Improving catch statistics from the non-commercial spear fishery in the Mariana Islands through census-based and club-based logbooks

FY 2016 Proposal

Marlowe Sabater
Created: 09/28/2015

1. Overview

1.1. Sponsor
Joshua DeMello

1.2. Focus Group
Survey Design and Evaluation

1.3. Background
The artisanal and subsistence fisheries are two inter-related fisheries harvesting near-shore resources. The principal methods employed by subsistence reef fishers are: spearfishing, gill netting, rod and reel, throw netting, handline, bamboo pole, gleaning and free diving. Surgeonfishes (Acanthuridae), parrotfishes (Scaridae), and groupers (Serranidae) together accounted for the greatest proportion of subsistence and artisanal catches (Saucerman, 1995). As a result of a rapidly growing human population and an upscaling in fishing technology (i.e. SCUBA), fisheries in the Mariana Islands are under increasing pressure from over-exploitation. A significant proportion of the total inshore fish catch from spearfishing (SCUBA or non-SCUBA) was caught during the night, and sold in small stores around the island.

Surgeonfishes and parrotfishes and were the most important families by weight in catches. Parrotfish and surgeonfishes sleep in refuges at night, which makes them vulnerable (especially the brightly colored terminal phase male scarids) to spearfishers. The practice of fishing at night is likely to have a significant effect on the inshore subsistence fishery. Herbivores such as surgeonfishes and parrotfishes have been demonstrated to be important in structuring coral reef ecosystems (Brock, 1979; McClanahan, 1995; Hart et al., 1996). Depletion in numbers of these fishes can result in increased filamentous algal production, with a simultaneous decrease in coral and coralline algal recruitment vital to the survival of the coral reefs. Reef must recover from such events as typhoons, acanthaster (Crown-of-Thorn starfish) infestation, and increased sediment loading and pollution due to human activities. Therefore, the potential depletion of key reef fishes should be given serious attention.

The Magnuson-Steven Fishery Management and Conservation Act requires the Western Pacific Fishery Management Council to specify annual catch limits (ACLs) to prevent overfishing of the stocks. ACLs have been established for Guam and CNMI parrotfish and surgeonfish. ACL specification relies on an acceptable estimate of total catch. Recent ACLs were specified on creel survey data that may not be sufficiently complete for the spear fishery. Improving the fishery information for the spear fishery is critical for proper management of stocks harvested in this fishery.

The spearfishing information is captured from two surveys, the shore-based and boat based creel surveys. The shore-based survey targets fishermen who fish without the use of a motorized vessel. They start and end their fishing trip anywhere along the shoreline. The boat-based survey targets spear fishermen who use a motorized vessel. They launch from one of the five launch ramps in Saipan and four marinas in Guam. Shoreline spearfishing is concentrated primarily on areas protected from strong wave surge mainly on reef crest, flats and lagoon habitats. Both surveys underestimate spearfishing activities. The current surveys are designed to capture the territorial fisheries in its entirety. However, the spear fishery does not overlap with the sampling frame. The evening nature of the fishery is a major factor and the government policy does not allow evening surveys. The catch interviews of the shoreline spear fishers are rare because the data collectors had to catch them at the exact time as they are coming in. Spear fishers also does not want to deal with the data collection once they come in unless its worthwhile for them to hang around until the data collectors completed the interviews and measurements.

Effort and CPUE information are calculated differently for the shore- and boat-based creel surveys. The shore-based effort is defined as the number of gears fishing per hour. CPUE is defined as pounds caught per gear hour. The boat-based effort is defined as the number of fishing trips (by boat) per day. CPUE is the pounds of fish caught per fishing trip per day. Because the shore- based creel survey is limited to the shoreline, interviews with spear fishermen, who fish in the water away from the shore, are extremely rare. These interviews are only possible at the very end of each spear fishing trip – when the fisherman return to shore. Unlike a land-based interview with a hook and line fisherman, an interview can take place at any time during his/her fishing trip. Boat-based interviews are also difficult to obtain. Some of the interviews are missed because the spearfishing boats return after the end of the survey.

The low number of spearfishing interviews has had adverse effects on the data expansion and subsequent annual catch estimates for spearfish caught fish. The expansion process requires three interviews per strata (year, quarter, day type, location, time, etc.) in order to obtain accurate CPUE average estimates. If interviews are lacking for certain strata, the expansion system borrows interviews in a defined hierarchical manner, until 3 interviews are obtained. If interviews are still lacking, no CPUE estimates are made. Multiplying effort counts by a CPUE of zero results in no catch being recorded. Effort x CPUE = Catch Effort x 0 (zero) = 0 (zero). Low catch estimates are common when multiple zeros are present in the calculation of CPUE averages.

For 2013, a total of 13 spearfishing shore-based and 5 boat-based interviews were conducted. This translated into unrealistically low ACLs for spearfish caught fish since the ACLs were calculated using the 75th percentile of the catch time series. For 2012, the ACL for parrotfish for the entire CNMI was 3,784 pounds – an unrealistic under-estimate. This is because the creel survey data collection did not adequately capture the fishing effort and the difficulty in accumulating catch interviews throughout the

catch time series. On the same year, the NMFS BioSampling Program (collects catch information on the commercial spearfishery from fish vendors at 20% coverage) recorded a total of approximately 59,000 pounds of the top 10 species alone (Gourley pers. comm.).

1.4. Project Description

The creel surveys are based on a stratified random design and should provide an unbiased estimate of catch and effort. However, implementation of proper data collection is confronted by logistical challenges which infuse bias in the estimates (Bak 2012). Random selection of sites and time of survey presents a unique problem in monitoring this fishery due the spatial heterogeneity of the fishing grounds and the time at which the fishery is normally conducted. A specialized data collection system needs to be developed for this fishery.

Another aspect of ACL based management that would require a reliable catch estimate is the monitoring of annual catches relative to the specified ACL. The challenges presented to the current survey design limit the ability to establish a near-real-time monitoring of the fishery.

This project proposes to explore multiple ways of capturing the spear fishery using a combined self-reporting and phone inquiry method via a registry and a targeted creel survey focusing only on the spear fishery. The existing creel surveys have been implemented for several decades and were improved on the earlier years. However, updates to the survey design to capture the current state of the fisheries have been ignored. This resulted in a large data gap and unreliability of the current survey methods to produce catch expansion estimates that reflects the total catch.

This pilot project aims to use multiple methods in capturing the information and determine the most efficient and cost-effective means of getting the information without sacrificing the accuracy of the estimates. Each island area in the Marianas has unique characteristics and challenges in which testing multiple methods may provide an insight on what may be applicable for each area.

1.5. Public Description

1.6. Objectives

The following are the objectives of this project:
1) develop a spear fishing registry through the networks of spearfishing clubs and tournaments;
2) develop a catch reporting system for the non-commercial spearfishery;
3) compare catch statistics from the catch reporting system and the existing creel surveys;
4) develop an education and outreach program to support the coral reef spearfishery data collection;
5) develop a recognition program for the participants of the spearfishery data collection program

1.7. References

Saucerman, S. (1995). The inshore fishery of American Samoa, 1991 to 1994. DMWR Biological Report Series , 48

McClanahan, T. R. (1995). A coral-reef ecosystem fisheries model: impacts of fishing intensity and catch selection on reef structure and processes. Ecological Modelling 80, 1-19.

Hart, A.M. (1996). Response ofherbivorous fishes to Crown-of-thorns starfish Acanthaster planci outbreaks. IlL Age, growth, mortality and maturity indices of Acanthurus nigrofuscus. Marine Ecology Progress Series 136, 25-35

Brock, R. E. (1979). An experimental study on the effects of grazing by parrotfishes and the role of refuges in benthic community structure. Marine Biology 51, 381-388

Bak S. 2012. Evaluation of Creel Survey Program in the Western Pacific Region (Guam, CNMI, and American Samoa). Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, USA. 96813. Pp. 59.

2. Methodology

2.1. Methodology

This project will utilize contractors to conduct the activities described below. The Principal Investigator will have oversight of the project with frequent site visits.

Defining the spearfishing universe: The island of Guam has an estimated population of 159,358 people. CNMI population was estimated to be at 48,220 people. In the island of Saipan for example, the 2010 US Census showed only a small segment of the population are engaged in fishing and subsistence activities: 1) civilian workforce engaged in agriculture, mining, forestry and fishing – 1.7%; and 2) employed and also did subsistence activities – 2.8%. Collection of spearfishing information via a census type collection program may be feasible for these small island communities. A database of spear fishers will be developed. To

establish the sampling frame for the project, the project identified subgroups of the spearfishing community as a starting point; The Marianas Underwater Fishing Federation (MUFF) in Guam and the Marianas Apnea Spearfishing Club (MASC) in CNMI are the largest spearfishing clubs in the Mariana Islands. The members are acquainted with the majority of the non-commercial spearfishing individuals in various communities.

The project will be introduced to the club and will generate a list of contacts within the club and will be extended to the people they know. A networking strategy will be implemented to branch out to the different contacts starting from the spearfishing clubs. The list of participants will also be taken from spearfishing tournaments. It is evident that some of the dive shops in the Marianas Islands carry spearfishing gears and could offer spearfishing tours to tourists from other countries especially from Asia. The contractors will gather information about dive shops that offer spearfishing tours to understand the level of spearfishing effort from tourism as it is unknown at this point. Inclusion of the dive shop in the sampling frame may be determined if the fishing effort or catch is found to be substantial. General elements of the Saltwater Angler Registry will be adopted for this spearfishing database. The contractor will also be conducting roving surveys and will be intercepting spear fishermen from known ports and known fishing areas to introduce the project and encourage them to join the data collection program.

The Council will also be working with the territorial fishery agencies to develop the spearfishing registry and launch an island-wide campaign to garner support from the spear fishery participants. The registry will be developed simultaneous with the registry of the spearfishing clubs. This would be a larger scale effort. The two registries will be merged and cross-referenced to remove duplication.

Sampling design and data collection: For the log book reporting project, it will be logical to stratify the sampling frame by the subgroup of the spearfishing population as catch and effort may differ by motivation of the activity. Within each stratum, fishers will be randomly selected for the voluntary participation of the catch logbook reporting. For the participants of the project, a log book will be developed that will contain essential fishery information. The contractors will hold a workshop to educate the logbook reporting system and follow-up procedure that may utilize different modes by group for effectiveness. The contractor (data collectors) will be following up on a weekly basis with the members in the registry. For participants that were accumulated through the roving survey and tournaments, the contractors will be contacting them via a phone interview on a bi-weekly basis.

A separate survey will be conducted by the contractors following the same protocol as existing creel surveys being done by the local fishery agencies. However, this survey will be targeting the specifically the spear fishery. Local agency staff and participants in the registry will be interviewed to characterize the spear fishery in terms of fishing location, hotspots, and temporal distribution of fishing effort. Common knowledge indicates that the spear fishery occurs mostly in the evening and sporadically during the daytime. The fishing areas will also be documented. Based on the exploratory interviews, the geographical and temporal sampling frame will be defined, and a stratified simple random sampling design will be used for the one year spearfishing creel survey.

Data entry and processing: All data will be encoded into the database on a weekly basis and careful quality control will be conducted on a regular basis. This will be one data stream that can be compared to the surveys being conducted by DAWR (Guam) and DFW (CNMI).

Comparative analysis: The local agency-conducted creel survey results will be compared with the information collected from the registry and the targeted creel survey. Between the local creel and the targeted creel surveys, the basic meta-data and statistical properties of the data collected will be compared. Total catch per species will be estimated at annual and island wide level. The Comparison of the two separate estimates will help the Council and the Fishery Data Collection and Research Committee evaluate the current data collection system and determine the best method to move forward.

Recognition Program: A recognition program will be developed for each of the jurisdiction. An incentive system had already been implemented in the past projects (Naval Base data collection and seasonal run fisheries) and had proven to be effective in getting the fishing communities to participate in the program. This incentive program is helpful in getting fisherman buy-in and participation in the data collection program. Recognition of fishermen who provide accurate and timely data submissions should be advertised in the local papers and radio to increase awareness and participation in the program. Contractor would assist in identifying and recognizing the important contributions these fishermen. In order to minimize the effect of the recognition program to the fishermen cooperation to any of the data collection, the recognition program will be implemented on all three data collection systems.

Outreach Program: Aside from the routine interaction with the fishers, the contractor will develop outreach materials in the form of brochures, flyers, and coordinate the printing of the existing fish posters that will support the fishers in fish identification. These outreach materials will include a description of: reporting requirements, past data results, how data are used in management actions, and sustainable fishing practices. The contractor would also coordinate the production of a video and radio advertisement in collaboration with DAWR/DFW that will be aired on the local media that promotes fishery data collection and the need for fishermen to collaborate. The contractor would also explore the use of social media in promoting this campaign.

2.2. Region

Western Pacific Islands

2.3. Geographic Coverage
The project will be conducted in the Mariana Islands particularly the Guam and the island of Saipan

2.4. Temporal Coverage
The project will be conducted for approximately 18 months

2.5. Frequency
The fisherman reporting and follow up will be done on a weekly basis

2.6. Unit of Analysis
The data will be collected per spearfisher since each fisherman is encouraged to report per trip

2.7. Collection Mode
The collection mode will be both in person and via telephone interview

3. Communication

3.1. Internal Communication
Quarterly in-person and conference call meetings will be held with the project team. The Principal Investigator will travel to the project site 5 times in 18 months to oversee the conduct of the project operations. The contractors will be reporting to the P.I. on a monthly basis. Preliminary analysis of the data collected will be conducted at the mid-point of the project and will be reported back to the project team.

3.2. External Communication
The results will be presented to the following bodies as part of the Program Planning and Research Section of the agenda
1. Western Pacific Fishery Management Council
2. Scientific and Statistical Committee
3. Fishery Data Collection and Research Committee
4. Archipelagic Plan Team

4. Assumptions/Constraints

4.1. New Data Collection
Y

4.2. Is funding needed for this project?
Y

4.3. Funding Vehicle
Distribution to the Western Pacific Fishery Management Council via the NMFS PIRO

4.4. Data Resources
Data are readily available to complete this project. A database compatible with the WPacFIN system will be developed.

4.5. Other Resources

4.6. Regulations
No regulations required to implement the project nor will inhibit the implementation of the project.

4.7. Other

5. Final Deliverables

5.1. Additional Reports
A final report will be submitted that will include full analysis of the data.

5.2. New Data Set(s)

A new data set will be generated from the census and will be compared with the existing creel survey

5.3. New System(s)

If feasible, this data collection system will be implemented in the Marianas

6. Project Leadership

6.1. Project Leader and Members

First Name	Last Name	Title	Role	Organization	Email	Phone 1	Phone 2
Sunny	Bak-Hospital	Statistician	Team Member	Mirae InfoDesign			
James	Borja	President	Team Member	Mariana Underwater Fishing Federation			
Ray	Roberto	Fishery Biologist	Team Member	Division of Fish and Wildlife			
Marlowe	Sabater	Marine Ecosystem Scientist	Team Leader	WPRFMC			
Felix	Sasamoto	Member	Team Member	Mariana Apnea Spearfishing Club			
Brent	Tibbats	Fishery Biologist	Team Member	Division of Aquatic and Wildlife Resources			

7. Project Estimates

7.1. Project Schedule

Task #	Schedule Description	Prerequisite	Schedule Start Date	Schedule Finish Date	Milestone
1	Hiring of data collectors and statistician; Coordination with MUFF and MASC regarding the project		05/01/2016	06/30/2016	
2	Dev. the registry & spearfish participants database; Collection of registry info for club members	1	06/01/2016	09/30/2016	
3	Development of logbook and survey design; Coordination with agencies and partners	1, 2	08/01/2016	09/30/2015	

Task #	Schedule Description	Prerequisite	Schedule Start Date	Schedule Finish Date	Milestone
4	Collection of fishery information; expansion of the fishers database	1, 2, 3	11/01/2016	10/31/2017	
5	Data analysis and final report	1, 2, 3, 4	11/01/2017	12/31/2017	

7.2. Cost Estimates

Cost Name	Cost Description	Cost Amount	Date Needed
Contractual cost - Data Collectors (Contract for the data collectors to conduct the collection of data, outreach and recognition program)	$35,000/year x 3 (2 in Guam and 1 in Saipan)	$105000.00	
Contractual cost - MUFF and MASC (to develop the spearfishing database in collaboration with the statistician; will include activities associated with the expansion of the registry to other participants)	$10,000 x 2 (1 for Guam and 1 for CNMI)	$20000.00	
Contractual cost - hire statistician for the survey design; development of database; analysis and report writing		$40000.00	
Supplies	budget will cover the materials needed for the recognition program and education and outreach	$30000.00	
Equipment cost	To purchase computers to encode the data; conduct analysis and house the database; field equipment	$20000.00	
Travel cost	The budget will cover the principal investigator's travel to Guam and CNMI for project oversight	$30000.00	
TOTAL COST		$245000.00	

8. Risk

8.1. Project Risk

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
The risk associated with this project is the ability to expand the registry beyond the spear fishing clubs. The project will	The impacts of these risks are: 1) limited sample size which would affect the expansion estimates;	Medium	In order to minimize the impacts of these risk factors, an extensive education and outreach will be conducted before

Risk Description	Risk Impact	Risk Probability	Risk Mitigation Approach
attempt to collect the information for the whole island of Guam and Saipan. If the universe of spear fishers are limited, it will create a bias on the data and estimates to be generated. Another risk is the aversion to cooperate in the project. Specific for the island of Saipan is the survey saturation. Having three data collection system tends to confuse the fishing participants. There are multiple projects occurring in the areas that deals with data collection improvements which creates multiple layers of reporting burden on fishing participants. There is also an inherent distrust between the fishing communities and the local fishery management agency who is a partner of the project.	2) non cooperation of fishery participants which would affect the sample size 3) create additional confusion from the public on the different data collection occurring		the implementation of the project. This would introduce the project team which is a collaborative effort between federal, private, fishing industry, and local agencies. The recognition program will also provide additional mitigation support. The recognition program will ensure buy-in from the fishing participant by making their time worthwhile to report and be surveyed by the contractors.

9. Supporting Documents