Project Title:

Cooperative Lionfish Containment Device Testing Program in the Southeast United States

Applicants Name:

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Proposed Budget period:

September 1, 2015 – August 31, 2016

Project Objectives:

Through a multi-phase science and industry based collaborative research program in the Gulf of Mexico, Florida Keys, and South Atlantic regions:

1. Develop and field test lionfish containment device (LCDs) designs for lionfish capture/harvest;
2. Develop a protocol for utilizing LCDs to slow lionfish invasion in the southeast;
3. Assess the geographical distribution and relative population densities of invasive lionfish;
4. Identify lionfish spawning aggregations;
5. Establish a pilot lionfish tagging program; and
6. Provide comprehensive education, outreach, and awareness on the lionfish issue.

Identification of the Problem:

Invasive species, defined as being non-native to an ecosystem and likely to cause economic or environmental harm, have increased in abundance and range over the last century. Introduced non-native species, whether intentional or unintentional, are capable of causing significant negative ecological and economic impacts through competition with native species, habitat alteration, and reduction in biodiversity (Mack et al., 2000; Olden et al., 2004). The frequency of bio-invasions has increased significantly over the last century, primarily due to the high interconnectivity of a blossoming global economy. Marine and fresh water bio-invasions are well-documented and nearly impossible to eradicate once established. According to the U.S. Geological Survey (USGS), 68 marine introductions have occurred in Florida, the Caribbean,

and the Gulf of Mexico from 1887 to 2009 (2009). Indo-Pacific lionfish are a prime example of an invasive species that has gained a foothold in the southeast.

Two species of lionfish, *Pterois miles* and *P. volitans*, were introduced into the Atlantic Ocean. These fish are native to the Indian Ocean, Western and Central Pacific Ocean, and Western Australia (Schultz, 1986). Lionfish are capable of becoming sexually mature within their first year of life and will spawn throughout the year, producing upwards of two million eggs annually (Morris, 2009). Larval dispersal is facilitated through oceanic currents and is likely responsible for the rapid range expansion lionfish have demonstrated over the last 15 years (Hare and Whitfield, 2003). Adult lionfish feed on nearly all small reef fish. These prey fishes are also important diet constituents for economically important species such snappers and groupers (Morris and Akins, 2009). Juvenile lionfish have been found in the stomach contents of several groupers, however, scientists are unsure if predation on lionfish is common (Malijkovic et al., 2008).

The range expansion of lionfish is adding stress to already highly stressed coral reef ecosystems. The most probable and dramatic impacts include reduction of forage fish biomass and competition with native reef fish (Albins and Hixon, 2008). Commercially important native reef fish species typically display localized movement patterns, thus making reef fish especially prone to localized fishing pressures (Claro and Lindeman, 2003). Competition with lionfish will reduce the resiliency and slow the recovery of reef fish populations in the southeast.

Socio-economic impacts of the lionfish invasion are currently not well quantified. However, potential impacts to the commercial and recreational fisheries and eco-tourism industries of the southeast could be severe (Table 1).

Table 1. Description of potential economic impacts of lionfish (Morris and Whitfield, 2009).

Potential Economic Impact	**Impact Type**	**Pos. or Neg.**
Reduction in landings of economically important species	Fishery	-
New fishery species	Fishery	+/-
Increase/decrease in dive/snorkel tourism	Tourism	+/-
Incidence of marine envenomations	Tourism; recreation	-
Decrease in aquarium sales of lionfish	Aquarium industry	-

At the first Florida Fish and Wildlife Conservation Commission (FWC) Lionfish Summit held October 2013 in Cocoa Beach, Fla., top marine scientists, researchers, extension agents, divers, anglers, community leaders, NGOs and state government officials were in attendance. Surprisingly only a small handful of newspaper and TV stations were present at this well organized and informative conference. There were more questions than answers regarding control methods, all asking for one main thing -- more research to “stem the tide” of the invasion. On the final day of the summit, participants chose their preferred priorities for lionfish control strategies. Among the top vote-getters requested was a research study for a directed commercial species-specific trap fishery to be implemented.

The Gulf and South Atlantic Fisheries Foundation, Inc (Foundation) is submitting this proposal for funding to establish an important program in order to meet the need for increased data and development of methodology for monitoring and removing lionfish in the southeast.

Project Impacts/Results or Benefits Expected:

The primary goal of this project is to test the effectiveness of lionfish containment devices to capture and remove lionfish in the southeast region. Additionally, long-term, systematic monitoring of lionfish densities is necessary to gather vital life history information and determine the effectiveness of control programs (Morris, 2012). Improved monitoring will provide the information needed to inform management as the lionfish range increases. Unfortunately, current lionfish monitoring is seriously lacking. This project has the potential to develop a long-term removal and monitoring program with cooperation from industry, regional management agencies, and state fisheries research organizations.

Utilizing industry vessels will allow for collection over a greater spatial range while being cost effective (biggest bang for the buck). Ideally, collaborative monitoring efforts will be discussed and a plan will be designed for continuation and possible expansion of efforts into additional areas (i.e. artificial reefs off Alabama). This project will provide immediate information for managers while providing the methodology and template for a long-term survey program for the future.

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 fishing industry of the southeastern United States. The funding of this project will allow the Foundation to directly assist the commercial reef fish industry through (1) direct participation of the industry in data collection for lionfish assessments, (2) direct participation of industry in solving a problem that negatively impacts their economic welfare while being good stewards of the reef fish resource, and (3) dissemination of project results to increase project awareness and illuminate the need for increased education and outreach on the issue. The Foundation has previously worked with the southeast reef fish industry and will build on these relationships during the course of this project (Award #s NA06NMF4540059, NA08NMF4540399, NA10NMF4540102)(GSAFF, 2008; 2010; 2013).

Need for Support:

This project will address several research priorities set forth during the 2010 Cancun Lionfish Workshop including: a) conduct applied research on lionfish bycatch; b) conduct applied research to target lionfish effectively in deep water, generally defined as 65–300 feet based on geographical location; c) determine the effectiveness of removals; and d) conduct spatial monitoring of lionfish. Additionally, this project will address research and management priorities outlined by stakeholders during the 2013 FFWCC Lionfish Summit including: a) continue research on development and application of lionfish specific traps (highest priority); b) determine the effort needed to maintain control on managed sites; c) determine how non-governmental organizations can contribute to lionfish data collection; and d) improve education and outreach

activities. 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 assistance to conduct this study.

While spearing and netting lionfish are active removal techniques, trapping provides a passive method. In areas with trap fisheries, lionfish bycatch frequently occurs, especially at deeper depths up to 300 feet. To date, no successful "lionfish only" containment devices have been developed. Future gear development efforts could result in more effective designs, baiting types, and deployment schemes. (Morris, 2012)

Statement of Work:

Planning Meeting

A planning meeting will be held at the beginning of the project, prior to initiation of sampling, to introduce all parties, review the research protocol, and resolve any questions prior to sampling. The Foundation staff will coordinate and plan the meeting with cooperators, and the Foundation Program Director will facilitate the planning meeting. The meeting will be held in a TBD location, most likely in the Florida Keys.

Geographical Location

As of April 2015, lionfish have been captured/sighted from South Padre Island, Texas throughout the Gulf coast, Florida Keys, and north to waters of Rhode Island. The expansion into the Gulf of Mexico has occurred most recently, since 2010. Reef sites from four geographical locations will be sampled: Gulf of Mexico (off Tampa, FL), Florida Keys, and South Atlantic (Ponce Inlet, FL and Murrells Inlet, SC). If the program proves successful, sampling will expand to reefs off Alabama and Texas.

Lionfish Containment Device Designs

Five LCD designs will be selected for testing (specifications included in Appendix A). All LCD designs will have biodegradable trap panels and modified funnels not to exceed 4 inches x 7 inches. These designs will include:

- Chevron – Standard NOAA/NMFS research design with modified throat(s) measuring 4 inches x 7 inches
- Standard, wood spiny lobster trap approved by NOAA and FWC with plastic funnel measuring 7 inches x 5 inches on the inside dimension
- Wire basket spiny lobster trap approved by NOAA and FWC with plastic funnel measuring 7 inches x 5 inches on the inside dimension
- Rectangular wire trap with modified throat(s) measuring 4 inches x 7 inches
- Sea Bass Pot – Standard NOAA/NMFS approved pot/trap with modified throat(s) measuring 4 inches x 7 inches

Initially, 20 of each design will be constructed for each (4) sampling region for a total of 400. An additional 100 LCDs will be built to account for sampling loss.

Vessel Selection and Compensation

The Foundation's Industry Cooperators will actively solicit the cooperation of fishing vessels and captains willing to participate in this project, with preference given to vessels that are familiar with the harvesting of reef fish, specifically lionfish.

In the Gulf of Mexico this research will be conducted aboard a commercial fishing vessel stationed out of Madeira Beach, FL. The vessel will be provided by Industry Cooperator Robert Spaeth, through Madeira Marine Services. Mr. Spaeth has utilized his fishing vessels for other cooperative research with NOAA Fisheries and the Foundation.

In the Florida Keys this research will be conducted by Gary Nichols, Nichols Seafood Suppliers, Inc., Conch Key, FL in the Middle and Upper Keys regions. Capt. Nichols was one of the first commercial trap fishermen to experience significant numbers of lionfish as bycatch in his spiny lobster gear especially in deeper waters (120–300 feet) off the Florida Keys. Capt. Nichols has engaged in cooperative research with interns from numerous agencies and learning institutions accompanying him on commercial trap retrieval trips for data gathering.

In the South Atlantic northeast Florida region this research will be conducted by Jimmy Hull. Capt. Hull, born and raised in Ormond Beach, FL has been engaged in the commercial fishing business all of his life. In addition to fishing, the family owns and operates Hull's Seafood, a retail fish market and eatery, also located in Ormond Beach. Capt. Hull is the current president of the Southeastern Fisheries Association, one of the oldest industry associations in the nation. Capt. Hull also serves on the South Atlantic Fishery Management Council's (SAFMC) Snapper-Grouper Advisory Committee.

In the South Atlantic Carolina region this research will be conducted by Wayne Mershon and Tom Swatzel. Mr. Mershon is President of the Council for Sustainable Fishing. He also owns and operates Kenyon Seafood in Murrells Inlet, SC, a seafood dealer that manages 8 to 10 commercial snapper-grouper fishing vessels. Mr. Mershon also serves on the SAFMC Snapper-Grouper Advisory Committee. For 15 years, he was the owner/operator of a number of commercial snapper-grouper vessels that were based in South Carolina.

Tom Swatzel is the Executive Director of the Council for Sustainable Fishing. He served for six years on the South Atlantic Fishery Management Council as a South Carolina representative. Mr. Swatzel has also served on the SAFMC Snapper-Grouper Advisory Panel, Winyah Bay-North Inlet National Estuarine Research Reserve Advisory Board, NOAA Marine Recreational Fisheries Statistics Survey--For-Hire Constituent Review Panel, Atlantic Coast Cooperative (Fisheries) Statistics Program, For-Hire Subcommittee, and as an area representative for the National Party Boat Owners Alliance. He was elected to the Georgetown County (SC) Council and served two terms. A native of Hickory, North Carolina, Mr. Swatzel received a degree in marine biology from the University Of North Carolina at Wilmington. He worked at Capt.

Dick's Marina in Murrells Inlet, SC for 34 years, serving in a variety of capacities: deckhand, fish cleaner, headboat captain, biologist, and eventually chief executive officer. Mr. Swatzel lives in Murrells Inlet, SC.

Additional data gathering and coordinating activity will be completed by Bill Kelly, Executive Director of the Florida Keys Commercial Fishermen's Association. Mr. Kelly serves on a number of advisory panels to both the Gulf of Mexico Fishery Management Council and SAFMC including spiny lobster, coastal migratory pelagics and habitat and ecosystem protection. Mr. Kelly has been actively involved in fisheries management for both the charter/for-hire and commercial fishing sectors for over 20 years.

Cooperating fishing vessels will be compensated $3500 for each day. Additionally, vessel liability insurance will be secured and funded by the Foundation to protect the vessel in the event of a catastrophic incident resulting in injury to an observer.

Fishery Observers

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 and includes (but is not limited to): overview of the data collection protocols, review and identification of all fauna harvested during hook-and-line fishing, proper handling of sea turtles, 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 NOAA Fisheries facility. In addition, all observers will undergo marine safety training that outlines procedures on how to respond properly and promptly to a variety of situations that could be encountered during fishing operations (e.g., man overboard drills, firefighting, radio communication, etc.). Each observer 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 NOAA Fisheries. Observers will be responsible for collecting and verifying all data collected during fishing operations and following all NOAA Fisheries Observer Guidelines.

Permits

Fishery Observers will have all required scientific collecting permits and Letters of Authorization (LOAs). The Foundation will apply for an Exempted Fishing Permit (EFP) to ensure the legality of deploying lionfish containment devices in federal waters. Industry Cooperators have already had discussions with NOAA Fisheries and the Florida Fish and Wildlife Commission representatives to expedite the permit application process.

Video Assessment

Video assessment of lionfish densities and abundance will be conducted via GoPro cameras attached to some LCDs.

LCD Data Collection

Sampling methodologies are borrowed and modified from protocols already in existence (FWRI, 2013; MARMAP, 2013; NOAA Fisheries Observer Manual, 2014). One fishery observer will be deployed per cooperating vessel to collect data. Three survey regions will be sampled: 1. Florida Keys, 2. Florida Gulf coast, 3. South Carolina coast, and 4. Northeast Florida coast. The goal of the program is to sample each region at least once a month. The sampling strategy will be further discussed during the planning meeting and will be approved by the research team.

Industry partners will be contracted to fish, while their catch and effort are carefully monitored. Initial sampling sites will be decided upon at the planning meeting. The list will include areas of known lionfish abundance.

The Fisheries Observer will record gear configurations and fishing effort data (e.g., date and time of deployment and retrieval, latitude, longitude and water depth of each deployed string), and collect biological samples (e.g., species, length, tissue samples, and gonads). Each line will be given a unique collection number to which sampling and biological information can be linked to. The Fisheries Observer will lead all data and sample collection efforts, but vessel crew shall assist the observer in such efforts upon request by the observer. All scientific sampling equipment and supplies, including data sheets and tools for gonadal sampling will be provided.

Participating vessels shall rig for LCD deployment according to the following specifications, based on standard fishing operations, but will be standardized for this study (alterations to the specifications listed below can be made at the planning meeting with input from the Industry Cooperators):

a) Twenty LCDs per design per string will be deployed at a time (100 LCDs/string).

b) Bait type will be determined during initial sampling and discussed at the planning meeting and will consist of live lionfish, cowhide strips, and/or female lionfish gonads.

c) Soak time for all sets (elapsed time between initiation of deployment and initiation of retrieval) will be determined through proof of concept tests.

d) Sampling will occur during daylight hours (or determined through proof of concept tests).

Contractors shall retain a percentage of the catch under the auspices of a Scientific Research Permit obtained by the Foundation prior to initiation of sampling. Catch shall be sampled by the Fisheries Observer (with assistance by vessel crew as required), adequately iced and handled per industry standards. A percentage of the lionfish catch will be tagged and released (see tagging

section); a percentage of the lionfish catch will be kept for biological sampling/analysis; and a percentage of the catch will be utilized in the promotion of lionfish as excellent table fare throughout the nation. Revenues generated through the sale of lionfish will be deposited in a not-for-profit operating account and used to assist in capitalization of the program.

Other species incidentally caught in traps and tagged lionfish will be released back to the bottom using decompression devices (to be determined at the planning meeting based on industry experience).

Biological Sample Processing

Fish that are caught will be processed following standard processing procedures. The on-board Length-Frequency (LF) workup will consist of identifying all fish in each trap to species level and total length (TL to the nearest mm) of all individual fish of each species.

The on-board work-up will consist of removing gonadal tissues and possibly other tissues such as stomach and intestinal tract (for diets studies), and tissues for genetic studies. Gonad tissues, to investigate reproductive parameters, and other tissues will be properly labeled and stored for later processing and analysis (in the MARMAP/SEAMAP-SA laboratory).

The MARMAP/SEAMAP-SA has in principle agreed to assist with processing the stomach and reproductive samples in the MARMAP/SEAMAP-SA Reef Fish Laboratory in Charleston, SC. This agreement depends on the number of fish that are expected to be collected. Analysis methods will vary depending on the information needed, but may include linear and non-linear regression analysis, and other methods. For Florida Keys based sampling, Mr. John Hunt at FWRI Marathon, is willing to provide an observer to collect data under a sub-award or similar instrument to cover observer costs.

After collection and fixing of the reproductive tissues at sea, the gonad samples will be processed using accepted standard histological techniques and examined to determine reproductive sex and reproductive stage (maturity, spawning, etc).

Tagging

For this project, select lionfish will be tagged. The offshore FWC Fishery Independent Monitoring datasheets will be used to document tagged fish. All released lionfish will be tagged externally with a Hallprint dart tag. Information recorded will include the coordinates of capture, water depth, total length of fish, and release condition. (FWRI, 2011)

Foundation staff will be responsible for tagging database management, responding to tag returns, and other aspects of public outreach associated with the project. Recaptured individuals will be identified by reports from recreational or commercial anglers to an existing tag return hotline. To improve reporting rates, the Foundation may offer rewards in some form for all individuals that report data for recaptured fishes. Mr. Mel Bell, SC Department of Natural Resources, has committed to assisting with the program.

Data Review, Entry and Analysis

As stated above, the Observer will be tasked with collecting all data. At the end of each fished station, the observer and vessel captain will verify the accuracy of the collected data by signature. At the conclusion of a fishing trip, the observer will thoroughly review all data sheets and verify that all data are legible and accurate. The Observer Coordinator will then debrief the observer and verify that all data sheets are legible and accurately/completely filled out. At this time, the Observer Coordinator will also inquire into any problems encountered during the trip that could have increased variance within the collected data. If any abnormal problems were encountered, the Observer Coordinator will consult with the Foundation's Program Director to discuss the experimental design and proper procedures necessary to alleviate the problem.

After the Observer Coordinator has thoroughly reviewed the data, he will make copies of the original data. He will keep all photocopies and forward the original data to the contracted Data Manager. The Data Manager will then review the data and enter it into a relational database that will be easily accessible to Foundation Contractors and NOAA Fisheries. After all data have been entered and backed-up, the data (both electronic and hard copies) will be archived at the Foundation's office in Tampa, FL where it will be available for use by interested parties.

The majority of data analyses for this project will be descriptive.

Outreach / Education / Marketing

Marine public relations specialists Johnson Communications, Inc. (JC) will be responsible for directing the education, publicity and media awareness of the extensive lionfish trap testing program, plus news of other compelling research and statistical materials on lionfish to the news media and general public. Through a wide variety of media outlets, the agency will aggressively lead the crusade in an effort to educate the public about the lionfish invasion, the need for and the step-by-step elements of the well-regulated trap testing program, and efforts to contain their spread.

Part of our plan is to not only work with the media but also to attract some of the top minds, researchers, and young marine scientists who have a passion for their work along with local community activists. JC will be a major force bringing together their voices across the states and with other countries. JC wants our message to get consumers reacting and creating a demand, asking for lionfish filets at their seafood markets, supermarkets and restaurants while becoming stewards in their own way of conservation efforts in saving other marine life from lionfish.

a. Working with outdoor writers, editors, trade publications, science journals, radio, TV, to create public awareness and marketing concepts and consumer demand for lionfish

Besides an occasional news piece, most updates and research on lionfish has been allocated to scientific trade journals and websites overlooked by the mainstream media. Leading off with announcing the trap testing program, JC will be the catalyst launching a full out assault of news to a wide expanse of the print and broadcast media. Key components will be marketing,

education and awareness to the media of the lionfish epidemic while always emphasizing in the process these fish can be a major sustainable food source to millions.

Johnson Communications will expand the public's awareness across North America and globally through numerous news media channels as story opportunities arise. Our goal is to incorporate cooperative commercial and recreational lionfish research, scientific studies, and demonstrate the responsible and highly sustainable lionfish harvesting programs through videos, photography, and an array of special events to pique the media and public's attention.

JC's long-term personal relationships with a vast number of news media is backed by a huge data bank of fishing, outdoors, environmental and science writers, plus news editors in traditional print (newspapers and magazines), wire services, broadcast media outlets, web and social media as well. After preparing for the Lionfish Summit, our team became fully absorbed in the subject generating over two dozen topics for future news releases JC knows will catch the media's attention. JC will align potential spokespersons with news release topics and opportunities. As a "lionfish watch communicator," JC will exchange information between states and countries with the steps and ultimate results of the promising trap testing. JC will share valid and innovative research, spreading the word to other communicators about the lionfish invasion and promising trap methods to control them. Through awareness JC hope to inspire much needed research by marine biologists in colleges and universities through cooperative research programs (CRP) with commercial fishermen who may help to bring a measurable control and balance by lionfish trapping.

b. Website development/postings, blogs and social networks

Johnson Communications will oversee the development of an "everything" lionfish informational and educational website. While other marine related websites, associations, governmental agencies, NGOs, etc. focus on a multitude of other subjects, lionfish will be our only focal point. Along with our news releases JC plans to develop not only a trusted authoritative website but a platform for lionfish authorities who have logical, understandable and meaningful scientific research. JC hopes to not only enlighten and educate, but to turbo-charge activities such as other viable research, marketing techniques, spring-boarding more awareness campaigns and bring a significant positive impact benefiting a broad commercialization of lionfish to dinner plates, while relieving the ecosystem of these destructive invaders.

Here are just a few highlights and subjects JC plans to include on the website:

- background history on the invasion and where they are now;
- trap designs and evaluations from researchers and commercial fisheries professionals;
- photos and videos showing concentrations and sizes of them at wide ranges of depths;
- news from state and federal governmental groups and fisheries commissions;
- latest news from commercial and recreational efforts towards control efforts;
- scientific research presented at events like the Lionfish Summit;
- what scientists say will happen to fisheries if controls are not implemented;
- how lionfish are affecting/will affect local economies, tourism, industries, etc.;
- interesting facts and figures with credits to the researchers;
- videos taken by divers, research vessels/subs crediting them and their research;

- conservation news on reef fish returning in control areas (when research is started);
- updated calendar of lionfish events around the U.S. and Caribbean;
- unofficial records of lionfish derbies and tips on how to start one;
- archived news collected around the U.S. and Caribbean;
- our latest press releases plus archived ones;
- NOAA and other maps of lionfish density since 1985;
- links to other websites;
- sponsors and research participants as time goes on;
- listings of fish markets frequently offering lionfish;
- listings of restaurants by states and cities with lionfish on the menu;
- safe and proper handling plus tips if stung;
- variety of recipes shared by chefs, restaurants already serving lionfish.

JC will incorporate within the website the photography and videos from the ROV's (remote operated underwater vehicle) and remote GoPro cameras. JC will also research stock shots and videos from other researchers willing to share their works and be credited. Editorial and promotional materials such as photos and videos will be made available to a wide range of broadcast and electronic media. Popular social media program platforms such as Facebook will be included, valuable in reaching a broader number of followers worldwide. In addition JC has talked about establishing a blog and/or a newsletter on a monthly basis with updates highlighting the trap testing productivity along with statistics, interesting new facts and more. It will also be a voice of comments and surveys from the commercial trappers and divers, and recreational divers alike as to what they are witnessing in their efforts at a variety of ocean depths and structures.

c. Marketing, Edibility, Sustainability, HACCP Standards

With the launch of the trap testing program, a major component needs to include an effective and well-funded lionfish marketing campaign, the frontline in creating demand to potentially 300 million consumers. It will be essential to "educate and involve" both industry, media and consumers by staging lionfish taste tests with appealing recipes in seafood markets, supermarkets and restaurants along with community gatherings and events such as seafood festivals, boat, fishing and outdoor shows. JC will advocate for promotional measures such as Public Service Announcements (PSAs) on TV, radio, web and print media about the invasion to fisheries, its many benefits as a food source, preparation and recipes. Many TV stations have interview segments on morning and noon programming which JC will identify for booking guests. Local seafood houses and restaurants that serve lionfish in those coverage areas will be called upon to join in helping out with on-air demonstrations.

Additional focus will be directed towards expanding efforts to regional and national food, restaurant, fishing and outdoor writers' conventions, plus TV fishing and cooking shows among many other programming opportunities which will be critical for promoting lionfish as highly sustainable and desirable "green" entrees. As the monitoring and deep water removal programs progress JC also proposes incorporating media/consumer awareness events in at least all four of the primary trap test site areas (Fla. Keys, Tampa/Gulf, central Fla. Atlantic and Carolina coasts) showing its progress and large scale effectiveness of population removal. JC will also suggest other media events to be staged in areas like Texas and Alabama where lionfish populations are

rapidly expanding and more commercial trapping and distribution of lionfish processing is beginning. JC will explore and report on differences and similarities of the lionfish in these regions (and more) such as migration, sizes, tagging findings, prey species found in stomachs, densities and depths with photography and videos.

Besides delivering the message about the latest news and research from the deepwater lionfish trap testing program, JC will also consistently feature the attributes of lionfish as:

- a highly sustainable, exceptional table-fare fish that's visibly appealing for its looks, flavor and versatility in recipes;
- nutritionally heart and brain healthy and high in the good omega 3 fats;
- freezes well with an extended shelf life;
- tastes like fresh-caught when thawed and prepared;
- by eating them it is beneficial to the environment.

Emphasis will be placed on the safety regulations of the FDA's HACCP (Hazard Analysis and Critical Control Points) regarding seafood and how the U.S. has among the highest regulated standards in the world through safety, freshness and responsible harvesting by America's commercial fishermen, distributors and seafood markets.

Our PR team will work with state fishing commissions, research scientists, extension agents, Sea Grant representatives, numerous outdoor trade associations and NGO's among others. Start-up will begin with -- and eventually go well beyond -- the lionfish coastal states, building a growing number of marketing, publicity and PR/media relations' opportunities as they arise.

Though recreational fishermen are not able to, or rarely catch lionfish in the conventional sense with hook and tackle, JC will appeal to and encourage anglers --- who are among the best conservationists --- to help save the other table-fare species they routinely eat by choosing lionfish for dinner. Signature slogans along with news release topics like: "Catch them at the dinner table," will be an integral part of the campaign.

d. Safe Cleaning and Handling Practices, Special Equipment

Because the venomous spines on lionfish can cause painful stings, there is a perception that the meat of the lionfish is poisonous. JC has learned this through direct phone conversations with scientists and teachers who conduct middle and high school classes and videos from community outreach programs in the Bahamas, Caribbean and the U.S. Students (and adults) equated the lionfish's venomous spines as adversely affecting its meat and stated in news stories and videos they would avoid eating it. Through our publicity, education and marketing awareness process, one primary goal JC will strive to overcome is this fear people may have regarding eating lionfish. This misperception will be addressed through "educate and involve" techniques.

Though JC is advocating the lionfish be bought through the seafood industry channels, our marketing efforts will include -- on the website and in many of the news releases -- videos and photos, with examples of how easy it is to safely handle, filet, clean and prepare lionfish meat before cooking or freezing. Proven tips from spearfishing professionals, on safety and special

equipment needed plus techniques to use for underwater harvesting by divers, will also be included.

Participation by Persons or Groups Other Than Applicant:

A project of this magnitude and importance requires the cooperation and active participation of many organizations and individuals. The Foundation has chosen to sole-source contract with several persons in conjunction with this project. The essential personnel needed to complete the project objects are:

Captain Bill Kelly, Industry Cooperator (Executive Director, Florida Keys Commercial Fisherman's Association)
Captain Robert Spaeth, Industry Cooperator (Madeira Marine Services)
Captain Jimmy Hull, Industry Cooperator (Hull's Seafood)
Captain Gary Nichols, Industry Cooperator (Nichols Seafood Suppliers, Inc.)
Mr. Tom Swatzel, Industry Cooperator (Executive Director, Council for Sustainable Fishing)
Mr. Wayne Mershon, Industry Cooperator (President, Council for Sustainable Fishing)
Mr. Daniel Parshley, Observer Coordinator
Fishery Observers (TBA)
Dr. Marcel Reichert, SC-DNR, Charleston SC, and staff associated with the MARMAP/SEAMAP-SA Reef Fish Program
Mr. John Hunt, FWRI, Marathon, Florida
Ms. Alison Johnson, Data Analyst
Mr. Pete Johnson, Johnson Communications, Inc.

Many of 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.

The Industry Cooperators will work with the Program Director to ensure program activities are conducted smoothly. All data will be gathered through the cooperation and direct participation of the commercial fishing industry of the southeast 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 and management process. 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 Observer Coordinator will recruit and train all observers and will assist in coordination of field sampling efforts. Prior to the deployment of a fishery observer, the Observer 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 rigorous NMFS certification training will be contracted by the Foundation. This training will include safety training, sea turtle handling 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 Observers to collect and proof all collected data for completeness and accuracy before being debriefed by the Foundation Observer Coordinator. The Foundation currently has a contracted observer working on complementary projects. Because this individual possesses the skills needed to fulfill the position and has proved himself under field conditions, one of the contracted observer positions will be offered to this individual.

Dr. Marcel Reichert is a Senior Scientist at the Marine Resources Research Institute, SC Dept. Natural Resources. He is primarily in charge of the MARMAP program and his input and participation on this project will ensure the data is collected properly for current and future use. Additionally, he will be responsible for managing the biological sample processing and analysis.

The Foundation, Florida Keys Commercial Fishermen's Association, Southern Offshore Fishing Association, and the Council for Sustainable Fishing have all participated in cooperative research programs with state/federal agencies in their respective areas.

Ms. Alison Johnson, Data Analyst, is a Biological Scientist that has worked with the Florida Fish and Wildlife Commission since 2009 specializing in resource management and sustainable fisheries in the Florida Keys.

Formed in 1983, Johnson Communications is a respected and responsive marine media relations / marketing agency in Scottsdale, AZ. Its principal, Pete Johnson and his team have represented non-profits including The Billfish Foundation and the IGFA along with such popular name brands as Rolex, Sea Ray, Chris Craft, Yamaha Outboards and Mercury Marine. The publicity/media relations agency has for nearly 25 years, brought international attention and growth to the Redbone Celebrity Fishing Tournaments for CF awareness and research. As Mercury's PR counsel for more than 13 years, Johnson Comm obtained several million dollars worth of publicity enhancing Mercury's brand name globally. A broadcast / journalism graduate of the University of Florida, Pete was a TV sportscaster for Tampa's CBS News affiliate WTVT-TV Ch. 13 and prior as a newsman for UPI, the *Miami Herald* and *St. Petersburg Times*. A lifelong angler Johnson also works with the scientific community on another rapidly multiplying, stinging, invasive species across 16 states; the eradication of the red imported fire ant.

Project Personnel and Management:

Principal Investigators:

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

Foundation Staff:

Ms. Gwen Hughes, Program Manager
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. (Foundation) through its office in Tampa, FL. A project of this magnitude is time consuming and requires the direct and constant attention of each Foundation employee. Qualifications of the Principal Investigators are highlighted in the attached resumes.

Monitoring of Project Performance:

For internally conducted studies, Principal Investigators (PIs) will regularly communicate with Observer and Foundation Observer and Regional Coordinators concerning fieldwork. PIs also review data for completeness and accuracy. The Program Director will monitor the data management procedure to ensure that all data entry and analyses meet objectives outlined within the proposal. Additionally, the quality of 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 Board of Trustees (attachment), 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.

Data Sharing / Dissemination of Results:

Data from this project will be made available in a variety of formal and informal ways. Since our team includes members from the fishing industry, SC DNR, and NOAA Fisheries, they will have direct access to our results, which can be disseminated through existing and appropriate channels. In addition, annual reports will be made available on the Gulf and South Atlantic Fisheries Foundation Website. Data will be made available to the Gulf of Mexico Fishery Management Council and South Atlantic Fishery Management Council, for use in the planning and management of lionfish. Additionally, project updates and accumulated data will be posted on a public website currently under development (www.TheLionfishFoundation.com).

Information and results of this project will be disseminated through public presentations convened in conjunction with South Atlantic Fishery Management Council and Gulf of Mexico Fishery Management Council meetings (to be announced at a later date). Additional presentations may be given to other management bodies. By coordinating the public presentations in conjunction with the Council meetings, we will maximize participation by commercial fishermen, fishery managers, and the concerned public. These public presentations will highlight the data collection methods for the project and the results derived from the analyses.

Industry Cooperators will be provided with regular updates and a copy of the Foundation's final project report. Summary reports of the project's findings will also 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 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. Copies of the final report will be made available for download from the Foundation's website.

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Milestone Table:

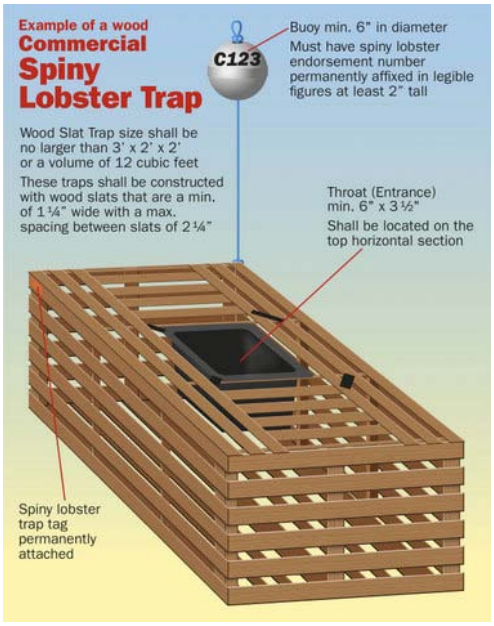
Project Activities	2015				2016										
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Project Start-up Activities / Contract Negotiations	**xx**	**xx**													
Project Coordination / Monitoring	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**
Observer Training	**xx**	**xx**	**xx**												
Planning Meeting	**xx**														
LCD Deployment and Data Collection		**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**			
Biological Sample Workup			**xx**		**xx**		**xx**		**xx**		**xx**				
Descriptive Data Analysis											**xx**	**xx**			
SAFMC Presentation													**xx**		
GOMFMC Presentation														**xx**	
PR		**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**	**xx**			
Project Closeout & Final Report Preparation													**xx**	**xx**	**xx**

Appendix A: Lionfish Containment Device Schematics

LIONFISH CONTAINMENT DEVICE TESTING PROGRAM
FIVE (5) LCD DESIGNS

- All designs to include a biodegradable panel as required by state/federal regulations.
- All designs to include a modified funnel not greater than 7" in length or diameter to minimize by-catch.
- Includes ballast devices to hold bottom, rope and buoys.
- Cost per unit $100.00 including transfer to testing locations.

1. Standard, wood, spiny lobster trap design approved by NOAA and FFWCC for use in state and federal waters.

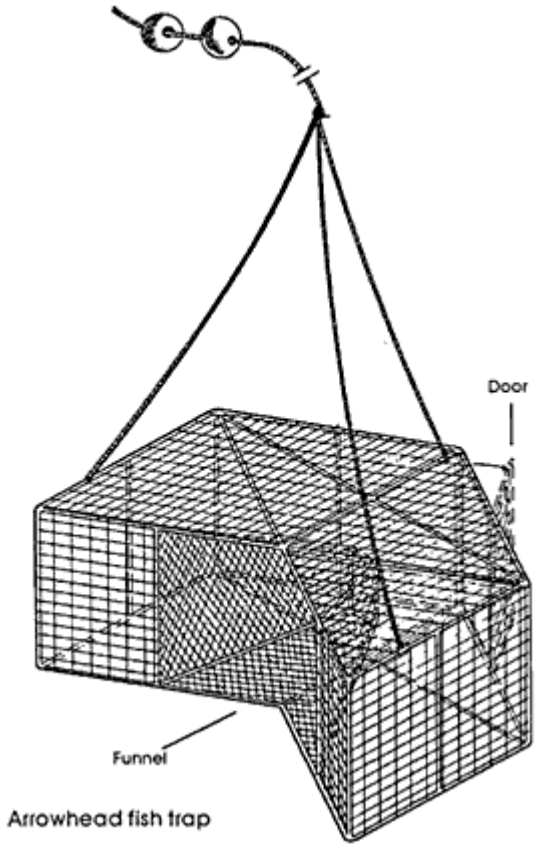


(a) *Construction specifications.* In the EEZ, a spiny lobster trap may be no larger in dimension than 3 feet by 2 feet by 2 feet (91.4 cm by 61.0 cm by 61.0 cm), or the volume equivalent. A trap constructed of material other than wood must have a panel constructed of wood, cotton, or other material that will degrade at the same rate as a wooden trap. Such panel must be located in the upper half of the sides or on top of the trap, so that, when removed, there will be an opening in the trap no smaller than the diameter found at the throat or entrance of the trap.

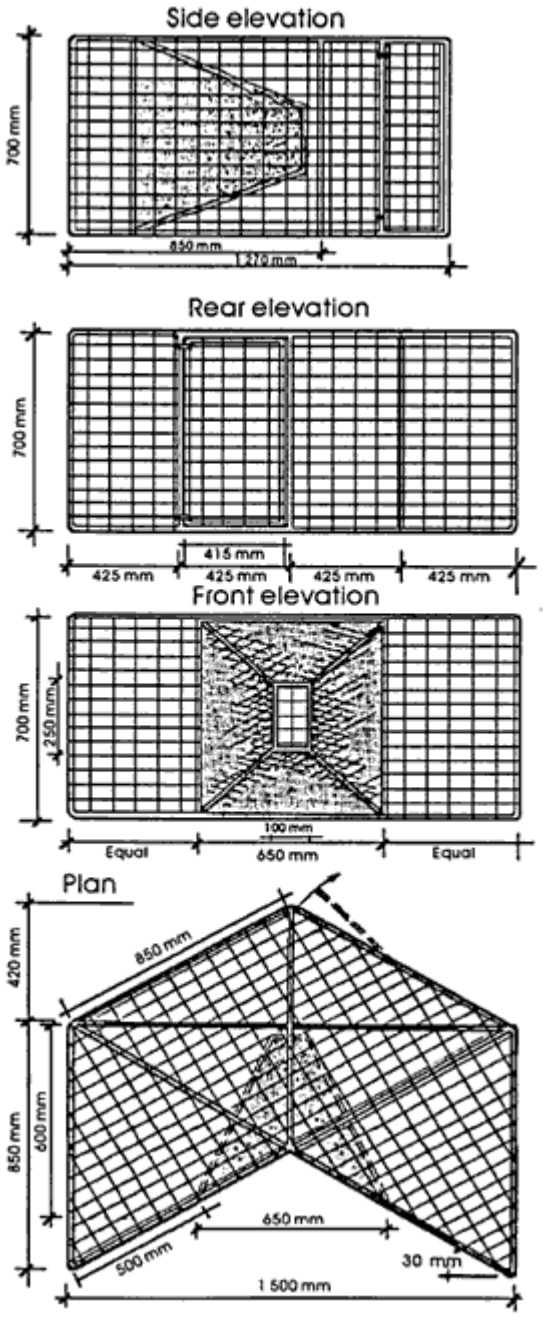
2. Wire basket, composite, spiny lobster trap of wood and plastic coated wire. (Federally permitted)

Wire Basket Spiny Lobster Trap - Dimensions
Length: 31"
Width: 24"
Height: 19"
Wire Mesh Size: 1.5" x 1.5"
Funnel: 7" x 4"

3. Arrowhead or Chevron trap utilized by NOAA in fisheries research and Caribbean Trap Fishery (Specifications and design from Food and Agricultural Organization of the United Nations)



Arrowhead fish trap



Making finfish traps. If you want to construct a "Z" trap, the materials that you need are:

- a 50 x 1.2 m roll of galvanized hexagonal-weave wire mesh;
- 24 hardwood sticks or poles about 2.0 m long;
- 1 kg of 3 cm nails;
- tools: hammer, saw, wire-cutting pliers and machete or hatchet.

With these materials you can make four pots 270 cm long, five pots 240 cm long or six pots 210 cm long.

The essential stages in making a typical 240 x 120 cm Antillean trap are:

1. Cut the roll of wire into 240 cm lengths.

2. Cut the overall "Z" shape into the wire. Each "Z"-shaped pattern will be the top or bottom of a pot (Figure 22).

3. Cut two lengths that are the height of the pot to be constructed; 120 cm in this case (Figure 22). These are the sides of the pot.

4. Set the sides on the ground and attach the top and bottom, forming a pot without a funnel or wooden supports.

5. Cut the two funnels, using 150 cm lengths of wire for each.

6. Double over the funnel material to make the two "horse-neck" or down-curving funnels; burr the edges.

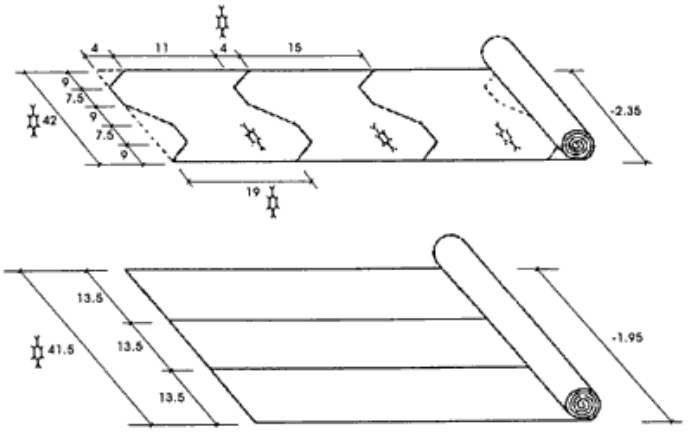
7. Fit the funnels into the opening cut in each corner of the pot and form the downward curve of the "horse-neck" by hand.

8. Fit a 30 cm "V"-shaped or square door in a corner of the pot.

9. Fit the pot sticks and wire them tightly into place to make up the framework in the previously formed pot. Leave a 10 cm overhang at the lower ends of the vertical sticks to hold the pot off the bottom.

10. Fit three long "key" sticks to the whole length of the top and bottom of the pot. The "top-back" and "bottom-back" sticks are important, as they are used as attachments for the buoy ropes.

Diagram for cutting rolls of mesh for a typical Caribbean "Z" pot



4. Rectangular wire, dual funnel trap.

Height: 10.5”

Width: 18”

Length: 24”

Galvanized wire mesh, biodegradable panel and concrete ballast to be added.

Dual funnel: One at each end of trap not to exceed 7” in length x 4” width

5. South Atlantic Commercial Sea Bass Trap (As defined in CFR 622.189)

- External Dimensions: 24”x24”x24”
- Composition: 2” Square Wire Mesh
- Biodegradable Panel Attached with Jute
- Entrances: 2 each measuring 7”H x 4”W