

Non-Tournament Highly Migratory Species Recreational Landings Reporting in Puerto Rico Phase I: Fishery Characterization and Outreach

FY 2008 Proposal

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Created: 05/13/2015

1. Overview

1.1. Sponsor

1.2. Focus Group

Survey Design and Evaluation

1.3. Background

Atlantic billfish management is influenced by both domestic and international considerations and management frameworks. Due to their highly migratory, transboundary movements and susceptibility to overfishing, international agreements have been developed for the management and conservation of many Atlantic billfish species. NOAA fisheries started monitoring billfish tournaments in the U.S. Atlantic in 1971. In 1978, the preliminary Atlantic billfish and shark management plan was first introduced in an effort to achieve sustainability and minimize conflicts. A ban on possession of Atlantic billfish by commercial longline and drift nets was established in 1989, along with the prohibition of sale of Atlantic billfish (with the exception for Puerto Rico's small scale hand line fishery). By 1997, Atlantic blue and white marlin were determined to be overfished and in 1998 sailfish was added to this list. Minimum sizes for blue and white marlin were established by 1998. The 2000 stock assessment showed that the blue marlin Atlantic stock was approximately 40% of Bmsy and the fishing mortality was approximately four times higher than Fmsy. The 2000 assessment for white marlin was even more pessimistic. The total Atlantic stock was estimated at less than 15% of Bmsy, and fishing mortality was estimated to be seven times higher than Fmsy. NOAA Fisheries is currently examining the question of whether or not white marlin should be listed as an endangered species under the Endangered Species Act. In response to an International Commission for the Conservation of Atlantic Tunas (ICCAT) recommendation, NOAA Fisheries has recently passed a rule establishing an annual domestic landings limit of 250 Atlantic blue and white marlin, combined. Atlantic billfish, including blue marlin (*M. nigricans*), sailfish (*I. platypterus*), white marlin (*T. albidus*) and longbill spearfish (*T. pfluegeri*), have been targeted by recreational fishing communities throughout the Caribbean for over 50 years. In Puerto Rico, billfish fisheries have been recognized as a sport since around 1950. In 1962, Erdman studied the blue marlin sport fishery off Puerto Rico based on catches from tournaments held at the municipalities of San Juan, Arecibo, Mayaguez, La Parguera and Ponce (Erdman D. 1962). This study collected data on blue marlin catch rates, distribution, and weight, sex ratio, and food habits. Recreational billfish fisheries in Puerto Rico have changed significantly in the 45 years since this study was conducted. Fishing capacity in terms of the number, size, and speed of boats, and the sophistication of fishing equipment, has increased tremendously. However, catch rates in fishing tournaments have declined consistently over time, and this decrease has been even more pronounced in the past decade (Rodriguez Ferrer and Rodriguez Ferrer 2003). Historical tournament data support the stock assessment results that Atlantic billfish are both overfished and that overfishing is occurring. NOAA Fisheries has implemented mandatory programs in an effort to monitor billfish landings in the Atlantic, Gulf of Mexico and Caribbean. Owners of vessels targeting Atlantic Highly Migratory Species (including billfish) must obtain either an Angling Category permit or a Charter/Headboat permit. Marinas and tournament organizers are required to register all tournaments where at least one of the species targeted is a billfish. The Recreational Billfish Survey (RBS) is a mandatory program aimed at collecting catch and effort data from all such tournaments (i.e., attempted census). For non-tournament recreational landings, vessel owners must report all landed blue marlin, white marlin, sailfish, and swordfish via phone or internet within 24 hours of landing at the dock. Compliance with these mandatory requirements is thought to be low, particularly for non-tournament landings reporting. In 2000 the Puerto Rico Department of Natural and Environmental Resources (DNER) created the Marine Recreational Fisheries Program. This program consists of two major components: 1) collection of fishing tournament data, and 2) implementation of the MRFSS in Puerto Rico. DNER biologists collect data at all fishing tournaments held in Puerto Rico. Through this successful program, DNER has been able to accurately assess HMS tournament fishing activity. A total of 103 tournaments targeting billfish have been sampled since the program began in 2000 (Rodriguez-Ferrer and Rodriguez Ferrer unpublished data). Non-tournament recreational harvest estimates for many offshore species in Puerto Rico are less reliable due to the rare event nature of these fisheries. MRFSS proportional standard errors (PSEs) on harvest estimates of billfish, greater amberjack, skipjack tuna, and yellowfin tuna typically exceed 50%. Lack of precision on these estimates makes it difficult to justify using these data for assessment and monitoring purposes. These data may also be inaccurate due to potential biases associated with the MRFSS design as identified in the National Research Council report. Data collection approaches for sampling non-tournament recreational HMS (and other large pelagic) fisheries in Puerto Rico need to be improved. In response to fishery management needs, DNER proposes to characterize HMS fisheries in Puerto Rico and identify and eliminate data gaps that could negatively affect decision making abilities when it comes to managing HMS in the Caribbean region and internationally. The HMS Work Group has recognized the need to first characterize HMS fisheries before either geographically expanding data collection programs (i.e., such as LPS or catch cards) or implementing new methodologies in these regions. Characterization studies and pilot surveys are an important initial step in the development and implementation of full-scale catch and effort data collection programs. Information obtained from such studies is often essential in selecting the appropriate methodology and in defining the scope of new data collection programs. One identified outcome of this proposed project is that it will help DNER comply with the new mandates of the reauthorized Magnuson-Stevens Fishery Conservation and Management Act for reporting annual catch to ensure that overfishing does not occur. This project will lead to improvements in marlin landings data that will help NOAA Fisheries monitor the 250 fish limit as recommended by ICCAT. It is anticipated that this pilot will also lead to improvements in the quality and quantity of information available for future management plans. With this project DNER plans to fulfill the following objectives: -To characterize HMS private boat fisheries in Puerto Rico -To improve the quality of HMS data collected in Puerto Rico. -To involve recreational fishermen and industry leaders in the development of a new data collection

system focused on HMS species. This project, specifically focused on non-tournament HMS landings, is the first of its kind in Puerto Rico. Highly migratory species comprise one of the most important target species groups for recreational fishermen in Puerto Rico. Therefore, it is imperative to fully understand the fishery and to manage it responsibly in order to conserve these fish stocks. Education and outreach programs aimed at the recreational fishing community will be an important component for attaining project objectives. Some of the specific questions that this project will answer are:-What is the best strategy to involve fishermen in the mandatory reporting of non tournament landed HMS?-How many vessels and fishermen in Puerto Rico fish for HMS species outside fishing tournaments?-What are the compliance rates in Puerto Rico with NOAA Fisheries mandatory permitting and reporting requirements for HMS?

1.4. Project Description

Survey Population Size In 2007, a total of 795 HMS Angling Category permits were issued for fishing vessels with Puerto Rico listed as their principle port. The actual number of vessels that fish for HMS in Puerto Rico may be higher. For 2006, a total of 61,456 recreational boats were registered with the Puerto Rico DNER Boating Commissioners Office, 24,179 of which were greater than 20 feet and may be suitable for offshore HMS fishing activities. It is estimated that there are approximately 72,000 recreational fishermen that fish from all private boats in Puerto Rico. These numbers suggest that either a very small proportion of the recreational private boat fleet targets HMS, or that there are a large number of non-permitted vessels targeting HMS in Puerto Rico. This project will only focus on the private boat mode. Although charter boats are an important component of Puerto Rico's HMS fishery, data collection for this mode will be pilot tested through another MRIP project plan submitted by the For-Hire Work Group (Title: For-hire census with pilot electronic reporting option for Puerto Rico catch and effort data.) General Tasks for Phase I-DNER will coordinate meetings with HMS recreational fishing industry leaders, captains, marina operators and other interested parties to involve them in development of the new data collection program. This will help develop better communication between the fishing industry and data collectors. Scoping meeting with these groups will help DNER hear their opinions and include the fishery participants in the process of implementing mandatory reporting. Making the fishermen, marinas and tournament organizers part of the process will enable DNER to come up with a better way to get fishermen to cooperate.-Coordinate a meeting with NMFS Southeast Regional Office, NMFS Fisheries Statistics Division, and Puerto Rico DNER to plan data sharing and analyses.-Characterize HMS fisheries by conducting surveys of Angling category permit holders and Puerto Rico Sportfish Association members. It is assumed that most Sportfish Association members will have an HMS Angling category permit, and therefore be a subset of this larger frame. A telephone survey will be conducted with all HMS Angling Category permit holders. Notification letters will be mailed in advance to let respondents know what the survey is about and when to expect a call.-Characterization questions will include (but not be limited to) the following:- Approximate number of HMS trips vessel made in past 12 months.-Approximate percent (or number) breakdown of 12-month trips by access site type (public/private, boat ramp/marina, etc.), site name, month, species targeted (i.e. 50 trips – 50% swordfish, 25% sailfish, 25% YFT), departure and return time blocks, areas fished, and tournaments participated in, ;-Estimated number of fish landed and released in past 12 months (rare event species only).-Survey will also include questions regarding captain's preferences for different landings reporting methods.-Estimate the number of non-permitted vessels targeting HMS in Puerto Rico. Questions will be added to the MRFSS intercept survey to determine if vessels have an HMS permit. Puerto Rico DNER staff may also collect information on non-permitted HMS vessels through tournament sampling and other dockside site visits.-This project will involve a second phase. The major objectives of Phase II will be:-Review of existing data and comparison of survey results with historical data.-Development of outreach materials to promote and increase awareness of the proposed new data collection approach.-Implementation of a new HMS data collection pilot in 2009. Phase II details and budget will be included in a separate project plan submitted to the Operations Team at the completion of Phase I.

1.5. Public Description

1.6. Objectives

The project will result in a report that will provide an assessment of the magnitude and impact of recreational non-tournament private boat fishing in Puerto Rico on HMS stocks. This is an important first step to eliminate the HMS data gaps that currently exist for the U.S. Caribbean. The results of this pilot study will assist managers in determining the best alternative for collecting HMS recreational fishery data in Puerto Rico. The final report will be submitted to the MRIP Operations Team and to DNER.

1.7. References

2. Methodology

2.1. Methodology

2.2. Region

Caribbean

2.3. Geographic Coverage

2.4. Temporal Coverage

2.5. Frequency**2.6. Unit of Analysis****2.7. Collection Mode****3. Communication****3.1. Internal Communication**

Project status reports will be provided bi-monthly to the Operations Team.

3.2. External Communication**4. Assumptions/Constraints****4.1. New Data Collection****4.2. Is funding needed for this project?****4.3. Funding Vehicle**

Gulf FIN Grant

4.4. Data Resources**4.5. Other Resources**

Project collaboration-The Puerto Rico Sport Fishing Association holds records of HMS capture for over the past fifty years and will provide this data to be reviewed by DNER personnel.-The Sport Fishing Association has agreed to help with meeting planning.-The NMFS Southeast Regional Office will work cooperatively with us and share results from the non-tournament reporting program.-To be able to complete the proposed project with two full time biologists.-OMB Approval Paperwork Reduction Act RequirementThe Paperwork Reduction Act requires that agencies obtain OMB approval before requesting most types of information from the public, including telephone interviews. OMB approval will likely be needed before implementation of the telephone characterization survey. From start to finish obtaining OMB approval could take six months or more. This could delay the collection of Puerto Rico HMS recreational characterization information.

4.6. Regulations**4.7. Other****5. Final Deliverables****5.1. Additional Reports****5.2. New Data Set(s)****5.3. New System(s)****6. Project Leadership****6.1. Project Leader and Members**

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
Grisel	Rodriguez		Team Leader				
Ron	Salz		Team Member				

7. Project Estimates

7.1. Project Schedule

Task #	Schedule Description	Prerequisite	Schedule Start Date	Schedule Finish Date	Milestone
2	Plan and hold project kick-off meeting	1	02/01/2008	02/10/2008	
7	Develop questionnaire	2	02/01/2008	04/01/2008	
4	Develop and execute outreach plan	1,2	02/01/2008	04/01/2008	
5	Plan and hold meeting with the NMFS Southeast Regional office	1	02/01/2008	03/01/2008	
8	Establish OMB PRA approval for implementing survey	7	01/15/2008	07/15/2008	
1	Finalize project plan for Phase I		01/01/2008	01/15/2008	
3	Bi-monthly progress reports (completed Bi-monthly)		02/01/2008	02/01/2009	
6	Implement HMS permit questions as add-on to MRFSS intercept survey	2	02/15/2008	03/01/2008	
9	Mail notification letters and implement HMS characterization phone survey dialing	7,8	07/15/2008	11/01/2008	
10	Analyze data and develop draft report	9	11/15/2008	01/01/2009	
11	Final report submitted to OT	10	01/01/2009	02/01/2009	

7.2. Cost Estimates

Cost Name	Cost Description	Cost Amount	Date Needed
Travel - Other	Travel for outreach activities. Per diem for 2 persons and 30 days @ \$21.00	\$1260.00	02/01/2008
Travel -Other	Gas for DNER vehicles for outreach travel	\$1200.00	01/01/2008

Cost Name	Cost Description	Cost Amount	Date Needed
Miscellaneous / Supplies	Postage for 800 notification letters (\$0.41/letter)	\$328.00	05/01/2008
Project Staff	Personnel; Biologist II (@50%); Biologist III (@50%)	\$20964.00	01/01/2008
Travel – Project Development	Project kick-off meeting; Meetings with collaborating offices (NMFS) and fisheries leaders	\$4000.00	02/01/2008
Utilities	Telephone survey line charge for 200 hours (\$0.15/minute)	\$1800.00	06/01/2008
Administrative Support Fees	Indirect cost rate (12.24%)	\$2566.00	01/01/2008
TOTAL COST		\$32118.00	

8. Risk

8.1. Project Risk

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
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9. Supporting Documents

"Final Report", page 1

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Phase One: Fishery Characterization and Outreach

Prepared by:

MRIP Highly Migratory Species Work Group

&

Puerto Rico Department of Natural and Environmental Resources

Marine Resources Division

January 2009



Non-tournament HMS Landings Reporting for Private Boats in Puerto Rico

Project Team	Organization
Grisel Rodriguez (project lead/co-author)	Puerto Rico Department of Natural & Environmental Resources
Ronald Salz (co-author)	NOAA Fisheries, Fisheries Statistics Division
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Acknowledgements: We would like to thank the following people who helped in development of the telephone survey questionnaire and participated in project planning sessions: Graciela Moliner (Caribbean Fishery Management Council), Kelvin Serrano Rodríguez (PRDNER Recreational Fishery Statistics Program), Zulena Cortés Rodríguez (PRDNER Recreational Fishery Statistics Program), Carlos Morales (President, Puerto Rico Sport Fisher Association), Hommy A. Ramos (Vice President, Puerto Rico Sport Fisher Association), Angel D. Díaz (Public Relations, Puerto Rico Sport Fisher Association), Marcos Hanke (Caribbean Fishery Management Council, Charter Captain), Edgardo Ojeda (UPR Sea Grant College Program), Maria Beatriz Riesco (UPR Sea Grant College Program). All of the HMS anglers and captains who participated in this survey also deserve acknowledgement for offering their time and information. The project team would also like to thank members of the MRIP HMS Work Group (listed below) for providing project guidance and reviewing this report.

MRIP HMS Work Group Members: Ronald Salz (Chair, NMFS Fisheries Statistics Division), Guillermo Diaz (NMFS, Science & Technology), Josh Demello, Western Pacific Fishery Management Council), Mark Terceiro (NMFS NEFSC), Stephen Stohs (NMFS SWFSC), Joe Desfosse (NMFS Highly Migratory Species Division), Craig Brown (NMFS SEFSC), Ron Coddington (HMS Advisory Panel; Southeast Swordfish Club), Dave McGowan (Florida Fish and Wildlife Conservation Commission), Greg Skomal (Massachusetts Division of Marine Fisheries), Grisel Rodriguez (Puerto Rico Department of Natural and Environmental Resources), Hiram Quinones (Puerto Rico Sport Fishing Association), and Corey Niles (Washington Division of Fish and Wildlife).

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Executive Summary

In response to an International Commission for the Conservation of Atlantic Tunas (ICCAT) recommendation, starting in 2001 the U.S. agreed to limit annual recreational landings of Atlantic blue and white marlin to 250 fish combined. In an effort to monitor Atlantic billfish landings, NOAA Fisheries has implemented a mandatory reporting program whereby anglers must report all non-tournament landed blue marlin, white marlin, sailfish, and swordfish via phone or internet. However, compliance with this mandatory requirement is thought to be extremely low, particularly in Puerto Rico. Non-tournament landings estimates and release estimates for billfish and other highly migratory species (HMS) in Puerto Rico based on NOAA Fisheries surveys are typically imprecise and may also be biased due to survey design issues. This project addresses the identified need to improve data collection approaches for estimating total catches and landings of billfish and other HMS in Puerto Rico. This report describes Phase One of the project: characterization of Puerto Rico's HMS recreational fishery. Phase Two of this project will entail actual development and implementation of a new HMS recreational data collection pilot in Puerto Rico.

A telephone questionnaire was developed with input from Puerto Rico Department of Natural and Environmental Resources (DNER) and NOAA Fisheries biologists, Puerto Rico Sport Fishing Association leaders, HMS charterboat captains, and Caribbean Fisheries Management Council staff. The questionnaire included questions related to HMS fishing avidity, angler characteristics, target species, access site types, fishing times, multiday fishing trips, seasonal trip distribution, and HMS catches. DNER outreach efforts aimed at increasing survey awareness and improving cooperation rates included meetings with fishing industry representatives, attending HMS tournaments, notification letters to HMS anglers, and notices published in sport fishing magazines. The initial goal was a complete census of all 2007-2008 Puerto Rico HMS Angling category permit holders. DNER attempted to contact 810 out of 1,011 permit holders from November 2008 through May 2009. Completed interviews were conducted with 405 permit holders for a 50% completion rate. Only about 1% of those contacted refused the survey.

Nearly half of those interviewed considered themselves "recreational anglers," 22% "sport fishermen" and 31% both "sport and recreational." Compared to "recreational anglers," "sport

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fishermen” 1) reported taking nearly twice as many HMS trips, on average, 2) were more likely to fish for a particular species on HMS trips, and 3) were more likely to fish in HMS tournaments. Respondents who self-identified as both “recreational and “sport” were more similar to “sport fisherman,” in terms of HMS avidity, propensity to target a particular species, and tournament participation, than they were to “recreational anglers.”

Two-thirds of interviewed permit holders indicated they fished for HMS outside of tournaments during the previous 12 month period. On average, respondents indicated having about 18 years of experience fishing for HMS. Respondents reported taking an average of 8.6 non-tournament HMS fishing trips in the past 12 months. The HMS recreational fishery occurs year round in Puerto Rico with peak effort from May through August. The majority (64.5%) of respondents indicated their primary access site for HMS fishing was a marina, about one-fourth used a boat ramp, and only 7.8% used a personal dock to fish for HMS.

Slightly over two-thirds (68.7%) of those who indicated fishing for HMS outside of tournaments in the past year said they plan their trip around a particular target species. Of the respondents who had fished for HMS outside of tournaments, 80.5% targeted billfish while 27.5% targeted tunas on at least one of those trips. Sharks and swordfish are considerably less important as recreationally target species in Puerto Rico. The large majority of respondents (85.7%) indicated they “always” target blue marlin when fishing for billfish. About one-half of respondents said they “never” target white marlin when fishing for billfish, and 42% said they “never” target sailfish. Interestingly, respondents who identified themselves as being both “sport and recreational” were more likely to target white marlin (only 37.3% said “never”) than those who indicated they were one or the other (“sport” 60.4% “never”; “recreational” 60.8% “never”). Yellowfin tuna was the most targeted species on trips targeting tuna, followed by blackfin tuna.

Only 2.3% of the non-tournament HMS fishing trips reported were overnight trips consisting of more than one fishing day. Of those respondents who fished for HMS outside of tournaments, 10.7% indicated fishing for HMS in the Dominican Republic and 11.1% in the U.S. Virgin Islands. Nearly 80% percent of the interviewed permit holders said that they go to port when fishing for HMS in these more distant locations.

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HMS Angling category permit holders were asked to recall the number of HMS fish harvested and released in the past 12 months. Of those respondents who fished for HMS outside of tournaments, 37.4% indicated they had landed at least one tuna and only 10.7% landed a shark. About half indicated they had caught and released at least one blue marlin in the past 12 months. Yellowfin tuna was the top HMS species harvested, while blue marlin was the most released HMS species. Over 98% of billfish reported as caught were released alive. About 14% of respondents indicated they had caught a previously tagged billfish. Only about half of those who caught a tagged fish said they report the tags they find. About half of all respondents indicated they had fished in at least one HMS tournament in the past 12 months.

Results suggest a very high rate of non-compliance in Puerto Rico for reporting billfish through the NOAA Fisheries Automated Landings Reporting System (ALRS). In this study, respondents reported landing a total of 18 blue marlin, 2 white marlin, 4 sailfish, and 3 swordfish in the previous 12 months. These should be considered minimum recreational landings estimates since they don't include landings from over 600 Angling category permit holders not interviewed, nor do they include HMS Charter/headboat category vessel landings. Although direct comparisons are difficult, since permit holders were interviewed over a 7 month period (November 2008 through May 2009), ALRS reported billfish landings for Puerto Rico from November 2007 through May 2009 are still considerably smaller (i.e., 6 blue marlin, 0 white marlin, 1 sailfish, and 0 swordfish). Comparisons with the DNER HMS tournament program, which covers all billfish tournaments on the island, suggest that, at least for 2008, far more billfish were landed outside of tournaments than during tournaments in Puerto Rico.

Summary of Data Collection and Management Recommendations

- NOAA Fisheries should consider piloting an HMS catch card program in Puerto Rico in an attempt to improve the accuracy and precision of billfish landings estimates.
 - NOAA Fisheries should work closely with the DNER, Puerto Rico Sport Fishing Association leaders, charterboat captains, marinas operators, and other affected stakeholders throughout all phases of this pilot. A widespread, bilingual outreach program targeting HMS anglers, captains, and fishing industry representatives should be launched prior to data collection implementation.

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- NOAA Fisheries should explore options for improving the accuracy and precision of billfish release estimates and tuna landings estimates in Puerto Rico. Possible alternatives include:
 - Increase MRFSS dockside sample sizes, particularly in months when the majority of HMS are caught (e.g., wave 3 through 5). More investigation is needed to determine how much additional sample size, and at what cost, would be needed to obtain precision levels within an acceptable range for management and assessment purposes. Precision of MRFSS Puerto Rico HMS catch estimates will also likely be improved by switching to a list frame (or dual-frame) approach for estimating fishing effort, as part of the proposed MRIP redesign of MRFSS.
 - Conduct a specialized HMS survey with Angling and Charter/headboat category permit holders. A specialized HMS survey in Puerto Rico could also be used to obtain valuable information regarding 1) numbers of billfish hooked but lost, 2) post-release mortality variables (i.e., hook type and location, fight time, and fish condition), and 3) tagging.
 - NOAA Fisheries should consider using Internet and email surveys for HMS in Puerto Rico since three-fourths of those interviewed indicated a willingness to participate in online surveys, and two-thirds provided an email address.
- NOAA Fisheries should investigate ways to improve the accuracy and completeness of contact information provided by anglers when they apply for an HMS permit.
- NOAA Fisheries should develop an educational outreach message aimed at Puerto Rico HMS anglers and captains regarding voluntary tagging programs, how to report tags, and the scientific importance of such programs.

Non-tournament HMS Landings Reporting for Private Boats in Puerto Rico

Background and Purpose

Billfish such as blue marlin, white marlin, and sailfish are popular recreational target species throughout much of the U.S. Atlantic, Gulf of Mexico, and Caribbean. As apex predators, these species are also highly susceptible to overfishing in the absence of adequate controls and management measures. Due to their highly migratory, transboundary nature and worldwide appeal, international agreements are in place for the management and conservation of billfish. The International Commission for the Conservation of Atlantic Tunas (ICCAT) has been responsible for the conservation of tunas, billfishes, and some species of shark in the Atlantic Ocean and adjacent seas since 1969. NOAA Fisheries started monitoring billfish caught in tournaments in 1971. However, prior to 1988, there was no approved fishery management plan for Atlantic billfishes in the U.S. The 1988 Atlantic Fishery Management Plan (FMP) for Billfish was implemented in an effort to achieve sustainability and minimize conflicts. The FMP established minimum size limits and a prohibition on sale of billfish based on the notion that billfish were best suited for recreational purposes because of their historical and traditional use by anglers, anglers' custom of releasing a large percentage of their catch, and the economic value of the recreational fishery. Although large numbers of billfish are caught incidentally by commercial gears, particularly longlines, the prohibition against commercial sale set a precedent by reserving directed billfish effort for the recreational fishery.

By 1997, Atlantic blue and white marlin were determined to be overfished and in 1998 sailfish was added to this list. The 2000 stock assessment showed that the blue marlin Atlantic stock was approximately 40% of Bmsy (biomass at maximum sustainable yield) and fishing mortality was approximately four times higher than Fmsy (fishing mortality at maximum sustainable yield). The 2000 assessment for white marlin was even more pessimistic. The total Atlantic stock was estimated at less than 15% of Bmsy, and fishing mortality was estimated to be seven times higher than Fmsy. NOAA Fisheries conducted Endangered Species Act (ESA) status reviews for white marlin in 2002, and again in 2006, in response to environmental organization petitions requesting NOAA Fisheries list the species as threatened or endangered. Both reviews concluded that an ESA listing was not warranted at this time, although the 2002 review noted that the stock could decline to a level that would warrant ESA protection if fishing mortality was not reduced significantly and relatively quickly.

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In response to an ICCAT recommendation, the U.S. agreed to limit annual recreational landings to 250 Atlantic blue and white marlin combined starting in 2001. Monitoring this fishery to stay within such a small landings limit requires highly accurate and precise data. A key element in complying with this portion of the Atlantic blue and white marlin rebuilding plan is to develop a comprehensive monitoring program for all recreational landings of marlin, particularly outside of fishing tournaments which are currently monitored through the Recreational Billfish Survey (RBS). Billfish landings outside of tournaments are rarely encountered by standardized recreational fishing surveys such as the Marine Recreational Fisheries Statistical Survey (MRFSS) and the Large Pelagics Survey (LPS). NOAA Fisheries has implemented a mandatory reporting program in an effort to monitor billfish landings in the Atlantic, Gulf of Mexico, and Caribbean. Owners of vessels targeting Atlantic Highly Migratory Species (including billfish) must obtain either an Angling Category or a Charter/headboat permit. HMS permit holders must report all non-tournament blue marlin, white marlin, sailfish, and swordfish landings to NOAA Fisheries via phone or internet within 24 hours of landing at the dock. However, compliance with this mandatory requirement is thought to be extremely low, particularly in Puerto Rico.

Billfish comprise one of the most important target species groups for recreational and sport fishermen in Puerto Rico. Therefore, it is imperative to fully understand the fishery and to manage it responsibly in order to conserve these fish stocks. In Puerto Rico, billfish fisheries have been recognized as a sport since around 1950. In 1962, Erdman studied the blue marlin sport fishery off Puerto Rico based on catches from tournaments held in San Juan, Arecibo, Mayaguez, La Parguera and Ponce (Erdman, 1962). His study collected data on blue marlin catch rates, distribution, size, sex ratio, and food habits. The recreational billfish fishery in Puerto Rico has changed significantly in the 47 years since this study was conducted. Fishing capacity in terms of the number, size, and speed of boats, and the sophistication of fishing equipment, has increased tremendously. However, catch rates in fishing tournaments have declined consistently over time, and this decrease has been even more pronounced in the past decade (Rodriguez Ferrer and Rodriguez Ferrer, 2003). Historical tournament data from Puerto Rico support the stock assessment results that Atlantic billfish are both overfished and that overfishing is occurring.

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In 2000 the Puerto Rico Department of Natural and Environmental Resources (DNER) created the Marine Recreational Fisheries Program. This program consists of two major components: 1) collection of fishing tournament data, and 2) implementation of the MRFSS in Puerto Rico. DNER biologists collect data at all fishing tournaments held in Puerto Rico. Through this successful program, DNER has been able to accurately assess HMS tournament fishing activity. A total of 103 tournaments targeting billfish have been sampled since the program began in 2000 (Grisel Rodriguez-Ferrer, PRDNER, personal communication). Non-tournament catch and landings estimates for billfish (and other HMS) in Puerto Rico based on MRFSS data are typically very imprecise due to the rare event nature of these fisheries. Lack of precision on these estimates makes it difficult to justify using these data for assessment and monitoring purposes. These estimates may also be inaccurate due to potential biases associated with the MRFSS design as identified in the National Research Council report (NRC, 2006). This project addresses the identified need to improve data collection approaches for estimating catches of marlin and other HMS in Puerto Rico.

The MRIP HMS Work Group recognized the need to first characterize HMS fisheries before either geographically expanding data collection programs (i.e., such as LPS or catch cards) or implementing new methodologies. Characterization studies and pilot surveys are an important initial step in the development and implementation of full-scale, on-going catch and effort data collection programs. Information obtained from such studies is often essential in selecting the appropriate methodology and defining the scope of new data collection programs, and identifying data gaps or potential biases that could negatively affect decision making abilities when it comes to managing HMS in the Caribbean region and internationally. Phase Two of this project, scheduled for 2010, will involve development and implementation of a new HMS recreational data collection pilot in Puerto Rico. This second phase will require targeted outreach aimed at informing billfish anglers, marinas operators, and industry leaders about the new program and involving them in its creation and implementation. This component is viewed as critical to the success of any new data collection effort.

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Methods

Planning meetings were organized by the MRIP project team to discuss project objectives and develop a telephone questionnaire for characterizing the HMS fishery. Attendees included members of the Puerto Rico Sport Fishing Association (PRSFA), charterboat captains, Caribbean Fisheries Management Council, PRDNER biologists, and NOAA Fisheries staff. The final questionnaire included questions related to HMS fishing avidity, preferences, angler characteristics, target species, access site types, fishing times, multiday fishing trips, seasonal trip distribution, and HMS catches (Appendix 1). Questions focused on each respondent's non-tournament HMS fishing activity during the previous 12 months.

An advanced notification letter announcing the start of the project with a brief description of the project objectives was developed. However, the proximity of the Puerto Rico general elections in to the planned survey start date created some issues with the advanced notice letters being sent out. Letters had to be approved by the state's electoral commission prior to being mailed to HMS permit holders. This bureaucratic process delayed the start of the dialing period and shortened the available time left to conduct surveys. After mailing the initial batch of letters approved by the electoral commission (about 100 letters), many came back to PRDNER as undeliverable mail due to an incomplete addresses or unknown addressee. Given the problems associated with the mailing and the unexpected project costs and time involved, PRDNER decided to stop mailing letters after this first batch went out. To increase awareness and improve cooperation rates, an announcement of the project was published in nautical periodicals *La Regata* and *El Pescador* prior to fielding the survey.

The 2007-2008 Puerto Rico HMS Angling category permit holder list was provided by NOAA Fisheries. This list provided the project personnel with addresses, phone numbers and basic permit holder information for permitted vessels with "principle port" indicated as Puerto Rico. This survey did not cover HMS fishing activity in Puerto Rico by vessels with principle ports in other states, nor did it cover vessels fishing illegally for HMS without a valid federal permit.

PRDNER personnel contacted permit holders by phone from November 2008 through May 2009. Initially, anglers were somewhat reluctant to answer survey questions. A second announcement of the project was published in *La Regata* and *El Pescador*. This, along with a

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meeting with the Puerto Rico Sportfishing Association, helped to convince anglers of the importance of the information being asked. When PRDNER personnel identified themselves and the purpose of the survey many anglers recalled the announcements and most were expecting the call and wanted their opinions regarding HMS management and regulatory issues to be counted. PRDNER biologists also conducted informal outreach regarding the characterization survey with captains at HMS tournaments.

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Results

As of October 2008, 1,011 active HMS Angling category permitted vessels were registered with Puerto Rico as the principle port. Attempts were made to contact 810 of these vessel representatives. Completed interviews were conducted with 405 permit holders for a 50% completion rate (Figure 1). Some information was collected from 397 (of the 405) permit holders who were contacted and agreed to be interviewed. Not eligible for an interview were three commercial fishermen and one for-hire captain who indicated they had accidentally purchased the wrong permit type for their fishing activities, and four other captains who indicated they had sold their permitted vessel. Only about 1% of those contacted refused the survey. The majority of non-response was due to calls not returned after leaving a message for the permit holder. A description of the types of call dispositions is shown in Table 1.

Permit Holder Characteristics

Nearly half (48.4%) of the interviewed HMS Angling Category permit holders in Puerto Rico considered themselves “recreational anglers” (Table 2). As defined in this study, a “recreational angler” is one who rarely participates in fishing tournaments and fishes primarily for pleasure, whereas a “sport fishermen” fishes in tournaments and is more motivated by the competition and challenge of catching fish. Interestingly, nearly one-third of respondents identified themselves as being both a “sport fishermen” and a “recreational angler” suggesting that their primary motivations for fishing can vary depending on the particular type of trip they are doing that day. Of the 405 respondents, 384 (94.8%) were the owners of the HMS permitted vessel, 13 (3.2%) were authorized representatives of the owner, and 8 (2.0%) worked as the vessel’s captain but did not own the vessel. Twenty-two respondents said they had more than one boat registered for HMS fishing.

Vessel Length

Vessel lengths were obtained from the HMS permit holder database rather than from the phone interview. The average length of an HMS Angling category permitted vessel in Puerto Rico was 29.8 feet. Angler category permitted vessels in Puerto Rico ranged in size from 13 to 74 feet. No significant differences were found in average vessel length between self-identified “sport fishermen” and “recreational anglers.”

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Table 1. Description of various call dispositions displayed in Figure 1.

Call description	Comments
Not known/ wrong number	The person was not known by the party who answered the phone call at that number.
Never returned the call	Messages were left either on an answering machine or with a person and the other party never called back.
No answer (5 attempts)	Calls were made but interviewer did not get an answer.
Out of service	A message from the phone company notified that the number was out of service.
Disconnected	A message from the phone company indicated that the phone was disconnected.
Refused	Respondent refused to be interviewed.
Complete interview	The interview was done and complete.

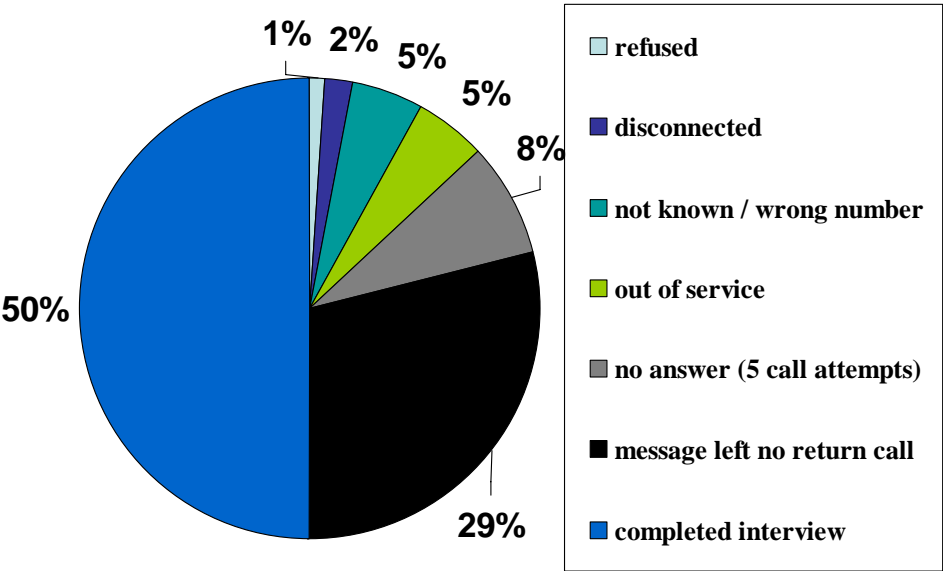


Figure 1. Disposition of call attempts for HMS characterization phone survey.

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Table 2. Permit holder type of angler self-identification results.

Type of Angler	Percent of respondents (N=384)
Sport fisherman	21.9 %
Recreational angler	48.4 %
Both Sport and Recreational	30.5 %

HMS Fishing Avidity

Of the 397 interviewed permit holders, 262 (66.0%) fished for HMS outside of tournaments during the past 12 months and 135 (34.0%) did not. Of the 135 respondents who indicated they had not fished for HMS outside of tournaments in the past year, 42 (31.1%) indicated they had fished for HMS in at least one tournament. The primary reasons provided for not taking any trips for HMS in the past 12 months on their permitted vessel were high fuel costs and the current economic situation. Other reasons cited included boat problems and that they fished for HMS aboard another captain's vessel.

The average number of years spent fishing for HMS was 17.2 for respondents that did not fish for HMS outside of tournaments in the past 12 months, and 18.5 years for those that did take at least one HMS trip in the past 12 months. Results for both groups were also fairly similar regarding years with an HMS permit. The average number of years permit holders indicated having the HMS permit for was 4.3.

The total number of HMS non-tournament fishing trips taken in the past 12 months by the 396 respondents was 3,415. The average was 8.6 HMS non-tournament fishing trips in the past 12 months per permit holder. When only those permit holders that took at least one non-tournament HMS trip are included (i.e., excluding zeros), the average is 13.0 trips per year. About 42% of respondents took between 1 to 5 HMS non-tournament trips, and 20% took between 6 and 11 trips (Figure 2).

Self-identified "sport fishermen" indicated taking almost twice as many non-tournament HMS trips in the past 12 months as did "recreational anglers" (Table 3). Average HMS trip avidity of

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respondents who identified as being both “sport and recreational” was similar to “sport fishermen” avidity.

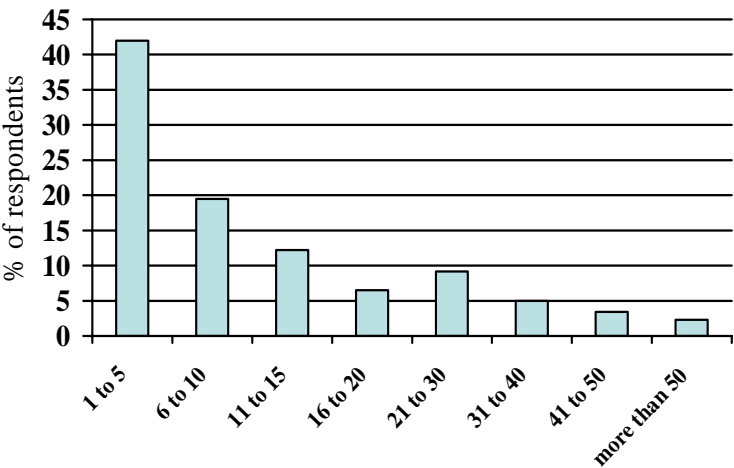


Figure 2. Frequency distribution of the number of non-tournament HMS fishing trips taken by Puerto Rico Angling category permit holders in the previous 12 months (note: only includes those who took at least one non-tournament HMS trip).

Table 3. HMS non-tournament trip avidity by self-identified type of angler.

Type of Angler	Percent fished HMS outside tournaments in past 12 months	Average number of non-tournament HMS trips	Average number of non-tournament HMS trips (excluding zeros)
Sport fisherman	70.4%	10.5	15.0
Recreational	59.0%	5.8	9.8
Both Sport and Recreational	76.1%	11.7	15.4

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Seasonal Distribution of HMS Fishing Trips

Respondents were asked to recall how many non-tournament HMS trips they took in each of six 2-month waves during the past year (Figures 3 and 4). The HMS recreational fishery occurs year round in Puerto Rico and effort appears to peak from around May through August.

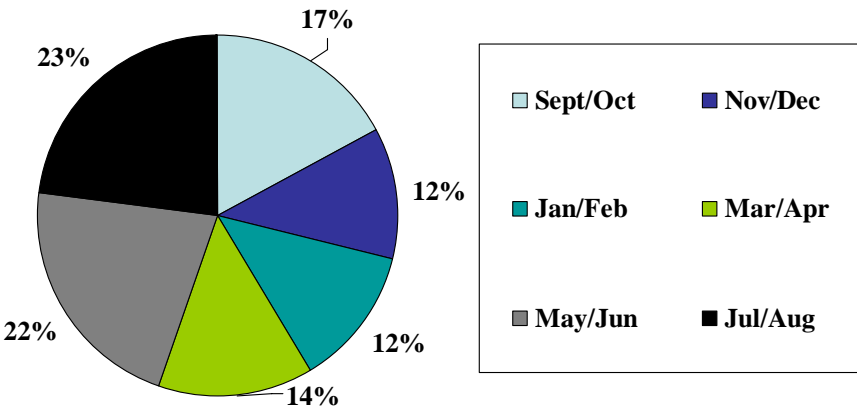


Figure 3. Seasonal distribution of non-tournament HMS trips as reported by Puerto Rico HMS Angling Category permit holders (N=3,415 total trips reported).

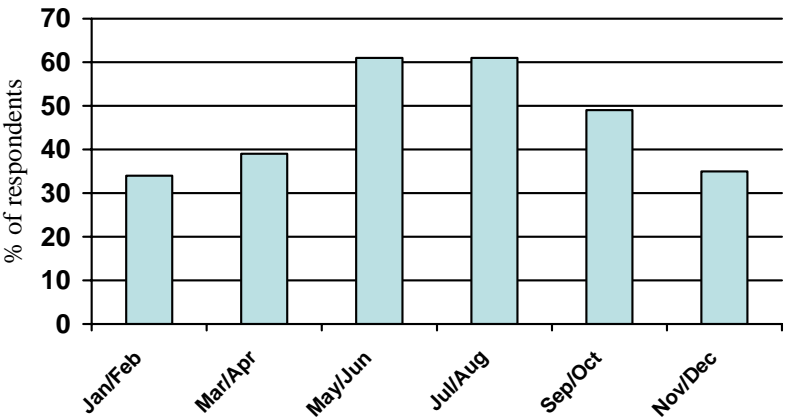


Figure 4. Seasonal participation in non-tournament HMS fishery as reported by Puerto Rico HMS Angling Category permit holders.

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Primary Access Type Used for HMS Fishing

The majority of Puerto Rico HMS Angling category permit holders indicated their primary access site for HMS fishing was a private marina (64.5%). Nearly one-fourth indicated using a public boat ramp (24.2%), 2.4% indicated a private boat ramp, and 7.8% indicated using a personal dock to fish for HMS. Results for primary access site type were similar between respondents that fished for HMS outside of tournaments in the past year and those that did not. Results for primary access site type were also similar between respondents who identified themselves as “sport fishermen” compared to those who self-identified as “recreational anglers.” Only about 12% of respondents indicated they had used a secondary access site for HMS fishing. Self identified “sport fishermen” were more likely to have used a secondary access site (17%) for HMS fishing compared to “recreational anglers” (7.1%).

Species Targeted During HMS Fishing Trips

Based on feedback from captains during the survey planning session, a general question was added to the questionnaire regarding whether anglers plan their HMS trips around a particular species or they are just out fishing for any number of species. Over two-thirds (68.7%) of those who indicated fishing for HMS outside of tournaments in the past year said they plan their trip around a particular target species. By self-identified type of angler, the percent who plan their trip around a particular target species was 82.5% for “sport fisherman”, 56.0% for “recreational anglers”, and 75.3% for respondents who identified as both “sport and recreational.”

Of the 262 respondents who had fished for HMS outside of tournaments in the previous 12 months, 211 (80.5%) targeted billfish while 72 (27.5%) targeted tunas on at least one of those trips. Sharks and swordfish are considerably less important as target species for HMS recreational anglers in Puerto Rico compared to billfish or tunas. Of those respondents who had fished for HMS outside of tournaments in the previous 12 months, only 3% targeted sharks and only 8% targeted swordfish on at least one of those trips.

Of the 397 permit holders interviewed, 51 (12.9%) said that they do not target HMS but get the Angling category permit just in case they land an HMS when fishing for other species that don’t require the HMS permit, such as dolphin or wahoo. Respondents who identified themselves as

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“recreational anglers” were more likely to indicate not targeting HMS (16.1%) compared to those who identified as “sport fishermen” (6.2%).

The large majority of respondents (85.7%) indicated they “always” target blue marlin when fishing for billfish outside of tournaments (Figure 5). Only 6% said they “never” target blue marlin when fishing for billfish. By contrast, less than one-third of respondents said they “always” target white marlin (26.5%) or sailfish (28.3%) when fishing for billfish outside of tournaments. Over one-half (51.0%) of respondents said they “never” target white marlin when fishing for billfish, and 42% said they “never” target sailfish. Interestingly, respondents who identified themselves as being both “sport” and “recreational” were more likely to target white marlin (33.3% “always”, 37.3% “never”) than those who indicated they were one or the other (“sport fishermen” 18.8% “always”, 60.4% “never”; “recreational anglers” 23.0% “always”, 60.8% “never”).

Nearly three-fourths of respondents (72.2%) indicated they “always” target yellowfin tuna when fishing for tunas outside of tournaments (Figure 6). Only 9.7% said they “never” target yellowfin when fishing for tuna. Blackfin tuna was the second most targeted tuna species as nearly one-half (45.7%) of respondents who fish for tuna indicated they target this species at least some of the time. Over two-thirds of respondents who fish for tuna indicated they “never” target bigeye, albacore, or skipjack tunas.

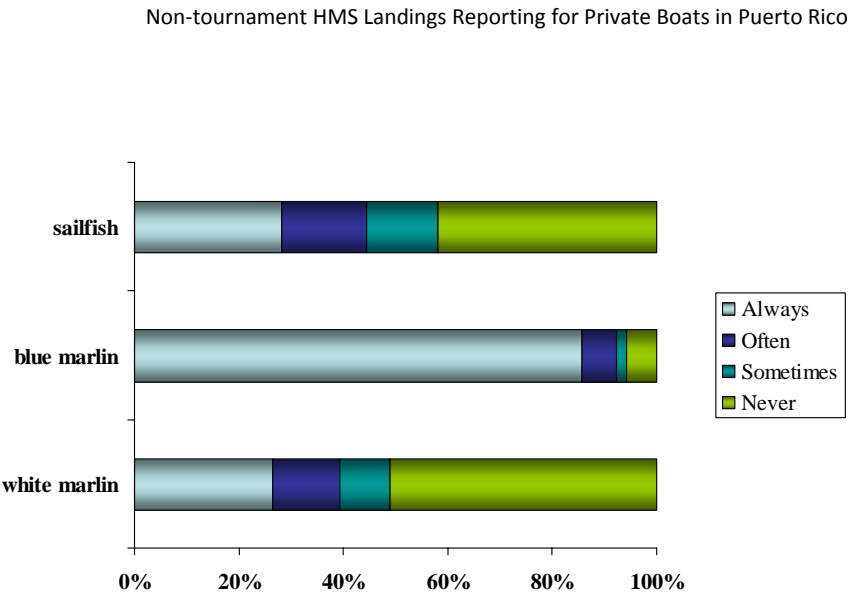


Figure 5. Puerto Rico Angling category permit holders’ responses to the question: *When targeting billfish, how often do you target each of the following species?* (Note: only includes those respondents who indicated they had targeted billfish outside of tournaments in the previous 12 months).

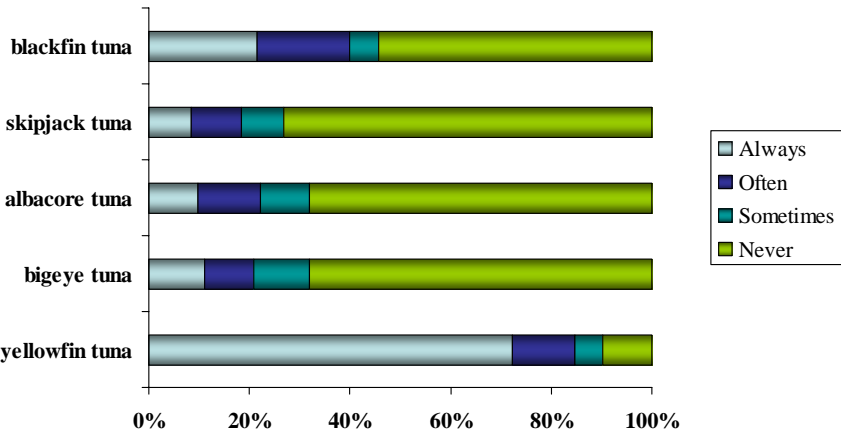


Figure 6. Puerto Rico Angling category permit holders’ responses to the question: *When targeting tunas, how often do you target each of the following species?* (Note: only includes those respondents who indicated they had targeted tunas outside of tournaments in the previous 12 months).

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HMS permit holders were asked if they ever caught HMS incidentally on trips targeting other (non-HMS) species. Nearly two-thirds (62.7%) of all respondents indicated they had caught HMS incidentally on a trip targeting non-HMS species. This is probably due to the fact that many fishing trips target dolphin which can be found in the same areas and caught using similar techniques as billfish. Incidental catch of HMS was significantly more prevalent among those respondents who took at least one non-tournament HMS trip in the past year (73.7%) compared to those who did not fish for HMS outside of tournaments (41.8%).

HMS Trip Duration, Overnight Trips, and Trips Outside Puerto Rico

The average duration of a Puerto Rico non-tournament HMS fishing trip reported by respondents was 7.2 hours per fishing day. Only 2.3% of the non-tournament HMS fishing trips reported were overnight trips consisting of more than one fishing day.

Respondents were asked about their HMS fishing experience in the last 12 months in other jurisdictional areas. A total of 67 respondents (17% of all those interviewed) indicated fishing in a different jurisdictional location for HMS in the previous 12 months. These were divided among “sport fishermen” (19), “recreational anglers” (22), and those who identified as both (26). Of those respondents who fished for HMS outside of tournaments, 10.7% indicated fishing for HMS in the Dominican Republic and 11.1% in the U.S. Virgin Islands. These two destinations were preferred by HMS anglers due to their proximity and target species availability. Other jurisdictional areas mentioned for HMS fishing included the British Virgin Islands, Anegada, St. Martin, Venezuela, Guatemala, and the Bahamas.

Based on previous anecdotal information, it was thought that Puerto Rico HMS permit holders did not frequently go to port or land in these other jurisdictions. However, when asked about this behavior, nearly 80% percent of the interviewed permit holders said that they did go to port when fishing for HMS in these more distant locations. Billfish are by far the species group most targeted by HMS anglers when fishing in these other countries and/or territories (Table 4).

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Table 4. Species targeted by Puerto Rico HMS Angling category permit holders when fishing for HMS in other countries/territories.

Species fished in other countries	Percent of permit holders
Blue Marlin (<i>M. nigricans</i>)	80.6
White marlin (<i>T. albidus</i>)	44.8
Sailfish (<i>I. platypterus</i>)	25.4
Tunas general	7.5
Spearfish (<i>T. pleugeri</i>)	4.5
Yellowfin tuna (<i>T. albacares</i>)	4.5
Sharks general	3.0
Albacore tuna (<i>T. alalunga</i>)	1.5
Blackfin tuna (<i>T. atlanticus</i>)	1.5
Bigeye tuna (<i>E. alletteratus</i>)	1.5
Skipjack tuna (<i>K. pelamis</i>)	1.5

Reported HMS Catches

HMS Angling category permit holders were asked to recall the number of HMS fish harvested and released in the past 12 months. Shorter recall periods are typically used for recreational fisheries surveys designed to produce more accurate effort and catch estimates needed for monitoring and assessment purposes. A 12-month recall period was, however, a cost effective way to achieve the projects primary objective of characterizing the HMS fishery in Puerto Rico. One might expect recall bias to be somewhat less of an issue with rare-event HMS fisheries since fishing for (and catching) large pelagics may be a more memorable experience compared to trips for other more commonly targeted and frequently caught species.

Of those 262 respondents who had fished for HMS outside of tournaments in the past 12 months, 98 (37.4%) indicated they had landed tuna (any species), 28 (10.7%) indicated they had landed any species of shark, and 22 (8.4%) indicated they had landed a billfish. About half (50.8%) of

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those respondents indicated they had caught and released at least one blue marlin in the past 12 months.

Yellowfin tuna was the number one highly migratory species landed while blue marlin was the most released species (Tables 5 and 6). Sharks are both rarely targeted and rarely caught by HMS Angling category permit holders in Puerto Rico. Respondents who had fished for HMS outside of tournaments in the past year reported catching only 51 total sharks (28 landed, 23 released alive).

Table 5. Tunas reported as released and landed outside of tournaments in the previous 12 months, and proportion of respondents reporting catch (Note: proportions are only of those respondents who took at least one non-tournament trip, N=262).

Species	Percent of respondents indicating they landed the species	Number landed	Percent of respondents indicating they released the species	Number Released
Yellowfin (<i>T. albacares</i>)	24.8	250	3.4	21
Albacore (<i>T. alalunga</i>)	6.1	65	3.4	104
Blackfin (<i>T. atlanticus</i>)	4.6	128	4.6	60
Bigeye (<i>T. obesus</i>)	3.4	42	2.3	39
Skipjack (<i>K. pelamis</i>)	3.8	239	4.2	66

Participation in Tagging Programs

Respondents were asked several questions related to their participation in tagging programs. Out of all 397 respondents interviewed, 57 (14.4%) indicated they had caught a previously tagged fish. Over 90% of the previously tagged fish caught by Puerto Rico Angling category vessels were blue marlin. Other species caught with a tag included white marlin and sailfish (1 tagged

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dolphin and 1 unknown shark were also reported). Of those anglers who indicated they had caught a previously tagged fish, only about one-half (50.9%) said they report the tags they find. About 9% of respondents said that they tag HMS outside of tournaments.

Table 6. Billfish reported as released and landed outside of tournaments in the previous 12 months, and proportion of respondents reporting catch (Note: proportions are only of those respondents who took at least one non-tournament trip, N=262).

Species	Percent of respondents indicating they landed the species	Number landed	Percent of respondents indicating they released the species	Number Released
Blue marlin (<i>M. nigricans</i>)	5.7	18	50.8	870
White marlin (<i>T. albidus</i>)	0.4	2	15.6	167
Sailfish (<i>I. platypterus</i>)	0.8	4	27.5	364
Swordfish (<i>X. gladius</i>)	1.1	3	1.5	9

Participation in HMS Tournaments

About one-half (48.9%) of all respondents indicated they had fished in at least one HMS tournament in the past 12 months. In all, the 397 permit holders interviewed reported fishing in a total of 461 HMS tournaments, or about 1.2 tournaments per respondent per year. The large majority of tournaments (76.9%) reported involved two fishing days, and the average number of days fished per tournament was 2.2. Of those respondents who fished in an HMS tournament, 42.9% had fished in only one tournament, 25.1% in two tournaments, 18.2% in three tournaments, and 13.8% in four or more tournaments. By type of angler, 69.2% of those who self-identified as both “sport and recreational” had fished in at least one HMS tournament, 58% of self-identified “sport fishermen” had fished in at least one tournament, and 36% of “recreational anglers” had fished in at least one tournament. Of those “recreational anglers” who

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had indicated fishing in an HMS tournament, the majority fished in only one tournament, whereas “sport fishermen” were more likely to fish in several tournaments per year.

Reporting Preferences

Respondents were asked to indicate their preferred method for mandatory reporting of billfish landings. Two-thirds of those interviewed answered “Internet reporting.” The next most popular reporting options were to fill out landings cards at a marina (12.5%) and by telephone (11.5%). “Recreational” and “sport” fishermen displayed similar HMS reporting preferences. Respondents were also asked if they would be interested in providing information about their fishing activity through online internet surveys in the future. Nearly three-fourths (74.6%) of those interviewed said they would be interested in participating in an online survey. Two-thirds of respondents provided an email address for follow-up fishery surveys.

Management Issues Raised by Respondents

Although Puerto Rico Angling category permit holders were not specifically asked questions pertaining to HMS management, several provided their opinions anyway to the interviewer. These were recorded in a comments field on the form. The alleged presence of longliners in the Puerto Rico Exclusive Economic Zone and off State jurisdictional waters, and the inaction of local and federal authorities to halt this activity, was mentioned by many respondents. Respondents complained of the impact of longliners in HMS fishing, stating that authorities blame recreational anglers for the loss of fishing resources when they should be more closely monitoring commercial fishing activities such as longliners in US Caribbean waters. Some anglers stated that undersized blue marlin were still being landed in Puerto Rico, specifically on the North Coast. The municipalities of Arecibo, Vega Baja, and Vega Alta were mentioned as places where undersized fish are frequently landed and sold. Respondents also complained that local and federal fisheries agencies only pay attention to HMS tournaments when HMS fishing occurs year round and much of the catch occurs outside of tournaments.

Some respondents stated that they are not given enough advance notification to be able to participate in public hearings regarding recreational fisheries issues. HMS anglers are aware of the economic importance of the HMS recreational fishery considering the millions of dollars spent on fuel, boats, fishing equipment, bait, and travel expenses related to fishing. They fully

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expect socioeconomic values to be taken into consideration when it comes to managing HMS fisheries in Puerto Rico and throughout the U.S.

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Discussion***Characteristics of Puerto Rico's HMS Recreational Fishery***

This study describes characteristics of the recreational fishery for HMS in Puerto Rico that have not been previously presented. Based on the results of this survey Puerto Rico's HMS Angling category permit holders can be characterized as follows:

- Nearly half (48.4%) self-identify as "recreational anglers" and only 21.9% self-identify as "sport fishermen." Interestingly, 30.5% considered themselves both "sport and recreational" depending on the particular fishing trip.
- Differences were found between self-identified "sport" and "recreational" anglers in terms of HMS trip avidity, target species, and tournament participation:
 - "Sport fishermen" reported taking nearly twice as many HMS trips, on average, compared to "recreational anglers."
 - "Sport fishermen" were more likely to fish for a particular species on HMS trips compared to "recreational anglers."
 - "Sport fishermen" were more likely to fish in HMS tournaments compared to "recreational anglers."
 - Respondents who self-identified as both "sport and recreational" were more similar to "sport fisherman" in terms of HMS avidity, whether they target a particular species, and tournament participation, than they were to "recreational anglers."
- Respondents averaged about 18 years of experience fishing recreationally for HMS.
- Two-thirds of respondents indicated they had fished for HMS outside of tournaments in the previous 12 months.
- Respondents took an average of 8.6 non-tournament HMS recreational fishing trips aboard their permitted vessel in the previous 12 months.

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- Puerto Rico anglers fish year-round for HMS with peak participation and avidity occurring from May through August.
- Average length of an HMS Angling category permitted vessel in Puerto Rico was 29.8 feet, with a range from 13 to 74 feet.
- About 2/3rds (64.5%) indicated using a private marina as their primary access sites for HMS fishing. About 1/4th used a boat ramp and less than 8% used a personal dock.
- Billfish were targeted by over 80% of respondents who indicated they had fished for HMS outside of tournaments. About 86% of respondents indicated they “always” fish for blue marlin when targeting billfish. By comparison, 42% of billfish anglers said they “never” target sailfish and about 51% said they “never” target white marlin.
- Tuna were targeted by 27.5% of respondents who indicated they had fished for HMS outside of tournaments. Yellowfin tuna was by far the most popular target species on trips targeting tuna, followed by blackfin tuna.
- Only 2.3% of HMS trips reported were overnight trips consisting of more than one fishing day.
- Over 98% of the billfish reported as caught outside of tournaments were released alive.
- About one-half (48.9%) of respondents indicated they had fished in an HMS tournament in the previous 12 months.

Comparisons of Reported Catches with other HMS Data Sources

The available data for billfish landings in Puerto Rico come mainly from recreational fishing tournaments. While billfish are also landed outside of tournaments, non-tournament landings are rarely reported through the NOAA Fisheries mandatory reporting system. For example, in this study a total of 18 blue marlin, 2 white marlin, 4 sailfish, and 3 swordfish were reported as landed by Puerto Rico Angling category permit holders. These are likely minimum estimates since less than one-half of the permit holders were interviewed, and they do not include non-tournament billfish landings by HMS Charter/headboat category vessels. Direct comparisons

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with landings reported through the NOAA Fisheries Automated Landings Reporting System (ALRS) are difficult since catches were reported for the previous 12 month period and phone interviews were conducted from November 2008 through May 2009. Depending on when the interview was conducted, respondents could have reported catches from November 2007 through May 2009. ALRS reported landings from Puerto Rico during this time period are as follows: 6 blue marlin, 0 white marlin, 1 sailfish, and 0 swordfish. Thus, ALRS reported billfish landings for this 19-month period (Nov. 2007-May 2009) are still considerably smaller than landings reported through the (12-month recall period) characterization survey, which should be considered minimum estimates since they don't include landings from over 600 HMS Angling category permit holders who were not interviewed, nor from HMS Charter/headboat category vessels. The number of billfish and swordfish landed by non-permitted vessels in Puerto Rico is also unknown.

Comparisons with the PRDNER HMS tournament program, which covers all billfish tournaments on the island, suggest that, at least for 2008, far more billfish were landed outside of tournaments than in tournaments in Puerto Rico. PRDNER reported only two blue marlin and zero white marlin, sailfish, or swordfish were landed in 2008 tournaments (G. Rodríguez-Ferrer, personal communication).

Survey respondents also reported releasing 870 blue marlin, 364 sailfish, and 167 white marlin outside of tournaments in the previous 12 months. MRFSS estimates for blue marlin released have fluctuated from 918 to 7,253 between 2000 and 2008 with PSE's ranging from 27% to 91%. MRFSS estimated sailfish and white marlin releases are even less precise. White marlin releases have been estimated at zero for six out of the last nine years, while sailfish releases have fluctuated from 449 to 8,480 during the same time period.

Yellowfin tuna (250 landed) were reported as the species of tuna most often landed (outside of tournaments) by Puerto Rico's Angling category permit holders, followed by skipjack (239), and blackfin tuna (128). As with billfish landings, these numbers are likely minimum estimates due to survey non-response and lack of charterboat landings. MRFSS annual recreational landings estimates for tunas in Puerto Rico are also very imprecise and fluctuate widely from year to year. For example, from 2000-2008 yellowfin tuna landings for all modes combined fluctuate between 0 and 6,620 fish with PSE's ranging from 36% to 100%. Skipjack estimates fluctuate even more

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widely over the same time period (i.e., from 50 to 13,569 fish; PSE's from 45% to 100%). Although, based on results of this pilot study, it appears that tunas are not landed in large numbers in Puerto Rico, current data collection methods are not reliable for estimating these landings with any degree of precision. Due to the extremely rare event nature of tuna landings, a specialized survey may be necessary to accurately and precisely estimate landings of these species. The same also applies to sharks which are caught even less frequently than tunas by HMS Angling category permit holders in Puerto Rico.

Survey Non-response

Non-response could have negatively affected the results since only less than half of the HMS Angling category permit holders in Puerto Rico were interviewed. Had the telephone survey dialing period been extended, a greater proportion of permit holders could have been surveyed and the results would have been more representative of all permit holders. It is unknown whether non-respondents differed from respondents in terms of fishing characteristics important to this study. The data on reported effort and catches should be considered minimum estimates since so many permit holders did not respond to the survey. Responses were also only limited to permitted anglers and it remains unknown how many anglers in Puerto Rico fish for HMS illegally without a federal permit. A question about the HMS permit can be added to the Access Point Intercept Survey (formerly MRFSS) to estimate the prevalence of anglers targeting and/or catching HMS without an HMS permit.

Based on this study, it is recommended that the accuracy of information provided when captains obtain their HMS permit should be validated and quality control checked. If the HMS permit list is to be used as a sampling frame for future data collections in Puerto Rico, it is essential that the contact information is as accurate and complete as possible. Typical problems identified through this study with the permit database included wrong or incomplete addresses, wrong phone numbers, and permits issued to boats with no valid registration number. Wrong numbers, out of service, and disconnected numbers accounted for 12% of all call dispositions. The process of attempting to send pre-notification letters to all permit holders was time consuming and it impacted the time available for conducting the telephone survey while still meeting project milestones.

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Recommendations for Future HMS Data Collection

This characterization survey was the first part (Phase One) of the proposed two phase MRIP project aimed at improving non-tournament HMS recreational data collection in Puerto Rico. The major objectives of Phase Two are to:

- Explore the feasibility of alternative data collection methods aimed at improving the accuracy and precision of HMS non-tournament catch estimates.
- Develop outreach materials to promote and increase awareness of any proposed new data collection approaches.
- Implement a new HMS recreational data collection pilot program in Puerto Rico.

The majority of Puerto Rico HMS Angling category permit holders indicated that their preferred method for reporting HMS catches was through the Internet. NOAA Fisheries currently has both telephone and Internet options available for mandatory reporting of all billfish and swordfish landed outside of tournaments. However, result of this project suggest that neither online nor telephone reporting works very well and non-compliance rates are very high for Puerto Rican HMS anglers who land billfish and swordfish. The current system, which allows anglers up to 24 hours to report their landings, makes enforcement of this mandatory requirement difficult, if not impossible. There is little incentive for anglers to report their billfish after the fact if there is no chance of being caught out of compliance. By comparison, catch card programs, which require anglers to tag landed fish prior to removal from the vessel, are enforceable at the dock since any off-loaded fish without a landings tag represents a violation. HMS catch card programs are currently run by state agencies in North Carolina and Maryland. In Maryland, compliance with the mandatory reporting of all recreationally landed bluefin tuna is thought to be around 80%, which is significantly higher than estimated compliance with the mandatory call-in or internet reporting for bluefin tuna in other Northeast states. Catch card programs in Maryland and North Carolina work as follows:

- Captains or operators of permitted vessels are required to complete a catch card to be submitted at a reporting station in exchange for a landing tag.
- A catch card must be submitted for each individual fish landed.

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- Catch cards are widely available at marinas, bait and tackle shops and other sources easily accessible to HMS anglers returning from fishing.
- The operator of the permitted vessel is responsible for the proper completion of the catch card.

Characterization survey results suggest that a catch card program might work well in Puerto Rico. For one thing, the large majority of HMS recreational vessels return to marinas or boat ramps. Only about 10% of Angling category permit holders indicated they use personal residences for their HMS fishing vessels. In addition, Puerto Rico has a relatively small number of access sites where recreational HMS vessels return to (G. Rodríguez-Ferrer, personal communication). Seven sites accounted for 92% of all MRFSS intercepted trips targeting billfish in Puerto Rico from 2004-2008. Therefore, catch card reporting stations could be set up at these central locations to facilitate the exchange of landings tags and catch cards. Also, since a large majority (over 97%) of reported HMS trips were within a single fishing day, most vessels should return to the dock at times when the reporting stations will still be open. The establishment of reporting stations at all marinas with HMS vessels will require a targeted outreach effort by PRDNER. The outreach message should emphasize how valuable the information provided by the recreational fishing community for the long-term health of sustainability of the resource. Since billfish and swordfish are landed in relatively small numbers, compared to bluefin tuna in Maryland for example, the burden on marinas or other businesses that serve as official reporting stations to hand out tags and collect catch cards will be minimal. Sharks could be added as species that would require a landings tag since they are also landed in very small numbers by Puerto Rico anglers.

While a catch card program should improve the accuracy and precision of billfish landings estimates, a different method will be needed to improve the accuracy and precision of billfish released estimates. One approach would be to increase MRFSS sample sizes, particularly in months when the majority of billfish are caught (e.g., wave 3 through 5). More investigation is needed to determine how much additional sample size would be needed to obtain precision levels within an acceptable range for management and assessment purposes. The cost of increasing sample sizes to achieve the desired level of precision may be prohibitive, particularly for white

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marlin and sailfish which are less frequently targeted and caught compared to blue marlin. If so, a more cost effective approach may be a weekly (or bi-weekly) random telephone survey of HMS Angling and Charter/headboat permit holders. It is expected that anglers should be able to recall the number of each billfish species they released alive in the past week (or two), particularly if an advance letter is sent notifying anglers that they have been selected to report. A specialized billfish survey in Puerto Rico could also be used to obtain valuable information regarding the number of billfish hooked but lost, post-release mortality variables (i.e., hook type, fight time, hook locations, fish condition, and bleeding), and tagging activity. Sample sizes and sampling period length (e.g., bi-weekly, monthly) for a survey of HMS permit holders could be adjusted monthly based on relative HMS effort or directed effort for key species of concern. NOAA Fisheries should also explore Internet data collection approaches for HMS in Puerto Rico since three-fourths of those interviewed indicated a willingness to participate in online surveys in the future and two-thirds provided an email address.

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Appendix. Telephone survey used to characterize HMS Angling Category fishery in Puerto Rico (translated to English for report purposes).

Hello, I'm calling for a survey being conducted for NOAA Fisheries as part of the Marine Recreational Information Program or MRIP. Can I please speak to name of contact? *If person sought is not available, ask if they will be available anytime this week. If yes, schedule convenient time to call back to talk to that person, thank respondent, and terminate interview. If no, thank respondent and terminate interview.*

Your name and phone number were obtained from a list of Highly Migratory Species (HMS) Angling category permit holders. The purpose of this study is to gather information about recreational fishing activities targeting highly migratory species such as tunas, sharks, billfish, and swordfish. This survey is being conducted in accordance with the Privacy Act of 1974. Any information you provide will remain confidential. The survey should only take about 15 minutes of your time.

Are you still the captain, owner or designated representative of the vessel name(s)?

If "yes", ask: Can you provide information on the activity of the vessel name (*or vessels*) during the past 12 months?

If "yes", continue to survey description.

If "no", ask: Is someone else currently operating the name of the vessel (s)?

If "yes", then ask: Do you know the name and telephone number of new contact?

If "yes", take name and telephone number, thank respondent and terminate Interview.

If "no", denote whatever information is given and terminate interview.

Do you consider yourself recreational or sport fishermen?

For the purpose of this study a recreational angler is defined as someone who fishes primarily for fun and social interaction. A sport fisherman is someone who fishes competitively in organized tournaments.

Q1. How many years total have you been saltwater fishing for tunas, sharks, billfish or swordfish?

Q2. How many years have you gotten an HMS Angling category fishing permit for any vessel?

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For the next series of questions we want to focus on your fishing habits outside of fishing tournaments.

Q3. Thinking about the past 12 months, about how many recreational saltwater fishing trips targeting tunas, sharks, billfish or swordfish did the name of vessel make in Puerto Rican waters?

Q4. Do you plan your trips by species? Yes ☐ No ☐

These next questions have to do with those response to Q3, trips taken on the vessel name in the past 12 months for tunas, sharks, billfish or swordfish in Puerto Rico.

Approximate number of trips by target species for the past 12 months.

Blue Marlin _____

Sailfish _____

White Marlin_____

Swordfish_____

Sharks_____

Tunas (in general)

Albacore _____

Yellowfin Tuna_____

Skipjack_____

Big Eye_____

Bonito (Blackfin)

Little tunny _____

Q5. Thinking about the response to Q3, trips taken for tunas, sharks, billfish or swordfish on the vessel name, can you tell me about how many or what proportion were targeting

a. Tunas

b. Sharks

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c. Billfish (marlins, sailfish, spearfish)

d. Swordfish

Q6a. When targeting tuna aboard the vessel name which of the following species do you fish for:Yellowfin tuna ☐ always ☐ often ☐ sometimes ☐ neverBluefin tuna ☐ always ☐ often ☐ sometimes ☐ neverBigeye tuna ☐ always ☐ often ☐ sometimes ☐ neverAlbacore tuna ☐ always ☐ often ☐ sometimes ☐ neverSkipjack tuna ☐ always ☐ often ☐ sometimes ☐ neverBlackfin tuna ☐ always ☐ often ☐ sometimes ☐ neverOther (specify) ☐ always ☐ often ☐ sometimes ☐ neverOther (specify) ☐ always ☐ often ☐ sometimes ☐ neverQ6b. When targeting sharks aboard the vessel name which of the following species do you fish for?blacktip ☐ always ☐ often ☐ sometimes ☐ neverbull ☐ always ☐ often ☐ sometimes ☐ neversandbar ☐ always ☐ often ☐ sometimes ☐ nevershortfin mako ☐ always ☐ often ☐ sometimes ☐ neverOther (specify) ☐ always ☐ often ☐ sometimes ☐ neverOther (specify) ☐ always ☐ often ☐ sometimes ☐ neverQ6c. When targeting billfish aboard the vessel name which of the following species do you fish for?White marlin ☐ always ☐ often ☐ sometimes ☐ neverBlue marlin ☐ always ☐ often ☐ sometimes ☐ neverSailfish ☐ always ☐ often ☐ sometimes ☐ never

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Other (specify) _____ always _____ often _____ sometimes _____ never

Q7. Do you ever catch HMS while fishing for other species (dolphinfish, wahoo etc)?

Q8. How many of your HMS trips consisted of more than one day of fishing?

Q9. Approximate time (hours) fishing for HMS on a typical trip

Q10. What type of access site did you primarily use for the vessel name?

_____ Marina

_____ Public boat ramp/launch

_____ Personal residence or dock

_____ Other

Q11. Was the response to Q9 the only access site used for the vessel name when fishing for tunas, sharks, billfish or swordfish?

Yes –

No –

Q12. What other access sites were used?

Q13. Thinking about the response to Q3, trips taken in the past 12 months for tunas, sharks, billfish or swordfish, can you tell me about how many or what proportion were taken during: record number or percent

September and October _____

November and December _____

January and February _____

March and April _____

May and June _____

July and August _____

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Q14. Now I'd like to ask you a few questions about the fish you caught aboard outside fishing tournaments the vessel name in the past 12 months. (Note: adjust species for particular states; include other options)

Q14a. Did you catch any tunas? Yes – ____ No – ____

About how many bigeye tuna ____ harvest ____ released?

About how many yellowfin tuna ____ harvest ____ released?

About how many albacore tuna ____ harvest ____ released?

About how many skipjack tuna ____ harvest ____ released?

About how many blackfin tuna ____ harvest ____ released?

Q14b. Did you catch any sharks aboard the _____ in the past 12 months?

Yes ____ No ____

Q14c. About how many of the following shark species did you harvest and release alive aboard the vessel name in the past 12 months?

About how many blacktip sharks ____ harvest ____ released

About how many sandbar sharks ____ harvest ____ released?

About how many mako sharks ____ harvest ____ released?

About how many bull sharks ____ harvest ____ released?

Any other sharks (record species) ____ harvest ____ released?

Any other sharks (record species) ____ harvest ____ released?

Any other sharks (record species) ____ harvest ____ released?

Q14d. Did you catch any billfish aboard the vessel name in the past 12 months?

Yes – ____

No – ____

Q14 e. Have you ever caught a previously tagged fish? How many?

Do you report tags? Do you send the information card to The Billfish Foundation?

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Q14f. About how many billfish did you harvest and release alive aboard the vessel name in the past 12 months?

About how many blue marlin ____harvest ____ released?

About how many sailfish ____harvest ____ released?

About how many white marlin ____harvest ____ released?

Q14g. Did you catch any swordfish aboard the vessel name in the past 12 months?

Yes – ____ No – ____

Q14h. About how many swordfish did you harvest and release alive aboard the vessel name in the past 12 months?

Record ____ harvest ____ released

In the past 12 month how many fishing trips have you taken to:

Dominican Republic ____

Virgin Islands ____

Other ____

On these trips do you

Go to the port ____

Stay within their waters but do not make port call ____

What species do you target on these trips?

Blue Marlin ____

Sailfish ____

White Marlin ____

Swordfish ____

Sharks ____

Tunas (in general) ____

Other ____ Which ____

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Do you tag billfish in these waters (i.e. DR, VI etc)? Yes _____ No _____

Q15. Of the _____ trips for HMS in past 12 months how many or what proportion were associated with tournaments

What tournament(s) did you fish in? Ask for each tournament: how many trips did you fish with the vessel name?

Q16. Would you be interested in providing information about your fishing activity through online internet surveys in the future?

Q17. Do you have an email address through which we can notify you about future fishing surveys?

Q18. How do you prefer to report your landings?

Online reporting _____

Report by phone _____

Fill out Reporting tags at the Marina and mail them _____

Fill out Reporting tags to be collected by DNER _____

Logbook Reporting _____

Other:

END: Those are all of the questions that I have for you, thank you for your time and cooperation. Have a good day/evening. Goodbye.