GUAM SHORE-BASED CREEL SURVEY DOCUMENTATION

Compiled by

Contributors: Risa Oram, Tom Flores Jr., Brent Tibbatts, Jay Gutierrez, JP Gesner, Shawn Wusstig, Michael Quach, David Hamm, Paul Tao

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1.0 INTRODUCTION

The purpose of this manual is to document the Guam Department of Agriculture Division of Aquatic and Wildlife Resources (DAWR) Shore-based Creel Survey Program and to provide standard guidelines for this program. This manual may be used by creel survey program managers, data collection technicians, data entry technicians, data managers, and programmers to guide their work and to train new staff. This manual can also be provided to users outside of DAWR who want to learn more about the island creel survey programs. DAWR also has a Boat-based Creel Survey Program that monitors fishing activity that originates from boats. A similar program manual is also available for that program (see Oram, Risa. et al., 2010. *"Guam Boat-based Creel Survey Documentation"*).

The objective of the Guam Shore-based Creel Survey Program is to estimate the total annual shore-based participation, effort, and catch of inshore recreational/subsistence fisheries — both to support management of marine fisheries resources — and to gather limited biological data that will add to a historical database on important inshore fish species. Effective management of Guam's marine fisheries resources necessitates collection and analysis of shore-based fishery data. The Guam Shore-based Creel Survey Program is one of the major data collection systems used by DAWR to estimate fisheries resources. This survey was formerly known as the "Guam Inshore Creel Survey" and this is still reflected in the data collection forms. The preferred term is "shore-based" because it covers all fishing done from shore regardless of where the fishing occurred, e.g., inside or outside the reef or lagoon. This is an important distinction because the place where fishing activity is initiated (shore vs. boat) determines how that activity is accounted for in the survey systems. For instance, the fishing activity of a small boat (without a motor) that is easily launched from the shoreline to hold gear (net, coolers, floating devices) is included in the Shore-based Creel Survey Program.

DAWR has been surveying shore-based fishing activities since 1970 to identify trends in fishing activities. At that time data were collected and analyzed manually on paper. In 1985 data collection methodologies were standardized and data processing was computerized. With the assistance of the Western Pacific Fisheries Information Network (WPacFIN) program, a computerized creel survey database system was programmed in Apple BASIC, and later in Macintosh 4th Dimension. In 1998 WPacFIN implemented a data processing application, which standardized the data processing and the method of expanding the estimated landings in Visual FoxPro 6.0 SP2. The current data processing application is used to enter, verify, process, expand, and analyze the data. Due to the lack of standardized survey methodology before 1985, data collected prior to this year have not been processed and are currently unavailable.

This documentation covers data collection procedures, including survey methodology, survey sites, scheduling methodology, quality assurance and quality control procedures, and reports generated by the data system. Survey forms and maps used by the program are shown in the Appendices.

2.0 SURVEY METHODOLOGY

Guam's Shore-based Creel Survey is a stratified, randomized data collection program. This program collects three types of data to estimate catch and effort information and to monitor fishing activity of the shore-based fishery: 1) Participation Counts to collect effort data, 2) Interviews to collect catch and effort data and 3) Aerial surveys that cover areas where a normal participation count survey could not access. The data collected are expanded at a stratum level (expansion period [quarterly or annually], day type [weekday or weekend], day or night, and gear type) to create the estimated landings by gear type for this fishery.

Note: The day and night surveys are essentially handled as separate surveys because of the vast differences in methods and species.

3.0 SURVEY SITES

Participation Counts and Interviews cover the most accessible shoreline areas along Guam's coast. The three main survey regions are described below along with their short-hand description and site codes (see "Appendix 1 Guam Shore-based Survey Sites Map").

- Region I: On the northwestern portion of Guam: Gun Beach to Adelup (G to A; sites 1-11).
- Region II: On the southwestern portion of Guam: Adelup to Agat (A to A; sites 12-34 – [Excluding inaccessible sites 35-39]).
- Region III: On central-eastern to south portion of Guam: Pago Bay to Merizo (P to M; sites 40-71 – [Excluding inaccessible sites 57-60]).

The Aerial Survey covers the entire coast of Guam including the areas where a normal participation count survey could not access. All Aerial Surveys begin and end at the same place (site #11 Adelup).

4.0 DATA COLLECTION

Guam's Shore-based Creel Survey Program uses three types of data collection methods to estimate the catch, effort, and fishing activity of the shore-based fishery. The three types of data collection methods include: 1) a Shore-based Participation Count that involves counting the number of people and fishing method around the island where their trip originated from the shoreline and not using a boat; 2) a Shore-based Interview that involves interviewing fishermen to determine catch, method used, length and weights of fish, species composition, catch disposition, and if any fish were not kept (bycatch); and 3) an Aerial Survey method that involves flying over the reef area counting fishermen and their methods of fishing and counting the number of sited turtles, sharks, and marine mammals. The Aerial Survey covers areas where a normal participation count survey could not access.

4.1 Participation Count

Participation Counts (also locally referred to as PAR) collect fishing effort information by counting the number of fishermen and their fishing methods along the accessible shoreline, on a minimum of four surveys per month (two weekdays and two weekend/holidays). Participation data are used to calculate the fishing effort (per hour) at the stratum level (expansion period [quarterly or annually], day type [weekday or weekend], day or night, and gear type).

Staff drive along the designated survey area along Guam's coastline (see "Appendix 1 Guam Shore-based Survey Sites Map", locations 1-71) without backtracking and make visual observations of fishing activity. Participation data are recorded on a Shore-based Participation Count Survey Form (see "Appendix 2 Shore-based Participation Count Survey Form").

The Participation Count Survey Form includes:

- Date of survey.
- Type of day – weekday (WD) or weekend/holiday (WE/H).
- Location.
- Shift start and end time (for the AM and PM shifts).
- Surveyor's name (for AM and PM shifts).
- Time and location observed.
- Number of persons.
- Number of gears.
- Fishing method.
- Reef zone fished.
- Weather conditions including clouds.
- Surf conditions.
- Tide.

Each of the access points are visited only once for about 10 minutes and all shore-based fishing activities are recorded. Traveling time between two observation posts are limited to safe driving practices. Any activity that involves a motorized vessel is counted unless the vessel is used primarily for transporting such items as gill nets, surround nets, and drag nets and was launched from a beach, not a boat ramp.

The Shore-based Participation Count is conducted jointly with the Boat-based Participation Count. Consequently, staff conduct the Shore-based Participation Count along the route until they encounter one of the public boat launching ramps — (Agana Boat Basin, Agat Marina, Merizo Pier, Pago Bay, Ylig Bay, Umatac Bay, Seaplane Ramp and any vehicle trailers encountered along that route) — at which time the Boat-based Participation Count is conducted.

Participation counts are collected during two separate shifts per scheduled day. AM shifts start at 06:30 and continue until finished; PM shifts start at 19:00 and continue until

finished (see Table 1). The Participation Count's starting location also determines the starting location for the Boat-based Participation Count (see "5.0 Survey Scheduling" for more information). The direction for the Participation run is alternated clock-wise and counter-clockwise for each subsequent day sampled. The direction used for the AM shift is repeated for the PM shift.

Table 1. Shore-based Participation Survey Schedule

Location	Minimum Survey Days per Month	Morning (AM) Shift	Evening (PM) Shift
Whole island.	2 weekdays & 2 weekend/holidays.	06:30 – until finished.	19:00 – until finished.

4.2 Interview

Interviews (also locally referred to as creel) collect data on fish catch by interviewing fishermen after they return from a fishing trip, or in some cases, while they are still fishing. Data collected during interviews are used to calculate catch per unit (hours fished) effort (CPUE) at the stratum level (expansion period [quarterly or annually], day type [weekday or weekend], day or night, and gear type). Detailed species composition and length-weight information are collected and used to calculate length-weight regression analyses, and to create the estimated landings for individual species. Interview data are collected on a minimum of four surveys per month (see Table 2).

Table 2. Shore-based Interview Survey Schedule

Location	Minimum Survey Days per Month	Morning (AM) Shift	Evening (PM) Shift
Region I: Gun Beach to Adelup (G to A; sites 1-11)	1 weekday or 1 weekend day – survey once per month.	06:30 – 12:00	19:00 – 24:00
Region II: Adelup to Agat (A to A; sites 12- 34)	1 weekday or 1 weekend day – survey once per month.	06:30 – 12:00	19:00 – 24:00
Region III: Pago Bay to Merizo (P to M; sites 40-71)	1 weekday and 1 weekend day – survey twice per month.	06:30 – 12:00	19:00 – 24:00

On a scheduled survey day, staff start from the beginning of the designated route and intercept fishermen who fish along the coastline to collect creel data. Data collected are recorded on a Shore-based Interview Survey Form (see "Appendix 3 Shore-based Interview Survey Form").

The Interview Survey Form includes:

- Date of interview.
- Type of day – weekday (WD) or weekend/holiday (WE/H).
- Number of fishermen.
- Interviewer's name.
- Interview number.
- Interview time.
- Start time and stop time of fishing.
- Day before (when the fisher has been fishing since the day before the interview, for example, the fisher started fishing at 7 PM Sunday night and the interview was conducted at 10 AM on Monday morning).
- Day after (when the fisher will be done fishing the day after the interview, for example, the interview is conducted at 7 PM on Friday and the fisher is planning to stay overnight fishing until 6 PM on Saturday).
- Down hours (hours not fished).
- Fishing method.
- Number of gears.
- Location.
- Reef zone.
- Weather conditions including cloud cover.
- Surf.
- Tide.
- Fish species/code.
- Fish length in millimeters and fish weight in kilograms.
- Total number of fish caught (actual or estimate)
- Total weight of fish caught (actual or estimate).
- Percent sold.
- Percent unsold.
- Buyer.
- Bycatch – if any fish were thrown back; bycatch species name; fishing method; released alive or dead; approximate length and/or weight of bycatch, total number of fish for each species (actual or estimated); total weight of fish (actual or estimated).

When staff reach the end of the designated region, they turn around and continue to interview fishermen on the way back, and turn around again when reaching the opposite end, and so on, continuing to interview fishermen until the shift ends. Staff attempt to complete as many interviews for different methods as possible during the survey period. Spearfishing is given top priority as this fishing method is difficult to encounter and is seldom captured during interviews. For returning fishermen, staff may ask, “How did you do today?", "What types of fishing did you do?" and "Did you do any other types of fishing?"

4.2.1 Fish Identification, Measure, and Weight

During the interview, staff ask if they may examine the catch to measure and weigh the fish caught. For smaller catches, staff attempt to measure, weigh, identify, and count all the fish (time permitting). At times, fishers will allow staff to obtain both length and weight information, especially for rarely seen specimens. This is important for improving length-weight regressions. For large catches, staff attempt to quickly identify and enumerate all the different fish species and measure at least three individual fish per species. Each individual of a particular species is randomly selected with no preference for size. For species with two or more definite size categories (e.g., 3-5 lbs of vs. 15-20 lbs of tuna), at least three individual fish per size category are measured. When an interview is difficult to obtain (e.g., the fisherman is a rush), staff attempt to estimate the fish catch by species level or by family level (e.g., miscellaneous reef fish, miscellaneous bottomfish).

Several standard units of measurement are used. For instance, all fish are measured with measuring tapes and recorded in millimeters/centimeters and grams/kilograms. For finfish with forked tails, fork length (FL) is the standard unit of measurement for fish. For all other fish, whichever jaw extends the furthest is used and measured to the notch of the tail. For species with rounded or truncated tails, FL equals total length (TL). (See "Appendix 4 Invertebrate Measurement Diagrams").

For recording disposition of the fish, if the fisher does not know which market s/he will sell to, the market is coded as "other". If a fisher is not sure if they will sell or keep their catch, the catch disposition is coded as "unknown". When fish are sold to the Fishermen's Coop, staff also attempt to obtain actual weights of fish sold from their receipt logs. Batch weight is acceptable, but if this is done, fisheries staff estimate or ask the fisher to estimate the number of each species caught.

4.2.2 A Complete Interview

A complete interview accounts for all of the catch and ensures that there are no missing or erroneous data. It is important to have a complete measure of all the catch per each interview since these data are used to determine the average catch per unit effort (CPUE) calculation. If staff are unable to count all of the catch during an interview, they do not have the whole landing for that period of fishing activity. When all catch cannot be measured individually during the interview (e.g., the fisher was in a rush or uncooperative), staff attempt to 1) estimate the total number of fish per species, or if they cannot do that, then 2) estimate the total weight of the entire catch per species. If not all fish are measured, and an estimate of species composition and weight per species cannot be made, this entails an incomplete interview and this data is not used in the data expansion process.

If later the staff interview the same fishermen they interviewed earlier in the shift while the fishermen continued fishing, they update their forms if they can or they recollect all catch information and discard the previous interview that was collected.

4.3 Aerial Survey

The Guam Shore-based Aerial Survey collects data to estimate island-wide participation. Staff fly in a plane along Guam's shoreline and count fishermen engaged in fishing and count the number of sited turtles, sharks, and marine mammals. The data collected are used to determine a ratio of fishing effort at the accessible fishing areas versus the non-accessible areas (or the rest of the island). Aerial survey data are recorded on an Aerial Survey Form (see "Appendix 5 Aerial Survey Form").

The Aerial Survey Form includes:

- Date of survey.
- Type of day – weekday (WD) or weekend/holiday (WE/H).
- Shift start and stop time.
- Take off and landing time.
- Surveyor's name.
- Time of an observation.
- Number of persons.
- Number of gears.
- Fishing method.
- Reef zone.
- Weather conditions including clouds.
- Surf.
- Other data include: observations of marine mammals, turtles, sharks, boat-based fishing activities and other incidental information.

An Aerial Survey is conducted on one weekday and one weekend per month. All Aerial Surveys begin and end at the same place (site #11 Adelup). The direction is always clockwise because of the trade winds and DAWR staff need to see out of the starboard side of the plane. In recent years, to enhance observations and simplify recording during bumpy days, data are recorded on tape and later transcribed to paper for data entry and digital archiving.

5.0 SURVEY SCHEDULING

Scheduling for the Shore-based Creel Survey Program is done in conjunction with scheduling for the Boat-based Creel Survey Program to make more efficient use of staff time. The same staff that work on the Shore-based Creel survey Program also work on the Boat-based Program. As mentioned previously, surveying for the Shore-based PAR count is done in conjunction with the Boat-based island-wide PAR Count.

The scheduling for the Shore-based Program was set up with the limited logistical resources in mind. It was designed and implemented to get the best representative sample as possible with the resources that are available. Consequently, the minimum scheduling times are not statistically ideal samples, but rather constrained by available resources. During scheduling of survey days, if a holiday is selected, it is removed because the government does not allow its

staff to work on holidays. For data expansion purposes, holidays are treated as weekend days for levels of participation, etc.

5.1 Participation Count Scheduling

To begin scheduling the Shore-based Participation Count, the numbers 1 – 31 are each written on small pieces of paper to represent the dates in a month. These papers are placed inside a small container. The dates for the Shore-based Participation Count are randomly selected first. (These dates are also the same ones used for Boat-based Participation Count, and as a Primary and Alternate day for the Aerial Survey). Selection involves choosing a piece of paper from the tin. The chosen date is marked down on a blank calendar, and noted whether it falls on a weekend day or a weekday. This paper is removed from the container and additional papers are chosen one by one until two weekdays and two weekend/holiday day are selected per month.

The next step is to determine where the participation run will begin by choosing a number from a tin for each participation date that is selected above (numbers 1-71, representing the Shore-based access points (see "Appendix 1 Guam Shore-based Survey Sites Map"). After an access point number is selected, this paper is removed from the tin and the starting location number is written on the corresponding date on the calendar. For each shore-based participation sampling date, the direction driven is alternated from clockwise to counterclockwise. The direction used during the AM shift is repeated for the PM Shift.

5.2 Interview Scheduling

The Shore-based Interviews are scheduled next from the remaining pieces of paper labeled 1-31 in the tin. Region I is scheduled first and the day type is alternated each month (weekday this month, weekend next month). The same process applies to Region II, except that the day type is opposite the day type in Region I for the same month (e.g., this month's Region I is on a weekday, so Region II is on a weekend). For Region III, the scheduler continues choosing numbers until one weekday and one weekend day are selected (see Table 2). After a date is selected, these papers are removed from the tin and the dates are written on the calendar along with "Shore-based" and "Region #".

5.3 Aerial Survey Scheduling

Aerial surveys are scheduled for one primary weekday and one primary weekend day per month, and one alternate weekday and one alternate weekend day per month. The same dates selected for the Shore-based Participation Counts are also used for the Aerial Survey. For example, the first weekday date selected for the Shore-based PAR Count (the first weekday date that occurs chronologically first in the month) is the primary weekday date surveyed for the Aerial Survey. This date is marked on a calendar along with "Aerial Survey, Primary Weekday". The second weekday date selected for the Shore-based PAR Count (the weekday date that occurs chronologically after the first weekday selected) is then used as an alternate day in the event that there is bad weather and the primary weekday survey needs to be cancelled. This date is marked on a calendar along with "Aerial Survey, Alternate Weekday".

Similarly, for the first weekend date selected for the Shore-based PAR Count (the first weekend date that occurs chronologically first in the month) is the primary weekend date surveyed for the Aerial Survey. This date is marked on a calendar along with "Aerial Survey, Primary Weekend". The second weekend date selected for the Shore-based PAR Count (the weekend date that occurs chronologically after the first weekend selected) is then used as an alternate in the event that there is bad weather and the primary weekend survey needs to be cancelled. This date is marked on a calendar along with "Aerial Survey, Alternate Weekend".

The starting times for the Aerial Survey are drawn at random. The times range from 08:00 – 12:00 (each survey takes about two hours to complete).

6.0 DATA QUALITY CONTROL

The Shore-based Creel Survey Program employs several methods to ensure quality assurance and quality control of the data that are collected.

6.1 Fish Identification Training

DAWR developed a comprehensive fish identification training program that all new Fisheries Section staff are required to participate in before they are allowed to collect data unaccompanied by senior staff. Staff members are trained to identify fish to the species level with the use of identification aids, including two fish posters (Oceanic Fishes of the Mariana Islands and Reef Fishes of the Mariana Islands), fish reference books, fish ID flash cards, and visiting fish markets to identify fish that are caught. All survey staff members undergo in-house testing using picture slides and answer sheets. After a shore-based creel survey biologist or project leader determines that new staff can successfully identify fish species about 95% of the time, the staff are trained in field survey methodology. Mini refresher training sessions are also provided for experienced staff to review reef and deep bottomfish species before the summer months when bottomfishing and spearing activity increase.

6.2 Data Collection Protocols Training

All staff are given a copy of this document and trained to use non-biased questions to engage fishermen. Next, the staff are allowed to participate in field surveys. New staff are accompanied on all surveys by an experienced biologist or project leader, who observes the new staff conducting the entire interview to ensure correct fish species identification. Experienced biologists supervise the new employee's ability to accurately identify, measure, and weigh a fisher's catch while the fisher retrieves their vehicle and boat trailer. Mini refresher training sessions are also provided for experienced staff to review reef and deep bottomfish species before the summer months when bottomfishing and spearing activity increase. Additionally, staff are trained to understand how to fill out all survey forms completely.

The data collection technicians are required to come back to the office and review the survey forms to check for mistakes or missing data. If there were any unknown species, staff identify these in the office using fish identification reference materials. If missing data are

easily recalled, then they can be filled in at that time. Staff write "log" and their initials on the forms and put them in binders labeled "log" and "date" in the file cabinet for the data manager to review.

6.3 Data Entry, Editing, Storage and Backup

The data manager reviews the forms for missing data and legibility. If information is missing or unclear, the data manager asks the data collection technicians to clarify it. All remarks and edits are written in red pencil and the data manager writes "edit" and their initials on the form. When the data manager approves the forms, then s/he will write "coded" and their initials and place these forms into the binders in the filing cabinet labeled "coded" and the "month ".

Next, the data are entered into the system either by a technician or a data manager. The data entry person retrieves the forms from the binder marked "coded" and enters the data into the central database. If the data manager is entering the data, they may need to apportion the right fish species to the correct fishing method used and make adjustments where necessary if this was not recorded on the Interview Form. The data entry staff or data manager then writes "entered" and their initials on the forms. The forms are placed into a binder in the file cabinet marked "entered" with the corresponding month. After the data are entered, the system is backed up on Fridays (first backup) onto an external hard drive. Paper forms in the binder marked "entered" are kept in the file cabinets for one year. After that, the data forms are scanned and archived using the Document Imaging Archival System (DIAS), developed by WPacFIN.

After data are entered, the data manager compares the data entry to the paper forms. If there is any need for changes, the manager crosses out the wrong information and writes the correct information next to it. The data manager also writes "edit" and their initials in red pencil on the form. All edits made to the data forms must also be made to the database. The edited data are backed up again (second backup, preferably on Fridays) to overwrite changes made to the data. Backups are done using an external hard drive and backup copies are placed on two additional computers. Data entry and edits are made only on the central database to ensure that everyone is working from the correct version of the database. Copies of the master database are transferred to other computers for local access.

7.0 REPORTS

The WPacFIN data processing application generates many kinds of Shore-based Creel Survey reports, in addition to data-entry error checking and maintenance reports, they generate Expanded Catch and Effort reports (see the example in "7.1 Shore-based Expansion Summary Report"), and Expanded Species Composition reports (see the example in "7.2 Shore-based Expanded Species Composition Report").

7.1 Shore-based Expansion Summary Report

The following is an annual creel survey expansion report containing estimated total catch by method:

November 12, 2009
1:07 PM

Division of Aquatic & Wildlife Resources
Department of Agriculture
Government of Guam

Page: 1
Weight Unit: lb

Shore-based Creel Survey Expansion Summary
Calendar Year: 2008 -- Day & Night

Method	Type of Day	Region	Num of Int.	Expanded Data (CV %) Avg Person	Avg Gear	Gear-hr	lb/gr-hr	Expanded lb
Weekday -- 24 Days Sampled in Total Days of 251 (5020 Hours)								
				0.03				
Hook and Line			78	14.93	14.39	72,250 (23.3)	0.3794 (45.3)	27,412 (19.7)
		Region 1	27	7.35	5.78	29,032 (16.0)	0.0692	2,011 (84.9)
		Region 2	17	3.17	3.08	15,437	0.7582	11,702
		Region 3	34	4.41	4.67	23,427	0.5280	12,368
		Region 4		16.79	1.45	4,355	0.3056	1,331
Cast Net			37	3.25	3.57	17,919 (23.6)	0.4669 (60.4)	8,369 (48.3)
Gill Net			6	1.70	0.99	4,949 (13.9)	2.6927 (19.3)	13,326 (10.6)
Snorkel Spear			3	1.29	1.29	6,459 (34.0)	1.3146	8,491
Hooks and Gaffs			2	0.42	0.45	1,343 (38.0)	0.8580	1,152
Other Methods				0.29	0.32	975 (54.1)	1.2421	1,211
Weekend/Holiday -- 24 Days Sampled in Total Days of 115 (2300 Hours)								
				0.02				
Hook and Line			105	22.26	24.97	57,435 (25.0)	0.3080	17,694 (24.4)
		Region 1	38	10.37	10.60	24,380 (22.2)	0.1750 (64.9)	4,268 (30.2)
		Region 2	18	5.27	5.37	12,343 (22.5)	0.1825 (66.0)	2,252 (51.9)
		Region 3	49	6.63	7.15	16,445	0.6254	10,285
		Region 4		29.63	3.09	4,267	0.2083	889
Cast Net			30	4.54	4.96	11,412 (25.1)	0.5035	5,747 (35.0)
Gill Net			13	2.94	1.70	3,900	2.7893	10,879
Surround Net				0.41	0.32	740 (98.6)	6.0519	4,480
Snorkel Spear			3	2.43	2.80	6,441 (14.9)	1.3494	8,692
Hooks and Gaffs			1	1.67	1.78	2,461 (23.3)	0.8580	2,112
Other Methods				0.06	0.06	141	0.7637	107
Combined Type of Day -- 48 Days Sampled in Total Days of 366 (7320 Hours)								
				0.02				
Hook and Line			183	17.23	17.72	129,685 (40.0)	0.3479	45,106 (15.3)
		Region 1	65	8.30	7.30	53,412 (34.6)	0.1175	6,279 (34.1)
		Region 2	35	3.83	3.80	27,780	0.5022	13,954
		Region 3	83	5.10	5.45	39,872	0.5681	22,653
		Region 4		20.82	1.96	8,621	0.2575	2,220
Cast Net			67	3.66	4.01	29,331 (37.5)	0.4813	14,116 (32.0)
Gill Net			19	2.09	1.21	8,849 (5.9)	2.7353	24,205 (60.6)
Surround Net				0.13	0.10	740	6.0519	4,480
Snorkel Spear			6	1.65	1.76	12,900 (34.3)	1.3320	17,183
Hooks and Gaffs			3	0.81	0.87	3,804 (51.8)	0.8580	3,264
Other Methods				0.14	0.15	1,116	1.1819	1,318
TOTAL:			**278**					**109,672**

7.2 Shore-based Expanded Species Composition Report

The following is an example of an annual expanded species composition report:

Division of Aquatic & Wildlife Resources
Department of Agriculture
Government of Guam

November 12, 2009
1:08 PM

Page: 1

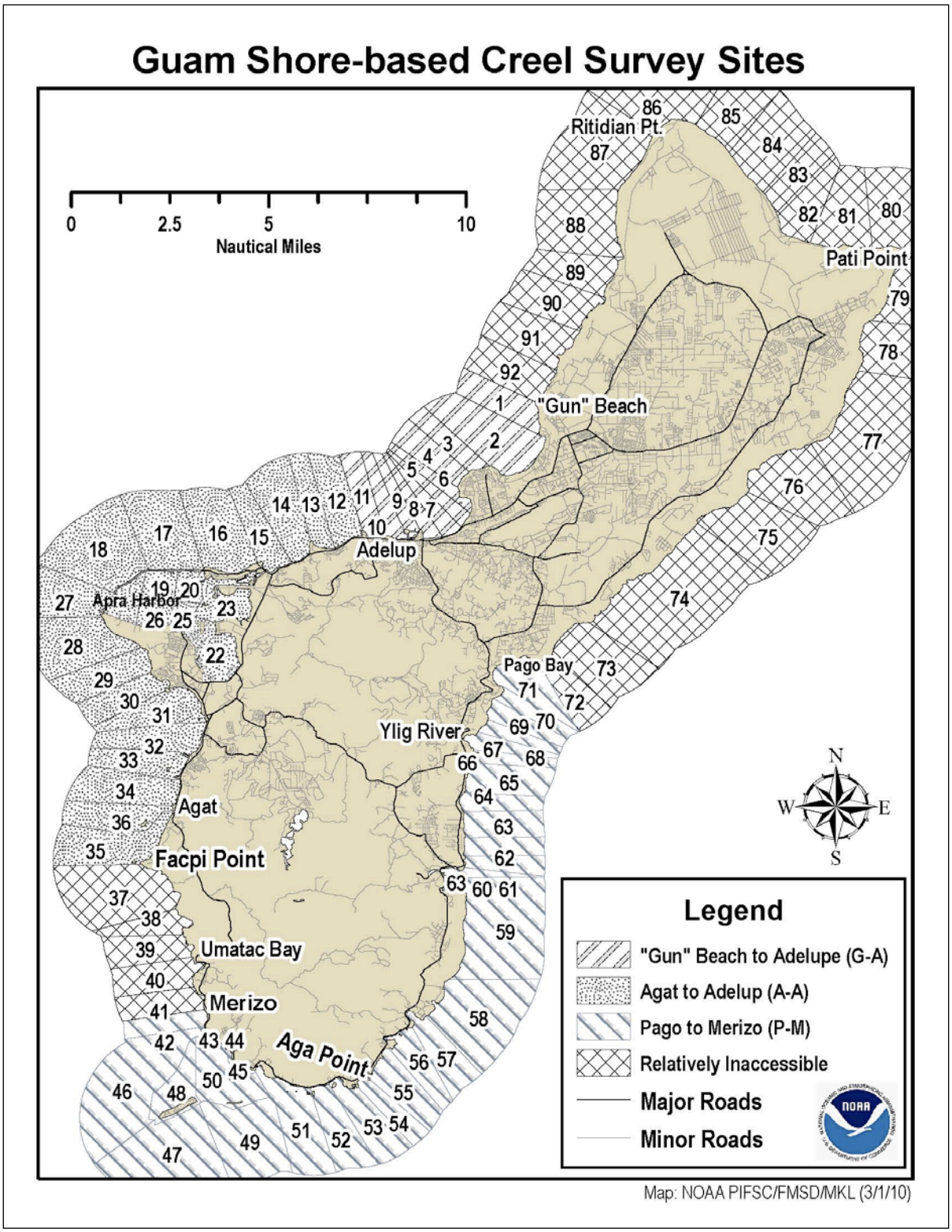
Shore-based Creel Survey Species Composition

Calendar Year: 2008 -- Day & Night (Top 40 Species)

Weight Unit: lb

Species	TOTAL	Hook & Line	Cast Net	Gill Net	Surround Net	Snorkel Spear	SCUBA Spear	Hooks & Gaffs	Drag Net	Other Methods
Finfish										
Caranx i'e'	23,328	17,174	2,580	3,566	8					
Naso unicornis	9,083	792	2,863	3,527	96	1,805				
Siganus spinus	7,481	1,466	2,324	1,143	1,775	754		16		3
Selar crumenophthalmus	7,439	7,439								
Caranx sexfasciatus	6,875	6,541	333							
Acanthurus triostegus triostegus	6,269	556	3,031	1,854	340	487				
Ellochelon vaigiensis	4,072		83	3,885		103				
Caranx melampygus	2,774	2,570				204				
Mulloidichthys ti'ao	2,416		2,413	3						
Leptoscarus vaigiensis	2,285	1,902			66	317				
Kyphosus cinerascens	1,997			1,659		338				
Naso lituratus	1,443	250		616	68	502				7
Acanthurus lineatus	1,436			366	13	1,057				
Acanthurus guttatus	1,215		1	1,074		140				
Carcharhinus melanopterus	1,176	1,100			75					
Lutjanus fulvus	1,171	793	17	256		105				
Gerres oyena	992		186	806						
Siganus punctatus	967			897		69				
Kyphosus vaigiensis	925					925				
Lethrinus xanthochilus	885				779	106				
Carangoides orthogrammus	836	799				37				
Lethrinus obsoletus	824	603		192	4	24				1
Hemiramphus lutkei	728	718		10						
Lutjanus monostigma	689	607	49			34				
Moolgarda engeli	672		3	668						
Lethrinus harak	643	388		92		162				1
Mulloidichthys flavolineatus	638		9	522	77	31				
Hyporhamphus acutus acutus	603				603					
Sphyraena barracuda	575	421				154				
Chlorurus sordidus	480			178		298				3
Acanthurus xanthopterus	452					452				
Siganus argenteus	450				293	156				
Leiognathus equulus	440			440						
Epinephelus merra	408	49			57	297		5		
Sargocentron spiniferum	385	156				229				

APPENDIX 1 GUAM SHORE-BASED SURVEY SITES MAP



APPENDIX 2 SHORE-BASED PARTICIPATION COUNT SURVEY FORM

Inshore Participation Survey

Date_____ WD WE Location_____

a.m. Start Time_____ Stop Time_____ a.m. Interviewer_____

p.m. Start Time_____ Stop Time_____ p.m. Interviewer_____

Par #	Time	Location	# Persons	# Gears	Method	Reef Zone	Weather	Clouds	Surf	Tide
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
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19										
20										
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

APPENDIX 3 SHORE-BASED INTERVIEW SURVEY FORM

INSHORE CREEL INTERVIEW FORM
Division of Aquatic and Wildlife Resources
Department of Agriculture, Guam

Date _____ WD/ WE Number of Fishermen ___ Interview #_____
Interviewer _____

Interview Time _____ Start Time _____ Day Before __ Stop Time _____ Day After __ Down Hours _____

Method	Gear Units	Location	Reef Zone	%Unsold	%Sold	Buyer
1. Hook and Line Bait_____						
2. Cast Net						Weather _____
3. Gill Net						
4. Surround Net						Cloud Cover _____
5. Snorkel Spear						
6. Scuba Spear						
7. Hooks and Gaffs						Surf _____
8. Drag Net						
9. Others Bait_____						Tide _____

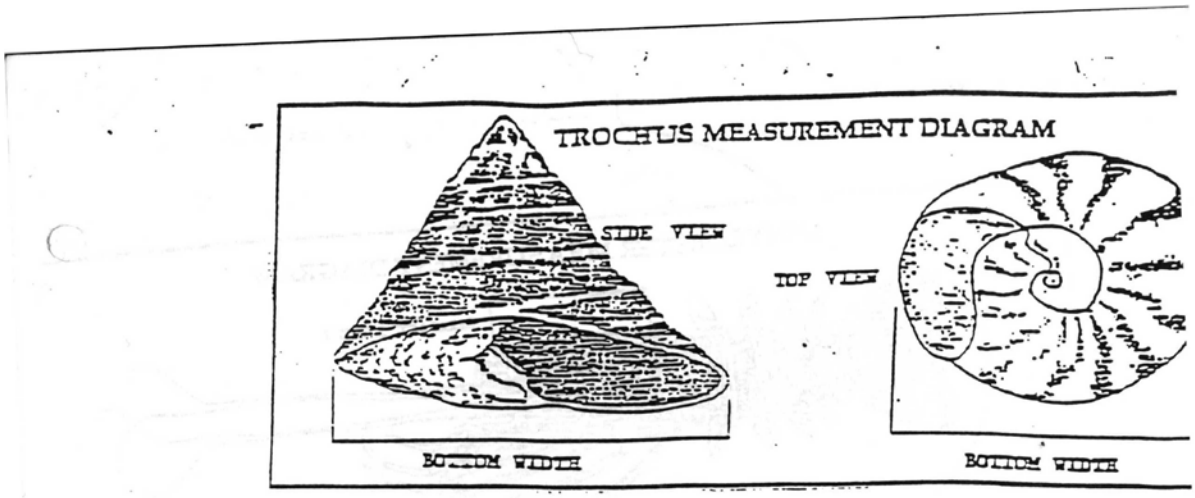
Species/Code	Length (mm)	Wt. (kg)	Length (mm)	Wt. (kg)	Length (mm)	Wt. (kg)	Total Actual	No. Est.	Total Actual	Weight Calc.	Est.

Bycatch: Did you release or throw back any fish? ( ) NO ( ) Yes (if yes, list below)

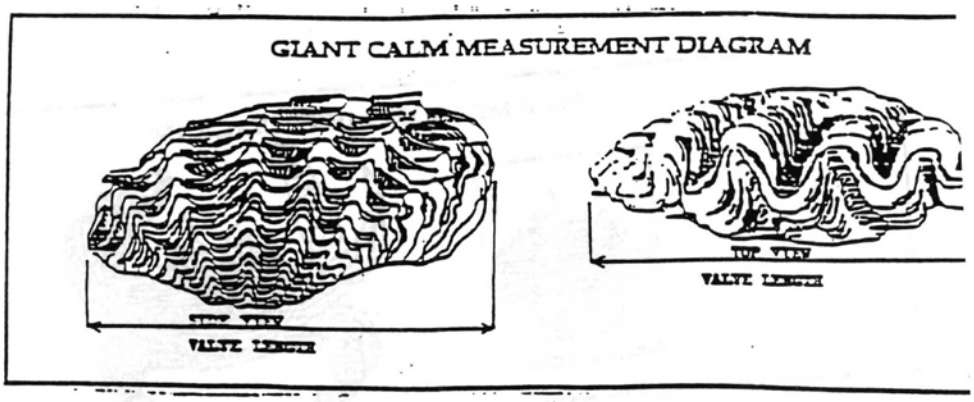
Species/Code	Method	Bycatch Type		Length (mm)	Wt. (kg)	Length (mm)	Wt. (kg)	Total Number		Total Weight		
		Released Alive(1)	Released Dead(2)					Act.	Est.	Actual	Calc.	Est.

REMARKS:

APPENDIX 4 INVERTEBRATE MEASUREMENT DIAGRAMS

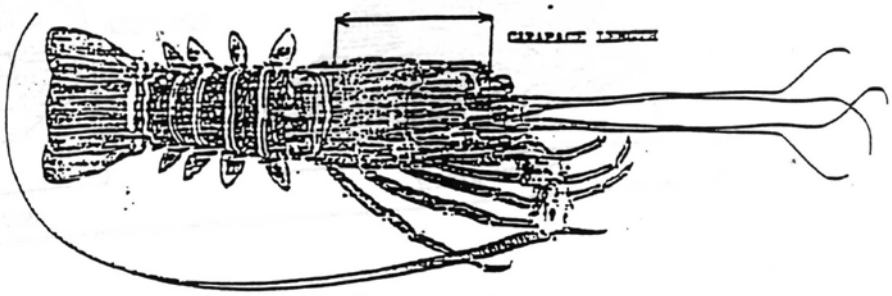


(Exhibit 1)



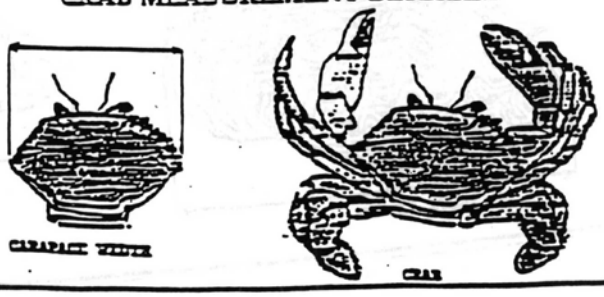
(Exhibit 2)

SPINY LOBSTER MEASUREMENT DIAGRAM

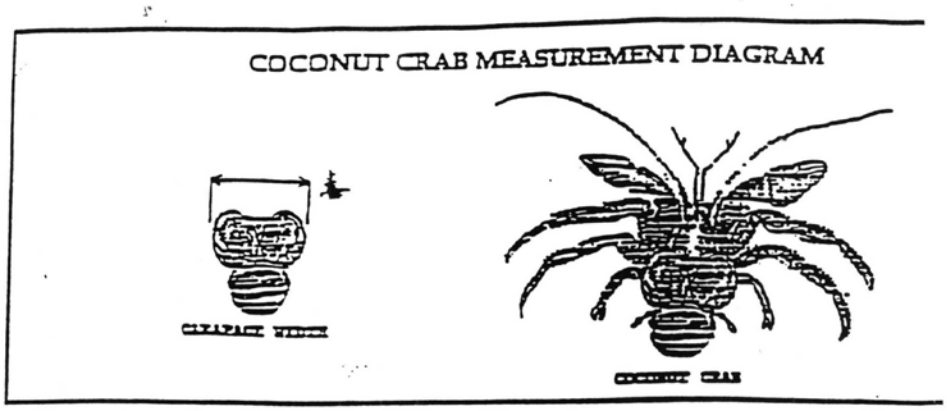


(Exhibit 3)

CRAB MEASUREMENT DIAGRAM



(Exhibit 4)



(Exhibit 5)

APPENDIX 5 AERIAL SURVEY FORM

INSHORE AERIAL SURVEY

Date____________________ WD WE Interviewer________

Start Time__________ Stop Time_________ Aerial Time

Take Off__________ Landing_________

Time	Location	# Fishers	# Gears	Method	Reef Zone	Animal	# Animals	Wthr	Cloud	Surf