

Statistical Consultants' Report: Review of Puerto Rico Sampling Needs

Authors: Breda Munoz¹, Virginia Lesser², Jim Chromy¹,
Jay Breidt³ and Jean Opsomer³

¹RTI International, ²Oregon State University, ³Colorado State University

1. Introduction

From September 12th to 14th, 2012, statistical consultants met in San Juan, Puerto Rico with representatives from the Puerto Rico Department of Natural and Environmental Resources (PR DNER), the Caribbean Fisheries Management Council (CFMC), National Oceanic and Atmospheric Administration (NOAA) and Puerto Rico stakeholders, researchers from the University of Puerto Rico, and fisheries consultants to discuss Puerto Rico sampling needs. The goal of this meeting was to listen to presentations and discuss past and current sampling efforts in Puerto Rico, their success and limitations. In addition, the Puerto Rico team presented their data needs to inform stakeholders and policy makers to better manage Puerto Rico fish stocks. The following are some observations of the Puerto Rico fisheries:

- The state waters of Puerto Rico extend from the shore line to 9 nautical miles off shore where the exclusive economic zone (EEZ) begins and extends to 200 nautical miles (Garcia-Moliner, 2009).
- By law, a commercial fishing license is required in Puerto Rico. The PR DNER also requires commercial fishing permits for spiny lobster and queen conch.
- Law 278 (PR Fisheries Law) and Fishing Regulation #7949 of 2010 require a recreational local fishing license, both for freshwater and saltwater. Puerto Rico is developing a system to implement a license process that will be available in 2013.
- There is a federal requirement to obtain a Highly Migratory Species (HMS) Angler permit (Angling or charter/headboat) to fish recreationally for tunas, sharks, billfish, and swordfish.
- Prior to 1998, reporting of commercial fishing harvest was voluntary in Puerto Rico. Starting in 2004 the new fishing regulation requires reporting catch on a trip basis for commercial fishing as a requirement to maintain a commercial fishing license and permits (Garcia-Moliner, 2009).
- There are special permits for recreational anglers that have not been implemented yet. Examples include reef fish, spiny lobster and queen conch (Garcia-Moliner, 2009).
- Corals can only be harvested for scientific purposes or small fragments found on the beach can be collected for art work, with a special permit. They are not considered to be part of the MRIP.
- Since the mid-80's, fishing activities grew at a fast pace in Puerto Rico. In recent years, participation in marine recreational fishing has declined – especially in shoreline fishing. Even so, the supply of private and public facilities and services are considered inadequate. Improvised piers, ramps and

launching facilities emerged over time along the Puerto Rico shore that provides anglers increased access to the water. Also, a number of coastal residents rent or lease water access and pier space to boaters and recreational anglers (Valdez et al, 1989). These private access sites are likely not included in the MRFSS sampling frame.

- The majority of the harvest in Puerto Rico is from private boats. The majority of the effort is from shoreline fishing (SH mode). Charter boat catch and effort is very minor compared to private and shore modes. No attempt has been made to determine the number of charter boats with a commercial license (Garcia-Moliner et al, 2002).
- In an effort to monitor Atlantic billfish (blue marlin, white marlin, swordfish and sailfish) landings and to follow recommendations from the International Commission for the Conservation of Atlantic Tunas (ICCAT), NOAA Fisheries implemented a mandatory reporting program of all non-tournament billfish, swordfish, and bluefin tuna landings using telephone or internet. However, compliance with this mandatory requirement is suspected to be extremely low in Puerto Rico (MRIP report, 2009; Del Pozo et al, 2012). 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 (due to the under reporting) and biased due to survey design issues (MRIP report, 2009).
- The HMS recreational fishery occurs year round in Puerto Rico with peak effort between May through August (MRIP report, 2009).
- There are between 20 to 35 different tournaments annually in Puerto Rico and all are monitored by the PR DNER staff.
- Billfish comprise an important target species groups for recreational and sport fishers in Puerto Rico (Del Pozo et al, 2012).
- Dolphin fish is the number one sought-after species in the marine recreational fishery.
- The improvement in fishing gear and the evolution and adaptability of fishing modes have resulted in an increase in the numbers of catch and catch of larger sizes over the years.
- Queen conch is one of the most important shellfish fishing resources throughout the Caribbean, including Puerto Rico (Garcia-Moliner, 1996).
- PR DNER staff suspect that illegal fishing using beach and gill netting is done at night between 10 pm and 4 am, often occurring in hard to access sites. It is suspected that this activity negatively impacts shoreline mode fishing and inshore (rivers and coastal lagoons) fishing¹. Since this type of effort is not captured by the current MRIP, commercial and recreational harvest totals are suspected to be under-estimated.

1. Puerto Rico data needs.

The following is a list of questions presented to the consultants from the Puerto Rico team during the review:

The primary questions are:

- How to better monitor the fishing effort and catch from private boats?

¹ Craig Lilyestrom comment on Puerto Rico Report.

- How to improve the current data collection program?

Another set of questions was also asked:

- How to address Puerto Rico needs to collect biological data (tissue) to estimate maturity and age?
- How to obtain trend estimates of catch for different species?
- How can PR DNER staff obtain access to Puerto Rico Marine Recreational Intercept Program (MRIP) data? The current data formats provided by MRIP are not compatible with Puerto Rico DNER data analysis systems.
- There is insufficient information currently collected to determine the location of fishing areas. This will help to establish appropriate Annual Catch Limits (ACLs) within specific locations.
- Long term commercial and Marine Recreational Fisheries Statistics Survey (MRFSS) data conclude that total harvest by weight from commercial and recreational fisheries are similar. These types of fishing focus on slightly different species. While both recreational and commercial fishers target conch, lobster, reef fish, tuna, wahoo, etc., the primary target of recreational fishers in terms of weight is the dolphin fish, while commercial fishers target deep water snapper. Deep water snapper is primarily caught with bandit gear, which is defined as a commercial fishing gear².

2. Past and Current data collection efforts in Puerto Rico

Puerto Rico has a long history of conducting surveys to collect data to inform policymakers so that scientific based regulations can be established to properly manage their fishing resources. A number of these studies have been conducted by the Marine Recreational Fisheries Statistics Survey (MRFSS). Other surveys include pilot studies led by the University of Puerto Rico researchers and the PR DNER to evaluate new or modified data collection methods to improve current data collection for specific species. A few of these survey efforts are described below.

In 2000, the PR DNER established the Marine Recreational Fisheries Program (MRFP) which consists of two major components: the collection of fishing tournament data and the implementation of the MRFSS in Puerto Rico. Currently, biologists from PR DNER collect data at all fishing tournaments. It is suspected that some boats without any catch of the tournament species don't return to the tournament location. This results in under-coverage of some of the Highly Migratory Species (HMS) tournament fishing activities (e.g. non-tournament species) that otherwise is considered adequate. Bycatch and catch/release data are also collected in these tournaments and the MRFSS. However, the MRFSS does not cover all types of fishing modes in Puerto Rico and does not have access to all fishing sites (e.g. some remote or private beaches, private marinas, access-restricted ports, private piers, etc.); this under-coverage of the sampling frame is likely to result in biased survey estimates for some modes and species.

In 2000, a telephone survey conducted by the Caribbean Fisheries Management Council (CFMC) collected information on the charter boat fisheries in Puerto Rico and Virgin Islands (Garcia-Moliner et al, 2002). In addition to identifying ownership of the vessel, the survey collected data on effort and

² Craig Lilyestrom and Barbara Kojis comments on Puerto Rico Report

catch, length of fishing trips, gear, and operation costs. This survey not only provided estimates about fishing activities of the charter fleet in Puerto Rico and Virgin Islands, but also offered an insight in the rapid turnover of charters and private vessels businesses in Puerto Rican waters. This survey also indicated the need to properly monitor the fishing activity of recreational anglers, since the recreational fishing license system is not yet operational.

Between 2007-2009, the PR DNER and NOAA Fisheries biologists, Puerto Rico Sport Fishing Association leaders, HMS charter boat captains, and Caribbean Fisheries Management Council staff conducted a survey to obtain data on HMS fishing effort, angler characteristics, target species, access site types, fishing times, multiday fishing trips, seasonal trip distribution, and HMS catch. Outreach efforts conducted to increase survey response included meetings between the research team staff and fishing industry representatives, research team staff attended HMS tournaments, notification letters alerting HMS anglers about the survey, and notices about the study were published in sport fishing magazines. A 50% participation rate was obtained. Main results derived from the survey are: data for billfish landings in Puerto Rico are mostly obtained from recreational fishing tournaments and non-tournament landings of billfish are rarely reported through the NOAA Fisheries mandatory reporting system. One of the key factors that affected the participation rate in this survey was the inaccuracy of the contact information in the HMS permit holders list (MRIP HMS Work Group Members, 2009).

An MRIP phone/internet survey was conducted in 2011 with HMS Angling and Charter/headboat category permit holders. The corresponding final report was not finalized at the time this report was completed.

In an attempt to increase billfish landings and improve the accuracy of billfish and swordfish landings data, the University of Puerto Rico Sea Grant College Program (UPRGCP) and NOAA Fisheries established a pilot HMS Catch Card Pilot Program (CCPP) between May to December, 2011. Reporting stations that provided access to catch cards and landing tags were placed at marinas and nautical clubs. In addition, the reporting stations provided anglers and captains access to outreach materials. Participation in this pilot study was voluntary since the mandatory non-tournament reporting via internet and phone and the mandatory reporting by billfish tournaments were still in effect. In conjunction with the reporting stations, several outreach activities were undertaken to increase participation: letters and emails encouraging participation were sent to HMS permit holders, meetings with the staff of marinas and nautical clubs to discuss the benefits of the program, a booth providing materials explaining the CCPP was set up at every fishing tournament, the creation of an informative web site, the creation of a Facebook group, information about the CCPP was published in newspapers and fishing blogs, and educational brochures and posters were broadly disseminated.

Recommendations from this pilot study include: implement a modified CCPP program to replace the existing phone and internet HMS system in Puerto Rico; make the CCPP program mandatory and enforce compliance; eliminate the reporting stations in marinas and nautical clubs and have NOAA send kits (tags and catch cards) to HMS angling, charter or headboat permit holders; and implement a catch card web data collection system to facilitate data collection (Del Pozo et al, 2012).

3. Recommendations

Accurate information on catch and effort along with the knowledge of the human dimension of recreational fisheries in Puerto Rico will allow resource managers and policy makers to develop policies and management plans that are in accordance with the social, cultural and economic parameters of this rich and evolving fishery. Puerto Rico is on the right track to properly manage their fisheries resources. We comment below on the three key questions that were asked at the face-to-face meeting.

1. How to cover most of the fishing activity in Puerto Rico?

The new MRIP design covers most of the fishing activity in Puerto Rico. A few modifications are suggested to address some of the fishing activity that may not be covered in the new MRIP design adopted in the mainland.

- ***Effort Estimates***

To obtain effort estimates, the revised MRIP design utilizes a telephone interview using a random digit dialing approach to obtain estimates of the number of anglers. Representatives from Puerto Rico indicated it is fairly likely that a mandatory recreational fishing license system will be implemented in Puerto Rico in 2013, in compliance with existing enabling legislation. This will provide an excellent frame to use to obtain effort estimates as well as obtaining estimates of fishing pressure for different locations.

Data on fishing pressure will be helpful to improve the selection of sites for interviewer visits. Procedures need to be established and followed to ensure that collection of basic information from the license applicant frame are as accurate as possible (e.g. checking IDs for name when the license is purchased and obtaining an accurate address with telephone number). However, anglers that do not purchase a license will not be on the list. For example, there may be exemptions for some demographic groups that need not buy a license as well as illegal anglers who refuse to purchase a license. MRIP pilot studies in the mainland have identified a considerable amount of fishing activity (as much as 50% of total effort) by non-licensed anglers. This has been consistent in every state where the MRIP has done pilot studies. Enforcing the license program and appropriate outreach programs must be developed to reduce the number of non-licensed anglers.

In order to obtain an estimate of fishing effort from this group of non-licensed anglers, a sample of random addresses or phone numbers in Puerto Rico is needed. A dual frame approach (using a license frame and a randomized list of residents) has been pilot tested in the mainland. This approach may be considered if there does appear to be a number of potential anglers missing in the license frame. Another list available to PR DNER containing angler information is the HMS permit list. Puerto Rico could use a dual frame approach consisting of either the license frame or the HMS permit list and a random sample of residents (phone numbers or mailing addresses). It is critical that Puerto Rico compares all frames and if a combination of frames is used, duplicates would be removed prior to sampling. Other pilot studies have compared the use of a mail, rather than telephone, approach to obtain effort. These studies make use of the address-based sample lists. The coverage of both the mailing addresses and

telephones in Puerto Rico should be examined to assess the level of coverage of all residents on the island and the cost efficiencies of these approaches.

- *Catch Estimate*

It is necessary to review the estimation process used to produce total catch estimates. For example, catch for vessels is based on data collected from vessels returning to a boat ramp. It is expected that some anglers on some vessels are visitors to Puerto Rico and not included in any catch/effort survey of Puerto Rico residents. Visitors should be identified on the data collection forms so their catch can be estimated independently of the local effort estimates. The current MRFSS/MRIP catch questionnaire includes questions about residency that are used to develop correction factors to account for nonresident fishing activity. Puerto Rico could use similar procedures to adjust estimates for the nonresident fishing activity.

The site registry needs to be reviewed and updated. The sampling frame should incorporate time of day as well as site location so that the selected sampling units cover the entire population defined spatially and temporally. Coverage of remote island areas with limited access will require construction of special primary sampling units (PSUs) that will allow the selection of a sample of these PSUs over an accessible period of time. Sample allocation proportional to fishing pressures (anglers or catch) should require that these remote areas be sampled only infrequently. One can start sampling for example, every other month. After review of the data, if the estimates don't change, the samples can be further spaced in time, perhaps once every six months.

The revised MRIP design includes sampling sites across the 24 hour period to address the issue of gaps in nighttime fishing. We recommend considering hiring contractors to assist in the interviews that occur on holidays and during nighttime.

Fishing location is also of interest. It may be helpful to conduct focus groups of anglers to investigate how to best obtain this information. It would be useful to compare whether the use of maps or just a description of the location is more suitable.

Continue revising and updating the frame of the MFRSS to include all access sites such as marinas, boat ramps, private and remote beaches, etc. Site closings and very low pressure sites result in low data collection productivity in the current MRIP surveys. Consider obtaining accurate pressure based on catch instead of effort to identify low, medium and high pressure sites by month, type of day and time of day combinations. By having an updated frame for each month of the year, MRIP should be able to adapt the sample size to capture high season and low fishing seasons in the appropriate areas in Puerto Rico.

In Puerto Rico, shoreline fishing mode includes fishing at beach segments and at piers, and also includes fishing from kayaks, jet skis and small boats that return to the shoreline. The questionnaire used for the intercept survey could include a box to denote kayak fishing, jet ski and small boats. We encourage appropriate testing of any modifications of any existing collection forms. There are sites with high fishing

activity causing inability to complete all surveying at the site. To address this problem Puerto Rico needs to adjust the sampling frame (e.g. splitting the shoreline in more manageable segments).

- ***HMS Reporting***

A number of recent studies investigated dockside intercept surveys, the HMS automatic reporting system, a catch card option, and a telephone study using the vessel registry to estimate HMS data. These studies revealed issues (e.g. under reporting) in existing data collection systems (e.g. HMS mandatory reporting) and provided recommendations to improve existing data collection efforts. For example, a catch card system can be used to supplement the mandatory reporting of HMS landings. Based on the pilot study results, the success of the catch card system may increase if permit holders (e.g. vessel captains or vessel owners) have access to kits (e.g. accessible through the marina) containing the needed forms (Del Pozo et al., 2012). A self-paid envelope can be added to the kit to encourage response. Other pilot studies have been conducted on this topic and should be examined for further ideas (e.g. Highly Migratory Species For-Hire Survey – Florida Pilot Study and Massachusetts Bluefin Tuna Pilot). Some of the recommendations from these studies include the enforcing of a catch/card program at the dock to increase compliance rate. In a catch/card program, anglers need to tag landed fish prior to removal from the vessel and any off-loaded fish without a landings tag represents a violation. Similar enforcement has resulted in larger compliance rates in North Carolina and Maryland (MRIP HMS Work Group Members, 2009) when compared to the current phone/internet method. The number of marinas or access sites that harbor HMS vessels is relatively small. PR DNER could establish reporting stations at all marinas with HMS vessels or could also facilitate reporting using phone or internet. To facilitate the process, the form used in the internet or phone system should be the same as the information collected in the catch/card option. This will require an outreach effort by PR DNER emphasizing the importance of the information for the sustainability of the resource. It is worth continuing to investigate cost efficient methods to estimate HMS landings.

In addition, in order to estimate the prevalence of anglers targeting and/or catching HMS without an HMS permit, a question about the HMS permit can be added to the current intercept survey questionnaire. We encourage appropriate testing of any modifications of any existing collection forms.

- ***Tournaments***

Currently, PR DNER collects tournament data. This coverage is not currently considered part of MRIP, but it has been included as part of a new MRIP sampling design pilot tested in the mainland. The coverage of tournaments currently occurring during non-holidays is excellent and it should provide high quality landings data. PR DNER may want to consider hiring a contractor to cover holidays and other days not covered by PR DNER staff. By not covering tournaments on holidays, underestimation of catch and effort for certain species is expected. Data collected in tournaments include species, weight and length as well as bycatch and catch and release. Some vessel specific data collected include name of vessel, name of captain, vessel length and weight, number of anglers, number of hours fished, hours of trip, number of lines and area fished. Adding questions to the current collection forms and training existing staff can help capture other important data that are not currently collected. For example, PR

DNER can add a question to identify commercial and recreational vessels that had landings during the tournament. Contact information could be collected (e.g. mailing address, email and phone number) that could be used later in a survey to collect data for estimating effort (e.g. estimate number of fishing trips in a given month or time of day). As mentioned before, we encourage appropriate testing of any modifications of any existing collection forms.

2. Can the smaller Puerto Rico islands be incorporated into the current design?

To obtain good quality catch and effort data from the Puerto Rico smaller islands, we recommend a pilot study to explore the most cost efficient method to get these data. Several methods of data collection can be investigated in the study. These include the following:

1) ferry intercepts: an interviewer can ride the ferry, intercept passengers and after identifying anglers, hand them a questionnaire that collects catch and effort. The questionnaire is then returned to the interviewer;

2) shore sampling: given the mobilization issues between islands, MRIP should consider the selection of weeks instead of days to capture low, medium and high season fishing in the different islands.

Interviewers will work on this island for a week and will collect information of fishing modes, catch and effort by intercepting anglers at or near the shore. Under this scenario, Puerto Rico and MRIP will need to adapt the estimation methods to reflect the clustering effect resulting from sampling weeks instead of days, and modify the estimation programs accordingly. Puerto Rico can consider hiring contractors to obtain this information; and

3) intercept of vessels returning from the smaller islands to the main island piers and collecting information on fishing trips. Information on timing of arrivals of these boats will be helpful to schedule field interviews.

3. Are Puerto Rico data needs being met?

Puerto Rico is currently not obtaining information on some species that are important to their assessment. In order to summarize effort for other species not currently collected in the MRIP questionnaire, options that include conch, whelk and spiny lobster as targeted species should be included in the MRIP questionnaire. Puerto Rico should consider a pilot study on how to best estimate catch (e.g., counts, sizes, counts at different sizes, etc.) for these species.

Kayak fishing, when found on shoreline sites, should be recorded under shoreline fishing. The questionnaire used for the intercept survey should include a box to denote kayak fishing. Puerto Rico should also consider whether to include another question on determining the location of fish caught using kayaks.

- ***Outreach Activities***

An intensive outreach program needs to be designed and tailored to Puerto Rican anglers to motivate participation in all reporting activities. It is critical that PR DNER motivates the interested parties involved (e.g. Puerto Rico Sport Fishing Association, HMS charter boat captains, and Caribbean Fisheries Management Council) to communicate to anglers the importance of these data for the management of Puerto Rico fisheries. Consider using a focus group of anglers to determine the best methods to improve participation.

- *Training*

NMFS should collaborate with PR DNER in providing continued training of interviewers. In addition, the Gulf States Marine Fisheries Council should provide access and training to PR DNER staff so they can analyze and interpret their data. PR DNER might consider submitting a proposal to obtain assistance in the analysis of data from different sources (e.g., HMS surveys, tournaments, supplemental boat survey).

- *Coordination of data from multiple sources*

Data are collected from a number of different sources and this is expected to continue. Multiple frame sampling methodology exists to combine data from multiple sources (e.g., HMS catch card data, special surveys of HMS license holders, tournament data, regular effort and catch surveys, etc.) (Haines and Pollock, 1998; Iachan and Dennis, 1993; Lohr and Rao, 2006; Skinne and Rao, 1996). This would provide improved estimates of overall catch by applying multiple frame estimation approaches.

We suggest a national level coordination of activities in this region, with MRIP supervising these activities.

4. Summary

Puerto Rico has specified the need for data at different intensities and resolutions (e.g., additional fishing modes, catch and effort on holidays, data for rare species and from different islands), the need for new data (e.g., obtaining the location of catch, collecting biological data such as age or tissue data), and more information on HMS landings (e.g., commercial vs. recreational, bycatch, etc.). Some of these needs can be obtained with additions or modifications to the data collection forms used in current studies. New data collection forms or modifications to current collection forms require pre-testing. In addition, training of the field interviewers is critical to collect accurate data. Other data requirements may necessitate new sampling procedures implemented by the field interviewer (e.g. creel survey) that require the creation of new data collection procedures and additional training. Data collection issues, for example the collection of night data, isolated shoreline and islands, could be resolved by hiring a contractor to perform the data collection. However, measures must be taken to maximize the security of the field interviewers when collecting nighttime data. It may not be feasible to perform night interviews in all areas of Puerto Rico with acceptable security for personnel. Puerto Rico needs to prioritize the data needs, and then perform cost-estimate studies to balance immediate needs with available funding. We encourage appropriate testing of any modifications of existing collection forms or new sampling procedures.

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