.

Dr. Jim Nance has agreed to be this project's NOAA Fisheries Cooperator. Dr. Nance has worked cooperatively with the Foundation for a number of years on fishing effort related projects. He will oversee the project throughout its entirety and ensure that all data is collected in a scientifically rigorous manor. The Foundation's Program Director will have frequent contact with Dr. Nance and update him of any, and all, progress and/or problems that occur.

Monitoring of Project Performance:

Given the current controversies and conflicts among various interest groups related to the programmatic concepts outlined here, there is a possibility that one (or more) of these groups will question the validity of the Foundation's findings. For internally conducted studies, Principal Investigators (PIs) will regularly communicate with observers and Foundation Field/Regional Coordinators concerning fieldwork. PIs will also review data for completeness and accuracy, and the Foundation's Program Director will monitor data management procedures

to ensure that all data analyses meet their required statistical assumptions and fulfill the project objectives outlined within this proposal. The quality of the data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of, and critically review, project reports. This program will be conducted as a Cooperative Agreement with NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and a NMFS Technical Monitor. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and reviewers will discuss data, data analysis, and data interpretation. Only after the analysis has undergone rigorous evaluation will the final report be accepted by the Foundation and printed.

Milestone Table:

Project Activities	2009							2010							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities/Contract Negotiations	xx	xx													
Project Coordination/Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Training of Observers	xx	xx													
Permit Applications & Maintenance	xx	xx													
Selection of Participating Vessels		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx				
Data Collection		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx		
Statistical Analysis											xx	xx	xx		
Project Closeout & Final Report Preparation													xx	xx	xx
Final Report Submission															xx

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#115

FORM CD-450
(REV 01/09)

U. S. DEPARTMENT OF COMMERCE

FINANCIAL ASSISTANCE AWARD

☐ GRANT ☒ COOPERATIVE AGREEMENT

AWARD NUMBER
NA10NMF4540108

RECIPIENT NAME: Gulf and South Atlantic Fisheries Foundation, Inc.	
STREET ADDRESS: 5401 W. Kennedy Blvd., Suite 740	FEDERAL SHARE OF COST: $237,533.00
CITY, STATE, ZIP CODE: Tampa FL 33609-2447	RECIPIENT SHARE OF COST: $0.00
AWARD PERIOD: 08/01/2010-07/31/2011	TOTAL ESTIMATED COST: $237,533.00
AUTHORITY: 16 U.S.C. 661; 16 U.S.C. 742(f)	
CFDA NO. AND PROJECT TITLE: 11.454 Continued Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery	

This award offer approved by the Grants Officer constitutes an obligation of Federal funding. By accepting this award offer, the Recipient agrees to comply with the award Terms and Conditions checked below. If this was a paper issued award offer, please send two signed documents to the Grants Officer and retain one set of signed award documents for your files. If this award offer is not accepted without modification within 30 days of receipt, the Grants Officer may unilaterally withdraw this award offer and de-obligate the funds.

- ☐ Department of Commerce Financial Assistance Standard Terms and Conditions
- ☒ Government Wide Research Terms and Conditions
- ☒ Bureau Specific Administrative Standard Award Conditions
- ☒ Award Specific Special Award Conditions
- ☒ Line Item Budget
- ☒ 15 CFR Part 14, Uniform Administrative Requirements for Grants and Agreements with Institutions of Higher Education, Hospitals, Other Non-Profit, and Commercial Organizations
- ☐ 15 CFR Part 24, Uniform Administrative Requirements for Grants and Agreements to States and Local Governments
- ☐ OMB Circular A-21, Cost Principles for Educational Institutions
- ☐ OMB Circular A-87, Cost Principles for State, Local, and Indian Tribal Governments
- ☒ OMB Circular A-122, Cost Principles for Non-Profit Organizations
- ☐ 48 CFR Part 31, Contract Cost Principles and Procedures
- ☒ OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations
- ☒ Department of Commerce Pre-Award Notification Requirements for Grants and Cooperative Agreements
  REF: 73 FR 7696 (February 11, 2008).
- ☒ Other(s)
  74 FR 34642 (July 16, 2009)

SIGNATURE OF DEPARTMENT OF COMMERCE GRANTS OFFICER	TITLE	DATE
Tracy Jackson	Grants Officer	07/22/2010
TYPE NAME AND SIGNATURE OF AUTHORIZED RECIPIENT OFFICIAL	TITLE	DATE
Judy Jamison Judy Jamison	Executive Director	08/10/2010

COOPERATIVE RESEARCH PROJECT SUMMARY

Project Title: Continued Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

Project Status/Duration: Sept. 1, 2010 – Aug. 31, 2011 New X Cont'd _ Proj. Period: 12 Months

Name, Address, and Telephone Number of Applicant:

Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, FL 33609-2447
(813) 286-8390

Principle Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison: Over 29 years administrative and grants management experience.
Mr. Frank Helies: Experience in biological and oceanographic research.

Project Objectives:

(1) Solicit and test new and/or promising BRDs that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts; (2) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic; (3) Calculate reduction rates achieved for each BRD tested to include total shrimp, finfish, and total bycatch, and estimate red snapper fishing mortality (F); (4) Increase the shrimp industry's participation in BRD research and development to enhance awareness and involvement in fisheries management; and (5) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf shrimp fishery, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*).

Specific Priority(ies) in Solicitation to Which Project Responds:

4. Commercial Shrimp Harvest, **b.** Quantification of effort; **c.** Bycatch Reduction Device Testing Protocols; **d.** Quantification of Bycatch Rates.

Summary of Work:

This project will field test new or promising bycatch reduction devices (BRDs) for certification following the NMFS BRD Certification Testing Protocol for the Gulf of Mexico and South Atlantic. BRD designs will be solicited from shrimp fishermen, industry gear innovators, Sea Grant Extension agents, and NMFS Harvesting Branch Personnel. Devices will be field tested aboard commercial fishing vessels with onboard observers collecting data outlined within the Testing Protocols. Collected data will be analyzed to identify the reduction in fishing mortality achieved by BRDs. To increase industry's involvement in the process of BRD research and development, the Foundation will solicit industry designed BRDs, contribute funds for industry BRD development, and reimburse the travel of industry members to Panama City to observe underwater hydrodynamic performance tests of fishing gear.

Project Funding:		
	Federal	$237,533
	Non-Federal	$ 0
	Total	**$237,533**

Project Title:

Continued Development and Assessment of Bycatch Reduction Devices Within the Southeastern Shrimp Trawl Fishery

Applicants Name:

Gulf & South Atlantic Fisheries Foundation, Inc.
Ms. Judy Jamison, Executive Director

Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, Florida 33609-2447
(813) 286-8390

Proposed Budget period:

September 1, 2010 – August 31, 2011

Project Goals and Objectives:

1.) Continue to solicit and test new and/or promising bycatch reduction devices (BRDs) that show potential for reducing the quantity of bycatch incidentally harvested during shrimp trawling efforts;

2.) Quantify the bycatch reduced by new and/or promising experimental BRDs within the EEZ of the Gulf of Mexico and South Atlantic;

3.) Calculate reduction rates for each BRD tested to include total shrimp, finfish, and total bycatch for certification purposes, and estimate red snapper fishing mortality (F);

4.) Increase the shrimp industry's participation in BRD research and development to enhance fisheries management awareness and involvement; and

5.) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf and South Atlantic shrimp fisheries, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*).

Identification of Problem:

Finfish bycatch is a contentious issue facing commercial fisheries worldwide and is defined as the discarded catch of a living marine resource, plus the retained incidental catch and unobserved mortality of a marine resource due to a direct encounter with fishing gear (NOAA, 1998). In the southeastern United States shrimp trawl fisheries, bycatch reduction technology (BRT) research has focused on excluding threatened or endangered species (ie. sea turtles - TEDs) and commercially/recreationally important species (ie. weakfish, Spanish mackerel, red snapper -

BRDs). Scientists and fishermen from the United States have pioneered this technology for shrimp trawls, and BRT is now being utilized across the globe (Brewer *et al.*, 1998; Broadhurst, 2000; Eayrs *et al.*, 2007; He *et al.*, 2007; Krag *et al.*, 2008). In the southeast U.S., while more and more stocks have been designated as overfished by the NMFS, bycatch reduction, particularly for the shrimp industry, has become a key management objective. Also, recent information suggests that blacknose shark (*Carcharhinus acronotus*) is overfished and that there is substantial shark bycatch in the Gulf shrimp fishery (NMFS, 2007). Some of these suggestions are disputed and will be addressed by this research through the collection of information on the bycatch of small coastal sharks. The Foundation has previously received funding to test new and promising BRDs (MARFIN Award No. NA08NMF4330406). This project looks to continue with a tested and proven method for eliciting industry participation and assistance in reducing bycatch in the shrimp trawl fishery.

With the decertification of the expanded mesh, the "fisheye" and the "Gulf fisheye" BRDs effective May 18, 2009, only three fully certified BRDs are available to Gulf fishermen; the Jones Davis, Modified Jones Davis and the Fisheye, placed no farther forward than 9 feet (Gulf) and 11 feet (S. Atlantic) from the cod end tie-off rings (Federal Register, 2008c). This coupled with the two year provisional certification period continued into 2010 for the Extended Funnel and the Composite Panel BRDs outlined in the recently revised BRD testing protocol (Federal Register, 2008a), continued testing of bycatch reduction devices for certification is critical to the future viability of the shrimp industry. These recent changes to the criterion for meeting bycatch reduction rates for both the Gulf and South Atlantic along with the decertification of the Gulf Fisheye (the most widely used BRD) have initiated a significant technology transfer within the southeastern shrimp trawl fishery. The following discussion describes the history of previous adaptations by the shrimp industry to modified regulations to address the issue of bycatch within the fishery and outlines the need for continued research.

The otter trawl revolutionized the commercial fishing industry by allowing fishermen to increase their catch-per-unit-effort (CPUE). A significant disadvantage to this gear is that it is non-selective with respect to catch. While fishermen direct their efforts at harvesting targeted species, other marine species are harvested as bycatch. Commercial shrimp fishermen of the southeastern United States have historically altered their fishing strategies and/or gear to reduce the harvest of non-target species. This has occurred through the use of increased mesh sizes to allow the escapement of small organisms and the integration of the "fisheye" and "cannonball shooter" (precursor to the TED) bycatch reduction devices (BRDs) into trawl net designs (Aparicio, 1999; Davis and Ryer, 2003). These gear designs were integrated into trawl nets prior to the implementation of national and regional bycatch regulations.

Although fishermen have voluntarily made efforts to reduce the quantity and composition of incidental harvest, bycatch mortality is thought to contribute largely to the overall fishing mortality of finfish species (Davis and Ryer, 2003). Stock assessments for red snapper (*Lutjanus campechanus*), weakfish (*Cynoscion regalis*), and Spanish mackerel (*Scomberomorus maculatus*) stocks indicated that incidental harvest by southeastern U.S. shrimp trawlers was a factor affecting fish populations (e.g., overfished). This information led to the implementation of BRD regulations for shrimp trawls operating in the Gulf of Mexico and South Atlantic EEZ (Federal Register, 1997; 1998; 2004).

In the past, five BRDs were certified for use in portions of the Gulf of Mexico and/or South Atlantic. These devices were the Gulf fisheye, fisheye, expanded mesh, extended funnel, and Jones-Davis. Most commercial shrimp fishermen used the fisheye or Gulf fisheye in trawl nets due to the low cost and simplicity of these devices. Previously, for a BRD to become certified, it needed to meet certification tests that specified a reduction in fishing mortality (F) for certain target species (e.g., red snapper, F = 44%; weakfish and Spanish mackerel, F = 50%). Target species were selected based on stock status (overfished), the extent to which the shrimp fishery impacted their populations, and the rebuilding strategies set forth for these species by the Regional Councils and NMFS.

Since the finalization of the first protocols, Spanish mackerel and weakfish populations within the South Atlantic are no longer characterized as overfished. With the reauthorization of the Magnuson-Stevens Act and the implementation of National Standard Number 9, bycatch, in all forms, must be minimized "to the extent practicable." This resulted in the South Atlantic Fisheries Management Council submitting an amendment to their Protocol to utilize a 30% finfish bycatch reduction as the sole criteria for BRD certification, in addition to transferring future responsibility for BRD certification to NMFS (Federal Register, 2005). Because BRDs currently certified for use within the Federal EEZ seem to be achieving the finfish reduction rates required by the South Atlantic Council and NMFS, there has been reduced effort focused on certifying new gear within the South Atlantic.

Bycatch issues within the Gulf of Mexico are more complex due to the continued overfished status of the red snapper stock. The NMFS Pascagoula Laboratory, under the auspices of the 1998 Red Snapper Initiative, conducted reevaluation studies on currently certified BRDs within the Gulf of Mexico shrimp fishery. The conclusions derived from this study indicated that the red snapper reduction achieved by the Gulf fisheye was lower than the finfish reduction originally used to certify this device (Foster, 2004). Further analysis on the configuration of fishing gear revealed that the cod end retrieval system (elephant ear) can obstruct the BRD opening and negatively affect finfish escapement (Foster, 2004). This information led to an amendment of the BRD regulations and disallowed the placement of the fisheye and Gulf fisheye BRDs in an area obstructed by the elephant ear (Federal Register, 1999).

BRD reevaluation efforts continued after the conclusion of the 1998 Red Snapper Initiative. From 2001-2003, onboard observers were contracted by NMFS and the Foundation to collect CPUE data aboard commercial fishing vessels operating within the Gulf of Mexico. A total of 4,089 tows were conducted with the cooperation of 32 commercial fishing vessels. Of these tows, 2,202 tows met the criteria for certification analysis. These criteria included (1) all paired tows with a functional BRD in the experimental net and a disabled BRD (or no BRD) in the control net, and (2) all successful tows (i.e., problem free; z-tows) with at least one red snapper present in one net. It is important to note that these criteria are not explicitly listed within the Manuals and that this is an alternate analysis.

Results from the 2001-2003 studies indicated that the red snapper F-mortality reduction achieved by the Gulf Fisheye was drastically lower (F = 11.7%) than that of the 1998 study and the original data used to certify the device (Foster, 2004). Also, performance of the Gulf Fisheye

was highly variable among vessels, but under no circumstance was the 44% reduction in red snapper fishing mortality achieved (Foster, 2004). Results also indicated that the Gulf Fisheye achieved a higher finfish reduction when placed closer to the tie rings or during net retrieval; a time in which shrimp loss can also be magnified. Due to the economic incentive of maintaining shrimp catch, it has been speculated that adaptations in fishing techniques used to increase shrimp retention (i.e., haul back speed/techniques, towing speed, cod end funnels, etc.) are also reducing the effectiveness of the fisheye and Gulf Fisheye BRDs. Gallaway and Cole (1999) published results suggesting that the Gulf fisheye BRD does not produce mortality reductions necessary to rebuild the red snapper stock. The results of these studies are of great concern to commercial shrimp fishermen since decertification of the Gulf fisheye BRD and the mandated use of other, more expensive and complex devices can add significant costs to their operating expenses. Furthermore, Amendment 27/14 to the Reef Fish and Shrimp Management Plans established a target reduction rate for juvenile red snapper mortality within the Gulf shrimp fishery of 74% from the baseline years of 2001-2003. Although a portion of this reduction is realized from reductions in effort from both hurricanes and global market forces, there will be a need for new viable bycatch reduction devices to meet target goals. To facilitate the certification of new gears, the Gulf of Mexico Fishery Management Council, like the South Atlantic Council, approved a regulatory amendment to revise BRD criterion to a 30% overall reduction of finfish bycatch into amended/revised BRD Certification Protocols.

Changes to the revised protocol have standardized the criteria for bycatch reduction devices such that they now must meet the criteria of 30% total finfish reduction by weight for both the South Atlantic and Gulf of Mexico (Federal Register, 2008a). In addition, the protocol identifies currently certified BRDs and those that meet the provisional certification of a successful reduction of total finfish bycatch by at least 25 percent by weight. BRDs that are currently certified include: Fisheye (placed no farther forward than 9 feet from the tie-off rings), Jones Davis and the Modified Jones Davis. In addition, two BRDs, the Extended Funnel in the Gulf EEZ and the Composite Panel in both the Gulf and South Atlantic EEZs, have received provisional certification as they fall within 5% of the current criteria of total finfish bycatch reduction. With provisional certification, fishermen are allowed to utilize a BRD for two years to allow testing to determine if its reduction meet the certification criteria of 30%. With the recent publication of the final rule to decertify the Fisheye, Gulf Fisheye and Expanded Mesh (Federal Register, 2008c), there is an urgent need for new certified Bycatch Reduction Devices to be made available for use, especially in the Gulf of Mexico shrimp fishery, as the Gulf Fisheye was by far the most popular BRD in use.

Project Impacts/Results or Benefits Expected:

The Gulf & South Atlantic Fisheries Foundation, Inc. (Foundation) has been instrumental in BRD research and development (Hoar *et al.*, 1992; GSAFFI, 1995; Branstetter, 1997; Jamir, 1999; Jamir, 2001; GSAFFI, 2002; Medici, 2004; Graham and Jamison, 2006; GSAFFI, 2008). Serving as the only regional research and development organization aimed at assisting the commercial fishing industries of the Gulf of Mexico and South Atlantic, the Foundation has developed a high level of credibility among the commercial shrimp fishing industry. By allowing the Foundation to continue their research and development efforts to reduce bycatch within the shrimp trawl fisheries, commercial fishermen will become actively involved in BRD

research and development, will be more trustworthy of the data or information generated aboard their vessels, and will be more accepting of those devices tested (e.g., fishermen will be more willing to utilize a device they helped certify). With greater industry "buy-in" achieved through the use of a device it helps certify, the greater the impact in reducing bycatch within the fishery (Campbell and Cornwell, 2008). Jenkins (2006) found that the most widely adopted BRDs are those that are cooperatively produced and modified by fishers.

The expected benefits and impacts of this proposed research can be divided into two separate categories, (1) resource user impacts, and (2) biological impacts. When considering the current state of the shrimp trawl fishery, revenue is a major concern. An influx of foreign, pond-raised imports has drastically reduced the price of shrimp since its zenith in 2000. Shrimp price, in combination with increased management restrictions, the effects of hurricanes, and fuel prices, has drastically reduced effort within the fishery (Haby *et al.*, 2002). This project has the ability to increase the gross revenue of an individual shrimp fishing business by increasing product quality and reducing the resources (fuel and labor) necessary to harvest the product.

Shrimp quality has been a concern since antidumping petitions were filed by the Southern Shrimp Alliance. Due to reduced labor, land, and environmental costs associated with the production of foreign, pond-raised product, the visual quality of the product being imported into the U.S. is perceived by some to be superior to that of the domestic wild-harvest product. Although culinary presentation is a major factor affecting the price and demand for a seafood product, so is taste. One way in which pond-raised product cannot compete with domestic product is taste – domestic product is highly sought after by chefs and restaurateurs (Miget *et al.*, 2004). An increased amount of bycatch associated with shrimp trawl fishing has a negative impact on the quality of a shrimp and can result in uropod breakage (e.g., the shrimp being 'smashed' by the total catch within the trawl cod end). Increased bycatch also extends product cull time. Shortening cull time would allow the crew to take preventative measures against spoilage, thus increasing shelf life of the product. An increased product quality associated with a decrease in bycatch, combined with the taste of domestic, wild-caught product, could generate greater revenue for shrimp fishermen.

Revenues could also be increased by decreasing the amount of fuel needed to harvest shrimp. During shrimp trawling operations, the cod end accumulates a greater quantity of catch over time (both target and non-target species). Greater amounts of bycatch within the cod end increases the size and weight of the trawl net, thus necessitating more power to drag the trawl nets, e.g., an increase in fuel consumption. By reducing the quantity of bycatch caught in the shrimp trawl, the size and weight of the cod end is reduced and allows the vessel to trawl at normal speeds while decreasing fuel consumption, and lowering the vessels' carbon footprint. Decreased fuel consumption reduces the price associated with the harvest of the product thereby increasing revenues for the vessel owner, captain, and crew.

Biological impacts associated with the reduction of bycatch are more evident. An overall reduction will create significant positive cascading effects on faunal assemblages within both top-down and bottom-up controlled ecosystems. These effects have extensive direct and indirect impacts on population and foodweb dynamics (Goni, 1998). The mortality reduction achieved by newly certified BRDs will allow Federal and State fishery management agencies to enhance

finfish populations, especially those potentially impacted by shrimp trawl fishing. Successful completion of this project will also add to the overall success of the national bycatch reduction program.

Project results also have the potential of impacting global fisheries. Cooperative research conducted by the Foundation, the southeastern shrimp fisheries, and NMFS has led to international efforts to reduce sea turtle mortality. As of August 31, 2004, turtle excluder devices (TEDs) are compulsory for all foreign, wild-harvest shrimp fishing fleets wanting to import shrimp into the US market. Non-compliance with this regulation can result in an embargo of the foreign-harvested product. Since bycatch is a contentious issue worldwide, the same import regulations could be imposed for the reduction of finfish bycatch. The continued efforts of southeastern shrimp fishermen to refine and design BRDs will assist in the global problem of incidental bycatch and further define the U.S. shrimp fleet as international innovators in fishing gear technology.

Historically, BRD programs have been relatively strong on the technology component, but weak in the area of communication/technology transfer strategy. Development of the latter becomes easier as industry leaders and innovators get involved in the BRD certification process. The benefits that accrue as a result of the direct cooperation and contribution of numerous fishermen in this project are important as they give the members of the fishing industry the opportunity to take ownership of research that may lead to the development of certified BRDs or fishery management strategies (Campbell and Cornwell, 2008). Industry involvement will also serve as a conduit to integrate other fishermen into the management process. Many commercial fishermen are unaware of how, when and where fisheries related research is conducted. This project will help familiarize fishermen with the management process and make the necessary connections (either through the Foundation, Councils, or NMFS) to stay active in the process.

Need for Government Assistance:

Decertification of the Gulf Fisheye BRD brings about an urgent need to provide additional certified BRD gear for use within the shrimp fishing community. The successful completion of this project will likely result in the certification of new, operationally simple BRDs within the southeastern U.S. shrimp trawl fisheries. As outlined in National Standard 9 of the Magnuson-Stevens Conservation and Management Act (MS-FCMA) [16 U.S.C. 1826c, 1851], i.e., "*Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*" Bycatch reduction remains a critical and high priority issue. Additionally, this project will address several priorities outlined within FY-2010 Cooperative Research solicitation (e.g. Section 4. Commercial Shrimp Harvest; b. Quantification of effort; c. Bycatch Reduction Device Testing Protocols; d. Quantification of Bycatch Rates), and those outlined within the Cooperative Bycatch Plan for the Southeast. U.S. fisheries resources and marine ecosystems are a public commodity and, as such, are managed by the United States Government. The research outlined within this proposal has the potential of impacting the commercial fishing industry, state and federal fisheries management agencies, seafood consumers, recreational anglers and the public-at-large. Given the extent of the benefits gained from this project by interest groups, it is fair and reasonable to ask for federal assistance to conduct this study.

Statement of Work:

Proposed Budget Period:

September 1, 2010 through August 31, 2011

Objectives and Procedures:

Pre-Certification Activities:

The Foundation will solicit BRD designs and/or prototypes from the shrimp industry, net designers/fishing gear construction shops, NMFS (Pascagoula Laboratory) fishing gear experts, and various Sea Grant/Marine Extension fishing technologists. Because this project is a continuation of previous Foundation research, the pre-screening process will be conducted by the Foundation Regional Coordinators. They will use their vast expertise, along with consultation with NMFS, to determine those devices that show the greatest potential of reducing finfish bycatch. Limited funds will be made available to the developer to allow construction and or modification of the device.

Previous field testing efforts conducted by the Foundation have revealed that certain BRD designs show greater potential than others at reducing finfish bycatch (Cooperative Agreement Nos. NA17FF2009 and NA87FM0221). These gears include the C.J. Kiffe and the Double Opposed Fisheye. Although these devices were tested during previous field efforts, variance between tows and trips was large. To reduce variance, additional data are necessary. Additionally, the participation of industry at NMFS annual hydrodynamic tests and conversations with NMFS personnel has revealed other devices that may be successful candidates for testing. These devices include mixed mesh nets (trawl nets with 2"-4" top panels and standard mesh floor and wings), T-90 cod ends (large mesh turned 90°), the Coulon TED/BRD, and 2" bar spacing for TEDs.

Criteria for Vessel Selection and Vessel Compensation:

After the experimental devices are identified, Foundation staff and Regional Coordinators will seek fishing vessels and captains willing to participate in the field testing of these experimental bycatch reduction devices. Although vessel selection will be non-random, all efforts will be made to utilize vessels whose captain and crew are attentive to their gear. This will ensure that a greater number of tows conducted are "problem free" and thus usable in any and all analyses. The Foundation will make available to cooperating fishing vessels funds that will cover or offset the costs of materials, labor, and shrimp loss associated with the development and evaluation of experimental BRDs. Fishing vessel owners who agree to cooperate in this project will be compensated $200/day while testing the device and $50/day when cruising to and from fishing grounds or no tow days.

Observer Training, Permits, and Insurance:

All contracted fishery observers will have undergone specific and detailed training prior to their deployment on any commercial fishing vessel. It is the responsibility of the Observer Coordinator to schedule and train all fishery observers. Training details all administrative and programmatic procedures necessary to conduct the proposed research listed below. This includes (but is not limited to): overview of the data collection protocols outlined within the Manuals, review and identification of all fauna harvested during shrimp trawling efforts (classroom and at-sea education), identification of sea turtles and proper handling/tagging procedures, description of fishing gear, and best practices while aboard a commercial fishing vessel. In addition, all observers will undergo marine safety training that outlines the procedures on how to respond properly to a variety of situations that could be encountered during experimental tests (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer will also be certified in first-aid and CPR. Due to changes in NMFS policies regarding the certification of fishery observers, each observer will undergo extensive sea turtle training by NMFS that outlines methods for the collection of biopsy samples and the tagging of individual sea turtles (flipper tags, PIT tags, etc.), however, observers will only be required to tag sea turtles with flipper tags. At the conclusion of observer training, individual observers are certified by NMFS.

The Foundation will secure all special permits required to test experimental BRDs onboard a commercial shrimp fishing vessel. These permits may include a Letter of Authorization from the NMFS-Southeast Regional Office allowing the testing of experimental devices within the federal EEZ and all necessary permits required to conduct experimental tests in state waters.

Vessel liability insurance will be secured and funded by the Foundation prior to any observer being placed onboard a participating vessel. Insurance protects the vessel owners in the event of a catastrophic incident resulting in the injury of a fishery observer.

Field Data Collection:

The Foundation will work cooperatively with commercial shrimp fishing vessels to ensure that all tests are conducted according to protocols and guidelines outlined in the following documents:

1.) "Shrimp Trawl Bycatch Research Requirements". November 1991. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Miami) and Southeast Regional Office (St. Petersburg).

2.) "A Research Plan Addressing Finfish Bycatch in the Gulf of Mexico and South Atlantic Shrimp Fisheries". August 1992. Published by the Gulf & South Atlantic Fisheries Foundation, Inc. with support of NOAA/NMFS under Cooperative Agreements NA17FF0233-01 and NA17FD0103-01.

3.) "Shrimp Trawl Bycatch Characterization Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS, Southeast Fisheries Science Center (Galveston).

4.) "Evaluation of Bycatch Reduction Devices Sampling Protocol Manual for Data Collection". September 1992. Published by U.S. DOC/NOAA/NMFS Southeast Fisheries Science Center (Galveston).

5.) "Bycatch Reduction Device Testing Manual". 2008. Published by NOAA/NMFS Southeast Regional Office, St. Petersburg, FL, Galveston Laboratory, Galveston, TX and Mississippi Laboratories, Pascagoula, MS.

Extensive descriptions of the sampling protocols are contained in the above documents, and the reader is referred to them for such detail, especially the latest official NMFS/Regional Fishery Management Councils' approved protocol (e.g., finfish reduction as the sole criteria for BRD certification). Additional changes that NMFS may develop will be followed accordingly.

All observers (Foundation and NMFS) are trained to only sample tows that are free of problems, both gear and non-gear related. We believe that the definition of a "problem-free" tow is subjective and that a wide degree of variance is associated with what is or is not perceived as a problem-free tow. Torn or damaged gear, trawls subjected to mudding or bogging, mixing of trawl catches on deck in severe weather, insufficient cable, etc., all constitute problematic tows. The most common occurrence resulting in an un-sampled tow is the fouling of the tickler chain (Personal communication, Mr. Gary Graham). During training, Foundation contracted observers are instructed that any fouling of the tickler chain can result in a problem tow; this would include any material hanging from the chain (seaweed, a short shot of line, wire, etc.). Usually the observer receives input from the experienced captains or rig-men regarding discernment of potentially problematic tows. Foundation observers are made aware of this problem during training and reliable vessels' crews assist the observer with proper designation.

Assuming a 28% success rate for sampled tows, that the average shrimp fishing trip lasts 20 days, and that 3 tows are conducted per day, it would take 2.5 trips per device to collect the necessary number of tows needed to certify an experimental device (minimum of 30 tows; 20 days/trip x 3 tows/day x 2.5 trips/BRD = 150 tows/BRD; 150 tows/BRD x 28% of tows are sampled = 42.0 sampled tows). Although these assumptions are variable based upon geography and time of year, these figures provide a reasonable and average estimate of the fishing effort of the Gulf of Mexico shrimp fishing fleet. Therefore, 150 at-sea days of observer coverage are needed to accurately sample from 1-3 experimental devices (3 BRDs x 2.5 Trips/BRD x 20 days/trip = 150 at-sea days). We also anticipate that 16 cruising days are needed for vessels to travel to and from fishing grounds (2 days per trip). For each tow sampled, the contracted observer will gather a detailed set of information concerning gear configuration, location, time, and catch in accordance with the NMFS BRD Certification Testing Protocol Manuals. Although bycatch is a contentious issue for most U.S. commercial and recreational fisheries, due to the decertification of the Gulf Fisheye BRD within the Gulf of Mexico, the scope of the work outlined within this proposal will focus efforts on certifying experimental BRDs within the Gulf of Mexico shrimp fishery with minimal effort in the South Atlantic.

Participating commercial shrimp fishing vessels will tow identical trawl nets. Before any data are collected for experimental purposes, a maximum of 20 tuning tows will be conducted. This will ensure that no net or side bias exists. A minimum sample size of 30 successful tows per test is required. However, additional tows may be necessary for sufficient statistical power. A standard tow time will be defined for each experimental BRD/treatment. Only the outside trawl nets on a quad-rigged vessel will be used for experimental tests. The experimental BRD will be switched every 4-6 tows between the two outermost trawl positions and all efforts will be made to gain an equal number of tows from each side of the vessel.

The total catch of the control and experimental nets will be weighed separately. A '1-basket' (approximately 30 kg) sample (a standard NMFS sampling protocol aboard vessels) from both the control (without BRD) and experimental (with BRD) net will be collected. A predefined set of species (finfish and invertebrates) within these samples will be identified, counted, weighted as a species lot, and individuals of selected species will be randomly chosen and measured. All incidentally harvested red snapper will be enumerated, weighed, and measured to produce accurate abundance and size-frequency estimates. Also, all small coastal sharks and sawfish will be enumerated, weighed, and measured from each net. The total number of tows to be sampled per trip will depend upon the fishing activity of the vessel and the logistics of sorting the catch aboard a fishing vessel. (i.e., one sample may not be completed before the next sample is brought aboard, thus the next tow is not sampled). All data will be collected and recorded on OMB approved datasheets to allow for consistent data collection between NMFS and Foundation observers.

All efforts will be made to make the cooperating vessel captain and crew aware of the data collected by fishery observers. At the end of each tow or, at the least, the end of each day, the observer will explain the collected data to the vessel captain and crew and have all station sheets signed by the vessel captain.

Data Entry:

The Foundation will handle all data processing and analysis for this project. Upon completion of an experimental fishing trip, the observer and cooperating vessel captain will verify the accuracy/completeness of all data by signature. Observers will then be debriefed by the Foundation's Observer Coordinator and data reviewed for accuracy and completeness. All raw data will then be photocopied; originals will be forwarded to the Data Manager and the copies will be filed by the Observer Coordinator. Copies of all raw data, and any completed analyses of those data, will be made available to each BRD prototype originator.

The Foundation's contracted Data Manager will review and archive all data at the Foundation and in the NMFS Galveston Laboratory database system (as part of the overall bycatch program dataset). The Foundation's standardized data management procedure has been modified to accommodate NMFS' adoption of the database management system. Under this system, once the data files are entered by the Data Manager and verified as correct, the data are then archived in a pooled, multi-organizational dataset at the NMFS Galveston Laboratory. All archived data are available for download to Foundation personnel and contracted Data Analyst for final

analysis/interpretation. After the Data Manager completes the archive of data, all raw data will be sent to the Foundation's office for storage.

Data Processing and Analysis:

Methodologies for a standardized data analysis are outlined within the Manuals and publications listed above. These protocols have recently been questioned due to the severe data truncation that results through a strict interpretation, e.g., tow times having to be within +/- 10% of an average tow time, and a minimum capture of 5 red snapper in either the control or experimental net. Therefore, we propose a series of analyses.

The statistical analyses will consist of a Bayesian analyses, to determine if the BRD candidate meets the following conditions: (1) There is at least a 50–percent probability that the true reduction rate of the BRD candidate meets the bycatch reduction criterion (i.e., the BRD candidate demonstrates a best point estimate [sample mean] that meets the certification criterion); and (2) There is no more than a 10–percent probability that the true reduction rate of the BRD candidate is more than 5 percentage points less than the bycatch reduction criterion.

Species number and weight for the entire tow of the designated sample nets will be extrapolated using the ratio of the sample weight (or number) vs. the total net weight:

Equation 1:

$$\frac{(Sample\ Species\ Weight) \times (Total\ Net\ Weight)}{(Total\ Sample\ Weight)} = Extrapolated\ Sample\ Weight$$

These extrapolated values will then be converted into catch-per-unit-effort (CPUE) based on the hours towed:

Equation 2:

$$\frac{(Extrapolated\ Species\ Weight)}{(Tow\ Time\ in\ Hours)} = Catch\ Per\ Hour$$

These CPUE values will be compared between the "control" and "experimental" net for shrimp retention, total biomass reduction, finfish reductions, and red snapper reduction. Total biomass reduction will be calculated as:

Equation 3:

$$\frac{(BRD\ Net\ Weight\ -\ Control\ Net\ Weight)}{(Control\ Net\ Weight)} x\ 100\% = Percent\ Reduction$$

For the various species, reductions will be calculated by:

1. Extrapolation using Equation 1, the total weight (or number) of species taken in both the control and BRD net based on the weight (or number) of that species present in the sample tow;

2. Generating a CPUE using Equation 2;

3. Generating a mean trip CPUE (or other unit of measure) for both the Control and BRD net, and;

4. Calculating an overall percent reduction in the BRD net based on these means using the format of Equation 3.

The CPUE means will be tested for significant difference ($p<0.05$) through the use of paired t-tests according to the following hypotheses:

$$H_o: \mu_{control} - \mu_{BRD} = 0$$
$$H_a: \mu_{control} - \mu_{BRD} \neq 0$$

To illuminate the reduction in red snapper fishing morality achieved by experimental BRDs on a per trip and per gear basis, we will use the following equation:

Equation 4:

$$(0.3)(\%\ \text{Reduction Age 0 Fish}) + (0.7)(\%\ \text{Reduction Age 1 Fish}) = \text{F Mortality}^1$$

This equation is consistent with methodologies used by NMFS to compute the reduction in red snapper F-mortality achieved by BRDs (Foster, 2004). We define age-0 fish to be <130mm, and age-1 fish to be >130mm, but no larger than 300mm.

Although the standardized analysis listed within the Manuals (and above) was agreed upon to alleviate the weighting of any outliers within the data, it severely truncates the data used in the final analysis due to a lack of red snapper being caught in either the control or experimental nets, or tow times being outside the +/- 10% average. Therefore we also propose to analyze all collected data according to the analysis contained within a paper presented at the SEDAR-7 Data Assessment workshop (Foster, 2004). This analysis utilized the Manuals as a guidance document and allows for leeway during analysis. The analysis is standardized (e.g., the computation of CPUE and percent reduction is the same as listed above), but the criteria used to select data to include in the analysis is slightly modified and allows the use of all tows with one or more red snapper in either the control or experimental net as long as the tow duration is between 2 and 8 hours.

[1] Staff will verify these mortality rates are considered the most current and update accordingly as dictated by recent SEDAR.

When all datasets have been archived and analyzed, they will be reported in an aggregate summary where comparisons between and among the various BRDs can be more readily interpreted. Should the need arise, these results will be provided to appropriate fishery management agencies and organizations for certification. All data analyses will be conducted by the staff of LGL Ecological Research Associates, Inc. with oversight and comment by the Foundation's Program Director and Regional Coordinators.

Efforts to Increase Industry Participation:

The Harvesting Systems and Engineering Division of the NMFS Pascagoula Laboratory annually conducts hydrodynamic evaluations of commercial fishing gear. The purpose of these evaluations is multifaceted, but one objective is to increase the number of industry-designed gears certified for use within the commercial shrimp fisheries of the southeastern U.S. The Foundation and NMFS actively solicit industry members for new and innovative TED and bycatch reduction device (BRD) designs they believe will enhance the efficiency of commercial shrimp fishing operations while still allowing bycatch to escape shrimp trawl nets.

Gear submitted for hydrodynamic testing is brought to Panama City, FL, evaluated and recorded *in situ* by NOAA divers. Upon completion of individual gear tests, a video recording of the gear is mailed to the industry designer and allows the designer to assess and modify the gear if necessary. Due to funding limitations, gear designers are often absent during hydrodynamic tests and immediate feedback is impossible. Thus, if gear modifications are needed, the modified gear must be resubmitted and tested during subsequent years. This process is time consuming and slows development and possible certification of BRDs.

To assist in the research and development of BRD designs and to increase the commercial shrimp industry's participation in cooperative research, funds will be made available for three fishermen to attend hydrodynamic evaluations in Panama City, FL. Fishermen will be solicited by Foundation Regional Coordinators and staff to design and build new and innovative bycatch reduction devices. Fishermen will be compensated for time and labor and all materials needed to produce experimental devices and all participating fishermen will accompany their respective gear designs to Panama City and observe any and all tests that occur. By having the gear designer present during hydrodynamic tests, gear modification can occur in the field, expediting the assessment, modification, and certification of industry designed devices.

Participation by Persons or Groups Other Than the Applicant:

A project of this magnitude requires the cooperation and active participation of many organizations and individuals with close management by those experienced in federal grants administration. The Foundation has chosen to sole source contract with several persons in conjunction with this project. These essential personnel needed to complete project objectives are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (Texas A&M Univ. Sea Grant)

Mr. Lindsey Parker, South Atlantic Regional Coordinator (UGA Marine Extension)

Mr. Daniel Parshley, Observer Coordinator

Mr. Phil Diller, Data Manager

Dr. Benny Gallaway (LGL Ecological Research Associates) and Staff, Data Analyst

1 Fishery Observer (To be contracted or solicited)

Mr. Robert Timmeney

Mr. John Williams, Southern Shrimp Alliance

Ms. Wilma Anderson, Texas Shrimp Association

Mr. Daniel Foster, Research Fishery Scientist, NOAA Fisheries Pascagoula Laboratory

The above individuals have been associated with other, similar, Foundation research programs and projects. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective. However, if training for new observers is needed, funds have been outlined within the budgeted items to train new individuals.

Through years of experience, the Foundation has found that working closely with local Sea Grant – Marine Extension Service personnel (Mr. Graham & Mr. Parker), who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen through a historical fishery research and development framework. The Regional Coordinators will act as liaisons between the Foundation and vessel owners, establishing a good working relationship by relaying information about the project goals and securing vessel participation. All vessel information will be provided to the Observer Coordinator.

The Observer Coordinator will assist the Foundation Program Director and Regional Coordinator in their day-to-day activities related to this project and will coordinate all field efforts through constant communication with Foundation staff and contractors. The Observer Coordinator will recruit and train all observers. Prior to the deployment of a fishery observer, he will review with each observer all established protocols on how and what data to collect while onboard a participating vessel. He will also provide all necessary sampling and safety equipment and is responsible for reviewing all data for completeness prior to data entry.

Only observers that have undergone NMFS certification training will be contracted by the Foundation. This training will include safety training, onboard practices to avoid interference with the participating vessel captain and crew, turtle handling, sampling and tagging, data collection protocols (both classroom and at-sea training), and administrative protocols. It is the job of the fishery observers to collect all data from the experimental and control nets, ensure that all experimental gear is fished optimally (i.e., highly tuned nets), and proof all collected data for completeness and accuracy before being debriefed by the Foundation Observer Coordinator.

The Foundation currently has one contracted observer working on complementary projects. Because the above listed individual possesses the skills needed to fulfill the position and has proved himself under field conditions during other Foundation projects, the contracted observer position will be offered to this individual. If additional observers are needed to collect data and conduct experimental tests, observers will be solicited from other complementary Foundation projects or through a competitive process.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the NMFS Galveston Laboratory and Foundation's Office. The Data Manager is responsible for checking and transferring all raw data into a manageable computer database for data archive. Once entered, the data will be forwarded to the Data Analyst (LGL Ecological Research Associates, Inc.) and Foundation Program Director.

The contracted Data Analyst will conduct all statistical tests on observer-collected data with overview from the Foundation's Program Director. Statistical tests will be varied and are listed below. The overall objective of the Data Analyst is to compute the reduction rates (shrimp, finfish, red snapper, and total catch) achieved by experimental BRDs. The Foundation will rely on the analytical and scientific skills of the Data Analyst to assist in any ancillary statistical tests (i.e., reduction rates achieved by experimental BRDs, etc.) that could be completed during the performance of this award. The NMFS Galveston Database Administrator will work closely with the Foundation's contracted Data Analyst, Data Manager and Program Director in this regard.

Direct industry participation is needed for the proposed work. All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico and South Atlantic regions. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results generated from this research and will be more willing to assist in future research.

Mr. John Williams, Executive Director of the Southern Shrimp Alliance and Ms. Wilma Anderson, Executive Director of the Texas Shrimp Association, will work with the Foundation to increase awareness of this project and solicit industry's support. Both Ms. Anderson and Mr. Williams have been active in the shrimp industry and related research for many years. Their contacts within the commercial fishing community will be of paramount importance.

The Foundation has historically worked cooperatively with staff and personnel at the NMFS Harvesting Systems and Engineering Division (Pascagoula Laboratory, Pascagoula, MS) to assist in the identification, pre-screening, modification, certification validation, and underwater hydrodynamic testing of various experimental BRDs. We propose to extend this cooperative participation during the award, collaborating on BRD development, testing and providing regular and frequent updates to allow for the close monitoring of this project.

Mr. Daniel Foster has agreed to be this project's NOAA Fisheries Cooperator. Mr. Foster has worked cooperatively with the Foundation for a number of years on fishing effort related projects. He will oversee the project throughout its entirety and ensure that all data is collected in a scientifically rigorous manor. The Foundation's Program Director and staff will have frequent contact with Mr. Foster and update him of any, and all, progress and/or problems that occur.

Project Personnel and Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Mr. Frank Helies, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 15% of their time over the course of the 12 month project period in the performance of this award. This percentage is similar (if not reduced) when compared to the overhead ('indirect rate') of academic institutions. A project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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, Mr. Frank Helies, 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 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 experimentally 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 fiscal 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 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 required for experimental testing, and individual scientific collection permits for contracted observers. 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 subcontracts and amendments. Additionally, she is responsible for securing vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Monitoring of Project Performance:

Given the current controversies and conflicts among various interest groups related to the programmatic concepts outlined here, there is a possibility that one (or more) of these groups will question the validity of the Foundation's findings. For internally conducted studies, Principal Investigators (PIs) will regularly communicate with observers and Foundation Coordinators concerning fieldwork. PIs also review data for completeness and accuracy, and the Program Director will monitor the data management procedure to ensure that all data analyses meet objectives outlined within the proposal. The quality of the data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of and critically review interim and final project reports. This program will be conducted as an award from the NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and a NMFS Technical Monitor. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and peer review consultants will discuss data, data analyses, and data interpretation. Only after the analyses have undergone rigorous evaluation will the final report be accepted and printed.

Information Dissemination:

Summary reports of the project's findings will be published as part of the "Foundation Project Update" section of the "Gulf and South Atlantic News," a 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). Mr. Helies will also provide summary results at a variety of advisory panel meetings and other venues while conducting Foundation business.

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.

Milestone Table:

Project Activities	2010				2011										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities / Contract Negotiations	xx	xx													
Project Coordination / Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Training of Observers	xx	xx	xx												
Selection of BRDs for Testing	xx	xx	xx												
Permit Applications & LOAs	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Selection of Participating Vessels		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Experimental Tests		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Evaluation of Test Results							xx	xx	xx	xx	xx	xx			
Hydrodynamic Tests										xx	xx				
Progress Report Submission						xx						xx			
Financial Report Submission	xx						xx								xx
Project Closeout & Final Report Preparation													xx	xx	xx
Final Report Submission															xx

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Continued Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery

1. Has any National Environmental Policy Act (NEPA) or other environmental compliance documentation (e.g., Endangered Species Act Biological Opinion; Letter of Concurrence or Biological Assessment/Evaluation; Clean Water Act permit; State Historic Preservation Officer consultation; state environmental compliance documentation (mini-NEPA); etc.) been completed? If yes, list the environmental compliance documentation that has been completed and provide copies of the documentation as appropriate.

No.

2. Would the proposed activity or environmental impacts of the activity be subject to public controversy? If yes, describe the potential controversy.

No.

3. Would the proposed activity have potential environmental impacts that are highly uncertain or involve unique or unknown risks? If yes, describe the impacts that are uncertain or involve unique or unknown risks.

No.

4. Is the proposed activity related to other activities (both NOAA and non-NOAA that together may cumulatively adversely impact the environment? For example, the proposed activity is one of a series of projects that together may cause a change in the pattern of pollutant discharge, traffic generation, economic change, flood plain change, or land use. If yes, briefly describe the other activities and discuss how the related projects would have cumulative impacts on the environment.

No.

5. Would the proposed activity involve a non-native species? If yes, describe how the non-native species in involved.

No.

6. Would the proposed activity occur within a unique geographic area of notable recreational, ecological, scientific, cultural, historical, scenic or aesthetic importance. If yes, describe the area, including the name or designation if known.

No.

7. Would the proposed activity affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or

destruction of significant scientific, cultural, or historical resources? If yes, describe the impact.

No.

8. Would the proposed activity affect public health or safety? The effects may be adverse or beneficial and temporary, long-term, or permanent. If yes, describe the effects and the circumstances that would cause these impacts.

No.

9. Would the proposed activity affect directly or indirectly, in an adverse or beneficial manner, any listed endangered, threatened, or otherwise protected species or their critical habitat under federal and state laws including the Endangered Species Act and the Marine Mammal Protection Act? If yes, name the species and/or habitat that will be impacted and describe the circumstances that would impact the species and/or habitat.

Yes. During trawling activity, endangered sea turtles or other species may be encountered; however, observers are trained to ensure that all are returned unharmed to their habitat.

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5305; FAX (727) 824-5308
http://sero.nmfs.noaa.gov

F/SER24:SB

Ms. Judy Jamison
Gulf and South Atlantic Fisheries Foundation, Inc.
5401 West Kennedy Boulevard, Suite 740
Tampa, Florida 33609

Dear Ms. Jamison:

This Exempted Fishing Permit (EFP) is issued, with limited special conditions, under procedures established at 50 CFR 600.745(b). The EFP exempts the activities described herein from regulations at 50 CFR 622, as they affect fish and invertebrates managed by the Gulf of Mexico and South Atlantic Fishery Management Councils (Councils). The EFP covers these Council-managed species that may be taken during standard fishing activities of the commercial shrimp fishery of the southeast United States. This would include reef fish, red drum, coastal migratory pelagics, stone crab, and lobsters in the Gulf of Mexico, and snapper-grouper, coastal migratory pelagics, dolphin and wahoo, and lobsters in the South Atlantic. The EFP exempts personnel from the Gulf and South Atlantic Fisheries Foundation, Inc. (Foundation) from bag limits, size limits, quotas, seasonal restrictions, and gear authorizations, when possessing Council-managed species as part of research conducted under Cooperative Agreements No. NA08NMF4330406, No. NA09NMF4540135, and No. NA10NMF4540108 awarded to the Foundation, as well as two pending Cooperative Research Program projects. The goal of the research is to provide additional information on the catch, bycatch, discards, and the ability to reduce such bycatch and discards in the southeastern shrimp fishery. The EFP authorizes the annual take of approximately 500 federally-managed finfish and invertebrate specimens for scientific research activities through December 31, 2013.

The EFP applies to research activities conducted in federal waters of the South Atlantic and Gulf of Mexico regions. Collecting efforts in state waters and protected areas must be authorized through appropriate government officials. Sampling will occur during normal year-round fishing operations of the commercial shrimp trawl fishery. NOAA Fisheries Service understands most specimens will be examined onboard, with legal specimens becoming part of the vessel's commercial catch and sub-legal sized fish or other forms of regulatory discards being documented and then returned to the water. As necessary, the EFP authorizes Foundation personnel to retain some specimens (both legal and regulatory discard) outside of the allowable harvest for extended onboard examination, later shoreside analyses or identification, or as documentation of quality assurance in the data collection process.

The permit is valid for Foundation-associated observers and fishing vessels identified on the enclosed list. A copy of this EFP, including the enclosed list, must be onboard and available for inspection. This list of approved vessels and personnel may be amended during the course of the EFP. Requests for such amendments must be provided at least 30 days before sampling begins.

Reporting and other requirements are included in the following conditions of this EFP:

1. The holders of this permit may not conduct research within marine protected areas, marine sanctuaries, special management zones, or over artificial reefs, without additional authorization.

2. The holders of this permit may not possess or retain Nassau or goliath grouper.

3. Foundation field personnel are considered designated agents of NOAA Fisheries Service while conducting work under a NOAA Fisheries Service-funded research grant, and as such, are authorized to handle sea turtles encountered during the course of this study. As outlined in the regulations at 50 CFR 222.310 and 50 CFR 223.206, an agent may aid and collect data from endangered or threatened sea turtles. Live turtles must be handled and resuscitation measures implemented according to procedures and requirements at 50 CFR 223.206(d)(1). Skin biopsy sampling is not allowed without separate authorization.

4. A report outlining the results of this study is due in accordance with the requirements of the identified Cooperative Agreements. The report should include a list of the species and their numbers retained under this EFP, as well as their final disposition. Please make a copy of this final report available to the Regional Administrator, NOAA Fisheries Service, 263 13th Avenue South, St. Petersburg, Florida, 33701.

Sincerely,

Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

cc: F/EN4, SEFSC, SAFMC, GMFMC

List of Personnel and Vessels associated with an Exempted Fishing Permit to the Gulf and South Atlantic Fishery Foundation, Inc.

Owner	Vessels	Coast Guard Doc #
Tim Adams	F/V Open Sea	588972
Louis Stephenson	F/V Master Brandon	607723
Charles Burnell	F/V Blood & Guts	504945
Charles Burnell	F/V Success	522949
Charles Burnell	F/V Captain Bligh	919517
Western Seafood	F/V Isabel Maier	572546
Western Seafood	F/V Lynda Riley	626404
David Chauvin	F/V Mariah Jade	1039109
Ernest Aparicio	F/V Miss Madeline	1088867

Current Foundation-associated Personnel identified under this project:
Frank Helies, Daniel Parshley, Lindsey Parker, Gary Graham, Robert Timmeney, David Mann, Mark Bane

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
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(727) 824-5305; FAX (727) 824-5308
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F/SER24:SB

MAY 25 2011

Mr. Robert Mahood
South Atlantic Fishery Management Council
One Southpark Circle
Suite 306
Charleston, South Carolina 29407-4699

Dear Mr. Mahood:

NOAA's National Marine Fisheries Service requests the South Atlantic Fishery Management Council review the enclosed Exempted Fishing Permit (EFP) application at the June 2011 meeting. The EFP proposal was submitted by the Gulf and South Atlantic Fisheries Foundation, Inc. (Foundation). The described research is part of three ongoing Cooperative Agreements (No. NA08NMF4330406, No. NA09NMF4540135, and No. NA10NMF4540108), plus two pending Cooperative Research Program projects awarded to the Foundation by NOAA Fisheries Service. The research is intended to involve commercial fishermen in the collection of fundamental fisheries information. Resource collection efforts support the development and evaluation of fisheries management and regulatory options. The EFP, if approved by both the Gulf of Mexico and South Atlantic Councils, would allow Foundation observers aboard commercial shrimp vessels to retain as many as 500 specimens of federally-managed finfishes outside of the allowable harvest. The EFP would exempt Foundation observers from bag limits, size limits, quotas, seasonal restrictions, and gear authorizations contained in 50 CFR Part 622 when possessing Council-managed species as part of scientific research activities during the period from August 1, 2011, through December 31, 2013. Retention may be needed for extended onboard examination, later shoreside analyses or identification, or as documentation of quality assurance in the data collection process.

The goal of the research is to provide additional information on the catch, bycatch, discards, and the ability to reduce such bycatch and discards in the southeastern shrimp fishery. This information would improve catch and effort data in the shrimp fishery, as well as improve information used in stock assessments for a wide variety of federally-managed finfish that are important to both recreational and commercial fishing interests.

Sincerely,

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure

Subject: Re: Re: Exempted Fishing Permit Request
From: "Frank C. Helies" <fchelies@verizon.net>
Date: Mon, 23 May 2011 09:57:11 -0500 (CDT)
To: Steve.Branstetter@noaa.gov
CC: judy.jamison@att.net, gwen.hughes@verizon.net

Steve,

We would like to request renewel of our shrimp EFP. Please reference the letter from Judy Jamison dated January 12, 2010. We will forward our project proposals to include in the application packet.

Thanks.

Frank

Frank C. Helies
Program Director
Gulf and South Atlantic Fisheries Foundation, Inc.
813-286-8390
www.gulfsouthfoundation.org

May 23, 2011 06:24:31 AM, Steve.Branstetter@noaa.gov wrote:

> Frank,
>
> I just realized your shrimp observer EFP dies at the end of July. If you want to continue this EFP, which I assume you do, it needs to go through the whole process again; there is no "renewal" process. Which means it needs to be reviewed by the Gulf Council at their upcoming June 6-10 meeting, plus it needs to be announced in the Federal Register, etc etc. So, I need to get the application etc into the Gulf Council briefing book; deadline for that is tomorrow...
>
> If you want to continue this EFP, please drop me an email with the current project proposal attached. I'll need the names of vessels and observers as well. If the vessels/observers are the same as the current ones, I obviously have that list.
>
> Steve Branstetter wrote:
> > Attached is your EFP, good through July 2011, which allows your
> > observers to retain specimens of Council-managed species that would
> > otherwise be prohibited from retention by regulations. Should you need

> to amend the list of vessels, please try to give me a 30-day advance
> request.
>
> Gwen Hughes wrote:
>> Hi Steve: Per our conversation, attached is a request for an Exempted
>> Fishing Permit. Please review and if you need anything else from me
>> let me know. Thanks for your help with this.
>>
>> Gwen
>>
>>
>>
>> Gwen P. Hughes
>>
>> Program Specialist
>>
>> Gulf & South Atlantic Fisheries Foundation, Inc.
>>
>> 5401 W. Kennedy Blvd., Suite 740
>>
>> Tampa, FL 33609
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>> (813) 286-8390
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>> www.gulfsouthfoundation.org
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>

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Dr. Steve Branstetter
Gulf Branch Chief
NMFS Southeast Regional Office
St. Petersburg, FL 33701

Gulf & South Atlantic Fisheries Foundation, Inc.

January 12, 2010

Dr. Roy E. Crabtree
Regional Administrator
National Marine Fisheries Service
263 13th Avenue South
St. Petersburg, FL 33701

RE: Request for Exempted Fishing Permit

Dear Dr. Crabtree:

The Foundation has been awarded funds under Awards # NA08NMF4330406 and #NA09NMF4540135 to conduct research that require the collection of characterization data in the Federal waters of the Gulf of Mexico and South Atlantic. (Proposals are attached outlining the details of this research.) To allow adequate time for the fishery observer to collect, enumerate, weigh, and identify all samples/species brought aboard a cooperating fishing vessel, the Foundation is requesting an Exempted Fishing Permit from the National Marine Fisheries Service to allow retention of Federally managed species under the Gulf of Mexico and South Atlantic Fishery Management Council's jurisdictions. The number of specimens that may be acquired on any given trip is highly variable, and specifying the number of individuals that will be retained is difficult. However, we anticipate approximately 500 sublegal and/or legal fish could be retained throughout the course of these studies, for continued onboard examination or returned to shore for lab analysis. No species retained for scientific purposes will be sold commercially.

The Foundation's current Awards are scheduled to end on July 31, 2010, however, one-year no cost extensions are also anticipated. Five hundred at-sea days have been anticipated for this study. Current Foundation contracted observers, Regional Coordinators and authorized personnel include: Frank Helies, Gary Graham, Lindsey Parker, Daniel Parshley, Robert Timmeney, David Mann and Mark Bane. Additional observers may be contracted during the course of this project.

Please note that contracted personnel who have undergone sea turtle training may handle threatened and endangered sea turtles that are encountered during normal fishing operations.

Lincoln Center, Suite 740 / 5401 West Kennedy Boulevard / Tampa, Florida 33609 / (813) 286-8390 / Fax: (813) 286-8261

National Marine Fisheries Service funded research grants (correspondence attached) and as such, are authorized to handle sea turtles encountered during the course of Foundation studies.

A list of vessels available to cooperate in this research will be submitted to the National Marine Fisheries Service as they are identified. Of the vessels identified, a sub-sample will be selected to participate in this project. Additional vessels may be identified throughout the course of the project and will be submitted to NMFS for approval.

Results of tests conducted will be provided in the final reports for the Awards issued.

Thank you for your assistance. Should you need any further information, please don't hesitate to contact us.

Regards,

Judy Jamison
Executive Director

Attachments: Research Proposals (#NA08NMF4330406 and #NA09NMF4540135)
October 22, 2009 Correspondence from Dr. Crabtree (Turtle Handling Authorization)

Cc: Board of Trustees
Dr. Steve Branstetter (w/attachments)

COOPERATIVE RESEARCH PROJECT SUMMARY

Project Title: Pilot Study to Characterize Fishing Effort of the South Atlantic Penaeid Shrimp Trawl Fishery through the use of Electronic Logbooks

Project Status/Duration: Aug. 1, 2011 – July 31, 2012 New X Cont'd __ Proj. Period: 12 Months

Name, Address, and Telephone Number of Applicant:

Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, FL 33609-2447
(813) 286-8390

Principal Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison; Over 30 years administrative and grants management experience.
Mr. Frank Helies; Experience in biological and oceanographic research.

Project Objectives:

(1) As a pilot study, use electronic log books (ELBs) to characterize the spatial and temporal distribution of penaeid shrimp fishing effort for a subset of vessels operating in the South Atlantic; (2) Estimate catch-per-unit-effort (CPUE) of penaeid shrimp for the monitored fishing vessels; (3) Through allotted observer coverage, estimate bycatch of sea turtles and blacknose shark, *Carcharhinus acronotus* and other important bycatch species; (4) Determine the feasibility of a South Atlantic-wide ELB program for the estimation of shrimp fishing effort; and (5) If an expanded program proves feasible, organize port meetings to explain the benefits of the program to shrimp fishermen, answer their questions, and address their concerns.

Specific Priority(ies) in Solicitation to Which Project Responds:

(1) Commercial finfish, **a.** Characterize the total catch (from all fleets affecting the stocks), including catch composition and disposition of catch; (**4)** Commercial Shrimp harvest; **b.** Quantification of effort; **d.** Quantification of bycatch rates.

Summary of Work:

Coastal shrimp trawl fisheries have long been the focus of government regulations to reduce bycatch of sea turtles and commercially/ecologically important species in the GOM and the U.S. Atlantic. In order to accurately measure bycatch, and thus protect both the fishermen and the resource, fishing effort estimates must be accurate. This proposal seeks to use the knowledge garnered from a successful ELB project conducted in the GOM and institute the same methodology and protocols in the SA penaeid shrimp trawl fishery. Because this is a pilot study, only minimal observer coverage is necessary, and the results will determine the feasibility of expanding the project. The benefits from this project will be to: (1) improve bycatch estimates, (2) identify traditional fishing grounds for use in designation of marine protected areas (MPA), (3) thwart the potential requirement for vessel monitoring systems, and (4) collect data that will improve stock assessments.

Project Funding:		
	Federal	$300,000
	Non-Federal	$ 0
	Total	**$300,000**

Project Title:

Pilot Study to Characterize Fishing Effort of the South Atlantic Penaeid Shrimp Trawl Fishery through the use of Electronic Logbooks

Applicants Name:

Gulf & South Atlantic Fisheries Foundation, Inc.
Ms. Judy Jamison, Executive Director

Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, Florida 33609-2447
(813) 286-8390

Proposed Budget period:

August 1, 2011 – July 31, 2012

Project Goals and Objectives:

1) As a pilot study, use electronic log books (ELBs) to characterize the spatial and temporal distribution of penaeid shrimp fishing effort for a subset of vessels operating in the South Atlantic;

2) Estimate catch-per-unit-effort (CPUE) of penaeid shrimp for the monitored fishing vessels;

3) Through allotted observer coverage, estimate bycatch of sea turtles and blacknose shark, *Carcharhinus acronotus* and other important bycatch species;

4) Determine the feasibility of a South Atlantic-wide ELB program for the estimation of shrimp fishing effort; and

5) If an expanded program proves feasible, organize port meetings to explain the benefits of the program to shrimp fishermen, answer their questions, and address their concerns.

Identification of Problem:

The South Atlantic (SA) penaeid shrimp fishery spans the eastern U.S. coast from Pamlico Sound and Ocracoke Inlet, North Carolina, across South Carolina and Georgia, to Fort Pierce, Florida. Throughout the SA, most shrimp trawling occurs within three miles of shore. In 1996, there were approximately 1,400 large and 1,000 small vessels harvesting 30 million pounds of predominately penaeid shrimp including white *Penaeus setiferus*, brown *P. aztecus*, and pink *P. duorarum* (SAFMC, 1996). By 2002, annual harvest was estimated at 33 million pounds from 1,731 vessels, of which 488 operated exclusively in inshore waters. On average, about 20% of

the harvest is taken in the exclusive economic zone (EEZ) (SAFMC, 2004). Since 2002, the downturn in the economy and the rise in fuel price have reduced fishing effort in this fishery.

Catch and effort data for the shrimp fishery are minimum requirements of the Atlantic Coastal Cooperative Statistics Program (ACCSP) and all the South Atlantic (SA) states are compliant (Jim Nance, National Marine Fisheries Service [NMFS], pers. comm.). However, these data are lacking detailed specificity and though total catch is often tractable, stratifying this catch and linking it to the estimates of effort that produced it is more problematic (Gallaway *et al*., 2003b). There are no longer NMFS port agent interviews in the SA, and catch and effort data are collected via trip tickets. Because the fishing trip is the basic sampling unit, the fundamental principle of the data collection is to record both catch and effort data on a trip-by-trip basis. However, because the reported number of fishing trips that occur in the shrimp fishery is on the order of tens of thousands, not every trip has information on fishing effort and location. The dealer must assign a catch and effort location for the landings from each trip, and uses information obtained from informal interviews or historical knowledge of the fleet's activity to perform this assignment. Thus, many chances exist for error to occur in location assignment of catch and effort (Gallaway *et al*., 2003b).

The justification for this project hinges on the need for accurate and precise effort estimation in the penaeid shrimp fishery. We will discuss the reasons comprising and benefits from fulfilling this need under the subsequent section — *Project Impacts/Results or Benefits Expected*. Below we explain the reasons why current effort estimates are inadequate and why an electronic logbook (ELB) program will solve these problems.

At least three possible solutions exist to resolve the current inaccuracies inherent with shrimp fishing effort data: 1) Have the fishing vessel captain maintain a tow-by-tow paper logbook; 2) Place observers on fishing vessels to maintain paper logbooks; or 3) Utilize electronic logbooks (ELB) to record the time, date, and location of fishing activities. Each of these three solutions has associated advantages and disadvantages. Commercial fishermen are typically wary of collecting data for use by fisheries managers and are sometimes concerned that the information will be used against them to implement further management regulations. Asking, or mandating, fishermen to collect fishing effort data may be difficult, necessitating the use of other data collection methods. Paper log books can be an expensive solution because the information must be keyed into a digital database before it is useable. The forms are often difficult to decipher as they are filled out at sea. Errors tend to go one direction as well; no one ever records a tow they did not make, but it is easy to miss a tow they did make.

Observers are unbiased with regard to effort data collection and can further augment data by recording the abundance and length-frequency of bycatch. The main disadvantage to utilizing an observer program is the cost of covering the necessary portion of the shrimp fishing fleet to provide the requisite accuracy and precision in the effort estimates (several millions of dollars).

The advantages of implementing an ELB system are that the device is passive, small, and accurately and autonomously records data (Gallaway *et al*., 2003a). Shortcomings of the ELB system include a lack of ancillary data collection. The most appropriate and effective resolution to estimate fishing effort and bycatch would be to combine some of these solutions. The Gulf

and South Atlantic Fisheries Foundation (Foundation) recently completed and received funding to continue a research study that augmented the collection of ELB data through the use of observers in the Gulf of Mexico (GOM) shrimp fishery (Award No. NA05NMF4540044 / NA09NMF4540135). The goal was to enable the fishing industry to evaluate and address fishery management issues, including the estimation of shrimp fishing effort and bycatch.

The ELB was developed by LGL Ecological Research Associates, Inc. (LGL) to directly measure shrimp fishing effort and provide better estimates of effort and red snapper bycatch in the GOM. It should be noted that the ELB studies that were successfully implemented in the GOM were conceived and initiated by shrimp fishing industry leaders and their consultants, namely LGL. There was considerable buy-in to the program by the captains and crews, because the fishermen viewed it as their program being conducted by scientists they have used and trusted over the last decade. Over the course of LGL's 3 year pilot study, ELB systems were placed onboard commercial shrimp fishing vessels to collect fishing effort data. To augment the data collection, both paper logbooks and observers were utilized to collect shrimp landings and red snapper bycatch data on a tow-by-tow basis. Results from this study indicated that the ELB system accurately estimated the fishing practices of a vessel on a per trip basis meaning that individual tows could be identified with accurate estimates of effort and catch (Gallaway *et al*., 2003a). Nevertheless, observers are still required to estimate bycatch.

Through the combination of the ELB data with paper logbooks and observer collected landings, it was demonstrated that total vessel landings (on a per trip basis) could be divided accurately on a tow-by-tow basis and allocated to specific statistical zones. Of the 135 trips where ELBs recorded effort data, port agents collected data on 62 of these trips. A comparison of the ELB and port agent data allowed for a direct comparison of fishing effort estimation methodologies (i.e. NMFS/State port agent data vs. ELB data). This analysis indicated that a directional bias existed and that port agent data overestimated effort in midshore regions (areas abundant in juvenile red snapper; between 10-30 fathoms) while underestimating effort in offshore and nearshore regions (areas where juvenile red snapper abundance is low; 30+ fathoms and 0-10 fathoms, respectively). These studies proved that an ELB system was accurate at recording shrimp-trawl fishing effort and estimating and allocating landings data (Gallaway, 2001; 2003a; 2003b). Based upon the results derived from the above-mentioned studies and recommendations made by the SEDAR-7 Shrimp Fleet Bycatch Working Group (NMFS, 2004), LGL was granted funding by NMFS to further expand the ELB program within the shrimp fishery in the GOM. This proposal seeks to use the knowledge garnered from the successful ELB project conducted in the GOM and institute the same methodology and protocols in the SA penaeid shrimp trawl fishery.

Project Impacts/Results or Benefits Expected:

The benefits from this project will be to: (1) improve bycatch estimates, (2) identify traditional fishing grounds for use in designation of marine protected areas (MPA), (3) provide a cheaper alternative to the potential requirement for vessel monitoring systems, and (4) improve stock assessment. Below we elaborate on each.

Coastal shrimp trawl fisheries have long been the focus of government regulations to reduce bycatch of sea turtles and commercially/ecologically important species in the GOM and the U.S. Atlantic. Action 3 of Amendment 6 calls for monitoring and assessing bycatch in the penaeid shrimp fishery of the SA (SAFMC, 2004). Two bycatch issues are currently looming for SA penaeid shrimpers. First, in the August 2009 status review, Conant *et al.* (2009) cited "the lack of comprehensive information on fishing distribution and effort" for SA fisheries as one of the reasons for concern when concluding that the "the extinction risk is likely to increase substantially in the foreseeable future" for the loggerhead sea turtle (*Caretta caretta*).

Second, the results of the SEDAR-13 (Small Coastal Sharks) stock assessment indicated that shrimp trawl bycatch is a source of fishing mortality for small coastal sharks within the South Atlantic. Recent information suggests that blacknose shark (*Carcharhinus acronotus*) is overfished and that there is substantial bycatch (45% of total bycatch) in the GOM shrimp fishery compared to 6% in the SA (NMFS, 2007a; 2007b). This 6% may become important if fishery specific quotas are implemented to reduce the overall bycatch of blacknose shark by 78% as recommended in February 2009 Predraft for Amendment 3 to the 2006 Consolidated Atlantic Highly Migratory Species (HMS) Fishery Management Plan (FMP).

The estimation of total bycatch for these species is necessary to quantify total mortality and project species viability. Total bycatch estimation for a fishery requires estimation of total effort for that fishery. Catch-per-unit-effort (CPUE) for each bycatch species is generally determined from observer programs, and these CPUEs are multiplied by estimates of total effort to derive total bycatch for the fishery. The estimates are most often stratified across time and space to improve accuracy; thus, the misallocation of effort across these strata introduces bias in addition to bias caused by under or over-estimating overall effort.

Increasingly, marine habitats are being parceled for use by various stakeholder groups. Inherent in this delineation is the recognition of traditional fishing grounds. Without established documentation of relative effort in the areas of interest, claims of utilization are more tenuous. ELB data removes all doubt concerning where and when shrimping occurred. In Texas and Louisiana the established ELB program in the GOM helped artificial reef committees to place new reefs in areas that were not important to the shrimp fishery (S. Raborn, pers. comm.). ELB data were also used by the GOM Fisheries Management Council (GMFMC) when citing proposed aquaculture areas (J. Cole, LGL, pers. comm.).

Federal regulations currently require a vessel monitoring system (VMS) on all shrimping vessels trawling for rock shrimp (*Sicyonia brevirostris*) in the SA. Currently, there is no VMS requirement for the penaeid shrimp fishery, but the tendency for this type of regulation to bleed into adjacent fisheries is common. The cost of an average VMS is around $3,500 for installation and a $500 annual service fee, both of which are at the expense of the vessel owner. The cost of an ELB is only $500, which will be paid through the government funded ELB program. Both VMS and ELB have hidden cost with respect to data processing and analysis, but these costs should be about the same for each. Both devices provide the exact location of the vessel, but only VMS data are real time, which is not necessary for accurate effort estimation and fishery management and is disconcerting to commercial fishermen. VMS data are used primarily for

enforcement and are not usually appropriate or available for effort estimation as they are not programmed to record positions frequently enough to estimate effort.

Furthermore, accurate effort estimation affords fisheries managers the necessary data for stock assessment to better manage the shrimp fishery for greater profit to all. Action 6 of Amendment 6 calls for status determination of penaeid shrimp in the SA (SAFMC, 2004). Government regulation is imminent and/or occurring and it is in the best interest of the shrimpers and all parties involved (including the bycatch species) that the shrimp trawl fishery is managed with the best possible information.

Need for Government Assistance:

This project addresses a national priority regarding conservation and management of marine resources. Through National Standard 9 of the Magnuson-Stevens Conservation and Management Act (MS-FCMA) [16 U.S.C. 1826c, 1851], i.e., "*Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*" Bycatch reduction remains a critical and high priority issue. Therefore, the impact that the shrimp fishery has on bycatch species serves to enhance national conservation goals set forth by the U.S. Congress. Additionally, this project will address several priorities outlined within FY-2011 Cooperative Research Program solicitation: e.g. **1.** Commercial Finfish, **a.** Characterize the total catch (from all fleets affecting the stocks), including catch composition and disposition of catch; 4**.** Commercial Shrimp Harvest; **b.** Quantification of effort; **d.** Quantification of Bycatch Rates), and those outlined within the Cooperative Bycatch Plan for the Southeast. Because fisheries resources are a public commodity and various user groups (commercial fishermen, head and charter boat fishermen, recreational anglers, the commercial shrimp industry, the public-at-large, and federal and state fisheries management agencies) have a stake in the conservation of this marine resource, it is fair and reasonable to ask for Federal assistance.

Statement of Work

Proposed Budget Period:

August 1, 2011 – July 31, 2012

Objectives and Procedures:

ELB Description

Hardware

The LGL Electronic Logbook (ELB) is a small, inexpensive GPS position logging device for commercial shrimping vessels, which has undergone four major revisions. Each major version change provided additional functionality. Detailed description of this device can be found in Gallaway *et al*. (2001, 2003a).

Software

The original software consisted of programs written in PBASIC which were loaded into the ELB, and programs written in C++ which were used to analyze the data collected (see Gallaway *et al*. [2001] for more detail). The current version of the ELB (v5.1) runs on a full function miniature computer (FFMC) running a customized version of the Linux operating system. The system uses built-in timers to activate the system periodically (normally every 10 minutes, but 1 minute intervals will be used for the pilot study) and record the current time and location by reading the data transmitted by the incorporated GPS unit. The position and time data are recorded into a temporary location in memory. Every hour the system wakes again to write the data from temporary memory onto a 128MB internal Multimedia Card (MMC). The MMC is formatted with a journaling file system to protect against disk corruption, and programmed with a unique card identifier number. The data collection system runs continuously when the vessel has power. In the event of a loss of power or activation of a reset circuit, the program resumes where it left off, with loss of recorded data between 0 and 5 observations. Periodically, the MMC card is retrieved and replaced with a newly initialized version. After the MMC card has been retrieved, it is sent back to the LGL offices for downloading and processing.

Vessel Selection, ELB Installation and Retrieval

All permitted vessels with landings in the previous year will be used as the universe of commercial fishing vessels for sample selection. The landings by vessel will be used to weight the probability that each vessel will be selected for ELB installation. The Regional Coordinators and Industry Cooperators will be responsible for securing vessels from the list to participate in the program. If the offer to install an ELB is refused by the vessel owner/captain then a new random selection will be made until 20 vessels are selected for participation. Once the 20 participating boats are identified, an experienced technician will install and service the devices for the life of the project. Data are downloaded from the ELB only after trips are completed; thus, real-time information from the ELB on the vessel's location and activity is not available.

Determining and Validating Catch and Effort Allocation

The data gathered by the ELB consist of date, time, and location of the vessel collected in 1 minute intervals. These data will be used to develop algorithms that can describe the duration and locations of individual tows made during each trip, i.e. effort, as well as allocate the corresponding catch (Gallaway *et al*., 2001). Each tow record will be associated with a trip completion date. Catch is reported for each vessel and trip through a trip ticket system, which began for North Carolina, Georgia, and Florida in 2001 and for South Carolina in 2003. The total pounds of shrimp landed from each trip are obtained from dealers. These landings data will be acquired and reduced to records that match vessel numbers and approximate trip completion dates from the ELB data set. Catch will be allocated among statistical area×depth zone strata with the following algorithm:

$$Catch_{ij} = \sum Effort_{ij}\left(\frac{TotalCatch}{TotalEffort}\right) \quad (1)$$

where, $Catch_{ij}$=catch in statistical area *i* and depth zone *j*, $Effort_{ij}$=the corresponding effort estimated from the ELBs, *TotalCatch* and *TotalEffort* represent catch and effort for the entire trip. Thus, CPUE of penaeid shrimp on a tow by tow basis can and will be provided from the ELB program alone. Observers will be used to (1) validate that the ELB catch and effort estimations are accurate and (2) estimate bycatch for species of interest. The first function of the observers will fade as managers and scientists are assured that shrimp CPUE is being estimated correctly, but observers will always be needed to estimate bycatch.

The accuracy of ELB catch and effort allocations across spatial and temporal strata has been validated with observers and paper logbooks in the GOM (Gallaway *et al*., 2003a). The logbooks used in the Gallaway *et al*. (2003a) study were dedicated to the GOM ELB pilot study; as such, special attention was given to their accuracy so that they did not reflect the poorer quality data typically obtained from fishery-wide logbook programs. Regressing ELB effort estimates against logbook effort estimates yielded an R^2_{adj} of 0.97 with a slope of one and intercept near zero; regressing ELB catch against observer catch yielded R^2_{adj} of 0.92, slope=1, intercept=0. Thus, we suspect that full validation (an observer watching every tow for numerous trips) in this pilot study is unnecessary.

Instead, we propose one observer confirm these agreements by observing a subset of tows; about 30 observer days should provide enough paired tows for comparison given this is a pilot study (more validation will be required with the expanded program). Observer estimates of catch and effort will be compared to ELB estimates using the agreement statistic known as the concordance correlation coefficient (CCC; Lin, 1989). If the pairs of estimates from the two different methods were identical then plotting one versus the other would render a graph with each pair of estimates falling on the 45° line originating from zero. Lin's (1989) CCC evaluates the degree to which this happens by ranging from 0 (no agreement) to 1 (perfect agreement with all pairs falling on the 45° line) and is the product of the Pearson correlation coefficient (*r*) and the systematic bias (c_a):

$$CCC = r \cdot c_a \tag{2}$$

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{(n-1)s_x s_y} \tag{3}$$

$$c_a = \frac{2}{u^2 + v + 1/v} \tag{4}$$

$$u = \frac{\bar{y} - \bar{x}}{\sqrt{s_y s_x}} \tag{5}$$

$$v = \frac{s_y}{s_x} \tag{6}$$

Where, x_i=observation i for method x, $\bar{x}$ = mean for all x_i, y_i=observation i for method y, $\bar{y}$ = mean for all y_i, s_x = sample variance in all x_i, s_y=sample variance in y, n=number of paired observations, v=scale shift, u=location shift relative to the scale.

Catch and effort data will be collected by a Foundation contracted observer placed onboard selected commercial shrimp fishing vessels that have an ELB installed. Observers contracted by the Foundation will have received a NMFS certificate of training prior to being deployed aboard a fishing vessel. This training will detail gear specifications, sampling protocols, data collection and documentation required by each observer and include sea turtle handling training at a NMFS Laboratory. Training will allow for data consistency and standardization between Foundation and NMFS datasets and facilitate data analysis by interested parties (i.e., Foundation contracted Data Analyst and stock assessment scientists). All Federal and state scientific collecting permits and exempted fishing permits will be acquired prior to observer deployment and data collection. The observer data collection will span 30 sea days. The Foundation will make available to cooperating fishing vessels funds that will cover the costs of accommodating an observer. Fishing vessel owners who agree to cooperate in this project will be compensated $100/day while fishing and $50/day when cruising to and from fishing grounds or no tow days.

An observer will be contracted by the Foundation to collect data and will record the weight (heads-on or heads-off) of all penaeid shrimp regardless of the quantity harvested (e.g., no sub-samples will be taken). All small coastal sharks will be identified, measured, and weighed, from each net. All sea turtles incidentally taken during experimental tows will be handled, measured, and flipper tagged according to established NMFS protocols.

Estimating Bycatch for Species of Interest

With respect to bycatch, observers will enumerate all species of interest and record the towing time from each observed tow. These data will generate bycatch CPUEs, which can be used in an expanded program to render fishery-wide bycatch estimates. We may not have enough data to accomplish this expansion from this pilot study alone, but an attempt will be made to cover as much of the fishery as the data will allow. A common way to accomplish the expansion is by use of the generalized linear model (GLM). This model helps to fill in factorial cells (e.g., year trimester, and area combinations) with missing or few data by "borrowing" information from all data. For each bycatch species, CPUE will be estimated for each year, trimester (e.g., Jan-Apr = Trimester 1) area (to be defined later), and depth zone (also to be defined later) combination. A common distribution for this type of count data is the negative binomial, but others such as the *Poisson* and the zero-inflated variants will be considered.

The negative binomial is a discreet probability distribution that is recognized as a suitable descriptor of catch count data (Power and Moser, 1999). We will portray the predicted catch rate through a global linear log link function to the negative binomial distribution, i.e.,

$$\log_e(\lambda_i) = \mu + Yr + Tri + A + DZ \qquad (7)$$

where all factors are without the strata identifier subscripts and represent their respective levels for the i^{th} tow, and where, λ_i = predicted catch rate for the i'th tow, μ = overall mean, Yr = year,

Tri = trimester, *A* = area, *DZ* = depth zone. All independent variables will enter the model as categorical. All computations will be conducted using the GENMOD procedure in SAS Version 9.2 Software (SAS Institute Inc., 2008).

The GENMOD procedure estimates the regression parameters to maximize the negative binomial log-likelihood which is the sum of the log-likelihoods for each set (l_i) ignoring constant terms, i.e.,

$$l_i = r\log_e(r) - \log_e\{\Gamma(r)\} + \log_e\left\{\Gamma(\tilde{C}_i + r)\right\} + \tilde{C}_i \log_e(\theta_i) - (r + \tilde{C}_i)\cdot\log_e\left\{\tilde{C}_i + \theta_i\right\} \quad (8)$$

Where

$$\theta_i = \lambda_i \tilde{w}_i, \quad (9)$$

and where $\log_e\Gamma(z)$ is the log-gamma function, $\tilde{C}_i$ is the observed catch in tow *i*, *r* is the negative binomial dispersal coefficient (an additional parameter that allows for inflated variance and requires estimation), θ_i is the predicted catch in tow *i* and $\tilde{w}_i$ is the total tow hours for tow *i*. Note that the predicted catch rate (λ_i) comes from Equation (7) and tow hours define the element size (also called weight or offset) of the negative binomial distribution.

Determining Feasibility of a South Atlantic ELB Program

The number of vessels and amount of landings will be researched and quantified for major shrimping ports throughout the South Atlantic penaeid shrimp fishery. The adequacy of the catch reporting at each port for use in tandem with effort estimates from the proposed ELB program will be noted and where failings occur, suggested remedies will be outlined. Sample size estimators will be used to determine the number of boats necessary to accurately describe shrimping effort for the entire fishery. This sample size will be allocated across ports based on landings reported in previous years. The total cost of the expanded project will be a function of the number of vessels to be outfitted, the number of ports that must be accessed, the corresponding personnel time for servicing the ELBs, and the time to manage the project, analyze the data, and report the results. Port meetings will be organized with the help of industry leaders to explain the benefits from and needed cooperation for a successful ELB program in the SA.

Organizing Port Meetings for Industry Participants

With the assistance of the Industry Cooperators and South Atlantic Regional Coordinator, meetings will be organized in the home ports of participating vessels. Results from the project will be disseminated and discussions with shrimp fishermen will be started to determine the feasibility of expanding the program. Input from Industry will be vital in ensuring the success of this project.

Participation by Others than Applicant:

To be successful, a project of this magnitude and importance requires the cooperation and active participation of many organizations and individuals. Most of these individuals have been associated with other similar Foundation research projects and programs since 1993. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective.

The Foundation has chosen to sole source contract with several persons in conjunction with this project, while leaving some positions open to competition. These essential personnel are:

Mr. Lindsey Parker, South Atlantic Regional Coordinator (UGA Marine Extension)

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (Texas Sea Grant)

Mr. Daniel Parshley, Observer Coordinator (Independent Contractor)

LGL Ecological Research Associates, Inc. (Data Analysts)
- Dr. Scott Raborn, Fisheries Scientist
- Dr. Benny Gallaway, Senior Fisheries Scientist
- Mr. John Cole, GOM ELB Coordinator and Analyst
- Mr. Robert Nguyen, GOM ELB Technician

Data Manager (Independent Contractor) (To be contracted or TBA solicited)

Contracted Fishery Observer (To be contracted or TBA solicited)

Through years of experience, the Foundation has found that working closely with the local Sea Grant – Marine Extension Service personnel who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen. As such, the South Atlantic Regional Coordinator, with assistance from the Gulf of Mexico Regional Coordinator, will act as liaison between the Foundation and vessel owners, relaying information about the goals of the project and securing vessel participation in the project. Due to his experience with vessel electronics, Mr. Parker will also participate in the installation and retrieval of ELBs.

The Observer Coordinator will work closely with the Foundation's Program Director and Regional Coordinator, with all activities coordinated through continual communication with Foundation staff. He will review, with the Data Analyst and Program Director, incoming data for completeness and accuracy. The Observer Coordinator will also recruit, train, coordinate, and monitor the fishery observer in the field.

One observer that has undergone rigorous NMFS certification training will be contracted by the Foundation. It is the job of the onboard observer to collect all landings data and proof all collected data for completeness and accuracy before forwarding to the Observer Coordinator. The Foundation has a contracted observer working on related projects. Because this individual

possesses the skills needed to fulfill the position and has proven themselves under field conditions, the contracted observer position will first be offered to this individual. If additional observers are needed to collect data, a competitive solicitation process will be conducted by the Foundation.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the Foundation and NMFS Galveston Laboratory. The Data Manager is responsible for checking and transferring all of the collected raw data into a manageable computer database for analysis and data archive at the Foundation's office and the NMFS Galveston Laboratory. Once the data have been reviewed and entered, they will then be forwarded to the Data Analyst and Foundation Program Director.

Dr. Scott Raborn, of LGL Ecological Research Associates, Inc., will work closely with the Foundation's Coordinators and Program Director with this project. Dr. Raborn has experience implementing a similar program in the Gulf of Mexico. He will oversee project operations from planning to submission of the final report. This will include planning and coordinating with the Foundation, Project Cooperators and other industry leaders. He will use 5 days for planning, 20 days for travel and field work, 15 days analyzing the data, and 20 days generating the final report and a manuscript to be submitted to a peer reviewed journal. Travel will include: up to four trips to the SA for installation and retrieval of ELBs and attendance at a port meeting, one trip for presentation of results to the South Atlantic Fishery Management Council and one trip to attend a scientific conference coinciding with manuscript submission.

Dr. Benny Gallaway is the senior project manager who will assist in drafting and reviewing LGL's final report. His experience in pioneering the ELB program in the Gulf of Mexico and his contacts within the NMFS and industry will be paramount to the success of this project. His involvement will constitute planning, analysis, and report writing.

Having written the software and developed the ELB device used for the ELB program in the Gulf of Mexico, Mr. John Cole will assist in training, report drafting and review. He will be instrumental during the planning and analysis phases of this project.

Mr. Robert Nguyen will travel to the South Atlantic twice: first to install the electronic logbooks on participating vessels and second to retrieve them. Depending on how close the participating vessels are to each other in space and time the number of field days could vary. Also, we have built into the budget the possibility of two more trips for troubleshooting. These trips may be used by John Cole instead.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the South Atlantic region. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results produced from this research and will be more willing to assist in future research.

Industry and NOAA Fisheries Cooperators:

Mr. Bob Jones, Executive Director, Southeastern Fisheries Association, Inc.

Mr. John Williams, Executive Director, Southern Shrimp Alliance

Dr. Jim Nance, Chief Scientist, NOAA Fisheries Galveston Laboratory

Direct industry participation is needed for the proposed work. Mr. Bob Jones, Executive Director of the Southeastern Fisheries Association and Mr. John Williams, Executive Director of the Southern Shrimp Alliance, will work with Foundation Coordinators and Dr. Raborn to increase awareness of this project and solicit industry's support. Mr. Jones and Mr. Williams have been active in the shrimp industry and related research for many years. Their contacts within the commercial fishing community will be of paramount importance.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the South Atlantic region. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results produced from this research and will be more willing to assist in future research.

Dr. Jim Nance has agreed to be this project's NOAA Fisheries Cooperator. Dr. Nance has worked cooperatively with the Foundation for a number of years on fishing effort related projects. He will oversee the project throughout its entirety and ensure that all data is collected in a scientifically sound manor. The Foundation's Program Director will have frequent contact with Dr. Nance and update him of all progress and/or problems that may occur.

Project Personnel and Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Mr. Frank Helies, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 20% of their time over the course of the 12 month project period in the performance of this award. A project of this enormity is time consuming and requires the attention of each

Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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 monitors performance to ensure project goals and objectives are met in a timely manner and to ensure compliance with NOAA/NMFS award requirements.

The Foundation's Program Director, Mr. Frank Helies, 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 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 sound manner to ensure the usefulness of all experimentally 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 fiscal 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 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 and securing federal and state scientific collection, experimental permits and exempted fishing permits that are required for the project; including those for the contracted observer. 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 meetings and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all subcontracts and amendments. Additionally, she is responsible for securing vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, and newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Monitoring of Project Performance:

PIs will review data for completeness and accuracy, and the Foundation's Program Director will monitor data management procedures to ensure that all data analyses meet their required

statistical assumptions and fulfill the project objectives outlined within this proposal. The quality of the data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable technicians and observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of, and critically review, project reports. This program will be conducted as an Award from NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and the NMFS Cooperator. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and reviewers will discuss data, data analysis, and data interpretation. Only after the analysis has undergone rigorous evaluation will the final report be accepted by the Foundation and printed.

Information Dissemination:

Cooperating fishing vessel owners will be provided with regular updates and a copy of the Foundation's project final report. Summary reports of the project's findings will also be published as parts of the "Foundation Project Update" section of the "Gulf and South Atlantic News", a publication of the Gulf & South Atlantic Fisheries Foundation, Inc. This newsletter is distributed to over 700 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.

A manuscript identifying the project's successes, failures, and potential for expansion will be made ready for submittal to a peer reviewed fisheries journal.

Milestone Table:

Project Activities	2011					2012									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities / Contract Negotiations	xx	xx													
Project Coordination / Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Training of Observers	xx	xx	xx	xx											
Permit Applications & Maintenance	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx				
Selection of Participating Vessels	xx	xx	xx	xx											
Data Collection		xx	xx	xx	xx	xx	xx	xx	xx						
Statistical Analysis										xx	xx	xx			
Followup Port Meetings												xx			
Progress Report Submission						xx						xx			
Financial Report Submission			xx					xx							xx
Project Closeout & Final Report Preparation													xx	xx	xx
Final Report Submission															xx

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Pilot Study to Characterize Fishing Effort of the South Atlantic Penaeid Shrimp Trawl Fishery through the use of Electronic Logbooks

1. Has any National Environmental Policy Act (NEPA) or other environmental compliance documentation (e.g., Endangered Species Act Biological Opinion; Letter of Concurrence or Biological Assessment/Evaluation; Clean Water Act permit; State Historic Preservation Officer consultation; state environmental compliance documentation (mini-NEPA); etc.) been completed? If yes, list the environmental compliance documentation that has been completed and provide copies of the documentation as appropriate.

No.

2. Would the proposed activity or environmental impacts of the activity be subject to public controversy? If yes, describe the potential controversy.

No.

3. Would the proposed activity have potential environmental impacts that are highly uncertain or involve unique or unknown risks? If yes, describe the impacts that are uncertain or involve unique or unknown risks.

No.

4. Is the proposed activity related to other activities (both NOAA and non-NOAA that together may cumulatively adversely impact the environment? For example, the proposed activity is one of a series of projects that together may cause a change in the pattern of pollutant discharge, traffic generation, economic change, flood plain change, or land use. If yes, briefly describe the other activities and discuss how the related projects would have cumulative impacts on the environment.

No.

5. Would the proposed activity involve a non-native species? If yes, describe how the non-native species in involved.

No.

6. Would the proposed activity occur within a unique geographic area of notable recreational, ecological, scientific, cultural, historical, scenic or aesthetic importance. If yes, describe the area, including the name or designation if known.

No.

7. Would the proposed activity affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources? If yes, describe the impact.

No.

8. Would the proposed activity affect public health or safety? The effects may be adverse or beneficial and temporary, long-term, or permanent. If yes, describe the effects and the circumstances that would cause these impacts.

No.

9. Would the proposed activity affect directly or indirectly, in an adverse or beneficial manner, any listed endangered, threatened, or otherwise protected species or their critical habitat under federal and state laws including the Endangered Species Act and the Marine Mammal Protection Act? If yes, name the species and/or habitat that will be impacted and describe the circumstances that would impact the species and/or habitat.

Yes. During trawling activity, threatened or endangered sea turtles or other species may be encountered, however, contracted Foundation observers are considered NMFS-designated agents and may aid and collect data from sea turtles. Observers have received sea turtle handling and data recording training prior to deployment. Whenever possible, live sea turtles will be returned to their aquatic environment as soon as possible.

COOPERATIVE RESEARCH PROJECT SUMMARY

Project Title: Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

Project Status/Duration: Aug. 1, 2011 – July 31, 2012 New X Cont'd __ Proj. Period: 12 Months

Name, Address, and Telephone Number of Applicant:

Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, FL 33609-2447
(813) 286-8390

Principal Investigator(s) and Brief Statement of Qualifications:

Ms. Judy Jamison; Over 30 years administrative and grants management experience.
Mr. Frank Helies; Experience in biological and oceanographic research.

Project Objectives:

(1) Complement an ELB study with onboard observers to collect data on fishing effort, red snapper bycatch, and shrimp landings within the Gulf of Mexico; (2) Analyze all observer collected data to further ensure that ELB landings estimates are accurate and defensible; (3) Determine the spatiotemporal abundance of juvenile red snapper, compute a total mortality (Z) estimate for shrimp-trawl red snapper bycatch, and conduct a formal cohort analysis (VPA) on all observer collected red snapper data; and (4) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf shrimp fishery, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*).

Specific Priority(ies) in Solicitation to Which Project Responds:

1. Commercial Finfish, **c.** Investigations are needed to determine more efficient methods to record effort accurately on a real-time basis during fishing operations. **4.** Commercial Shrimp Harvest, **b.** Quantification of Effort; **d.** Quantification of Bycatch Rates.

Summary of Work:

The dynamics of the red snapper fishery are complex and various user groups are thought to impact the stock. To alleviate the confusion surrounding the bycatch of juvenile trawl-caught red snapper and blacknose shark in the Gulf shrimp fishery, the Foundation proposes the continuation of a program to augment an electronic logbook (ELB) project with fishery observers. Fishery observers will be placed aboard shrimp trawl vessels that have been randomly selected and have an ELB installed. Observers will collect catch and bycatch data on total penaeid shrimp, red snapper, and small coastal sharks. Data collected during this project will be used to update the formal cohort analysis (VPA) and compute mortality estimates for all Foundation collected red snapper bycatch data (both past and present). Results will be used to validate ELB landings estimates by region (statistical zone) and quantify red snapper and small coastal shark bycatch rates.

Project Funding:		
	Federal	$300,000
	Non-Federal	$ 0
	Total	**$300,000**

Project Title:

Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

Applicants Name:

Gulf & South Atlantic Fisheries Foundation, Inc.
Ms. Judy Jamison, Executive Director

Lincoln Center, Suite 740
5401 W. Kennedy Blvd.
Tampa, Florida 33609-2447
(813) 286-8390

Proposed Budget period:

August 1, 2011 – July 31, 2012

Project Goals and Objectives:

1) Complement an electronic logbook (ELB) study with onboard observers to collect data on fishing effort, red snapper bycatch, and shrimp landings within the Gulf of Mexico;

2) Analyze all observer collected data to further ensure that ELB landings estimates are accurate and defensible;

3) Determine the spatiotemporal abundance of juvenile red snapper, compute a total mortality (Z) estimate for shrimp-trawl red snapper bycatch, and conduct a formal cohort analysis (VPA) on all observer collected red snapper data; and

4) Provide improved data collection on the extent of bycatch of small coastal sharks in the Gulf shrimp fishery, particularly blacknose shark (*Carcharhinus acronotus*) and smalltooth sawfish (*Pristis pectinata*);

Identification of Problem:

Fish stocks with commercial and recreational value are typically managed via the regulation of fishing mortality to maintain a sustainable harvest (Hilborn and Walters, 1992). Because the red snapper (*Lutjanus campechanus*) stock of the Gulf of Mexico is classified as overfished, the National Marine Fisheries Service (NMFS/NOAA Fisheries) has regulated the directed commercial (IFQ system) and recreational (size and trip limits and closed seasons) red snapper fisheries to reduce mortality of large juvenile and adult fish. To reduce the fishing mortality of small juvenile fish, the NMFS has also regulated the shrimp trawl fishery of the Gulf of Mexico; a fishery that is thought to bottleneck adult populations. Disagreement has existed regarding the magnitude, age composition, and monthly distribution of shrimp trawl red snapper bycatch in

time and space (Goodyear, 1995; Schirripa and Legault, 1997, 1999; Gallaway *et al*., 1998; Gallaway and Cole, 1999; Ortiz *et al*., 2000). However, more complete observer data have provided the basis for reaching agreement (e.g., NMFS, 2004).

Estimates of red snapper bycatch are directly dependent upon estimates of shrimp fishing effort. Historically, port agents have collected shrimp landings and value data from dealer records. Fishing effort data are collected by port agents through detailed interviews with fishing vessel captains and/or crew. Interview data provides resolution on shrimp fishing effort at the trip level. Even with the reduced number of shrimp fishing trips occurring within the Gulf of Mexico, a comprehensive survey of the shrimp fleet is not feasible and sub-sampling occurs. Monthly, port agents contact all shrimp dealers within their region and collect landings information for individual fishing trips. Port agents then sub-sample these trips by randomly selecting interviewees to obtain further information regarding effort and catch location (Nance, 2004).

Historically, NMFS has not directly measured shrimp fishing effort, catch, or length-frequency data on commercial shrimp trawl red snapper bycatch. These estimates are derived through indirect approaches or modeling, thus adding to the contention of the red snapper bycatch issue. Inaccuracies in trip interviews, time fished, or reported catch data can result in skewed fishing effort calculations (Nance, 2004) and biases in the assessment of the red snapper stock (NMFS, 2004).

At least three possible solutions exist to resolve the current inaccuracies inherent with shrimp fishing effort data: 1) Have the fishing vessel captain maintain a tow-by-tow paper logbook; 2) Place observers on fishing vessels to maintain paper logbooks; or 3) Utilize electronic logbooks (ELB) to record the time, date, and location of fishing activities. Each of these three solutions has associated advantages and disadvantages.

Commercial fishermen are typically wary of collecting data for use by fisheries managers and are sometimes concerned that the information will be used against them to implement further management regulations. Asking, or mandating, fishermen to collect fishing effort data would be the most inexpensive option, but such data may be unreliable, necessitating the use of other data collection methods.

Observers are unbiased with regard to data collection and can further augment data by recording the abundance and length-frequency of shrimp trawl red snapper bycatch. A disadvantage to utilizing an observer program, covering at least a significant portion of the shrimp fishing fleet, is expense (on the order of tens of millions of dollars).

The advantages of implementing an ELB system are that the device is passive, small, and it accurately and autonomously records data. Shortcomings of the ELB system include a lack of ancillary data collection and the price of the device. The most appropriate and effective resolution to estimate fishing effort and bycatch would be to combine all, or part, of these solutions.

The Gulf and South Atlantic Fisheries Foundation (Foundation) recently completed a research study that augmented the collection of electronic logbook (ELB) data through the use of observers in the Gulf of Mexico Shrimp Fishery (Cooperative Agreement No. NA05NMF4540044). The goal was to enable the fishing industry to evaluate and address fishery management issues, including the estimation of shrimp fishing effort and bycatch. The electronic logbook was developed by LGL Ecological Research Associates, Inc. (LGL), to directly measure shrimp fishing effort, thereby reducing the dependence on modeling to provide better estimates of effort and red snapper bycatch. Over the course of LGL's 3 year pilot study, ELB systems were placed onboard commercial shrimp fishing vessels to collect fishing effort data. To augment the data collection, both paper logbooks and observers were utilized to collect shrimp landings and red snapper bycatch data on a tow-by-tow basis. Results from this study indicated that the ELB system accurately estimated the fishing practices of a vessel on a per trip basis and that individual tows could be identified. Through the combination of the ELB data with paper logbooks and observer collected landings, it was demonstrated that total vessel landings (on a per trip basis) could be divided accurately on a tow-by-tow basis and allocated to specific statistical zones. Of the 135 trips where ELBs recorded effort data, port agents collected data on 62 of these trips. A comparison of the ELB and port agent data allowed for a direct comparison of fishing effort estimation methodologies (i.e. NMFS/State port agent data vs. ELB data). This analysis indicated that a directional bias exists and that port agent data overestimated effort in midshore regions (areas abundant in juvenile red snapper; between 10-30 fathoms) while underestimating effort in offshore and nearshore regions (areas where juvenile red snapper abundance is low; 30+ fathoms and 0-10 fathoms, respectively). These studies proved that an ELB system was accurate at recording shrimp-trawl fishing effort and estimating and allocating landings data (Gallaway, 2001; 2003a; 2003b).

Based upon the results derived from the above-mentioned studies and recommendations made by the SEDAR-7 Shrimp Fleet Bycatch Working Group (NMFS, 2004), LGL was granted funding by NMFS to further expand the ELB program within the shrimp fishery in the Gulf of Mexico. The project, entitled "Estimation of Shrimp Fishing Effort in the Gulf of Mexico: Phase 1 and Phase 2 Implementation," was designed to capture accurate estimates of shrimp-trawl fishing effort from the construction and installation of 150 ELBs on a random and representative sample of the shrimp fishing fleet operating in the Northern Gulf of Mexico. To date, there have been approximately 500 ELBs placed aboard Gulf shrimp fishing vessels. Although the data collected during the ELB study will be invaluable to fishermen and fisheries managers in resolving effort related questions, no red snapper bycatch and shrimp landings data are collected.

The results of the SEDAR-7 (Gulf of Mexico Red Snapper) and SEDAR-13 (Small Coastal Sharks) stock assessments indicate that shrimp trawl bycatch is still a source of fishing mortality for red snapper and small coastal sharks within the Gulf of Mexico. The estimated natural mortality of age-0 red snapper obtained from Foundation research is almost double of that used in the SEDAR-7 (Gazey *et al.*, 2008). Also, recent information suggested that blacknose shark (*Carcharhinus acronotus*) was overfished and that there is substantial bycatch in the Gulf shrimp fishery (NMFS, 2007b). Though an analysis on the "TED effect" on the catch rates of blacknose sharks in the GOM shrimp trawl fishery showed a significant reduction from the current estimates, additional data will improve the catch statistics and future stock assessment updates (Raborn *et al*., 2010). Also, with the upcoming reinitiation of the ESA section 7 consultation for

smalltooth sawfish in the GOM and South Atlantic, any additional data will improve the knowledge base for this data poor species. The Foundation proposes to continue a project (Award No. NA09NMF4540135) that collects data with the ELB system and observers to make the results of the previous work more robust. Importantly, this will increase the data available to verify models used by scientists to compute red snapper bycatch levels within the fishery. Also, by including small coastal shark data in the collection protocol, the assessment data used for these species will be improved.

Project Impacts/Results or Benefits Expected:

The dynamics of the red snapper fishery are complex and various interest groups (recreational, head boat, charter boat, direct and indirect commercial fisheries, and the shrimp trawl fishery) are thought to impact the stock. In previous stock assessments, shrimp trawl bycatch was thought to bottleneck adult populations. Through previous efforts funded by the Foundation, shrimp trawl effort was found to be directionally biased, thus skewing shrimp trawl red snapper bycatch estimates (Award No. NA07NMF4330125). The continuation of the Foundation's ELB program will help to alleviate some of the confusion regarding shrimp trawl fishing effort and the F-mortality directly attributable to the shrimp trawl fishery operating in the Gulf of Mexico.

By augmenting LGL's current ELB research with onboard observers, red snapper bycatch and landings data will be collected as before. Landings data will be used to verify models used by scientists to allocate landings and effort on a trip-by-trip basis. Previous publications have shown that the ELBs can accurately predict landings on a tow-by-tow level (Gallaway *et al.*, 2001). The SEDAR Shrimp Fishing Effort Working Group brought up concerns regarding these estimations. Specifically, more data were needed to validate the accuracy of the ELB landings model. If the landings model is validated and found to accurately assess shrimp landings on a tow-by-tow scale (versus the current trip-by-trip scale used by NMFS), the ELB landings information could be used by fisheries managers to accurately assign landings data to individual statistical cells.

Shrimp trawl bycatch data and the respective analyses have already illuminated the magnitude, composition, and mortality of juvenile red snapper. Results thus far indicate that age-0 red snapper are found to constitute the majority of red snapper shrimp trawl bycatch. This has important implications for the impact that the shrimp trawl fishery has on the red snapper stock which could be negligible or reduced from previous estimates. Although the dataset generated from this study cannot be considered "standalone", these data will significantly increase the current database of shrimp trawl red snapper bycatch data and constitute "the best available". These data will also be valuable to scientists assessing the impact that shrimp trawling has on the red snapper stock of the Gulf of Mexico.

Need for Government Assistance:

This project addresses a national priority regarding conservation and management of marine resources. Through National Standard 9 of the Magnuson-Stevens Conservation and Management Act (MS-FCMA) [16 U.S.C. 1826c, 1851], i.e., "*Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch*

cannot be avoided, minimize the mortality of such bycatch." Bycatch reduction remains a critical and high priority issue. Therefore, the impact that the shrimp fishery has on the red snapper stock serves to enhance national conservation goals set forth by the U.S. Congress. Additionally, this project will address several priorities outlined within FY-2011 Cooperative Research solicitation (e.g. **1.** Commercial Finfish, **c.** Investigations to determine more efficient methods to record catches accurately on a real-time basis during fishing operations (e.g. electronic logbooks); **4.** Commercial Shrimp Harvest, **b.** Quantification of Effort: research is needed to improve shrimp effort data; **d.** Quantification of Bycatch Rates), and those outlined within the Cooperative Bycatch Plan for the Southeast. Also, the Cooperative Research Program solicitation includes priorities to investigate species of concern put forth by the regional Councils and NMFS, red snapper and blacknose shark specific to this project. Because fisheries resources are a public commodity and various user groups (commercial fishermen, head and charter boat fishermen, recreational anglers, the commercial shrimp industry, the public-at-large, and federal and state fisheries management agencies) have a stake in the conservation of this marine resource, it is fair and reasonable to ask for Federal assistance.

Statement of Work

Proposed Budget Period:

August 1, 2011 – July 31, 2012

Objectives and Procedures:

ELB Description:

Hardware:

The LGL Electronic Logbook was developed to track the fishing effort of shrimp trawlers operating within the northern Gulf of Mexico. The ELB system is currently in version 4.0 and each version has increased the systems functionality. Data formats and software have been altered to complement the ELB system and allow for all data formats to be read. A brief description of past ELB versions are discussed in Appendix A.

Version 4.0 – This most recent version of the ELB incorporates major revisions in both hardware and software. The Parallax Javelin Stamp processor was upgraded to the Systronics JStamp and increased processing speeds and RAM availability 30 and 14 times, respectively, than that of the Javelin. This conversion only increased unit price by $10. Additionally, STMicroelectronics has released a new 512 kb EEPROM memory chip (M24512-B) compatible with the 24LC256 pin layout allowing observation periods to exceed 520 days. Although it is expected that data will be on a semiannual basis, this version would allow a vessel to be late in returning memory modules with no data being lost.

The most significant improvement in Version 4.0 is the inclusion of point-in-polygon calculation capabilities. This program, which runs at the same time as the data collection program, can warn the vessel Captain when he is approaching a designated area, and provides a different warning

when he actually enters the area. This allows the unit to be preprogrammed with areas (polygons) that are to be avoided, for regulatory reasons (MPA's or closed areas) or because they contain reefs or other trawl hangs.

Software:

The original software consisted of programs written in PBASIC which were loaded into the ELB, and programs written in C++ which were used to analyze the data collected. The software described below has since evolved along with the ELB hardware. The following descriptions for the original software are provided to show the basic functions of the ELB software.

PBASIC Programs – PBASIC programs are loaded into the microprocessor and allow it to test and reset the ELB system, collect and store data, or export previously collected data for use in other programs. Only one program can be held in the microprocessor's non-volatile memory at a time. The program in memory is run from the beginning each time the unit powers up or the reset circuit is activated. The system test program turns the GPS unit on, captures the transmitted SACII sentences, and displays them on the host PC. This program also tests the GPS for satellite coverage to ensure an accurate position. After accurate positional data is received, the system reset program is run to set a unique identifier number for the ELB system, erase previous memory locations, and set the memory index to the start.

The data collection and storage program runs continuously when in the field. In the event of a loss of power, or activation of the reset circuit, the unit restarts the program where it last left off. The GPS unit is activated once every 10 minutes, keeping it on until it receives an accurate position fix (usually within 30 seconds). Once an accurate position is fixed, the program then turns the unit off, reformats the position and time data into an efficient 8 byte format, and writes the data to non-volatile external EEPROM memory. Upon completion of a fishing trip, the export program is loaded and executed. The program pauses for 30 seconds while the host PC activates a C++ program and uploads all data to the host PC memory.

C++ Program – ELB_Analysis, a C++ program written to run under Windows 95 and Windows 98, allows the user to select an electronic logbook data file to analyze, select the version of the program used to store the data, run the analysis and the summarization programs, and save the results. The resulting files are comma-separated ASCII files which include positional data that can be loaded directly into ArcView. The tracking file provides all positional information collected by the logbook, along with an interpretation of activity for each position. The logbook estimate file shows each ELB-detected tow including positional data and total tow time.

Activity at each position is inferred from the vessel's calculated speed which is approximated in three steps using "flat map" calculation techniques – a method that provides the required precision when working with closely located geographic points: 1) Latitude and longitude line lengths between observations are calculated in decimal degrees of longitude and latitude; 2) The line lengths are converted to kilometers using 111.18 km per degree of Latitude and 98.0052 km per degree of longitude; and, 3) The direct distance between the observation points, calculated in km using Euclidean geometry, is divided by the time between observations.

Using the calculated speed, activity is assigned in accordance with the following table:

Speed Range (Knots)	Activity Code	Activity Description
< 1.0	H	On Hook – Stopped
≥ 1.0 < 2.0	h	Buffer b/t Stopped & Trawling
≥ 2.0 < 3.8	T	Trawling
≥ 3.8 < 5.0	s	Buffer b/t Trawling & Steaming
≥ 5.0	S	Steaming

The tow summary function of the *ELB_Analysis* program estimates tows by relating the activity code associated with each location to the other activity codes from previous and following locations. Because the "H" and "h" activity codes can mask either slowing down during a trawl or turning, the program requires four "H" codes between two "T" codes to terminate a tow, while it only requires two "S" codes to terminate a tow. In either case, the time attributed to the codes that result in tow termination is not included in the total tow time.

Identification of Trips for ELB Datasets:

Since NMFS records landings at the end of each trip, ELB vessel datasets (which can cover many trips) must be analyzed to identify the beginning and end of each separate trip. The LGL C++ program *elb-trip-calc* performs this analysis for each of the ELB datasets (one dataset is created each time a box is serviced). The program reads the location data from the first records (the location when the box is installed) and creates a rectangle 2.22 km tall by 1.97 km wide with the original location point in the center. The program then tests each record in the dataset until the vessel leaves the rectangle, at which time the program records the trip start date.

After the vessel has left the rectangle, each record is reviewed until the vessel returns to the rectangle, at which time the trip end date is recorded. This is repeated for all records in the ELB dataset.

Vessel Selection and Effort Calculation:

Any permitted vessel with landings from a trimester in the previous year is used as the universe of commercial fishing vessels for sample selection. Within each time period (e.g., trimester), the landings by vessel are ordered from high to low, and this list is divided into quartiles. The ratio of summed landings for each quartile to the total landings observed for that time period constitutes the proportion of the sample to be drawn from that quartile. These selections will be made independent of the port from which the vessel operates.

The basic equation used to estimate effort in each defined time/space cell is:

$$\text{Effort} = \sum Landings_{\text{cell}} / CPUE_{\text{cell}}$$

ELB data are retrieved from each vessel and summarized by trawl tow (described in Gallaway *et al.*, 2003a), and combined into a sample dataset. These data are analyzed to associate a trip completion date with each tow record. A NMFS landing data file is acquired and reduced to records that match vessel number and trip completion dates in the ELB dataset. These data are also summarized into a dataset containing the vessel's trip information, along with pounds landed. For observer collected red snapper bycatch data, effort will be calculated on a per month basis.

The spatial cells used in the analysis are created in ArcView (shapefile) and joined to the ELB starting point data to add location data to each tow record. The resulting data are then combined with the NMFS trip total landings data and each tow record is assigned landings based on the percent effort for the trip multiplied by the total landings associated with the trip (described in Gallaway *et al.*, 2003a).

Current Field Program and Expected Completion:

The Foundation completed a project augmenting the ongoing LGL effort program (Award No. NA05NMF4540044) and received funding to continue observer data collection (Award No. NA09NMF4540135). The results of this most recent research have been reported in a peer reviewed journal article (Gazey *et al*., 2008). A length-based, age-structured model was developed using length frequency data collected by observers of the Gulf of Mexico penaeid shrimp fishery from 1999 to 2006. The model results indicate that the age-0 red snapper fraction of the shrimp trawl bycatch in the first and third trimesters exceeds 90% and during the second trimester, the bycatch is more evenly split between age-0 (48%) and age-1 (52%) red snapper. The growth data suggest age-0 and age-1 fish form an opaque annulus in winter which is consistent with results found for older fish. The total mortality estimates for age-0 and age-1 red snapper were about 2.5 and 1.8, respectively. The natural mortality rate for age-0 red snapper based on this study is approximately double the value used in the last red snapper stock assessment. The evidence for the model with density dependence over the model with density independent mortality is overwhelming. Therefore, continuation of this project is essential as the continued need for data to enhance stock assessments is vital.

Observer Training and Coverage:

Catch data will be collected by Foundation contracted observers placed onboard selected commercial shrimp fishing vessels that have an ELB installed. All contracted fishery observers will have undergone specific and detailed training prior to their deployment on any commercial fishing vessel. It is the responsibility of the Observer Coordinator to schedule and train all fishery observers. Training details all administrative and programmatic procedures necessary to conduct the proposed research and includes (but is not limited to): overview of the data collection protocols, description and measurements of fishing gear, and best practices while aboard a commercial fishing vessel (classroom and at-sea education). Contracted observers will complete sea turtle training at a NMFS facility. In addition, all observers will undergo marine safety training that outlines procedures on how to respond properly and promptly to a variety of emergency situations that could be encountered during fishing operations (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer is also required to complete a

First-Aid and CPR course. At the conclusion of observer training, individual observers will be outfitted with the necessary sampling (baskets, fish boards, etc.) and safety (personal EPIRBs, lifejackets, etc.) gears, and will be officially certified by the NMFS. Training will allow for data consistency and standardization between Foundation and NMFS datasets and facilitate data analysis by interested parties (i.e., Foundation contracted Data Analyst and stock assessment scientists). All Federal and state scientific collecting permits and exempted fishing permits will be acquired prior to observer deployment and data collection.

Observers will be responsible for collecting and verifying all data collected during fishing operations and following all NMFS Observer Guidelines. Observers will be contracted by the Foundation to collect data and will record the weight (heads-on or heads-off) of all penaeid shrimp regardless of the quantity harvested (e.g., no sub-samples will be taken). All incidentally harvested red snapper will be enumerated, measured, and weighed, to produce accurate abundance and size-frequency estimates. Efforts will be taken to sort, weigh, size, and record all red snapper from individual nets. In the event that individual net sorting becomes impractical, observers will sort, weigh, and size red snapper taken from all nets combined (i.e., catch from all fished nets will be combined and red snapper separated). All small coastal sharks will be identified, measured, and weighed, from each net also. All sea turtles incidentally taken during experimental tows will be handled, measured, and flipper tagged according to established NMFS protocols, after the crew completes the vessel's sea turtle handling responsibilities.

We project 225 at-sea days are needed to adequately sample the vessels cooperating in the ELB program within the Gulf of Mexico. To the extent practicable at-sea days will be stratified by yearly trimester and proportionally allocated to each trimester based on fishing effort (e.g., more sea days will be allocated to the summer trimester due to the increased fishing activity during this time). It is at the discretion of the Foundation Coordinators and PIs to change the at-sea day allocation. If a redistribution of at-sea days is needed, efforts will be taken to ensure that this redistribution is performed in a scientifically rigorous manor and validated through communication with industry, NMFS, and LGL Cooperators.

Analysis of Observer Collected Red Snapper Data:

To better estimate the impact that the commercial shrimp fishing industry has on the red snapper population, a virtual population analysis (VPA; e.g., "cohort analysis") will be conducted on all observer collected red snapper bycatch data to update the cohort analysis with the most recent data. VPA's are used by fisheries managers to calculate stock size based on catches with no underlying statistical assumptions (Hilborn and Walters, 1992). Once year-class stock size is known, cohort selectivity and vulnerability can be estimated.

Age-0 and age-1 fish comprise the bulk (~99%) of red snapper shrimp trawl bycatch (Gazey *et al*., 2008). To better define red snapper cohorts, all fish below 130 mm will be considered age-0 fish and all fish less than 300 mm that are not age-0 will be counted as age-1. Due to the continuous fishing practices (in time and space; with some time/area exceptions) of the shrimp fleet, the VPA must rely on natural mortality and population estimates for both age-0 and -1 fish. As such, mortality and population estimates derived from the most recent SEDAR-7 (Red Snapper) Assessment/Review Workshop will be utilized. This will ensure the robustness of the

estimates used for, and results derived from, the analyses (i.e., all estimates will have undergone extensive peer review prior to analysis).

To compute a total mortality (Z) estimate for age-0 and -1 red snapper, catch-per-unit-effort (CPUE) data by length and month will enable the relative abundance of year classes over time to be computed. CPUE will be converted to the number of fish caught per net per 10,000 hours. Effort will be multiplied by the CPUE values to approximate bycatch by age, month, and region (e.g., statistical zone). From these data, survival can be estimated and total mortality (Z) calculated. All efforts will be made to compute a Z estimate from all Foundation datasets, both past and present.

Participation by Others than Applicant:

To be successful, a project of this magnitude and importance requires the cooperation and active participation of many organizations and individuals. Most of these individuals have been associated with other similar Foundation research projects and programs since 1993. Their continued involvement will provide stability and allow for a smooth progression into this project from both a management and performance perspective.

The Foundation has chosen to sole source contract with several persons in conjunction with this project, while leaving some positions open to competition. These essential personnel are:

Mr. Gary Graham, Gulf of Mexico Regional Coordinator (TX A&M Univ. Sea Grant)

Mr. Daniel Parshley, Observer Coordinator (Independent Contractor)

Data Manager (Independent Contractor) (To be contracted or TBA solicited)

LGL Ecological Research Associates, Inc.
- Dr. Benny Gallaway, Data Analyst
- Mr. John Cole, Data Analyst
- Mr. Bill Gazey, Data Analyst
- Dr. Scott Raborn, Data Analyst

Contracted Fishery Observers (To be contracted or TBA solicited)

Through years of experience, the Foundation has found that working closely with the local Sea Grant – Marine Extension Service personnel who have years of experience with the local fishing industry, is an efficient way to achieve rapid communication and cooperation with local shrimp fishermen. As such, the Gulf of Mexico Regional Coordinator, with assistance from the Observer Coordinator, will (1) act as liaison between the Foundation and vessel owners, relaying information about the goals of the project and securing vessel participation in the project; (2) review, with the Data Analyst and Program Director, incoming data for completeness and accuracy; and (3) monitor observer performance.

The Observer Coordinator will work closely with the Foundation's Program Director and Regional Coordinator, with all activities coordinated through continual communication with Foundation staff. He will review, with the Data Analyst and Program Director, incoming data for completeness and accuracy. The Observer Coordinator will also recruit, train, coordinate, and monitor fishery observers in the field.

Two observers that have undergone rigorous NMFS certification training will be contracted by the Foundation. It is the job of the onboard observers to collect all landings and red snapper bycatch data and proof all collected data for completeness and accuracy before forwarding to the Observer Coordinator. The Foundation has contracted observers working on related projects. Because these individuals possess the skills needed to fulfill the position and have proven themselves under field conditions, the contracted observer positions will first be offered to these individuals. If additional observers are needed to collect data, a competitive solicitation process will be conducted by the Foundation.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the Gulf of Mexico region. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results produced from this research and will be more willing to assist in future research.

Observer collected data for this project will be electronically entered by a Foundation contracted Data Manager and archived at both the Foundation and NMFS Galveston Laboratory. The Data Manager is responsible for checking and transferring all the collected raw data into a manageable computer database for analysis and data archive at the Foundation's office and the NMFS Galveston Laboratory. Once the data have been reviewed and entered, they will then be forwarded to the Data Analyst and Foundation Program Director.

Dr. Benny Gallaway, of LGL Ecological Research Associates, Inc., will work closely with the Foundation's Coordinators and staff with this project. Dr. Gallaway has traveled the region presenting the results of previously conducted effort studies to increase the awareness of the project and randomness of ELB placement. In addition, Dr. Gallaway and LGL staff/contractors (including Mr. Bill Gazey, Mr. John Cole and Dr. Scott Raborn) will be conducting all data analyses on landings and red snapper bycatch data.

Industry and NOAA Fisheries Cooperators:

Mr. John Williams, Southern Shrimp Alliance

Ms. Wilma Anderson, Texas Shrimp Association

Dr. James Nance, NOAA Fisheries Galveston Laboratory

Direct industry participation is needed for the proposed work. Mr. John Williams, representing the Southern Shrimp Alliance and Ms. Wilma Anderson of the Texas Shrimp Association, will work with Foundation Coordinators and Dr. Gallaway to increase awareness of this project and solicit industry's support. Both Ms. Anderson and Mr. Williams have been active in the shrimp industry and related research for many years. Their contacts within the commercial fishing community will be of paramount importance.

Dr. Jim Nance has agreed to be this project's NOAA Fisheries Cooperator. Dr. Nance has worked cooperatively with the Foundation for a number of years on fishing effort related projects. He will oversee the project throughout its entirety and ensure that all data is collected in a scientifically rigorous manor. The Foundation's Program Director will have frequent contact with Dr. Nance and update him of any, and all, progress and/or problems that occur.

All data will be gathered through the cooperation and direct participation of the commercial shrimp fishing industry of the South Atlantic region. Without the cooperation of industry, this project would not be possible. The use of fishing vessels as research platforms, not only reduces the costs associated with this project, but ensures that industry is aware of the research and allows them to be involved in all steps of the scientific method. By allowing fishermen to actively participate in the collection of data, they will be more trusting of the results produced from this research and will be more willing to assist in future research.

Project Personnel and Management:

Principal Investigators:

Ms. Judy Jamison, Executive Director
Mr. Frank Helies, Program Director

Foundation Staff:

Ms. Gwen Hughes, Program Specialist
Ms. Charlotte Irsch, Grants/Contracts Specialist
Administrative Assistant

Overall project quality control and assurance will be assumed by the Gulf & South Atlantic Fisheries Foundation, Inc. through its office in Tampa, FL. Foundation personnel will each spend 20% of their time over the course of the 12 month project period in the performance of this award. A project of this enormity is time consuming and requires the attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

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 monitors performance to ensure project goals and objectives are met in a timely manner and to ensure compliance with NOAA/NMFS award requirements.

The Foundation's Program Director, Mr. Frank Helies, 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 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 experimentally 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 fiscal 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 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 required for experimental testing, and individual scientific collection permits for contracted observers. 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 meetings and auditing and paying program related invoices. She processes requests for reimbursement to conform with federal guidelines and prepares and maintains all subcontracts and amendments. Additionally, she is responsible for securing vessel insurance and verifies that all cooperators are maintaining worker's compensation coverage on their employees, if applicable.

The Administrative Assistant is responsible for receptionist/clerical duties, word processing, filing correspondence, dissemination of materials to industry (final reports, press releases, and newsletter). She is also responsible for creating and organizing meeting files, processing invoices and maintaining cooperative program files.

Monitoring of Project Performance:

Given the current controversies and conflicts among various interest groups related to the programmatic concepts outlined here, there is a possibility that one (or more) of these groups will question the validity of the Foundation's findings. For internally conducted studies, Principal Investigators (PIs) will regularly communicate with observers and Foundation Regional/Observer Coordinators concerning fieldwork. PIs will also review data for completeness and accuracy, and the Foundation's Program Director will monitor data management procedures to ensure that all data analyses meet their required statistical assumptions and fulfill the project objectives outlined within this proposal. The quality of the

data collected, and the procedures used to collect those data, will be assured through the use of highly qualified and knowledgeable observers who are experienced in this line of work.

Internal and external monitors will oversee the PIs' activities and responsibilities. The Foundation's Board of Trustees, representing various commercial fishing and seafood interests throughout the southeastern United States, oversee the PIs' tasks and are kept aware of, and critically review, project reports. This program will be conducted as an Award from NMFS and the timely completion of project objectives will be externally monitored by the Program Office of the NMFS Southeast Regional Office, NOAA Grants Management, and the NMFS Cooperator. Interim and final progress and financial reports concerning the program will be submitted to NOAA/NMFS, as required, to help the agency track the successful implementation, performance, and completion of the various tasks outlined in this proposal. During the period when analysis of the data is being conducted, the PIs and reviewers will discuss data, data analysis, and data interpretation. Only after the analysis has undergone rigorous evaluation will the final report be accepted by the Foundation and printed.

Information Dissemination:

Cooperating fishing vessel owners will be provided with regular updates and a copy of the Foundation's project final report. Summary reports of the project's findings will also be published as parts of the "Foundation Project Update" section of the "Gulf and South Atlantic News", a publication of the Gulf & South Atlantic Fisheries Foundation, Inc. This newsletter is distributed to over 700 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.

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Milestone Table:

Project Activities	2011					2012									
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities / Contract Negotiations	xx	xx													
Project Coordination / Monitoring	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Training of Observers	xx	xx	xx												
Permit Applications & Maintenance	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx				
Selection of Participating Vessels		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx				
Data Collection		xx	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx			
Statistical Analysis											xx	xx			
Progress Report Submission						xx						xx			
Financial Report Submission		xx						xx						xx	
Project Closeout & Final Report Preparation													xx	xx	xx

Final Report Submission														xx

Appendix A

Version 1.0-1.6 – This is the original version of the LGL ELB and the only version which has been used within the Gulf of Mexico shrimp fishery. Hardware engineering was based upon the Parallax Basic Stamp II™ microprocessor, and utilized the Microchip PIC16C57 microcontroller. The Basic Stamp II is programmed in PBASIC, a language based on a subset of the BASIC computer language. This ELB version included two external EEPROM memory chips (non-volatile Microchip 24LC256) which were mounted on the same printed circuit board as the microprocessor. To receive positional data, the circuit board was connected to a Garmin Trac-Pac-35 OEM Global Positioning System unit. Versions 1.0-1.4 recorded data in a 10 byte encoded record; versions after 1.4 compressed data to 8 byte records allowing 4,096 observations to be recorded per memory chip. Increasing data compression allowed slightly more than 56 days of memory to be stored. A more complete description of the device, data collected, and results have been published in peer reviewed literature (Gallaway *et al.*, 2003a; 2003b; Cole *et al.*, 2002) and the reader is directed to these publications for further information.

Version 2.0 – This version modified the unit by removing the EEPROM memory chips from the main printed circuit board and replacing them with an external memory board capable of holding eight 24LC256 memory chips. This change increased the observation period from approximately 56 days to over 227 days of records; and more importantly, made the memory box serviceable by the vessel's personnel. In the event that memory was full, the vessel Captain could disconnect the full memory module and replace with new memory; thus drastically reducing the cost of unit maintenance. The most difficult and costly part of installing an ELB is intercepting the vessel in a port where the service person can access it. In theory, this version of the ELB would mean that a vessel would only need to be intercepted once (for initial installation of the unit); after which the Captain could remove and replace the memory modules as appropriate.

Version 3.0 – Version 3.0 of the ELB changed the microprocessor from the Parallax Basic Stamp II to a single board Parallax Javelin Stamp computer. This feature allowed the ELB to be programmed with a subset of Sun MicroSystem's Java programming language (a more robust programming language) and increased processing speed. As part of the programming changes, the encoded data records were reduced to 7 bytes with no loss of data precision. This change increased the observation period to an excess of 260 days. Further programming changes extended the observation period by not recording positional data if the vessel was stationary for 24 hours (e.g., tied up or at anchor). Observation periods were extended to >365 days.

Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery

1. Has any National Environmental Policy Act (NEPA) or other environmental compliance documentation (e.g., Endangered Species Act Biological Opinion; Letter of Concurrence or Biological Assessment/Evaluation; Clean Water Act permit; State Historic Preservation Officer consultation; state environmental compliance documentation (mini-NEPA); etc.) been completed? If yes, list the environmental compliance documentation that has been completed and provide copies of the documentation as appropriate.

No.

2. Would the proposed activity or environmental impacts of the activity be subject to public controversy? If yes, describe the potential controversy.

No.

3. Would the proposed activity have potential environmental impacts that are highly uncertain or involve unique or unknown risks? If yes, describe the impacts that are uncertain or involve unique or unknown risks.

No.

4. Is the proposed activity related to other activities (both NOAA and non-NOAA that together may cumulatively adversely impact the environment? For example, the proposed activity is one of a series of projects that together may cause a change in the pattern of pollutant discharge, traffic generation, economic change, flood plain change, or land use. If yes, briefly describe the other activities and discuss how the related projects would have cumulative impacts on the environment.

No.

5. Would the proposed activity involve a non-native species? If yes, describe how the non-native species in involved.

No.

6. Would the proposed activity occur within a unique geographic area of notable recreational, ecological, scientific, cultural, historical, scenic or aesthetic importance. If yes, describe the area, including the name or designation if known.

No.

7. Would the proposed activity affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources? If yes, describe the impact.

No.

8. Would the proposed activity affect public health or safety? The effects may be adverse or beneficial and temporary, long-term, or permanent. If yes, describe the effects and the circumstances that would cause these impacts.

No.

9. Would the proposed activity affect directly or indirectly, in an adverse or beneficial manner, any listed endangered, threatened, or otherwise protected species or their critical habitat under federal and state laws including the Endangered Species Act and the Marine Mammal Protection Act? If yes, name the species and/or habitat that will be impacted and describe the circumstances that would impact the species and/or habitat.

Yes. During trawling activity, threatened or endangered sea turtles or other species may be encountered, however, contracted Foundation observers are considered NMFS-designated agents and may aid and collect data from sea turtles. Observers have received sea turtle handling and data recording training prior to deployment. Whenever possible, live sea turtles will be returned to their aquatic environment as soon as possible.

ROUTING

EXEC. DIR.
PROGRAM DIR.
PROGRAM SPEC.
GRANT SPEC.
ADMIN. ASST
FILE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southeast Regional Office
263 13th Avenue South
St. Petersburg, FL 33701-5505
727.824.5312, FAX 824.5309
http://sero.nmfs.noaa.gov

OCT 22 2009

F/SER31:MCB

Ms. Judy L. Jamison
Gulf and South Atlantic Fisheries Foundation, Inc.
5401 West Kennedy Blvd Suite 740
Tampa, FL 33609

RECEIVED
10/27/2009

Dear Ms. Jamison:

This letter addresses Gulf and South Atlantic Fisheries Foundation's (GSAFF) projects that may involve observation of incidental capture of threatened and endangered sea turtle species and specifically outlines allowable data collection activities and handling of these species. Currently, GSAFF has two projects where GSAFF personnel may observe incidental captures in the course of the associated commercial fishing activities. These are *Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery* and *Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery*; we understand that the project *A Continuation of Catch Characterization and Discards Within the Snapper Grouper Vertical Hook-and-Line Fishery of the South Atlantic United States* has concluded onboard work and, therefore, its ongoing work will not be potentially interacting with sea turtles. While conducting work related to these National Marine Fisheries Service (NMFS) research grants, GSAFF personnel are considered NMFS-designated agents.

In regard to work related to the NMFS research grants *Development and Assessment of Bycatch Reduction Devices within the Southeastern Shrimp Trawl Fishery* and *Continuation of a Project to Augment the Data Collection of an Electronic Logbook System Used Within the Gulf of Mexico Shrimp Fishery*, and as outlined in the regulations for endangered and threatened sea turtles at 50 CFR 222.310 and 50 CFR 223.206, an agent may aid and collect data from endangered or threatened sea turtles. These regulations have been previously provided to your staff. Live turtles must be handled, and resuscitation measures must be implemented, according to the enclosed procedures. Whenever possible, live sea turtles shall be returned to their aquatic environment as soon as possible. The regulations specify reporting requirements and the allowable data collection activities for live, incidentally captured turtles. All GSAFF observer personnel have received sea turtle handling and data recording training from the NMFS Southeast Fisheries Science Center (SEFSC). With the exception of skin biopsy sampling, which is not authorized through these regulations and should not be undertaken without a separate permit, following the SEFSC protocols for turtle handling and subsequent turtle data reporting will ensure compliance with the applicable requirements.

If you have any questions regarding this matter, please contact Michael Barnette, fishery biologist, at the number listed above, or by e-mail at michael.barnette@noaa.gov.

Sincerely,

James E. Weaver

for Roy E. Crabtree, Ph.D.
Regional Administrator

Enclosure