Implementation of the iSnapper smartphone application to collect data across all recreational sectors in the Gulf of Mexico

FY 2014 Proposal

Greg Stunz, Tara Topping
Created: 05/13/2015

1. Overview

1.1. Sponsor

Mark Fisher – Science Director for the Coastal Fisheries Division, TPWD

1.2. Focus Group

Survey Design and Evaluation

1.3. Background

The status of the world's fisheries is a primary concern of resource managers as one-third is overfished and 50% is fully exploited (Pauly et al., 1998; Pauly et al., 2003). Overfishing has been a principle contributor to their decline (Jackson et al., 2001), and rebuilding severely depleted stocks continues to be hindered by large informational data gaps. One such major hindrance has been fisheries-dependent data collection for the recreational sector (Walters and Martell, 2004). Moreover, federal and state mandates ensure that fisheries management decisions are based on the best available data and resources (United States Congress, 2006). Resulting management actions derived from these data are only as good as the data collected, meaning that subsequent actions may not always have the desired results (e.g., fishermen report historic high numbers of fish, management reports that they may be much lower). This can result in stakeholders and management groups reporting very different viewpoints concerning the status of the fishery. These real or perceived discrepancies can lead to large, and often well-publicized, conflicts between user groups and management agencies. The most effective way to manage fisheries is by increasing the amount of high-quality and accurate data collected from user groups to most accurately represent trends in the fishery (Claroa et al., 2009). Currently, fisheries scientists determine an Acceptable Biological Catch (ABC) which in the case of Red Snapper is then distributed between the commercial and recreational sectors. However, with the large number of participants in each group, accurate data can be difficult to gather. Compared to the recreational sector, commercial fisheries data is relatively easier to generate because there are less participants and fish must move through "wholesalers" that provide a checkpoint for data collection and validation. In the much more diverse recreational fisheries, data are more difficult to accurately obtain because fishermen are the final consumer, leave and return to a variety of ports, and with the exception of headboats, there are no reporting requirements (National Research Council, 2006). Improving harvest estimates in the recreational fisheries is also important because at times recreational harvest has the potential to be greater than the commercial harvest, increasing the need for more accurate reporting (Coleman et al., 2004; de Mutsert et al., 2008). Clearly, there is much need to improve and expand the data collection system to estimate the recreational component for many fisheries, and electronic logbooks hold promise as an effective collection tool. The Gulf of Mexico reef fish fishery provides an ideal testing ground for electronic logbooks. Most for-hire vessels and private recreational anglers target many species of reef fish with Red Snapper being a primary target. Red Snapper is the most economically important reef fish in the Gulf of Mexico, and while it is no longer undergoing overfishing it is still classified as overfished (SEDAR, 2009). Further, the Red Snapper recreational fishing season has increasingly declined from 330 days to 49 days from 1997-2013 (SEDAR, 2013). Shorter seasons have created "derby" style fishing and made it increasingly difficult to produce conventional and timely estimates from traditional creel surveys and other survey methodologies. Moreover, much of the MRIP survey is conducted after the season ends, thus real-time catch data are not available to employ in-season adaptive management strategies to maintain the 51/49% split between commercial and recreational fisheries, respectively (Walters and Martell, 2004). In addition, several other fisheries that are targeted by for-hire and private recreational anglers have shown declining populations and are under strict management guidelines, with little data available for these species. A program that has the ability to rapidly and more accurately estimate the total number of fish harvested would help to reduce uncertainty toward maintaining catches below the federally mandated benchmarks. Finally, given the problem of identifying exactly how many private anglers are targeting reef fish species, a major advantage of iSnapper is it will begin the initial steps towards defining the "universe of Red Snapper anglers." These data will be essential for future panel selection, surveys, and simply gaining better information on exactly how many anglers are participating in this fishery (i.e. estimate of participants, similar to the waterfowl Harvest Information Program).

1.4. Project Description

A major challenge to fisheries management is the ability to collect timely catch data from the private fishing sector; yet, these data remain essential to the management process. The lack of timely and robust data from recreational anglers (i.e., private anglers, headboats, and for-hire charters) creates issues and controversy in the decision making process as managers seek to optimize fisheries harvest. While the Marine Recreational Information Program (MRIP) has clearly made significant improvements to the recreational data reporting process, there is still need for rapid in-season and near real-time data collection including the possibility of new management strategies (e.g., regional management of Gulf Red Snapper). Thus, this proposal is timely in that it represents a unique opportunity to expand and supplement the MRIP data collection process. Based on our success and overwhelmingly popular pilot studies, we specifically propose an application-based smartphone technology that will work in combination with current MRIP data collection protocols to provide a supplementary means of rapid in-season (and out of season) data collection that would otherwise be impossible. Moreover, in addition to catch statistics, these "modern" electronic logbook reporting mechanisms will generate information for parameters that are typically difficult to collect (e.g., fish discard rates, depths fished, better effort estimates, and socioeconomic parameters) to optimize a fisheries full potential from both a harvest and economic perspective. In 2011 and 2012, the Harte Research Institute for Gulf of Mexico Studies (HRI) successfully evaluated the use of an iPhone/iPad application ("app"), "iSnapper," to report catch data in the for-hire (charter) sector. This pilot

was a tremendous success with major buy-in and continuing support from participants. Many of these participants are now asking for regulation/accounting for catch for their section and iSnapper is frequently named as the preferred data collection tool. While certainly the field of electronically collected and self-reported data faces implementation challenges, the previous accomplishments of our research has clearly shown that this app has the potential to generate real-time, validated, and usable data for fisheries managers. Building on these achievements, the overall goal of this proposal is to use the electronic data collection tool iSnapper to supplement MRIP data collection by improving the timeliness and filling key data gaps in the recreational fishery. Our key objectives are summarized below, delineated in Figure 1 (see full original proposal in supporting documents), and detailed in the methodology section. Briefly, iSnapper will be implemented across the recreational fishing sector for anglers targeting Gulf of Mexico Red Snapper (Lutjanus campechanus; from here on Red Snapper) and other key species. The key component of this proposal will be providing two data collection methods for private recreational anglers by: (1) developing a statistically valid panel of randomly selected anglers; and (2) allowing open access to iSnapper to any licensed private angler across the northern Gulf that would like to voluntarily report their catch. The defined panels will be selected for each major port in Texas first as a pilot approach. Having these two groups will be essential for developing a comparative approach to “panel” vs. “self-reported data.” Certainly, it will be necessary that data collected be carefully validated, as well as weighted and assessed for angler avidity and other systematic biases. These validation activities are detailed in the methodology sections. Briefly, we will partner with the Texas Parks and Wildlife Department’s (TPWD) creel survey program as well as carry out directed creels surveys for participants to assess the accuracy of the data collection. While not the focus of this proposal/funding, we will continue to make iSnapper available for ongoing charter for-hire data collection if requested at no-cost to this project.

1.5. Public Description

1.6. Objectives

Objective 1: Develop and implement iSnapper as a data collection app (for Apple, Android and Windows platforms including a web portal) for private recreational anglers in the Gulf of Mexico.Objective 2: Compare iSnapper data from statistically selected panels of private anglers to TPWD creel survey data to validate the applicability of electronic data collection.Objective 3: Collect and assess socioeconomic data from reef fish fishery participants using iSnapper.Objective 4: Provide iSnapper as a data collection tool for NOAA-approved Exempted Fishing Permit programs targeting Red Snapper in the Gulf of Mexico.

1.7. References

Claroa, R., Mitchesonb, Y.S.D., Lindemanc, K.C., García-Cagidea, A.R., 2009. Historical analysis of Cuban commercial fishing effort and the effects of management interventions on important reef fishes from 1960–2005. Canadian Journal of Fisheries and Aquatic Sciences 99, 7-16. Coleman, F.C., Figueira, W.F., Ueland, J.S., Crowder, L.B., 2004. The impact of United States recreational fisheries on marine fish populations. Science 305, 158-160. de Mutsert, K., Cowan, J.H., Essington, T.E., Hilborn, R., 2008. Reanalysis of Gulf of Mexico fisheries data: Landings can be misleading in assessments of fisheries and fisheries ecosystems. Proceedings of the National Academy of Sciences of the United States 105, 2740-2744. Jackson, J.B.C., Kirby, M.X., Berger, W.H., Bjorndal, K.A., Botsford, L.W., Bourque, B.J., Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., Hughes, T.P., Kidwell, S., Lange, C.B., Warner, R.R., et al., 2001. Historical overfishing and the recent collapse of coastal ecosystems. Science (Washington) 293, 629-638. National Research Council, 2006. Review of Recreational Fisheries Survey Methods. National Academies Press, Washington, D.C., 203 pp. Pauly, D., Christensen, V., Dalsgaard, J., Froese, R., Torres, F., Jr., 1998. Fishing down marine food webs. Science 279, 860-863. Pauly, D., Alder, J., Bennett, E., Christensen, V., Tyedmers, P., Watson, R., 2003. The future for fisheries. Science 302, 1359-1361. SEDAR, 2009. Stock assessment of Red Snapper in the Gulf of Mexico – SEDAR update assessment. Miami, Florida, pp. 224. SEDAR, 2013. Gulf of Mexico Red Snapper Stock Assessment Report. SEDAR, North Charleston, South Carolina, pp. 1103. United States Congress, 2006. Magnuson-Stevens Fishery Conservation and Management Act, PL 94-265, 16 U.S.C. 1801, pp. 111. Walters, C.J., Martell, S.J.D., 2004. Fisheries Ecology and Management. Princeton University Press, Princeton, N.J, 399 pp.

2. Methodology

2.1. Methodology

Objective 1: With the success of the original iSnapper pilot program, we have established a strong relationship with Elemental Methods, LLC who created the original app. For this proposal, we are teaming with this group of programmers that are very experienced in working in the fisheries arena (including other projects with NOAA, FWRI, and private groups). Thus, it will be a very easy transition to expand iSnapper to the Android and Windows platforms, while also making modifications to the original app using the feedback from for-hire fishermen during the previous pilot study. These modifications will make iSnapper “off-the-shelf” ready for any user in the recreational fishing sectors.The concept of iSnapper is simple and effective; anglers log their catches and relative location of each catch using an electronic logbook “app” on their smartphone or tablet device. First, anglers “hail out” as they leave the dock and record basic information about the number of individual anglers and general fishing location. Throughout the day anglers can record the number of fish kept including their approximate total weight/length, the number of regulatory discards released alive or dead to help estimate discard mortality, and the depth fished (See Figure 3A in supporting document). Anglers also have the option to enter the location information (latitude/longitude) of the vessel at a resolution of 1 square mile to provide valuable information about the areas being fished in the Gulf (See Fig. 3B in supporting document).We will use iSnapper to collect private recreational data collection using two primary methods: (1) panels of carefully

selected anglers according to strict statistically valid protocols, and compare these data collections to (2) any “self-selected” angler wishing to participate (see below). Certainly, we recognize there are numerous constraints associated with the inclusion of private individuals; however, this represents an important opportunity for comparative purposes, as well as a chance to begin to identify how many private anglers are participating in the fishery. Moreover, we feel we are poised to collect an unprecedented amount of fisheries dependent data from private anglers in the recreational fisheries sector. These data are much needed by NOAA/NMFS and when coupled with recreational data from MRIP, will be a stronger tool to close the data gap in these fisheries. Objective 2: We have developed a series of very controlled and directed validation methods to ensure the data collected from this project will provide reliable data for use in the management process. As mentioned above, we will rely on two primary groups of private anglers: (1) a panel approach and (2) self-selected private recreational anglers. To test the feasibility of collecting catch data from private recreational anglers, a pilot study will be conducted on a selected panel of recreational anglers located only throughout the State of Texas during the initial study. We have chosen this region due to undertaking a manageable until of anglers during the pilot, our geographical location, and built on the strong partnership we have with TPWD. However, the groundwork laid here will make the approach applicable and adaptable to any of the Gulf States. We will work closely with NOAA and MRIP officials to select panels by a stratified, systematic random sampling design (following designs by D.A. Dillman). However, this panel approach will require much discussion with key experts and MRIP staff to develop panels that are most appropriate to MRIP’s needs and applicability for this study. Thus, during the “Project Plan” development for this proposal, we will work with MRIP staff and other in-house statisticians that are experts in panel design and selection to develop a statistically valid panel approach.There are several options to solicit general volunteers and select panelist. Briefly, we will work with MRIP staff to identify these anglers from their prior survey data base. Additionally, we will partner with angler organizations (i.e. Coastal Conservation Association - CCA) and news media to distribute pamphlets/emails and post requests in newspapers/websites for active recreational anglers who are familiar with and currently use smartphone/tablet technology. Interested anglers will be asked to fill out a short survey on our website (www.fisheries.tamucc.edu) in order to facilitate successful panel contacts (i.e. residence location, fishing location, typical amount of time spent fishing). The goal is to develop a panel for each major port along the Texas Coast (see Figure 1 above). Further, to prevent bias, we will include anglers throughout the state of Texas, not just coastal residents, of varying fishing avidity levels. Once a pool of applicants is available, we will use the designated statistical approach (developed in coordination with MRIP officials) to select anglers for each major port panel. We will also work with MRIP officials to determine the appropriate and reasonable amount of anglers for the panel survey. (For instance, n = 7 panels * 50 anglers = 350 total private anglers.) These anglers will log catch data from any fishing trip during the evaluation period, as well as include other information such as discards, depth fished, and other parameters specified in iSnapper.Objective 3: iSnapper contains a built-in socioeconomic feature that allows these types of data to be collected from groups participating in the program. To demo this or other features of iSnapper, visit http://www.harteresearchinstitute.org/images/research/oceanhealth/isnapper/website-howto.pdf. The reef fish fishery in the Gulf is ideal for evaluating the socioeconomic impacts of implementing an electronic logbook program in the for-hire and private recreational fishing industries using a smartphone/tablet device to collect data on user groups. Compared to the highly migratory species, the reef fish fishery is relatively less expensive and has participants represented by most economic strata. The fishery is also present in all parts of the Gulf of Mexico, and implementing a logbook program could potentially provide vital information required to better disseminate the socio-economic impacts of recreational fisheries in the U.S economy. Additionally, it is required by NOAA/NMFS to collect socioeconomic data as part of the EFP requested by the Gulf Headboat Cooperative (GHC). We will work closely with our NOAA partners to ensure that our survey questions complement and mesh well with the information needed by federal managers. It is critical to balance between type and number of questions in order for the perceived benefit/cost ratio to stay positive and the respondent to volunteer the information. Private recreational anglers will take the survey during their initial registration for the program, as it will be unnecessary for them to take the survey each time they fish.Objective 4: Given the successful iSnapper pilot study in the for-hire sector and groundswell of interest by others, many groups routinely inquire as to the availability of its use for their programs. One of these requests is for iSnapper to be applied to the several Exempted Fishing Permits. Specifically, the Gulf Headboat Cooperative (GHC) requested and was approved by the Gulf of Mexico Fishery Management Council for a two-year exempted fishing permit granted from NOAA/NMFS to test an alternative management system for the headboat industry. Within this request, iSnapper was defined as the method to electronically monitor catch under this temporary EFP. We therefore have included an EFP subsector into this proposal. The program will function very similar to others, but represents a prime opportunity to test the efficacy of iSnapper as an “out-of season” electronic reporting tool under real-world fishing conditions for very minimal costs to this program.*See attached document for detailed approach

2.2. Region
Gulf of Mexico

2.3. Geographic Coverage
Northern Gulf of Mexico ports ranging from South Texas to South Florida.

2.4. Temporal Coverage
April 1, 2014 to April 1, 2015

2.5. Frequency
Daily/Weekly data collection (52 weeks)

2.6. Unit of Analysis
Gulf of Mexico. See attached supporting document for details.

2.7. Collection Mode
Electronic logbook apps, web portals, and dockside creel survey sampling.

3. Communication

3.1. Internal Communication
We have already begun setting the stage for a series of both internal and external communication strategies. These communications will be summarized in monthly reports to the MRIP Operations Team. We will work closely with Leah Sharpe through the Office of Science and Technology with Outreach Resources staff on communication strategies both internal among project teams and external to program participants. Internal communication will be the key for success of this project. We will have weekly in-person meetings with the day-to-day operations team and monthly conference calls among all the groups participating to ensure timely completion of proposed milestones, solve problems, and plan future tasks. We will meet monthly with MRIP's Outreach Resources to facilitate our communication goals.

3.2. External Communication
We have already had an initial conference call to begin this process. Because this project lends support for outreach prior to commencing, there is much opportunity for proactive external outreach. The project will also greatly benefit from outreach during and after completion. We will work closely with Outreach Resources and update communication goals at monthly conference calls. Additionally, there are several options to solicit general volunteers and select panelist. Briefly, we will work with MRIP staff to identify these anglers from their prior survey data base. Additionally, we will partner with angler organizations (i.e. Coastal Conservation Association - CCA) to outreach to and identify appropriate anglers for this study. Finally, any project that involves the general public, outreach will be key, and we have a wealth of resources such as webpages, social media, and other avenues at the Harte Research Institute to further outreach and communication activities.

4. Assumptions/Constraints

4.1. New Data Collection
N

4.2. Is funding needed for this project?
Y

4.3. Funding Vehicle
See attached supporting document

4.4. Data Resources
iSnapper electronic logbook app, iSnapper web-portal, and TPWD fish creel surveys

4.5. Other Resources
A primary purpose of this proposal and iSnapper is to supplement MRIP data collections, not to replace them. Pending funding, and prior to final Project Plan development, we plan to have a series of extensive meetings with MRIP analysts to identify data gaps and how iSnapper can best help solve those issues. We also would work intensely with Ken Brennan and Andy Strelcheck to determine exactly what data needs to be collected from the exempted fishing permits. Additionally, we will work closely with each state's representative to verify their requirements for iSnapper. Finally, while we have outlined a method to create a panel of private recreational anglers, certainly, we will want to have MRIP input and guidance to ensure we identify panel members to their standards to make the data most readily useable and applicable.

4.6. Regulations
Data collections will occur throughout the entire year to include collections in state waters where applicable. We feel having data "out of season" is just as important as in season (e.g., discard rate, effort, etc.). However, certainly the amount of time for data collections to occur in federal waters largely depends on the length of the 2014 Red Snapper season. Very intensive data collection and validation will occur when federal waters are open. We will ensure iSnapper is collecting data as long as the federal season is open, as well as if a "re-opening" ancillary season occurs (see timeline for proposed dates). We also plan to be adaptable to fit within any changes to regulation (i.e., State changes, regional management, etc.). Our research team is heavily engaged in the fisheries management process, and very in tune with management changes. Thus, we will be very responsive to any changes occurring in the fishery, and iSnapper is easily adaptable to accommodate any regulatory changes.

4.7. Other
The primary costs for this project have not changed substantially from the original proposal. Although we have modified the project to exclude for-hire sector saving some funds, the principle costs of expanding and programming iSnapper and carrying out the program with the private recreational group still remain. It was also necessary to included costs for consultation by professional statisticians for development of the panel approach.

5. Final Deliverables

5.1. Additional Reports
Yes, extensive. See attached supporting document.

5.2. New Data Set(s)
Yes, extensive. See attached supporting document

5.3. New System(s)
Yes, extensive. See attached supporting document

6. Project Leadership

6.1. Project Leader and Members

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
Michael	Christopher	Managing Director, PMP	Team Member	Elemental Methods, LLC	mchristopher@elementalmethods.com	214-683-4743	
Dave	Donaldson	Assistant Director	Team Member	Gulf States Marine Fisheries Commission	ddonaldson@gsmfc.org		
Mark	Fisher	Science Director for the Coastal Fisheries Division	Team Member	Texas Parks and Wildlife Department	mark.fisher@tpwd.texas.gov	361-729-2328	
Pat	Murray	President	Team Member	Coastal Conservation Association	Pdmurray@joincca.org		
Andy	Strelcheck	Fishery and Wildlife Administrator	Team Member	NOAA Fisheries - Southeast Regional Office	Andy.Strelcheck.noaa.gov		
Gregory	Stunz	Endowed Chair and Professor of Marine Biology	Team Leader	Texas A&M University - Corpus Christi	greg.stunz@tamucc.edu	361-825-3254	
Jason	Williams	Research Specialist II	Team Member	Texas A&M University - Corpus Christi	jason.williams@tamucc.edu	361-825-2084	

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
David	Yoskowitz	Endowed Chair and Professor of Environmental Economics	Team Member	Texas A&M University - Corpus Christi	david.yoskowitz@tamucc.edu	361-825-2966	

7. Project Estimates

7.1. Project Schedule

Task #	Schedule Description	Prerequisite	Schedule Start Date	Schedule Finish Date	Milestone
1	Meet with captains and federal/state officials to determine data needs		03/03/2014	03/21/2014	
3	Solicit private angler volunteers		03/03/2014	05/30/2014	Y
8	Data analysis	6, 7	07/11/2014	01/30/2015	Y
4	iSnapper range testing and modifications	2	04/01/2014	05/30/2014	Y
5	Distribute app to selected private angler participants	2, 3, 4	05/19/2014	05/23/2014	Y
6	Data collection	5	06/01/2014	07/10/2014	Y
7	Intense data collection/creel validation during Red Snapper federal season	5, 6	06/01/2014	07/10/2014	Y
9	Prepare Final Report	8	01/05/2015	03/31/2015	Y
2	Update/expand application for multiple platforms and servers		03/03/2014	04/30/2014	Y

7.2. Cost Estimates

Cost Name	Cost Description	Cost Amount	Date Needed
Sub-Award	Professional consultation with statistician to develop the private recreational panel design	$20000.00	
Salaries	Funds to support Stunz, Williams, Yoskowitz, a Research Technician and a Research Associate	$96478.00	

Cost Name	Cost Description	Cost Amount	Date Needed
Travel	For creel agents to travel between TX ports, to meet developers and captains, and research travel	$19500.00	
Equipment	To purchase phones/tablets with various platforms to test the app functions across all platforms.	$5800.00	
Indirect Costs	TPWD indirect rate (15%) is applied to total direct costs and first $25K of the Sub-Contract/Award	$37117.00	
Fringe Benefits	Benefits are calculated as 17.7% of salaries plus healthcare.	$30670.00	
Sub-Contract	Funds to support 1 TPWD Technician to enhance creel surveys	$37980.00	
Other Expenses	GSMFC administration fees and for education/outreach to provide information to anglers	$25000.00	
Sub-Award	Funds for Elemental Methods, LLC to develop, modify and maintain the app and website.	$100000.00	
TOTAL COST		$372545.00	

8. Risk

8.1. Project Risk

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
As with any project, there is some level of risk; however, for this project the risk is relatively low. We have learned a great deal from very successful pilot studies, and plan to build on those lessons learned. Thus, while these risks include angler avidity, proper statistical design, validation, and angler participation, much can be reduced by proactive approaches described below. One additional risk is that funding award may be approaching the relatively short open recreational fishing season, and thus an extension could possibly	The window for data collection give the shortened Red Snapper seasons in the Gulf is relatively short. Thus, the primary impact of the risks would be a need to potentially extend the time of this project (no-cost) to capture more data during a following season that would likely occur in fall or the following summer season. The impacts of the other potential risk can be mitigated as described below.	Low	Given our successful pilot of this technology, we have previously reduced the risk by become more aware of any potential pitfalls. Much of the risk can be mitigated by carefully designed statistical approached and thorough validation strategies for our data collection methods. These mitigation techniques are summaries in the supporting documentation.

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
be needed to capture additional data depending on how quickly work can begin.			

9. Supporting Documents