PACIFIC ISLANDS FISHERIES SCIENCE CENTER

Western Pacific Creel Survey Program
Data Summary and Analysis

Guam, the Commonwealth of the Northern Mariana Islands, and American Samoa

A report submitted under Contract No. WE-133F-12-SE-2100
January 3, 2014

Sun Bak Hospital

Mirae Info Design LLC

July 2015

Administrative Report H-15-06C

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Preface

To provide independent expertise in the statistical analysis of a 30-year record of fish catch and effort data for Guam, the Commonwealth of the Northern Mariana Islands (CNMI), and American Samoa, the Pacific Islands Fisheries Science Center (PIFSC) contracted the services of Sun Bak Hospital, Mirae Info Design LLC (Contract No. WE-133F-12-SE-2100). The data were collected in each island area through creel surveys conducted by local fisheries agencies that are partners in the Western Pacific Fisheries Information Network (WPacFIN) including the Division of Aquatic & Wildlife Resources, Guam Department of Agriculture; the Division of Fish & Wildlife, CNMI Department of Lands & Natural Resources; and the American Samoa Department of Marine & Wildlife Resources. These data collections, belonging to the respective agencies, are warehoused by PIFSC, also a member of WPacFIN. In collaboration with its island fisheries agency partners, WPacFIN staff has helped modify the creel surveys, developed expansion algorithms to estimate total catch and effort for insular species, and created software to facilitate summary data analyses to help meet various federal reporting requirements and local needs for fisheries landings data.

The contractor was asked to conduct a statistical analysis of the historical time series of boat-based and shore-based creel survey data for each island area; to evaluate the adequacy of the survey sampling design and temporal and geographic coverage by gear type; to examine data expansion procedures used to estimate total catch and fishing effort from survey statistics; to attempt to estimate confidence intervals for total landings by species; and to produce a report of findings and recommendations. To make the results widely accessible, the contractor's report is being released here in the form of a PIFSC Administrative Report.

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Executive Summary

This report summarizes data from boat-based and shore-based creel survey programs conducted by fisheries agencies in Guam (Division of Aquatic & Wildlife Resources), the Commonwealth of the Northern Mariana Islands (CNMI Division of Fish & Wildlife) and American Samoa (Department of Marine & Wildlife Resources), with data management and programming support from NOAA's Western Pacific Fishery Information Network (WPacFIN). The report is an effort to understand the geographic and temporal extent of creel survey data collected throughout the 30-year period from 1982-2012, and to understand the performance of the current estimation process to compute annual catch estimates across island areas.

WPacFIN data support for creel survey programs in the western Pacific region began on Guam in 1982, and was implemented in American Samoa and CNMI shortly thereafter. Creel survey data collected by local agencies prior to 1982 are not considered in this analysis. Over the years in question, the creel survey effort (days surveyed) has fluctuated for various reasons, including changes in fisheries, management, and fiscal resource availability. The surveys were stratified geographically and temporally and survey days were allocated across stratum. In addition to staff, funding, and transportation issues, stratification varies by island due to a variety of differences in geography, accessibility, culture and other aspects of local fisheries. The survey design appears to adequately monitor certain fishing methods. For example, in recent years, trolling and bottomfishing trips made up of over 90% of the boat-based survey data, while hook and line type fishing trips dominated the shore-based survey. Historical trends suggest that popular fishing methods and preferred locations of fishing have changed over time.

The catch data are highly dispersed and skewed with a substantial proportion of zero and extreme values. A greater number of extreme values for catch data are present in survey data from Guam and the CNMI than from American Samoa. Fishing effort appears to differ by day type (weekend and weekday) and port (for boat-based fishing trips), while differences in CPUE are more affected by seasonality. The data also suggest that certain locations show higher levels of fishing effort for specific fishing methods.

The number of successful interviews completed via these voluntary surveys has been decreasing over the years. Moreover, for some regions, the amount of fishing effort detected in participation counts has also decreased. This may be due to changes in local fishery conditions. However, it may also be as a result of changes in survey implementation. While the number of survey days has not changed noticeably over the years, the actual survey hours completed on a survey day may have changed. That information cannot be easily detected from the survey data. If the survey hours were shortened, this may affect the coverage of daily participation counts and as well as the number of voluntary interviews. The fishing effort estimation algorithm for each island area assumes that participation counts obtain a consistent proportion of daily fishing effort on a given survey day. It is necessary to assess the survey implementation and to validate these assumptions in order to reflect any variance from these assumptions in the expansion algorithms.

The expansion algorithm is an estimation method that endeavors to compute annual catch and effort from the creel survey data. Due to the complexity of the existing expansion algorithms for each island area, obtaining a valid theoretical calculation of the standard error for the annual catch and effort is difficult. Instead, bootstrap methods were used to assess CPUE estimates and compute standard errors. The results suggest that the existing *expansion algorithm* provides reliable estimates for annual CPUE,

total effort and catch for the fishing methods that are frequently surveyed due to large sample sizes. However, the estimates from the other fishing methods do not appear to be stable. The standard error for catch estimates of rarely encountered fishing methods cannot be obtained, since the estimates are based on fixed numbers (default values, not estimated from the survey data). It may be possible to use historical data to increase the number of interviews used in developing default CPUE tables. However, this should be done with caution and consistent retrospective statistical analyses should be performed, since fisheries trends are variable, as is survey implementation.

Invalid data and outliers were present in the data. Careful statistical data screening is important between the data entry and estimation process, rather than relying on automated quality control prior to running the *Expansion algorithm.* To estimate CPUE for a given species, using the creel survey data, one must first ask whether the species is caught by the fishing methods the creel surveys are capable of intercepting. While annual fishing effort estimates may be improved by increasing the number of survey days for species targeted primarily by the gears that are well sampled via these creel surveys, catch estimates for species targeted by other fishing methods may require an alternative (and separate) survey design.

Introduction

The Western Pacific Fishery Information Network (WPacFIN) is a cooperative network of fisheries agencies. The WPacFIN Program of the Pacific Islands Fisheries Science Center provides software and IT support to a network of state and territorial fisheries agencies, conducting creel surveys and other data collection programs in the Western Pacific. The territorial fisheries agencies include:

- Guam Department of Agriculture, Division of Aquatic and Wildlife Resources (DAWR)
- Commonwealth of the Northern Mariana Islands (CNMI) Department of Lands and Natural Resources, Division of Fish & Wildlife (DFW)
- American Samoa Department of Marine and Wildlife Resources (DMWR)

Among the most widely described agency data collections are their creel surveys, which began in the 1980s, and were designed to obtain fishing catch and effort data from boating access areas (ports, launch ramps, etc.) and from fishing areas along the shoreline. The creel survey data have been used to estimate and report total catch, catch-per-unit-effort, and fishing effort at annual levels across island areas. Over the years, various aspects of the fisheries and the survey implementation have changed, and it is necessary to evaluate the current sampling design, data collected, and estimation methods through an evaluation of historical creel survey data. This report intends to provide insights into the creel survey data coverage over the years. In addition, the estimation methods for annual CPUE levels are also examined.

The creel survey data are often reported as group estimates that are derived and expanded based on the estimation method developed by the WPacFIN program. It must be noted that the data summary in this report is based solely on the observed (survey) data, and *does not* necessarily follow the definitions and grouping of the WPacFIN standards. The computation and definitions used in the summary report are described in the report.

Data and Analysis of the Creel Survey

Summary of Survey Data

For boat-based creel surveys, two types of data are collected: *fishing effort data,* collected by observing the number of fishing trips at various boat ramps across the islands, and *catch data,* collected by interviewing boat-based fishers when they return from a fishing trip. For the shore-based creel survey, similar to the boat-based survey, two types of data are collected: *fishing effort data* from visiting pre-determined locations along the shoreline within the sampling frame, and *catch data,* collected by interviewing fishers while and/or after they fish.

The sampling design is used to determine the survey locations and to appropriately allocate the number of survey days in each month and day type (weekday versus weekend/holiday) within a given year to accurately estimate island-wide annual fishing catch and effort. Implementation and design of the surveys are slightly different in each territory in the Western Pacific, and can be limited by staff availability and other factors at the time of survey.

In this report, the entire time series of data for both the boat-based and the shore-based creel surveys are used to understand the historical survey design and implementation, as well as observed changes taken place in the fishing catch and effort over the years.

Boat-based fishing effort – The boat-based fishing effort in this report is defined as the number of fishing trips or boat counts. The data from the boat log survey are summarized across years for each stratum (type of day, port, and quarter) and/or by each group (charter/non-charter, fishing method). The stratification and grouping may differ slightly by territory. The daily average boat count was computed as the total number of boat counts over total number of survey days. It should be noted that while the survey hours may not cover the entire day, the survey was designed to target the time period of the most active fishing period (Oram et al., 2010a-f).

(Equation 1) $$daily\ average\ boat\ count_{boat} = \frac{\sum_{survey\ days} total\ boat\ counts}{total\ number\ of\ survey\ days}$$

Shore-based fishing effort – Two fishing effort definitions are used to summarize the shore-based fishing data: (1) the number of gears used in fishing activities, and (2) the number of fishing hours per gear. The participation count survey is designed to observe and record island-wide fishing activity and the number of gears are recorded during this survey. The participation count survey data are summarized for each stratum (type of day, quarter) and/or by each group (fishing method). The daily average participation count was computed as the total number of fishing gears over the total number of survey days. This report will summarize the participation count survey data and compare them over time.

In computation of the shore-based CPUE estimates, the fishing effort is defined as the total number of fishing hours per gear since the duration of the fishing activities can be obtained from the interview surveys, and this is how the WPacFIN reports shore-based fishing effort.

(Equation 2) $$daily\ average\ participation\ count_{shore} = \frac{\sum_{survey\ days} total\ number\ of\ gears}{total\ number\ of\ survey\ days}$$

Boat-based catch-per-unit-effort (CPUE) – For this report, the CPUE from boat-based fisheries is defined as total estimated weight of the catch per fishing trip, using catch data from interviews. For comparison, the CPUE data are summarized by each group. Descriptive statistics of the CPUE estimates are provided and the distribution of the CPUE is graphically represented using boxplots for the most recent decade.

(Equation 3) $$CPUE_{boat} = total\ weight\ of\ catch\ per\ trip$$

(Equation 4) $$Mean\ of\ CPUE_{boat} = \frac{\sum_{trips} CPUE_{trip}}{total\ number\ of\ trips}$$

Shore-based catch-per-unit-effort (CPUE) – The CPUE for shore based fisheries is defined as total catch weight per gear and hour, using catch data from interviews. Descriptive statistics are provided, and boxplots are used to graphically represent these CPUE distributions for the most recent decade.

(Equation 5) $$CPUE_{trip} = \frac{total\ weight\ of\ catch\ per\ trip}{(\#\ of\ gears\ used)_{trip} \times (\#\ of\ hours\ fished)_{trip}}$$

CPUE comparison –The creel survey CPUE data were positively skewed with a substantial proportion of trips with no catch. The data include measurement errors of unknown quantity and it is unrealistic to assume the independence of the CPUE data. The catch data were transformed, using $\log_e(CPUE + 0.01)$. Even with a log-transformation, the variable sample size of the catch data between groups, large variation within each group and unknown error associated with data collection and processing make the assumption of normality and constant variance unrealistic. The difference in CPUE between strata was evaluated using non-parametric Kruskal-Wallis test (α=0.05). The CPUE data from the last 5 years (2008-2012) were combined. The strata include day type, seasonality (quarter) and port (for boat-based survey data only), with the assumption that all other effects are constant.

Species Composition – Many species were registered as having been caught during the interview surveys over the years. The most caught species by weight and numbers over the survey period are presented as well as tables with more recent data (2008 – 2012).

Analysis of Expansion Algorithm

The creel survey data are used to estimate total catch and effort at annual levels and across island areas. The statistical method to compute and report estimates is referred to as the WPacFIN *Expansion Algorithm*. The CPUE and effort are computed by fishing method, day type, trip type (charter and non-charter), and location (port). The CPUE estimates are computed using the interview data and the fishing effort using the participation count survey data. The total catch is then derived from the estimates of CPUE and the fishing effort.

For effort estimation, simple random sampling is used to compute total effort at island and annual levels with additional adjustment factors (Bak, 2012). For catch estimation, if the number of interviews is three or more in a given "fishing subgroup" (method-trip type-day type-location), the CPUE computed from the survey data are adequate to estimate CPUE at annual and island level assuming the survey data are representative of the population. If data from three interviews are not available in a 'fishing subgroup",

various methods are applied in an effort to pool data. If none of the pooling methods can produce more than three relevant data points to average, the survey data for that group is discarded and the data expansion uses a pre-determined (default) value.

As shown in the creel survey data summary, the number of interviews fisheries agencies have been able to complete in a given "fishing subgroup" has been decreasing in recent years. The reasons for this include limited funds and staff availability, as well as other more complex administrative issues. Moreover, there are some fishing activities and certain gear types that do not easily lend themselves to the particular creel survey logistics of a given area or the roving and access-point survey design. The number of interviews for such fishing methods is always low.

Due to the complexity of the rules applied in the estimation process, the computation of the standard error (variance) of the estimates cannot be defined by a simple equation. Therefore, in the following section, the performance of the *Expansion Algorithm* is examined, using non-parametric bootstrapping techniques with the 2011 Guam boat-based creel survey data. The bootstrap estimate of standard error requires no theoretical calculations and can be used for the complex estimators (Efron and Tibshirani, 1993). The bootstrap algorithm works by drawing many independent samples with replacement, and computing the estimates from them and estimating standard error of the replicates (Equation 6). The *Expansion Algorithm* estimates ($\hat{\theta}'s$) of the CPUE are computed. Resampling the interview data with replacement within each stratum (quarter and day type), we obtain the bootstrap replicates ($\hat{\theta}^{*}s$) of the *Expansion Algorithm* estimates. If the *Expansion Algorithm* provides good estimates, the replicates will be close to the value of $\hat{\theta}$.

$$\widehat{se}_B = \left(\frac{\sum_{b=1}^{B} \left(\hat{\theta}_b^* - \hat{\theta}_\cdot^{*} \right)^2}{B-1} \right)^{\frac{1}{2}} \qquad where \;\; \hat{\theta}_\cdot^{*} = \sum_{b=1}^{B} \frac{\hat{\theta}_b^*}{B},$$

(Equation 6)

$$\hat{\theta}_b^* = \; boostrap\; CPUE\; replicate,$$

$$\hat{\theta}^* = WPacFIN\; CPUE\; estimate$$

Data summary and results

Guam boat-based creel survey

The Guam boat-based creel survey is conducted at the three most active ports on the island: Agana (Hagåtña) Boat Basin, Agat Harbor and Merizo. In 1982 when the program was first implemented, only Agana Boat Basin was surveyed and Merizo and Agat were added in 1988 and 1994 respectively. The number of survey days was increased substantially in 1995 (Figure 1). The survey days were allocated to each port in proportion to the level of fishing activity. In general, Agana boat basin has received nearly twice as many survey days as Agat Harbor and Merizo Pier. The allocation of the survey days among the three ports has remained consistent throughout the program.

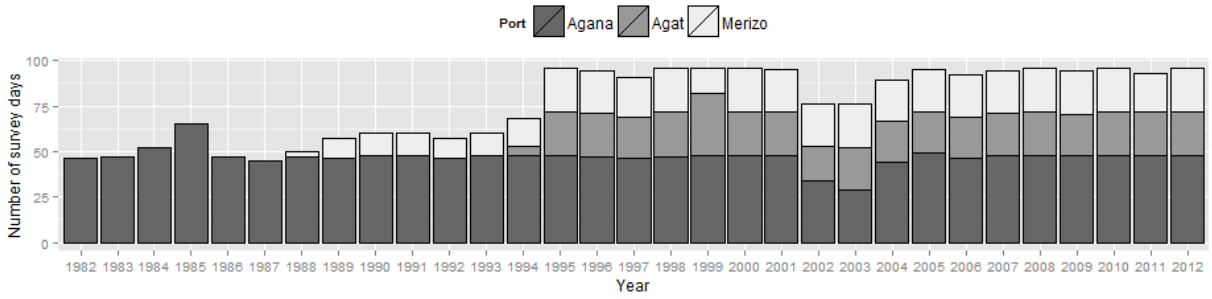

Figure 1. Survey days for Guam boat-based creel survey by port and year

The number of voluntary interviews has fluctuated greatly over the years (Figure 2). Trolling and bottomfishing were the two most popular types of fishing trips between 2008 and 2012, over 70% of the interviews were from trolling trips, and both trolling and bottomfish trips made up over 90% of the interview survey data (Figure 4). The total number of interviews completed with other fishing methods was small, with most other methods having fewer than three interviews for each stratum and group.

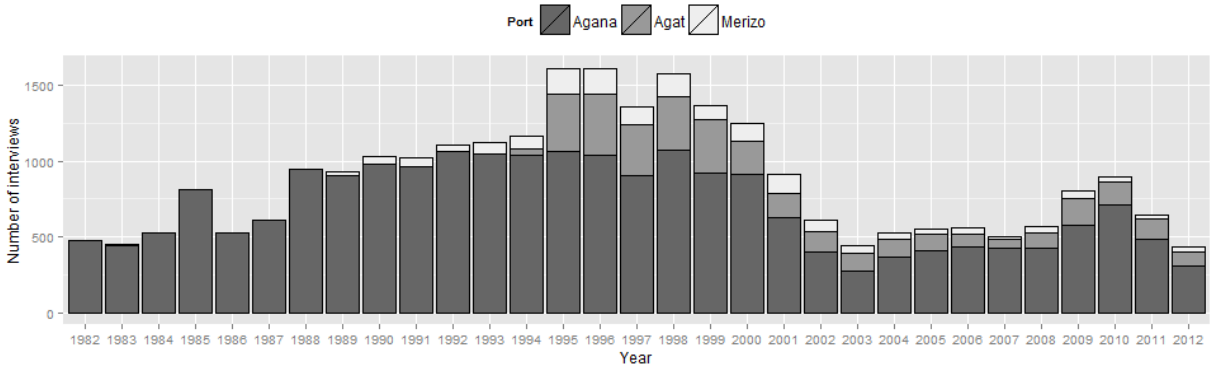

Figure 2. Guam boat-based voluntary interviews conducted by port and year

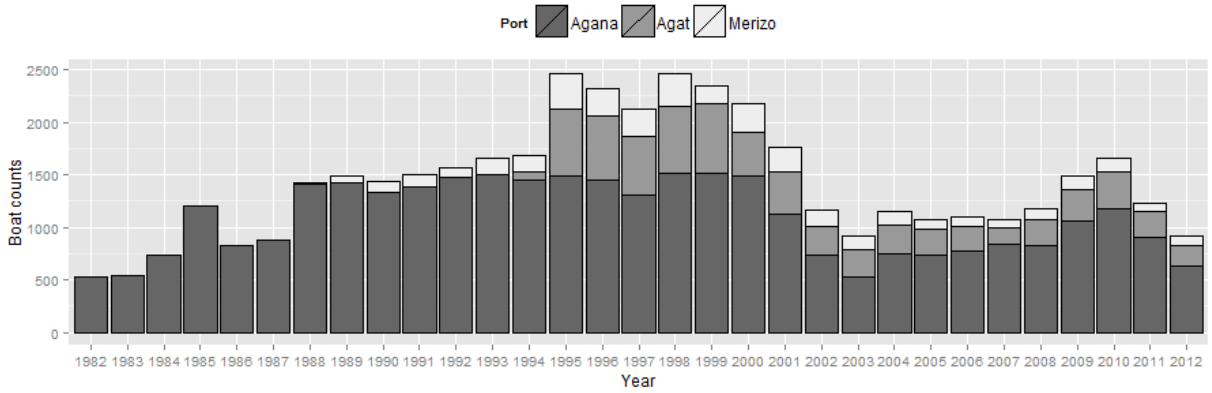

Figure 3. Total number of boat trip counts from Guam boat log survey by year and port

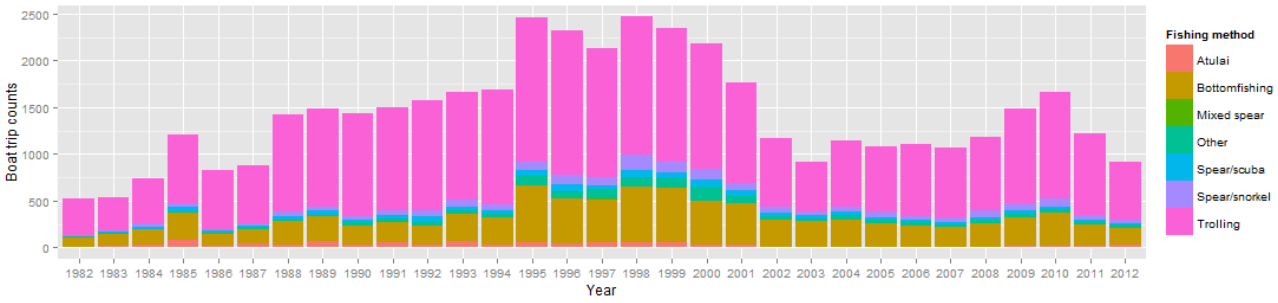

Figure 4. Total number of boat trip counts from Guam boat log survey by year and fishing method

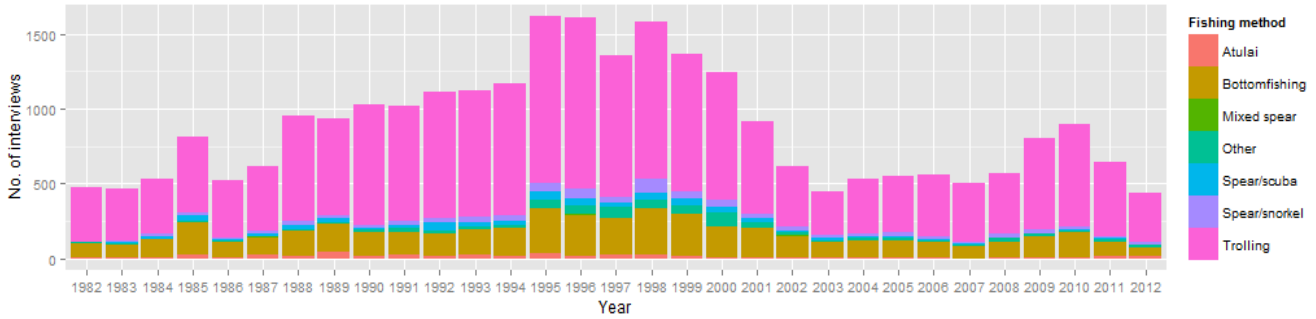

Figure 5. Number of Guam boat-based interviews by year and fishing method

Fishing effort – From the early 2000s, recorded boat counts during boat log survey dropped substantially (Figure 3). The average daily trips for both non-charter trolling (Figure A9) and bottomfishing (Figure A10) appear to be affected by type of day; data suggest a higher number of trips during weekends.

Catch-per-unit-effort – The distributions of the CPUE for both trolling and bottomfish fishing are highly skewed with a substantial proportion of zero catch trips. There were a significant number of extreme values present in the CPUE data. The number of charter fishing interviews is very small especially for bottomfishing. The CPUE for trolling trips shows a significant difference in seasonality, day type and port (Table 1). For bottomfishing, the CPUE appears to be affected by day type, but no significant effects

from port or seasonality. Although the level of CPUE between weekend and weekday varied year to year, the weekend bottomfishing trips appear to have higher CPUE.

Table 1. Kruskal-Wallis test results for Guam boat-based trip CPUE across stratum (survey data from 2008 to 2012)

Stratum	Trolling				Bottomfishing			
	Non-charter		Charter		Non-charter		Charter	
	KW	p-value	KW	p-value	KW	p-value	KW	p-value
Season (quarter)	47.35	<0.00	60.31	<0.00	1.68	0.643	6.93	0.074
Day type	54.51	<0.00	0.17	0.676	1.41	0.235	10.12	0.001
Port	8.11	0.017	8.57	0.014	7.43	0.024	3.75	0.053

Catch and species composition – Between 2008 and 2012 over 200 species were recorded during the interview surveys. A total of 31 species were caught during trolling trips and 149 species on bottomfish trips. Some species were strictly caught by a particular fishing method while others were caught by multiple methods. Most of the catch during trolling trips appeared to be unique to trolling trips. However, bottomfish and spear/SCUBA fishing shared catch of many of the same species. The ten most caught (in weight) species and the ten most frequently caught species (in number of fish) are shown in Tables 2-9. The list of species that were most caught both in weight and count in recent years (2008-2012) varies slightly from the full time series. It should be noted that the weight and counts were not always recorded during the voluntary interviews, thus the numbers may not represent the actual values. However, the summary tables may provide a general understanding of the species most frequently caught and their landings.

Table 2. Ten most caught species (weight) by Guam trolling

Species Name	Weight (lbs)	Fish count
Katsuwonus pelamis	158913.4	75478
Coryphaena hippurus	135949.5	32312
Acanthocybium solandri	63199.98	11391
Thunnus albacares	52478.28	14027
Makaira mazara	51903.82	901
Sphyraena barracuda	3564.96	960
*Elagatis bipinnulat**a***	3546.55	1930
Euthynnus affinis	2622.62	3358
Gymnosarda unicolor	1821.37	528
Istiophorus platypterus	1353.69	64

Table 3. Ten most frequently caught species (counts) by Guam trolling

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Makaira mazara	51903.82	901
Gymnosarda unicolor	1821.37	528
ASSORTED TROLLING FISH	1161.55	337

Table 4. Ten most caught species (weight) by Guam trolling (2008-2012)

Species name	Weight (lbs)	Fish count
Katsuwonus pelamis	39219	23800
Coryphaena hippurus	16847.55	3673
Acanthocybium solandri	7559.28	1334
Thunnus albacares	5203.01	2504
Makaira mazara	3633.81	69
Sphyraena barracuda	464.67	112
ASSORTED TROLLING FISH	351.54	140
Euthynnus affinis	312.64	480
Elagatis bipinnulata	287.73	170

Table 5. Ten most frequently caught species (counts) by Guam trolling (2008-2012)

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Katsuwonus pelamis	39219	23800
Coryphaena hippurus	16847.55	3673
Thunnus albacares	5203.01	2504
Acanthocybium solandri	7559.28	1334
Euthynnus affinis	312.64	480
Elagatis bipinnulata	287.73	170
ASSORTED TROLLING FISH	351.54	140
Sphyraena barracuda	464.67	112

Table 6. Ten most caught species (weight) by Guam bottomfishing

Species Name	Weight (lbs)	Fish count
Lethrinus rubrioperculatus	4993.4	12608
SHALLOW BOTTOMFISH	3820.36	10233
Etelis coruscans	3266.63	571
Pristipomoides auricilla	2265.08	5431
Aprion virescens	1807.11	792
Etelis carbunculus	1723.84	1413
Epinephelus fasciatus	1573.07	7075
Pristipomoides zonatus	1520.72	2730
Aphareus rutilans	1287.75	579
Gymnosarda unicolor	1131.56	280

Table 7. Ten most frequently caught species (counts) by Guam bottomfishing

Species Name	Weight (lbs)	Fish count
Lethrinus rubrioperculatus	4993.4	12608
SHALLOW BOTTOMFISH	3820.36	10233
Epinephelus fasciatus	1573.07	7075
Pristipomoides auricilla	2265.08	5431
Lutjanus kasmira	714.82	3947
Lethrinus obsoletus	753.77	2996
Lethrinus harak	687.04	2758
Pristipomoides zonatus	1520.72	2730
Epinephelus merra	227.97	2026
ASSORTED BOTTOMFISH	920.16	1884

Table 8. Ten most caught species (weight) by Guam bottomfishing (2008-2012)

Species name	Weight (lbs)	Fish count
Etelis coruscans	692.7	132
Etelis carbunculus	540.92	267
Sphyraena qenie	340.19	70
SHALLOW BOTTOMFISH	337.47	1055
Lethrinus rubrioperculatus	310.56	656
Pristipomoides zonatus	309.28	490
Gymnosarda unicolor	261.69	46
Pristipomoides auricilla	197.54	348
Lethrinus xanthochilus	194.9	245
Lethrinus harak	174.0	718

Table 9. Ten most frequently caught species (counts) by Guam bottomfishing (2008-2012)

Species name	Weight (lbs)	Fish count
SHALLOW BOTTOMFISH	337.47	1055
Epinephelus fasciatus	142.97	723
Lethrinus harak	173.95	718
Lutjanus kasmira	115.64	703
Lethrinus rubrioperculatus	310.56	656
Pristipomoides zonatus	309.28	490
Lethrinus obsoletus	98.76	388
Pristipomoides auricilla	197.54	348
Cephalopholis urodeta	68.8	287
Etelis carbunculus	540.9	267

Guam shore-based creel survey

The Guam creel survey program began collecting shore-based fisheries data from 1985. Figure 6 shows the total number of survey days that interviews were conducted between 1985 and 2012. Although the days with no interviews are not included in Figure 6, the graph suggests that the interview survey days have been consistent throughout the years. The number of interviews however, has fluctated over time (Figure 7). Eight types of fishing gears were identified during the shore-based survey, and the most frequently observed fishing gears include hook and line, cast net, snorkel spear and gill net. Over 90% of the interviews were of hook and line and cast net fishing trips (Figure 8).

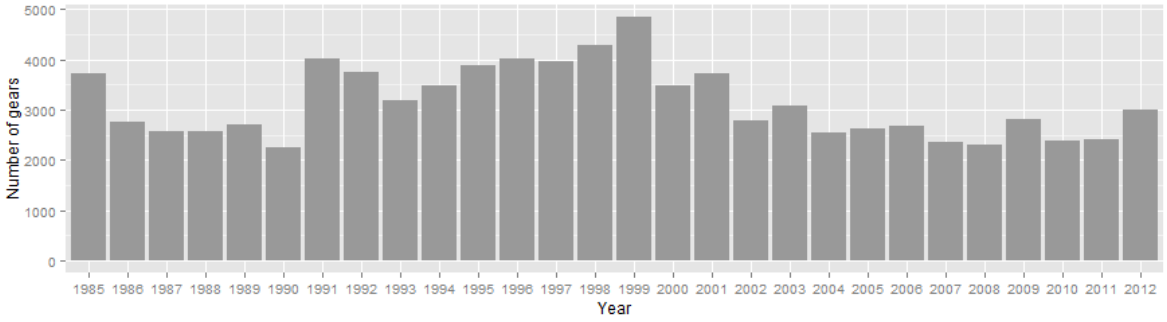

Figure 6. Total number of gears from Guam shore-based participation survey by year

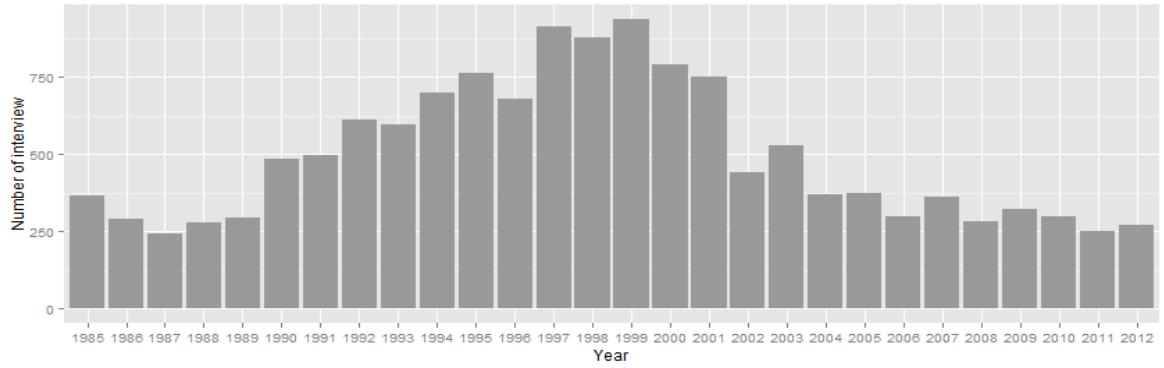

Figure 7. Guam shore-based interviews by year

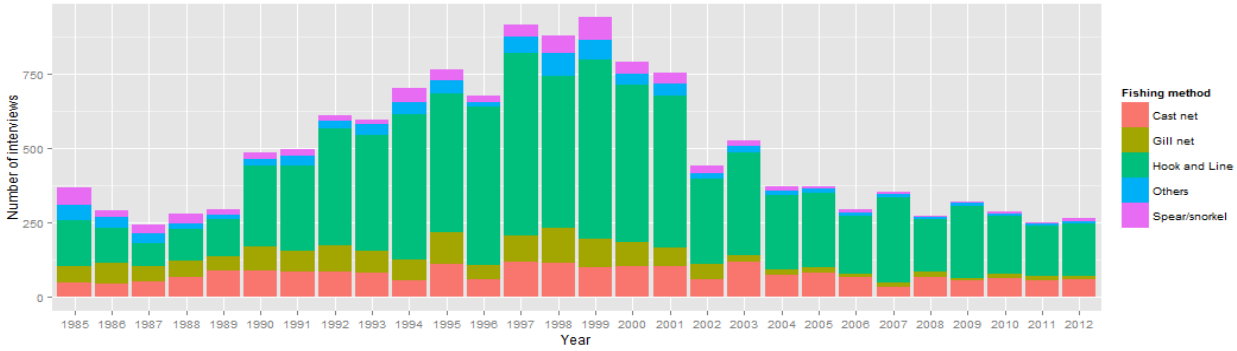

Figure 8. Guam shore-based interviews by year and fishing method

Fishing effort – The total gear count during participation count surveys have fluctuated over the years (Figure 6). The majority of the gear counts observed during participation count surveys was hook and line and cast net fishing.

Catch-per-unit-effort – Similar to the boat-based catch data, the distribution of CPUE is highly skewed with a substantial proportion of zero catch for both hook and line and cast net. Extreme values of catch are present in the data. The Kruskal-Wallis test result (Table 10) suggests significant differences in CPUE between seasons for both hook and line and cast net fishing.

Table 10. Kruskal-Wallis test results for Guam shore-based trip CPUE across stratum

Stratum	**Hook & line**		**Cast net**	
	KW	p-value	KW	p-value
Season (quarterly)	16.01	0.001	35.1	<0.00
Day type	0.20	0.657	0.41	0.523

Catch and species composition – A total of 541 species were registered in shore-based creel survey data over the survey period (1985-2012) and 169 species during the last 5 years (2008-2012). Tables 11-18 present the ten most caught species (by weight) as well as the ten species that are most seen in interviews. The list of species showing the highest weight and numbers caught in last 30 years are slightly different from the list of species in recent years (2008-2012). It should be noted that the weight and counts were not always recorded during the voluntary interviews, thus the numbers may not represent the actual values. However, the summary tables may provide a general understanding of the species most frequently caught and their landings.

Table 11. Ten most caught species (weight) by Guam hook & line

Species name	Weight (lbs)	Fish count
Selar crumenophthalmus	565.5	4857
Naso unicornis	342.5	944
Caranx spp. (i'e')	336.9	19257
Caranx melampygus	221.2	590
Lethrinus harak	127.8	659
Siganus spinus	92.3	1277
Caranx sexfasciatus	75.9	376
Epinephelus merra	72.4	642
Sphyraena barracuda	56.2	43
Lethrinus olivaceus	55.9	96

Table 12. Ten most frequently caught species (counts) by Guam hook & line

Species name	Weight (lbs)	Fish count
Caranx spp. (i'e')	336.9	19257
Selar crumenophthalmus	565.5	4857
Siganus spinus	92.3	1277
Naso unicornis	342.5	944
Lethrinus harak	127.8	659
Epinephelus merra	72.4	642
Caranx melampygus	221.2	590
Lutjanus fulvus	50.2	404
Hyporhamphus acutus	21.9	397
Caranx sexfasciatus	75.9	376

Table 13. Ten most caught species (weight) by Guam hook & line (2008-2012)

Species Name	Weight (lbs)	Fish count
Selar crumenophthalmus	187.3	1747
Caranx melampygus	44.9	153
Caranx spp. (i'e')	44.8	4304
Caranx sexfasciatus	21.6	118
Lethrinus harak	8.8	64
Siganus spinus	6.5	146
Lethrinus xanthochilus	5.1	9
Naso unicornis	3.5	9
Carangoides orthogrammus	3.3	6
Myripristis berndti	2.8	43

Table 14. Ten most frequently caught species (counts) by Guam hook & line (2008-2012)

Species Name	Weight (lbs)	Fish count
Caranx spp. (i'e')	44.8	4304
Selar crumenophthalmus	187.3	1747
Caranx melampygus	44.9	153
Siganus spinus	6.5	146
Caranx sexfasciatus	21.6	118
Lethrinus harak	8.8	64
Myripristis berndti	2.8	43
Naso lituratus	2.5	32
Acanthurus triostegus triostegus	1.0	26
Siganus argenteus	0.9	18

Table 15. Ten most caught species (weight) by Guam cast net

Species name	Weight (lbs)	Fish count
Siganus argenteus	290.8461	1419
Siganus spinus	266.7983	3718
Mulloidichthys spp. (juv./ti'ao)	161.5442	20201
Acanthurus triostegus triostegus	156.7439	2990
Mulloidichthys flavolineatus	152.5568	4849
Kyphosus cinerascens	104.8117	191
Caranx spp. (i'e')	97.2986	6403
Kyphosus vaigiensis	64.2192	49
Moolgarda engeli	50.2679	1505
Naso unicornis	38.4148	93

Table 16. Ten most frequently caught species (counts) by Guam cast net

Species name	Weight (lbs)	Fish count
Mulloidichthys spp. (juv./ti'ao)	161.5	20201
Apogon novemfasciatus	1.7	7600
Caranx spp. (i'e')	97.3	6403
Mulloidichthys flavolineatus	152.6	4849
Siganus spinus	266.8	3718
Acanthurus triostegus triostegus	156.7	2990
Moolgarda engeli	50.3	1505
Siganus argenteus	290.8	1419
Crenimugil crenilabis	31.5	1016
Ellochelon vaigiensis	21.1	900

Table 17. Ten most caught species (weight) by Guam cast net (2008-2012)

Species name	Weight (lbs)	Fish count
Siganus argenteus	290.5	1206
Mulloidichthys spp. (juv./ti'ao)	36.1	5890
Caranx spp. (i'e')	28.5	2123
Acanthurus triostegus triostegus	20.5	364
Siganus spinus	10.9	534
Ellochelon vaigiensis	7.8	265
Naso unicornis	7.1	13
Mulloidichthys flavolineatus	6.4	227
Caranx sexfasciatus	6.0	207
Siganus argenteus	5.1	254

Table 18. Ten most frequently caught species (counts) by Guam cast net (2008-2012)

Species name	Weight (lbs)	Fish count
Mulloidichthys spp. (juv./ti'ao)	36.1	5890
Caranx spp. (i'e')	28.5	2123
Siganus argenteus	290.5	1206
Siganus spinus	10.9	534
Acanthurus triostegus triostegus	20.5	364
Ellochelon vaigiensis	7.8	265
Siganus argenteus	5.1	254
Mulloidichthys flavolineatus	6.4	227
Caranx sexfasciatus	6.0	207
Siganus sp. (manahak lesso')	0.1	200

CNMI boat-based creel survey

The CNMI boat-based creel surveys (boat count and interview) were conducted primarily at the three most active ports on Saipan: Sugar Dock, Fish Base and Smiling Cove. The number of survey days was allocated equally amongst the three ports and were randomly assigned to each port. However, despite this scheduling strategy (Figure 9) the number of completed interviews varies considerably by port (Figure 10). A total of 13 different fishing methods were registered during interviews and the majority of interviews were trolling trips, followed by bottomfishing. There were very few interviews captured from trips other than trolling and bottomfishing.

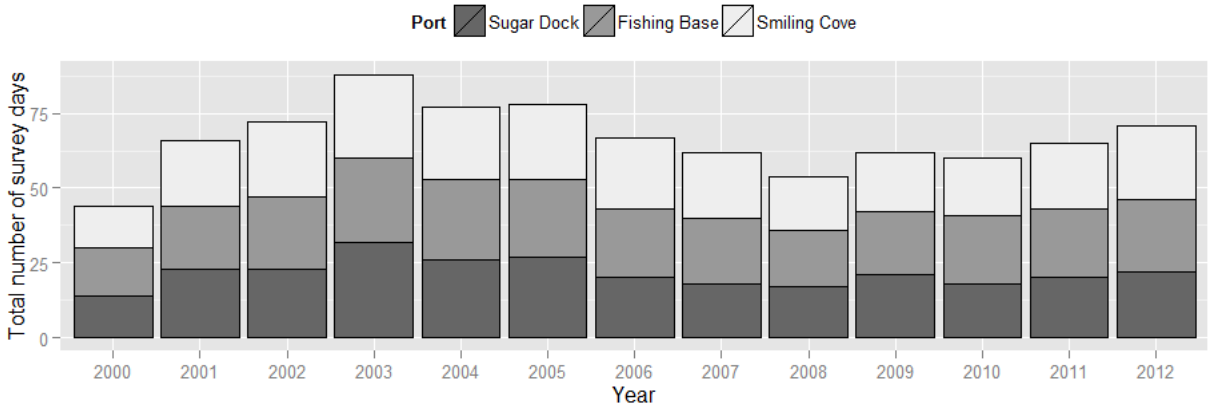

Figure 9. CNMI boat-based survey days by port and year

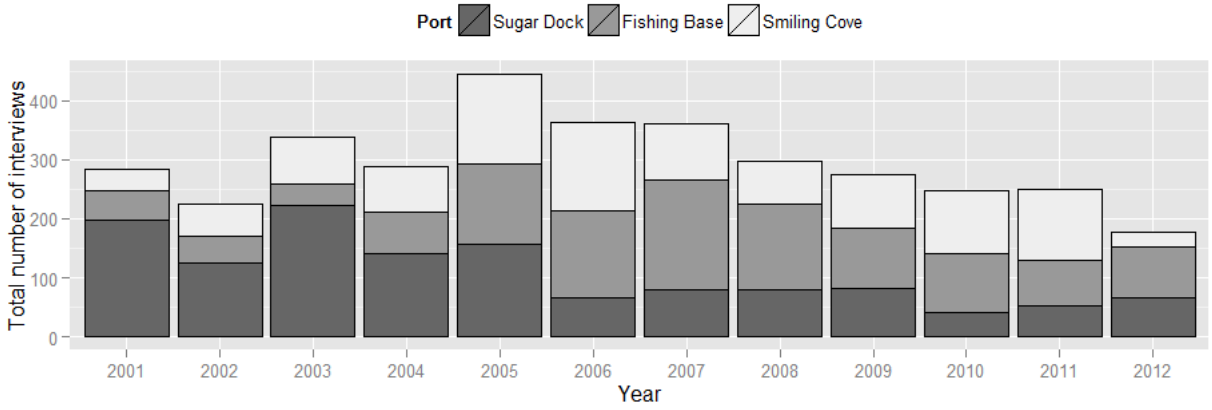

Figure 10. CNMI boat-based interviews by port and year

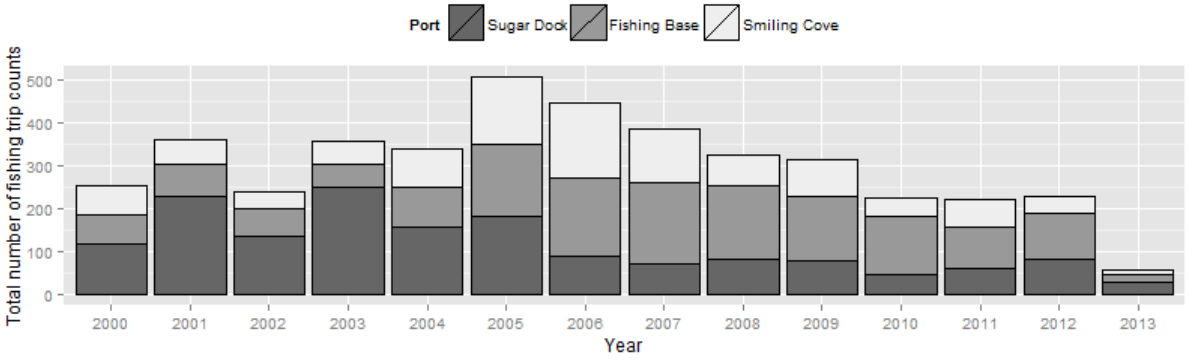

Figure 11. CNMI boat counts from boat log survey by port and year

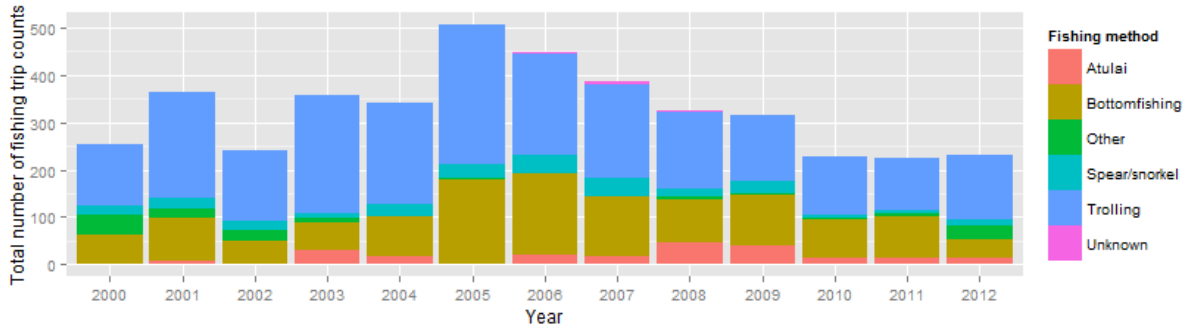

Figure 12. CNMI boat-based boat trip counts by fishing method

Fishing effort – Over the years, the number of boat counts has fluctuated. A higher number of fishing trips are observed during the weekend (Figures A37 – A40). Non-charter trolling trips were made predominantly at Sugar Dock in early 2000 and from mid 2000s, the trolling boat counts had been more evenly distributed between Sugar Dock and Fishing Base (Figure A41). Relatively smaller number of trolling trips had been made from Smiling Cove. Bottomfishing trips are observed primarily at Fishing Base and Sugar Dock, and charter trips are mainly observed at Smiling Cove.

Catch-per-unit-effort – The distributions of the CPUE for both trolling and bottomfishing are highly skewed with a substantial proportion of zero to low catch trips. There were a significant number of extreme values present in the data. The effect of location and the seasonality show significant differences in the CPUE of trolling trips (Table 19). The CPUE recorded at Fishing Base appears to be higher than that observed at other ports. The trolling CPUE during the dry season was also significantly higher than during the wet season. Bottomfishing CPUE was significantly higher during weekdays than on weekends.

Table 19. Kruskal-Wallis test results for CNMI boat-based trip CPUE across stratum

Stratum	Trolling				Bottomfishing			
	Non-charter		Charter		Non-charter		Charter	
	KW	*p-val*	KW	*p-val*	KW	p-val	KW	*p-val*
Season (quarter)	27.30	<0.00	0.72	0.87	0.22	0.97	4.84	0.18
Day type	0.64	0.42	0.67	0.41	11.48	<0.00	1.90	0.17
Port	38.19	<0.00	0.63	0.43	9.56	0.01	-	-

Catch and species composition – Between 2000 and 2012, approximately 132 species were recorded in the CNMI boat-based survey. There were 31 species caught on trolling trips and 99 species caught during bottomfishing trips. The total weight and number of fish counts recorded in the voluntary interviews are shown in the follow tables (Tables 20-27). It should be noted that the weight and counts were not always recorded during the voluntary interviews, thus the numbers may not represent the actual values. However, the summary tables may provide a general understanding of the species most frequently caught and their landings.

Table 20. Ten most caught species (weight) by CNMI trolling

Species name	Weight (lbs)	Fish count
Skipjack Tuna	99065.0	44310
Mahimahi	14143.0	3495
Yellowfin Tuna	8098.9	2437
Wahoo	2747.2	521
Saba (kawakawa)	2037.2	1486
Blue Marlin	1549.6	30
Rainbow Runner	1515.7	752
Tunas (misc.)	207.8	73
Barracuda	195.2	217
Sailfish	154.1	7

Table 21. Ten most frequently caught species (counts) by CNMI trolling

Species name	Weight (lbs)	Fish count
Skipjack Tuna	99065.0	44310
Mahimahi	14143.0	3495
Yellowfin Tuna	8098.9	2437
Saba (kawakawa)	2037.2	1486
Rainbow Runner	1515.7	752
Wahoo	2747.2	521
Barracuda	195.2	217
Blackspot Emperor	12.3	89
Tunas (misc.)	207.8	73
Emperor (mafute/misc.)	16.2	73

Table 22. Ten most caught species (weight) by CNMI trolling (2008-2012)

Species Name	Weight (lbs)	Fish count
Skipjack Tuna	23583.8	11931
Mahimahi	4684.1	1140
Yellowfin Tuna	2813.2	915
Saba (kawakawa)	1064.7	556
Wahoo	1015.4	182
Blue Marlin	732.6	9
Rainbow Runner	282.3	117
Tunas (misc.)	205.3	72
Lizardfish misc.	60.8	60
Sailfish	53.7	3

Table 23. Ten most frequently caught species (counts) by CNMI trolling (2008-2012)

Species Name	Weight (lbs)	Fish count
Skipjack Tuna	23583.8	11931
Mahimahi	4684.1	1140
Yellowfin Tuna	2813.2	915
Saba (kawakawa)	1064.7	556
Wahoo	1015.4	182
Rainbow Runner	282.3	117
Tunas (misc.)	205.3	72
Lizardfish misc.	60.8	60
Barracuda	44.1	17
Leatherback	29.5	16

Table 24. Ten most caught species (weight) by CNMI bottomfishing

Species name	Weight (lbs)	Fish count
Redgill Emperor	2064.4	4308
Onaga (red Snapper)	786.8	84
Kalikali (pink Snap)	771.9	1508
Ehu (red Snapper)	625.3	770
Emperor (mafute/misc.)	352.2	1243
Blackspot Emperor	323.3	1206
Black Tip Grouper	285.1	1120
Jobfish (uku)	261.3	144
Dogtooth Tuna	242.0	43
Opakapaka (pink Snp)	235.1	375

Table 25. Ten most frequently caught species (counts) by CNMI bottomfishing

Species name	Weight (lbs)	Fish count
Redgill Emperor	2064.4	4308
Kalikali (pink Snap)	771.9	1508
Emperor (mafute/misc.)	352.2	1243
Blackspot Emperor	323.3	1206
Triggerfish (misc.)	218.9	1173
Black Tip Grouper	285.1	1120
Blueline Snapper	183.7	931
Ehu (red Snapper)	625.3	770
Flagtail Grouper	61.6	643
Goatfish (misc.)	83.5	544

Table 26. Ten most caught species (weight) by CNMI bottomfishing (2008-2012)

Species name	Weight (lbs)	Fish count
Redgill Emperor	468.9	648
Ehu (red Snapper)	388.2	434
Onaga (red Snapper)	383.1	41
Blackspot Emperor	243.1	872
Goby	158.0	83
Triggerfish (misc.)	118.6	761
Emperor (mafute/misc.)	113.1	411
Gindai (flower Snap)	102.0	150
Kalikali (pink Snap)	87.3	137
Blueline Snapper	84.3	452

Table 27. Ten most frequently caught species (counts) by CNMI bottomfishing (2008-2012)

Species name	Weight (lbs)	Fish count
Blackspot Emperor	243.1	872
Triggerfish (misc.)	118.6	761
Redgill Emperor	468.9	648
Blueline Snapper	84.3	452
Ehu (red Snapper)	388.2	434
Emperor (mafute/misc.)	113.1	411
Goatfish (misc.)	33.2	339
Flagtail Grouper	26.2	307
Yellowstripe Emperor	37.8	203
Gindai (flower Snap)	102.0	150

CNMI shore-based creel survey

The CNMI shore-based creel survey was conducted at a total of 29 different locations along the shoreline on Saipan since 2005, and there were eight different fishing gear/methods observed during the participation counts and interviews. About 90% of the fishing activities were hook and line, followed by spearfishing (spear/snorkel) and cast net (Figure 16).

Fishing effort –The survey data suggest that higher amounts of fishing activity occur on weekends than on weekdays (Figures A60-A62). Fishing effort varied by location with the most active sites including Fishing Base, Smiling Cove and the shoreline between Agingan and S.A School, among others.

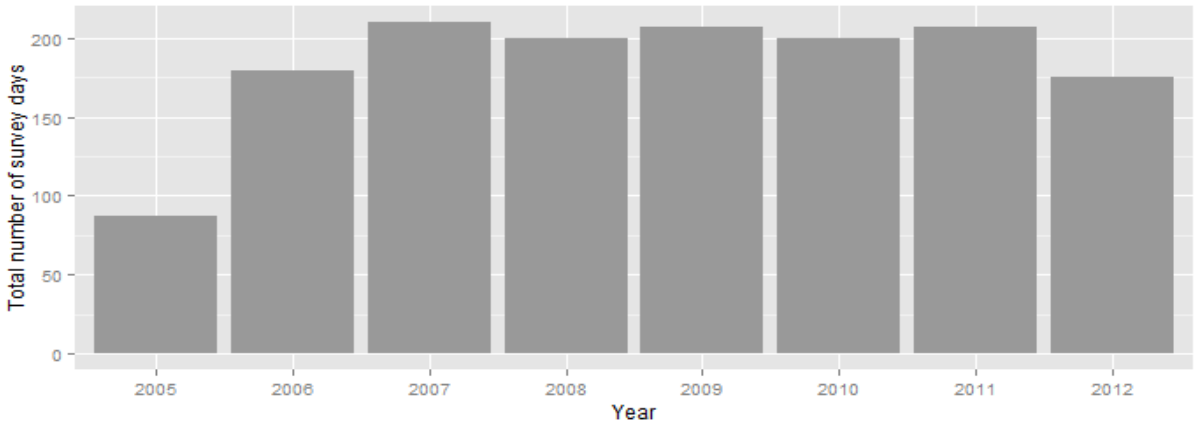

Figure 13. CNMI shore-based survey days by year

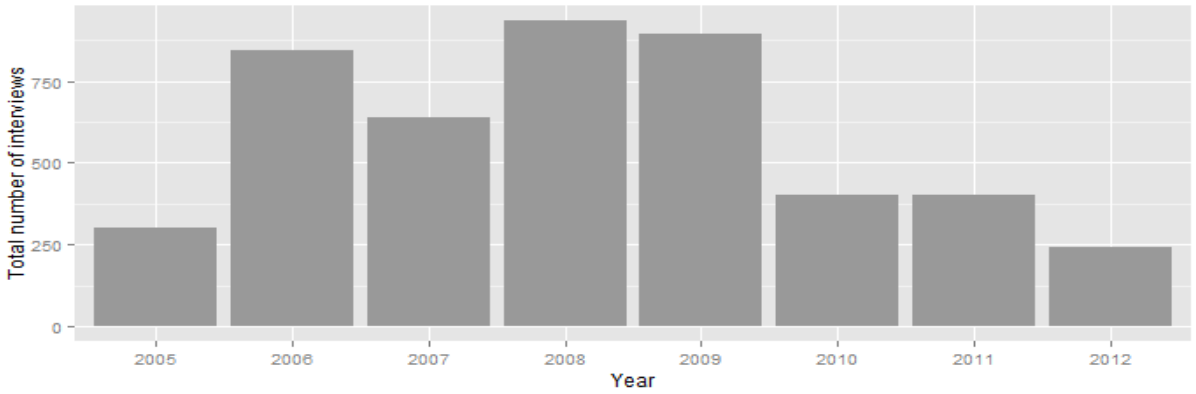

Figure 14. CNMI shore-based interviews by year

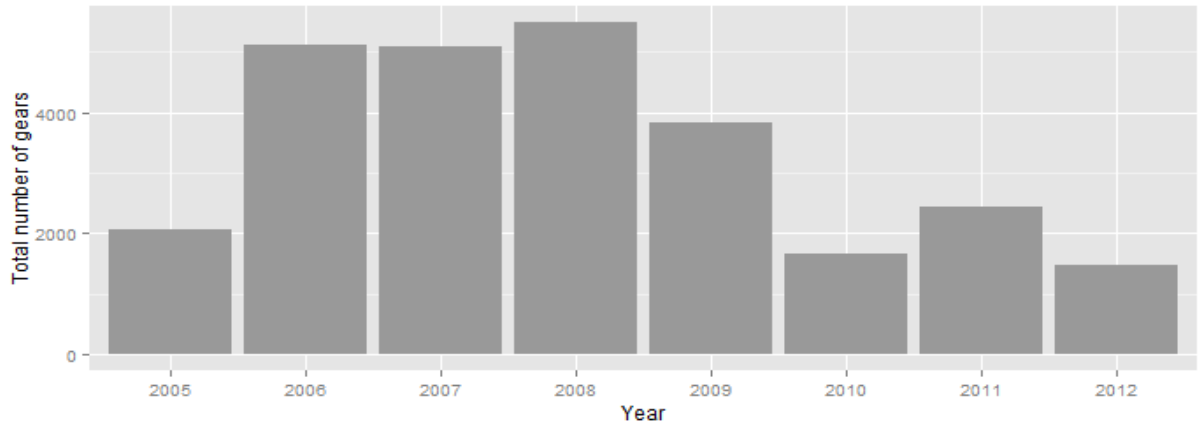

Figure 15. Total number of gears from CNMI shore-based participation count survey by year

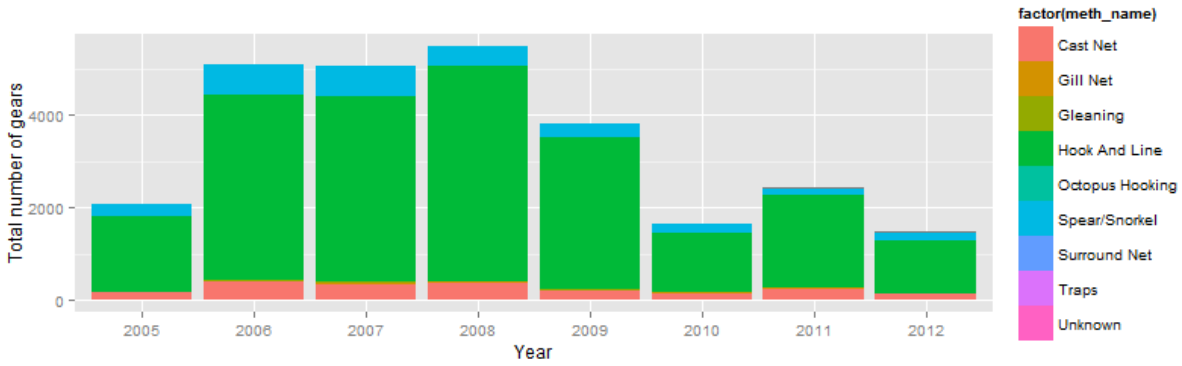

Figure 16. Total number of gears from CNMI shore-based participation count survey by year

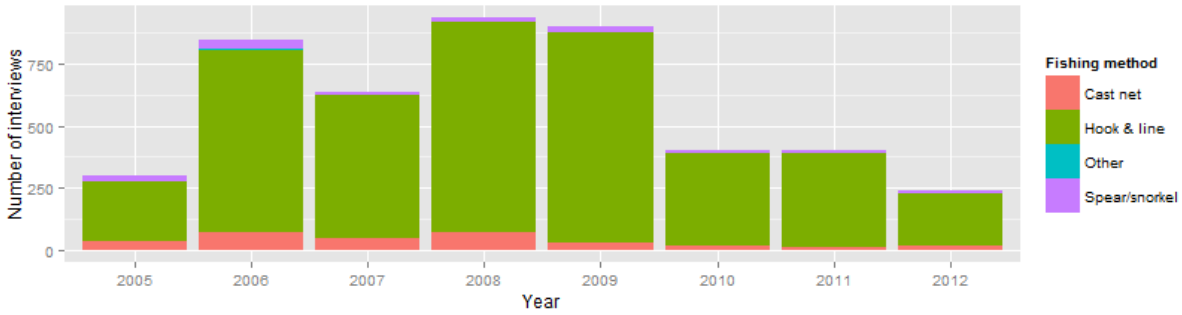

Figure 17. Total number of CNMI shore-based interview survey by year and fishing method

Catch-per-unit-effort – Interview data consisted primarily of hook-and-line trips, followed by spearfishing (spear/snorkel), and cast net fishing (Figure 17). Approximately 47% of the interview data show zero catch, and there are many extreme values present in the data. The estimated number of hours fishing on a trip varied widely, ranging from 6 minutes to 27 hours with a median of 2.5 hours. The Kruskal-Wallis test results suggest that the mean CPUE differs by type of day and seasonally for hook and line trips (Table 28). The seasonality also appears to affect the CPUE for spear/snorkel fishing.

Table 28. Kruskal-Wallis test results for CNMI shore-based trip CPUE across stratum

Stratum	**Hook & line**		**Spear/snorkel**		**Cast net**	
	KW	p-value	KW	p-value	KW	p-value
Day type	16.57	< 0.00	1.57	0.21	0.96	0.33
Seasonality (quarterly)	54.06	< 0.00	14.62	0.002	3.20	0.36

Catch and species composition – Between 2005 and 2012, approximately 118 species were recorded during the CNMI shore-based survey. The total weight and number of fish counts recorded in the voluntary interviews are shown in the follow tables (Tables 29-34). It must be noted that the weight and counts were not always recorded during the voluntary interviews, thus the numbers may not represent the actual values. However, the summary tables may provide a general understanding of the species most frequently caught and their landings.

Table 29. Ten most caught species (weight) by CNMI spearfishing

Species name	Weight (lbs)	Fish count
Octopus	86.7	92
Parrotfish (misc.)	78.1	324
Surgeonfish (misc.)	53.6	332
Orangespine Unicornfish	39.5	298
Goatfish (misc.)	37.6	281
Gold Spotted Rabbitfish	30.8	316
Emperor (mafute/misc.)	23.8	146
Rudderfish (misc.)	18.5	28
Forktail Rabbitfish	17.8	191
Blackspot Emperor	16.2	140

Table 30. Ten most frequently caught species (counts) by CNMI spearfishing

Species name	Weight (lbs)	Fish count
Surgeonfish (misc.)	53.6	332
Parrotfish (misc.)	78.1	324
Gold Spotted Rabbitfish	30.8	316
Orangespine Unicornfish	39.5	298
Goatfish (misc.)	37.6	281
Forktail Rabbitfish	17.8	191
Scribbled Rabbitfish	15.8	181
Emperor (mafute/misc.)	23.8	146
Blackspot Emperor	16.2	140
Dash & Dot Goatfish	13.1	119

Table 31. Ten most caught species (weight) by CNMI hook & line

Species name	Weight (lbs)	Fish count
EE: Juvenile Jacks	212.5	10942
Blackspot Emperor	154.9	1306
Mullet	66.1	518
Cigar Wrasse	37.4	632
Bigeye Scad	31.8	222
Needlefish	31.6	681
Yellowstripe Emperor	30.7	527
Emperor (mafute/misc.)	15.4	161
Jacks (misc.)	14.3	19
Bluefin Trevally	12.9	28

Table 32. Ten most frequently caught species (counts) by CNMI hook & line

Species name	Weight (lbs)	Fish count
EE: Juvenile Jacks	212.5	10942
Blackspot Emperor	154.9	1306
Needlefish	31.6	681
Cigar Wrasse	37.4	632
Yellowstripe Emperor	30.7	527
Mullet	66.1	518
Bigeye Scad	31.8	222
Wrasse (misc.)	9.2	169
Emperor (mafute/misc.)	15.4	161
Forktail Rabbitfish	5.0	119

Table 33. Ten most caught species (weight) by CNMI cast net

Species name	Weight (lbs)	Fish count
Bigeye Scad	76.1	651
EE: Juvenile Jacks	44.9	2602
Mojarra	40.2	435
Goatfish (juvenile-misc)	30.6	2141
Mullet	22.0	971
Goatfish (misc.)	9.8	541
Catfish (Striped eel)	9.0	155
Rabbitfish (Juv.)	7.2	25
Scribbled Rabbitfish	3.0	32
Anchovy	3.0	1000

Table 34. Ten most frequently caught species (counts) by CNMI cast net

Species name	Weight (lbs)	Fish count
EE: Juvenile Jacks	44.9	2602
Goatfish (juvenile-misc)	30.6	2141
Anchovy	3.0	1000
Mullet	22.0	971
Bigeye Scad	76.1	651
Goatfish (misc.)	9.8	541
Mojarra	40.2	435
Catfish (Striped eel)	9.0	155
Forktail Rabbitfish	1.3	65
Yellowstripe Goatfish	1.0	55

American Samoa boat-based creel survey

The boat-based creel survey data collection began in 1986, and the survey effort has fluctuated over the years (Figure 18). This survey was designed to be conducted on foot. Because the fishing areas are within such a short distance of each other, unlike Guam and the CNMI, the survey days are not allocated to specific boat ramps. Instead, all of the ports can be visited on a given survey day. In the initial design of the program most of the survey effort was allocated during weekdays, as it was culturally unacceptable to fish on Sundays and administratively impossible to work on Saturdays. The number of voluntary interviews has decreased substantially since 2000. The total number of boat counts also shows a decreasing trend.

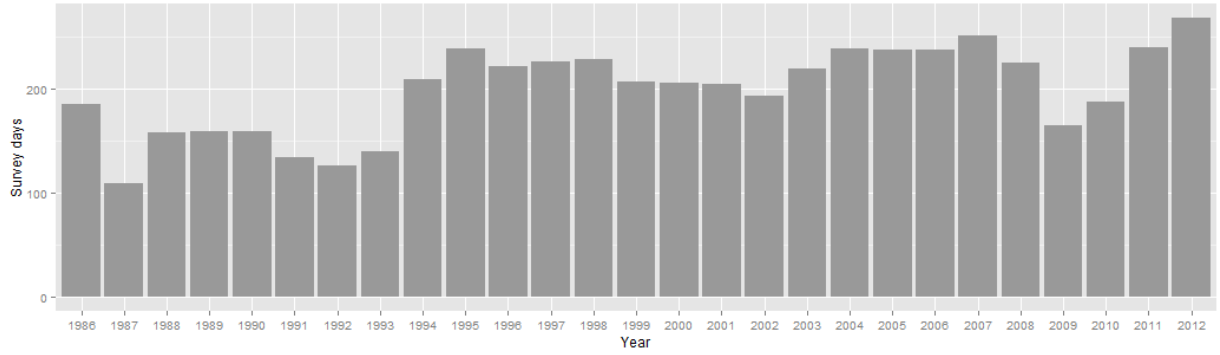

Figure 18. American Samoa boat-based survey days by year

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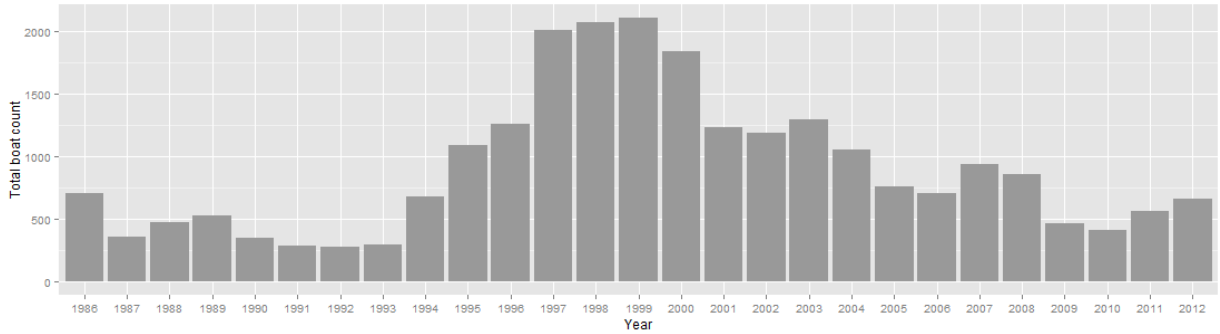

Figure 19. Total number of boat trip counts in American Samoa by year (Tutuila only)

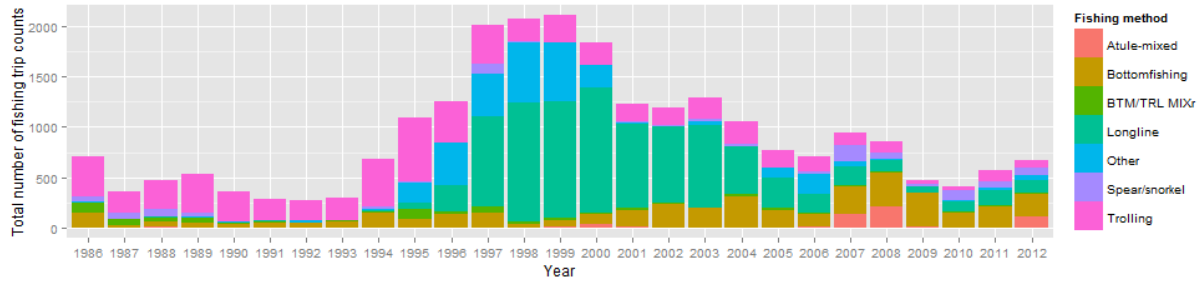

Figure 20. Total number of boat trip counts in American Samoa by year and fishing method (Tutuila only)

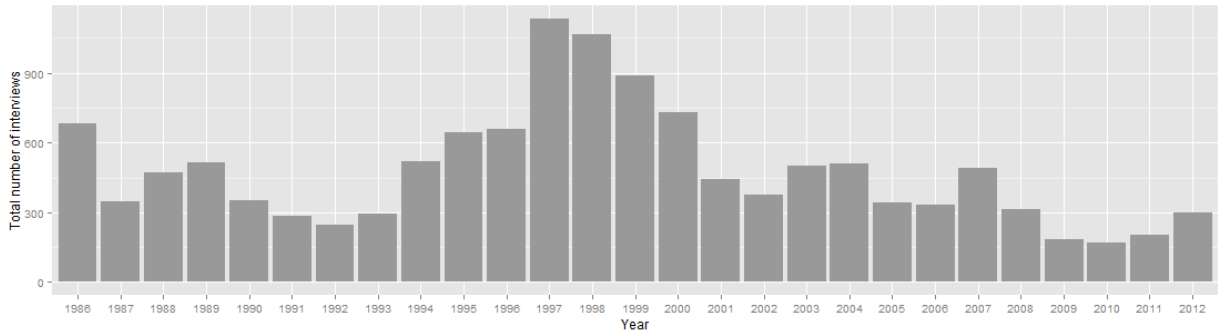

Figure 21. American Samoa boat-based interviews by year

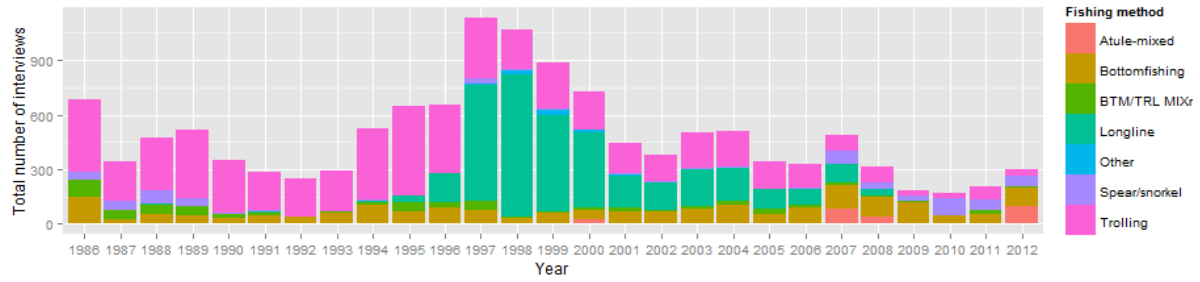

Figure 22. American Samoa boat-based interviews by year and fishing method

Fishing effort – Between 1986 and 2012, the survey was conducted at 10 different boat ramps on the island of Tutuila. The most active boat ramps include Fagatogo marina dock, Pago Pago, Fagasa, and Leone. Over 90% of boat activities, especially of trolling and bottomfishing, occurred at Fagatogo alone (Figures A73 and A74).

Catch-per-unit-effort – The distribution of the CPUE is positively skewed, with higher counts of lower catch rates and some extreme values. As more trips were observed at Fagatogo thus more interviews were conducted to obtain CPUE data. Higher CPUE is recorded from Fagatogo than other boat launching areas (Figures A75 and A76). The mean CPUE by quarter shows significant differences (Table 35).

Table 35. Kruskal-Wallis test results for American Samoa boat-based trip CPUE across stratum

	Trolling		**Bottomfishing**		**Spearfishing**	
Stratum	KW	p-value	KW	p-value	KW	p-value
Quarter	14.78	0.002	13.58	0.004	42.00	<000
Port	2.26	0.133	1.21	0.546	0.12	0.735

Catch and species composition – Between 1986 and 2012, 195 species were recorded during the American Samoa boat-based survey. It should be noted that the weight and counts for fish species were not always recorded during the voluntary interviews. Due to technical issues associated with merging

interview and catch data series, species rank tables cannot be presented for American Samoa boat-based survey data.

American Samoa shore-based creel survey

The American Samoa shore-based creel survey began in 1987 and some years have no survey data. The participation count and the voluntary interviews were conducted from a total of 53 different locations on the island of Tutuila. The fishing gear counts and the number of voluntary interviews substantially decreased from early 2000s despite the higher number of survey days allocated during those years (Figures 23 and 24). The most frequently observed fishing gear/method types in recent years include rod & reel, spearfishing and throw net (Figure 25).

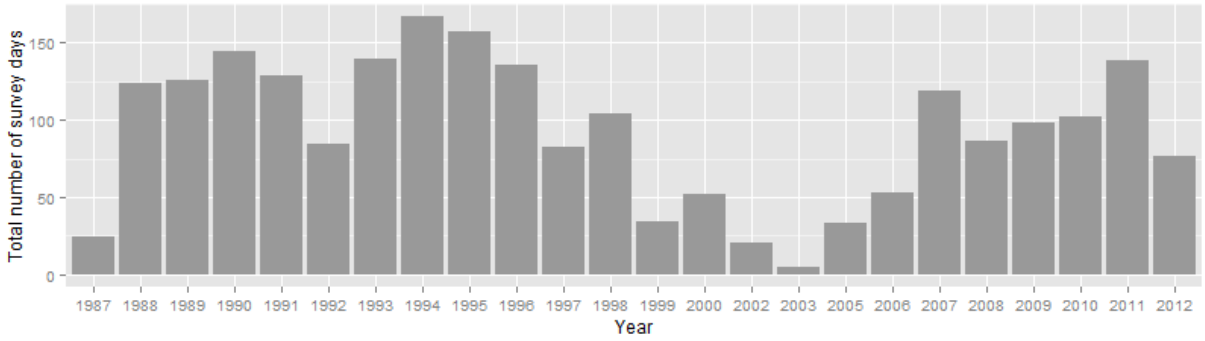

Figure 23. American Samoa shore-based survey days by year

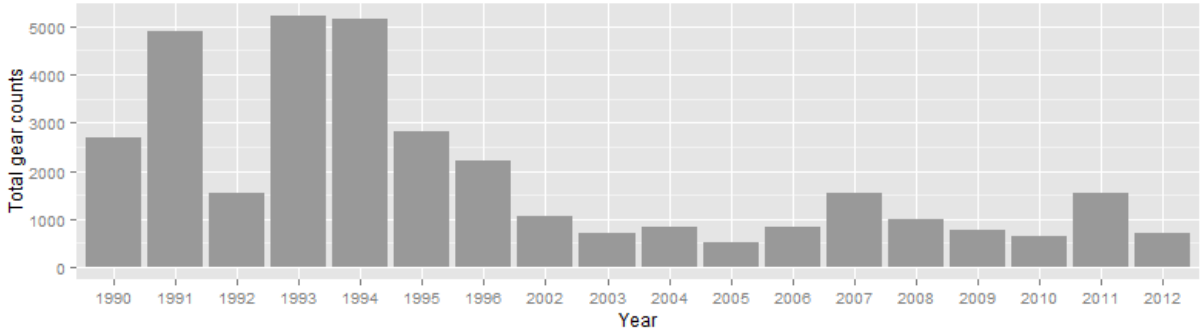

Figure 24. Total fishing gear count from American Samoa shore-based survey by year

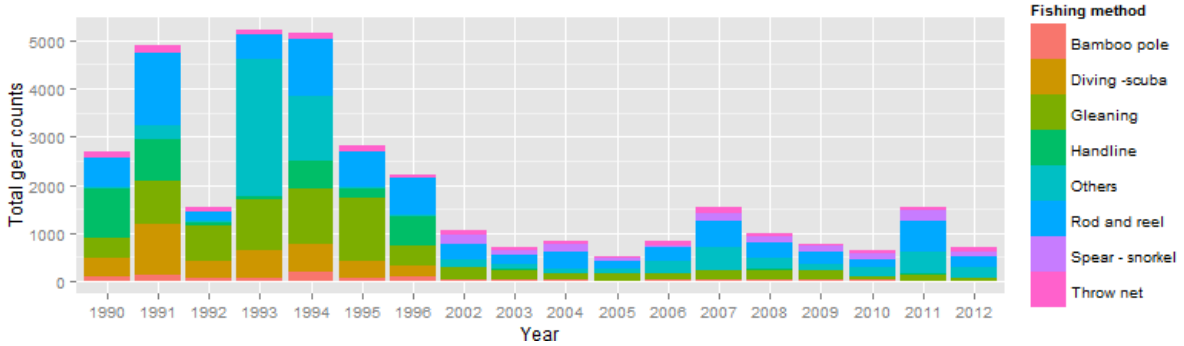

Figure 25. Total fishing gear counts from American Samoa shore-based survey by year and fishing method

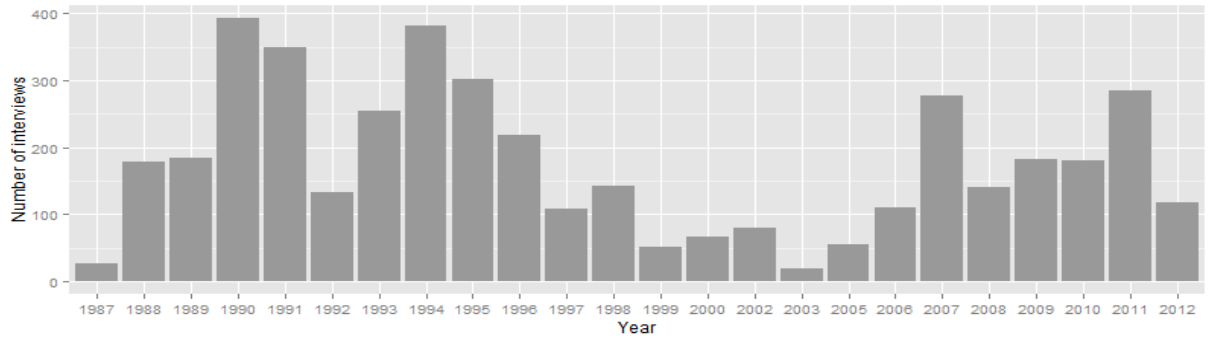

Figure 26. American Samoa shore-based interviews by year
(The number of survey days was computed by counting number of interviews from the shore-based interview dataset (AIN_Int.dbf))

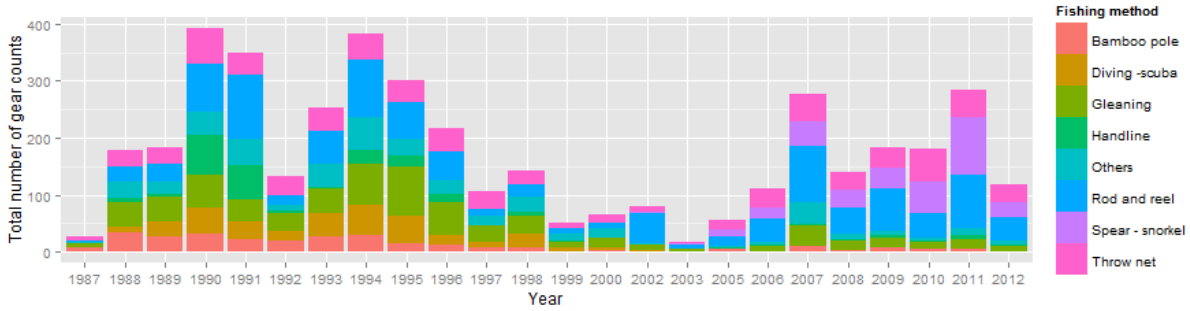

Figure 27. American Samoa shore-based interviews by year and fishing method

Fishing effort – The total number of gears observed have decreased over the years. While the decline is apparent in the average daily gear count estimates, it does not seem to show significant difference over time.

Catch-per-unit-effort – The distribution of the CPUE is positively skewed, with high counts of lower catch rates and some extreme values. Although the frequency of the extreme values is not as high as that of Guam and CNMI, there are some CPUE values that seem unrealistic. The Kruskal-Wallis test result suggests significant difference in spear/snorkel CPUE trips (Table 36).

Table 36. Kruskal-Wallis test results for American Samoa shore-based trip CPUE across stratum

	Rod & reel		**Spear/snorkel**		**Throw net**	
Stratum	KW	p-value	KW	p-value	KW	p-value
Quarter	4.28	0.23	18.96	<0.00	0.86	0.74

Catch and species composition – Between 1990 and 2012, approximately 200 species were recorded during the American Samoa shore-based voluntary interview survey. It should be noted that the weight and counts for fish species were not always recorded during the voluntary interviews. Due to technical issues associated with merging interview and catch data series, species rank tables cannot be presented for American Samoa shore-based survey data.

Analysis of Expansion Algorithm

To evaluate the performance of the Expansion algorithm, the 2011 Guam boat-based survey data were used. Since the majority of the complexity in the *Expansion Algorithm* is in the computation of CPUE, this analysis focuses on the CPUE part of the *Expansion Algorithm*.

The Guam boat-based *Expansion Algorithm* computes the CPUE estimates using the interview data. In 2011, the survey was conducted on a total of 96 days: 49 weekdays and 47 weekend days. The total number of voluntary interviews conducted is 644 (Table 38). The *Expansion Algorithm* groups the interview survey data by fishing method, day type (weekday or weekday), type of trip (charter or non-charter) and port, and computes and reports the group estimates of total catch and effort. If there are not enough data (fewer than 3 independent interviews), the algorithm uses pooling methods to borrow data.

The Expansion Algorithm process

The pooling rule for the *Expansion Algorithm* attempts to borrow interview data from groups that are close in characteristics (Table 37). The pooling effort continues until the number of interviews for the group reaches three or more (Table 39). For groups that fail to reach the three or more cut-off point, interview data are discarded and a default value is used.

Table 37. The pooling order used by the Expansion Algorithm in borrowing data

Pooling order (priority)	Algorithm description
1	Combine type of day of the same group
2	Borrow data from other ports of the same group
3	If grouping is of trolling and Merizo, borrow data from Agana and Agat of the sample group
4	Use pre-computed estimate in “Refer Table”

The number of interviews for each group is shown in Table 38. Groups with fewer than 3 observations are subject to the pooling.

Table 38. Guam boat-based interviews summarized by fishing method, day type and port: 2011

		Number of interviews						
		Agana Boat Basin		Agat Marina		Merizo Pier		
Fishing method	**Type of Day**	**NC**	**C**	**NC**	**C**	**NC**	**C**	**Total**
trolling	WD	145	26	21	1	2	-	**195**
	WE	184	46	63	4	4	-	**301**
Bottom	WD	12	3	7	1	6	-	**29**
	WE	38	7	20	1	5	-	**71**
spear/snorkel	WD	4	-	1	-	-	-	**5**
	WE	5	-	4	-	1	-	**10**
atulai night light	WD	1	-	-	-	2	-	**3**
	WE	4	-	5	-	1	-	**10**
spear/scuba	WD	-	-	3	-	-	-	**3**
	WE	-	-	1	-	-	-	**1**
jigging	WD	-	1	-	-	1	-	**2**
	WE	1	-	-	-	-	-	**1**
surround net	WD	-	-	-	-	1	-	**1**
	WE	-	-	-	-	2	-	**2**
spin casting	WD	-	-	-	-	-	-	**0**
	WE	1	1	-	-	-	-	**2**
hand gleaning	WD	-	-	1	-	-	-	**1**
	WE	2	-	-	-	-	-	**2**
castnet	WD	1	-	-	-	-	-	**1**
	WE	-	-	-	-	1	-	**1**
aquarium fish collecting	WD	1	-	-	-	-	-	**1**
	WE	-	-	-	-	-	-	**0**
longline	WD	-	-	-	-	-	-	**0**
	WE	-	-	1	-	-	-	**1**
gillnet	WD	-	-	-	-	-	-	**0**
	WE	-	-	-	-	1	-	**1**
Total		**399**	**84**	**127**	**7**	**27**	**0**	**644**

(WD: weekday; WE: weekend), Trip type (NC: non-charter, C: charter)

Table 39 shows the *Expansion algorithm* estimates and which pooling methods were applied to obtain the estimates. This table includes observations that do not meet the interview number requirement.

The first row, for example, displays an estimate of the 2011 non-charter weekday trolling interview from Merizo (M="1", C="F", P="3" D="1"). The number of interviews (N) is 2 and subject to the pooling. The Pooling priority 1 (Table 37) is applied and the data from the weekend of the same group were added. The number of interviews combined is 6, thus it meets the interview requirements, and the algorithm stops here. The CPUE (19.3 kgs/trip) is computed using the 6 interviews.

Table 399. Expansion Algorithm pooling process and estimation for 2011 Guam boat-based data

	Group Description	Group Members
C	Trip type	False : (non-charter) True : (charter)
P	Port	1 : Agana Boat Basin 2 : Agat Marine 3: Merizo Pier
D	Day type	1: Weekday 2: Weekend
M	Fishing method	

CODE	FISHING METHOD
1	Trolling
2	Bottomfishing
3	Atulai night light
5	Spear/snorkel
6	Spear/scuba
7	Longline

CODE	FISHING METHOD
10	Jigging
11	Gillnet
12	Castnet
13	Spin casting
17	Aquarium fishing collec.
20	Hand gleaning
21	Surround net

Group level				Sample		Expansion Algorithm								
						Pooling 1		Pooling 2		Pooling 3		Pooling 4	Final Estimate	
M	**C**	**P**	**D**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**N**	**CPUE**	**CPUE**	**N**	**CPUE**
1	F	3	1	2	19.1	*6	19.3	-	-	-	-	-	6	19.3
1	T	2	1	1	0.6	*5	10.7	-	-	-	-	-	5	10.7
2	T	2	1	1	0.4	0	0.0	*12	0.7	-	-	-	12	0.7
2	T	2	2	1	0.0	0	0.0	*12	0.7	-	-	-	12	0.7
3	F	1	1	1	0.0	*5	2.2	-	-	-	-	-	5	2.2
3	F	3	1	2	14.0	*3	33.7	-	-	-	-	-	3	33.7
3	F	3	2	1	53.4	*3	33.7	-	-	-	-	-	3	33.7
5	F	2	1	1	1.9	*5	5.2	-	-	-	-	-	5	5.2
5	F	3	2	1	13.6	0	0.0	*14	16.5	-	-	-	14	16.5
6	F	2	2	1	5.5	*4	44.0	-	-	-	-	-	4	44.0
7	F	2	2	1	91.3	0	0.0	0	0.0	0	0	* 1.0	**0**	1.0
10	F	1	2	1	2.4	0	0.0	0	0.0	0	0	* 10.9	**0**	10.9
10	F	3	1	1	0.3	0	0.0	0	0.0	0	0	* 10.9	**0**	10.9
10	T	1	1	1	7.7	0	0.0	0	0.0	0	0	* 10.9	**0**	10.9
11	F	3	2	1	0.4	0	0.0	0	0.0	0	0	* 24.9	**0**	24.9
12	F	1	1	1	5.0	0	0.0	0	0.0	0	0	* 14.7	**0**	14.7
12	F	3	2	1	11.8	0	0.0	0	0.0	0	0	* 14.7	**0**	14.7
13	F	1	2	1	2.5	0	0.0	0	0.0	0	0	* 9.1	**0**	9.1
13	T	1	2	1	0.3	0	0.0	0	0.0	0	0	* 9.1	**0**	9.1
17	F	1	1	1	0.4	0	0.0	0	0.0	0	0	* 1.0	**0**	1.0
20	F	1	2	2	22.7	0	0.0	*3	23.2	-	-	-	3	23.2
20	F	2	1	2	23.7	0	0.0	*3	23.2	-	-	-	3	23.2
21	F	3	1	1	8.6	*3	344.5	-	-	-	-	-	3	344.5
21	F	3	2	1	680.4	*3	344.5	-	-	-	-	-	3	344.5

Bootstrap replicates

The 2011 Guam boat-based interview data (n=644) were resampled with replacement within day type and wet and dry season to ensure independence of the interview data. The CPUE bootstrap replicates ($\hat{\theta}^*$) were generated and the standard error and bias estimates were computed using the bootstrap method. Figures 28-31 show the distribution of the bootstrap replicates ($\hat{\theta}^{*\prime}s$) for some of the sampling groups (sampling stratum), and the red line indicates the *Expansion Algorithm* CPUE estimates ($\hat{\theta}$) computed from the survey data. Some distributions, for example the CPUE estimates of trolling trips (Figure 28), suggest that the *Expansion Algorithm* produces estimates that are reliable (Figures 28 and 29). However, other group estimates (Figures 30 and 31) show non-normal distributions away from the true estimate ($\hat{\theta}$).

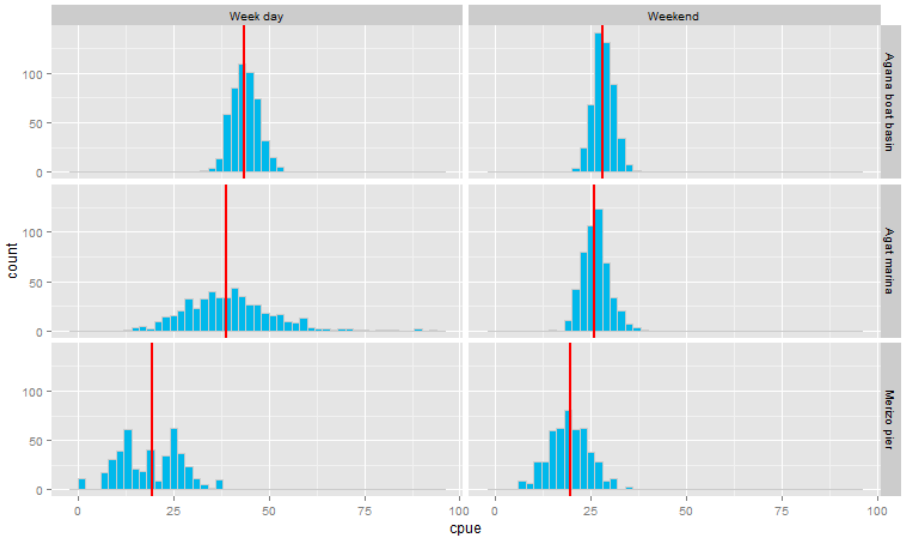

Figure 28. CPUE replicate distribution for non-charter trolling fishing trips by day type and port.

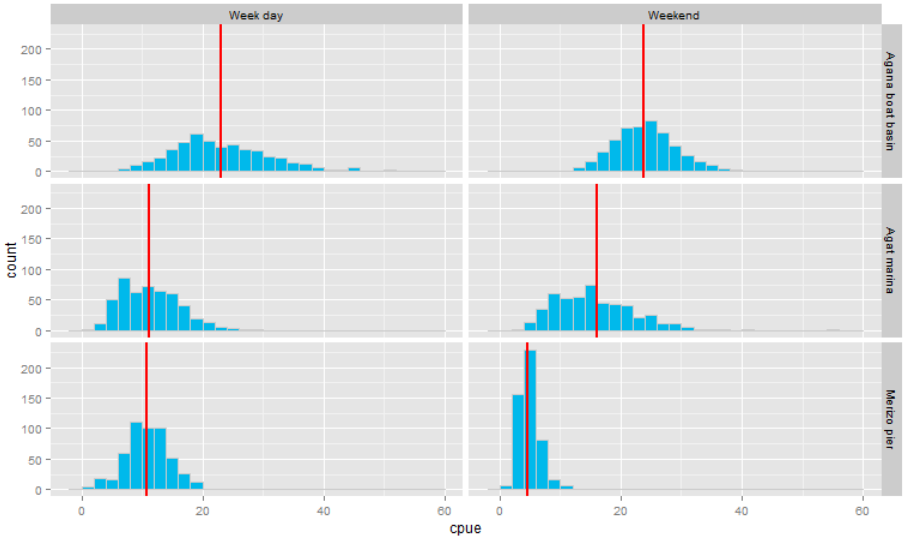

Figure 29. CPUE replicate distribution for non-charter bottomfishing trips by day type and port.

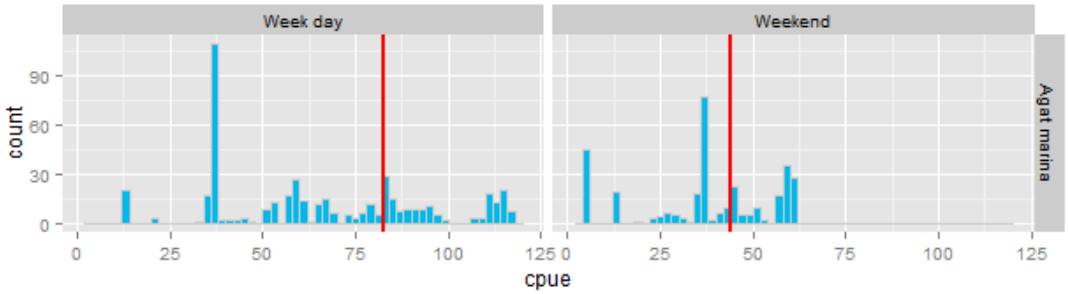

Figure 30. CPUE replicates distribution for non-charter spear-snorkel trips by port.

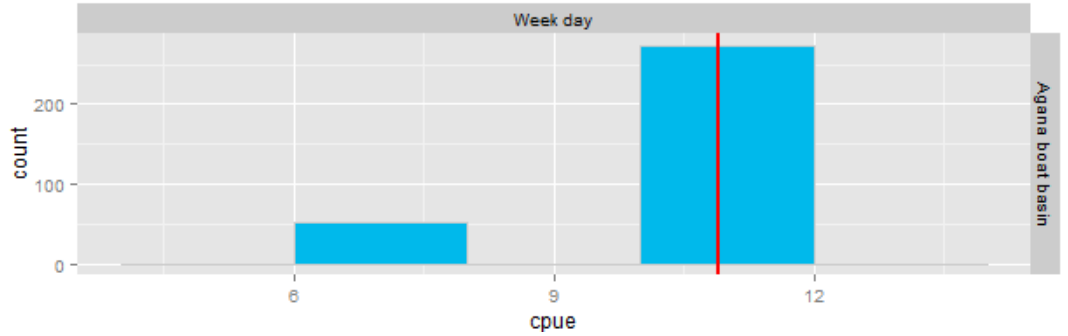

Figure 31. CPUE replicates distribution for charter jigging trips by port.

Bootstrap estimates of the standard error

Bootstrap estimates of the standard error and bias were computed. The bootstrap standard errors can be used to assign approximate confidence intervals to the CPUE estimates. For estimates in which bias is small compared to the estimated standard error (%ratio) the bias can be ignored. However, if the bias is large, compared to the standard error, it may be an indication that the *Expansion Algorithm* estimates are not an appropriate estimate for CPUE.

Table 40. Bootstrap estimates of standard error and bias for 2011 Guam boat-based CPUE

			CPUE ($\widehat{\theta}_{wpac}$)		Mean CPUE ($\overline{\theta}^{*}_{boot}$)		Standard Error ($\widehat{SE}_{boot}$)		Bias ($\overline{\theta}^{*}_{boot} - \widehat{\theta}_{wpac}$)		%ratio (Bias/SE)	
P	**M**	**C**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1	1	F	43.7	28.2	43.6	28.2	3.4	2.7	0.0	0.0	0.0	0.0
1	2	F	23.1	23.7	23.3	24.1	8.3	5.1	-0.2	-0.4	-0.02	-0.08
1	3	F	2.2	4.3	2.7	5.4	2.9	4.6	-0.5	-1.1	-0.17	-0.24
1	5	F	51.4	4.1	47.1	6.7	17.7	8.2	4.3	-2.6	0.24	-0.32
1	10	F	-	10.9	-	9.8	-	2.9	-	1.1	-	0.38
1	12	F	14.7	-	13.4	-	3.3	-	1.3	-	0.39	-
1	13	F	-	9.1	-	8.5	-	2.0	-	0.6	-	0.30
1	17	F	1.0	-	0.9	-	0.2	-	0.1	-	0.50	-
1	1	T	11.2	8.1	11.4	8.1	3.1	1.4	-0.2	0.1	-0.06	0.07
1	2	T	1.5	1.1	1.4	1.1	0.7	0.5	0.1	0.0	0.14	0.00
1	10	T	10.9	-	10.4	-	1.2	-	0.5	-	0.42	-
1	13	T	-	9.1	-	8.2	-	2.7	-	0.9	-	0.33
2	1	F	38.8	26.0	39.8	26.3	11.8	3.5	-1.0	-0.3	-0.08	-0.09
2	2	F	11.2	16.0	11.3	15.8	4.9	6.7	-0.1	0.2	-0.02	0.03
2	3	F	-	31.9	-	29.9	-	13.0	-	2.0	-	0.15
2	5	F	5.2	8.6	5.2	9.4	2.9	4.8	0.1	-0.8	0.03	-0.17
2	6	F	82.5	44.0	65.5	37.7	28.7	17.7	17.0	6.3	0.59	0.36
2	7	F	-	1.0	-	15.6	-	33.3	-	-14.6	-	-0.44
2	1	T	10.7	20.9	8.7	19.0	6.1	10.0	2.0	2.0	0.33	0.20
2	2	T	0.8	0.6	0.7	0.4	1.2	0.5	0.1	0.2	0.08	0.40
3	1	F	19.3	19.6	18.9	19.3	8.1	5.2	0.5	0.3	0.06	0.06
3	2	F	10.9	4.5	10.8	4.9	3.6	1.7	0.1	-0.3	0.03	-0.18
3	3	F	33.7	33.7	19.1	30.2	9.1	12.2	14.5	3.5	1.59	0.29
3	5	F	-	14.9	-	14.8	-	0.4	-	0.1	-	0.25
3	10	F	10.9	-	9.7	-	3.4	-	1.2	-	0.35	-
3	11	F	-	24.9	-	22.0	-	7.9	-	2.9	-	0.37
3	12	F	-	14.7	-	14.4	-	0.9	-	0.3	-	0.33
3	21	F	344.5	344.5	291.0	539.2	123.2	166.1	53.5	-194.6	0.43	-1.17

Discussion

This summary of the historical creel survey data shows that changes have occurred in both the fisheries and survey effort over the years. One of the most apparent changes is the decreasing number of voluntary interviews completed. Moreover, for some regions, the fishing effort (participation counts) has also decreased. While this may be due to changes in the fisheries, it may also be as a result of changes in survey implementation. While the number of survey days has not changed substantially, the actual survey hours on a given survey day may have changed and the change of total hours of surveys cannot be detected from the survey data. If the survey hours were shortened, it affects the participation counts and also the number of voluntary interviews. The estimation of the fishing effort assumes that the participation count survey obtains a census or pre-determined proportion of daily fishing effort on a given survey day. It is necessary to assess the survey implementation and to validate that these assumptions so that any changes can be reflected in the estimation.

The bootstrap analysis shows that for the fishing methods that are commonly recorded in the field, the *Expansion Algorithm* provides reliable estimates of the annual CPUE, and the standard errors can be computed. However, the *Algorithm* does not provide stable estimates from fishing methods with small sample sizes of interview data. It may be possible to use historical data to increase the number of interviews; however, it should be done with caution and careful analysis since fisheries trends are variable and so is the survey implementation.

Invalid data and outliers were present in the data which include negative values for catch weights and number of hours fished. The *Expansion Algorithm* includes some level of quality control; however, the automated computation of the *Expansion Algorithm* makes it difficult to identify data errors and extreme values. Data analysis is recommended between the data entry and estimation process to screen and validate the data.

To estimate CPUE for a given species using the creel survey data, one must first ask whether the species is caught by the fishing methods that the creel survey is capable of intercepting. While annual fishing effort estimates may be improved by increasing number of survey days, the catch estimates may benefit less from increasing survey days if the catch is not by fishing methods easily intercepted by the creel survey design.

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Appendix 1. Additional data summaries

Guam boat-based creel survey

Table A1. Guam boat-based survey days allocated by port, quarter, and day type: 1982 – 1991

		Q1		Q2		Q3		Q4	
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
Agana Boat Basin	1982	6	6	6	6	4	6	6	6
	1983	7	5	6	5	6	6	6	6
	1984	6	4	6	6	6	6	12	6
	1985	11	6	12	6	12	6	6	6
	1986	6	6	6	6	6	5	6	6
	1987	5	6	6	6	6	6	5	5
	1988	6	6	6	6	5	6	6	6
	1989	5	6	5	6	6	6	6	6
	1990	6	6	6	6	6	6	6	6
	1991	6	6	6	6	6	6	6	6
Merizo Pier	1988	-	-	-	-	-	-	1	2
	1989	2	1	1	2	2	-	1	2
	1990	2	1	1	2	2	1	1	2
	1991	2	1	1	2	2	1	1	2

(WD = Weekday; WE = Weekend)

Table A2. Guam boat-based survey days allocated by port, quarter, and day type: 1992 – 2001

		Q1		Q2		Q3		Q4	
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
Agana Boat Basin	1992	6	6	6	6	6	5	5	6
	1993	6	6	6	6	6	6	6	6
	1994	6	6	6	6	6	6	6	6
	1995	6	6	6	6	6	6	6	6
	1996	6	6	6	6	6	6	6	5
	1997	6	6	6	6	5	6	5	6
	1998	6	6	6	6	6	5	6	6
	1999	6	6	6	6	6	6	6	6
	2000	6	6	6	6	7	6	6	6
	2001	6	6	6	6	6	6	6	6
Agat Harbor	1994	-	-	-	-	-	-	2	3
	1995	3	3	3	3	3	3	3	3
	1996	3	3	3	3	3	3	3	3
	1997	3	3	3	3	3	2	3	3
	1998	3	3	3	3	3	4	3	3
	1999	6	6	5	5	3	3	3	3
	2000	3	3	3	3	3	3	3	3
	2001	3	3	3	3	3	3	3	3
Merizo Pier	1992	2	1	1	2	2	-	1	2
	1993	2	1	1	2	2	1	1	2
	1994	2	1	1	2	2	1	3	3
	1995	3	3	3	3	3	3	3	3
	1996	3	3	3	3	3	3	3	2
	1997	3	3	3	3	2	3	3	2
	1998	3	3	3	3	3	3	3	3
	1999	-	-	1	1	3	3	3	3
	2000	3	3	3	3	3	3	3	3
	2001	3	3	3	3	2	3	3	3

(WD = Weekday; WE = Weekend)

Table A3. Guam boat-based survey days allocated by port, quarter, and day type: 2002 – 2012

		Q1		Q2		Q3		Q4	
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
Agana Boat Basin	2002	6	6	6	6	3	3	3	1
	2003	3	2	3	3	3	3	6	6
	2004	6	6	5	4	5	6	6	6
	2005	6	6	6	6	7	6	6	6
	2006	6	6	6	6	6	4	6	6
	2007	6	6	6	6	6	6	6	6
	2008	6	6	6	6	6	6	6	6
	2009	6	6	6	6	6	6	6	6
	2010	6	6	6	6	6	6	6	6
	2011	6	6	6	6	6	6	6	6
	2012	6	6	6	6	6	6	6	6
Agat Harbor	2002	3	3	3	2	1	2	2	3
	2003	3	3	3	3	3	3	3	2
	2004	3	3	2	3	3	3	3	3
	2005	3	3	3	3	2	3	3	3
	2006	3	3	3	3	3	3	2	3
	2007	3	3	2	3	3	3	3	3
	2008	3	3	3	3	3	3	3	3
	2009	3	3	3	3	2	2	3	3
	2010	3	3	3	3	3	3	3	3
	2011	3	3	3	3	3	3	3	3
	2012	3	3	3	3	3	3	3	3
Merizo Pier	2002	3	3	3	3	3	3	3	2
	2003	3	3	3	3	3	3	3	3
	2004	3	3	2	2	3	3	3	3
	2005	3	3	3	3	2	3	4	2
	2006	3	3	3	3	3	3	3	2
	2007	3	2	3	3	3	3	3	3
	2008	3	3	3	3	3	3	3	3
	2009	3	3	3	3	3	3	3	3
	2010	3	3	3	3	3	3	3	3
	2011	2	2	3	3	3	2	3	3
	2012	3	3	3	3	3	3	3	3

(WD = Weekday; WE = Weekend)

Table A4. Guam boat-based interviews by quarter and day type: Agana boat basin

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1982	49	89	33	87	16	86	53	62
1983	45	78	28	49	41	79	25	94
1984	41	46	49	113	52	106	68	54
1985	57	64	100	130	141	153	47	120
1986	22	73	45	116	45	102	21	98
1987	25	76	51	142	31	113	55	119
1988	78	137	60	178	88	187	49	166
1989	55	135	68	130	55	203	58	199
1990	62	132	81	238	80	170	73	145
1991	58	135	85	229	66	184	54	154
1992	97	175	111	228	95	144	53	164
1993	81	130	97	236	80	155	109	157
1994	86	192	104	195	114	161	64	122
1995	93	141	103	196	110	187	90	147
1996	105	139	123	193	76	165	102	139
1997	102	123	77	176	59	174	57	138
1998	63	161	104	183	108	199	70	184
1999	54	139	105	196	68	146	73	141
2000	73	106	70	159	93	164	98	153
2001	77	93	98	143	60	52	45	59
2002	31	104	74	98	22	43	25	5
2003	13	7	28	43	27	44	46	68
2004	51	50	42	30	30	68	28	67
2005	29	52	36	85	34	80	32	58
2006	24	95	22	76	21	85	24	85
2007	48	92	29	60	41	54	37	65
2008	16	51	20	80	32	97	34	92
2009	28	88	51	88	47	88	54	133
2010	91	85	67	110	47	130	62	116
2011	60	71	46	73	55	76	33	69
2012	20	36	30	52	43	63	28	33

(WD = Weekday; WE = Weekend)

Table A5. Guam boat-based interviews by quarter and day type: Agat harbor

	Q1		Q2		Q3		Q4	
Year	WD	WE	WD	WE	WD	WE	WD	WE
1982	1	-	-	-	-	-	-	-
1991	-	-	1	-	-	-	-	-
1994	-	-	-	-	-	-	11	35
1995	42	63	25	63	29	68	34	54
1996	45	74	42	70	30	47	28	63
1997	41	85	28	75	18	31	15	38
1998	35	53	29	60	34	76	23	41
1999	57	89	48	45	29	23	24	34
2000	42	23	13	27	19	29	30	32
2001	33	40	25	10	7	20	17	10
2002	17	35	14	24	5	13	9	17
2003	20	18	11	7	13	15	3	30
2004	16	36	9	9	3	19	10	15
2005	10	31	8	16	2	21	4	19
2006	9	20	8	8	5	14	-	25
2007	5	20	2	10	-	5	2	12
2008	5	20	7	9	5	28	6	24
2009	12	37	16	29	3	24	16	36
2010	19	24	13	26	12	25	7	28
2011	9	22	3	15	14	27	9	35
2012	7	35	4	6	9	8	4	22

(WD = Weekday; WE = Weekend)

Table A6. Guam boat-based interviews by quarter and day type: Merizo harbor

	Q1		Q2		Q3		Q4	
Year	WD	WE	WD	WE	WD	WE	WD	WE
1983	4	-	1	-	3	-	-	-
1988	-	-	-	-	-	-	-	6
1989	7	5	-	3	3	-	2	8
1990	6	9	1	19	3	1	-	8
1991	9	9	7	5	12	7	1	3
1992	2	14	7	9	3	-	2	5
1993	12	8	7	8	22	-	4	13
1994	8	5	4	12	11	4	17	23
1995	14	30	20	11	20	25	14	33
1996	12	27	23	26	11	22	17	29
1997	5	15	20	26	12	18	13	11
1998	22	29	13	31	16	11	10	24
1999	-	-	14	10	7	37	12	15
2000	7	16	23	19	11	22	10	8
2001	9	28	11	25	7	22	8	11
2002	11	30	10	7	4	8	4	1
2003	7	14	7	9	3	4	4	5
2004	8	8	2	6	-	9	5	8
2005	3	11	3	3	1	1	7	2
2006	6	7	3	10	2	-	5	2
2007	2	2	1	5	-	1	3	3
2008	3	5	-	4	4	17	4	7
2009	8	10	4	6	9	1	3	8
2010	1	7	1	8	6	4	5	4
2011	-	-	1	5	8	1	3	9
2012	-	7	1	6	2	3	8	8

(WD = Weekday; WE = Weekend)

Table A7. Guam boat-based interviews by fishing method: Agana boat basin

Year	Trolling	Bottom fishing	Spear Scuba	Spear Snorkel	Spear Mixed	Atulai	Other
1982	362	96	1	5	1	1	9
1983	331	85	13	4	-	3	3
1984	365	123	12	20	-	5	4
1985	503	217	36	19	1	25	11
1986	382	103	8	14	2	7	6
1987	431	114	11	20	2	27	7
1988	694	171	25	33	-	12	8
1989	633	178	21	20	3	42	6
1990	790	144	14	12	2	17	2
1991	757	133	26	14	1	24	10
1992	833	135	46	26	-	17	10
1993	829	133	28	25	-	26	4
1994	823	145	25	25	-	15	5
1995	845	146	30	23	-	12	11
1996	881	100	20	20	-	6	15
1997	729	99	17	16	3	19	23
1998	824	152	32	46	1	5	12
1999	699	135	22	29	-	13	24
2000	732	109	17	19	-	5	34
2001	500	87	14	7	-	3	16
2002	307	74	4	7	2	-	8
2003	212	48	7	7	-	1	1
2004	282	66	3	5	-	2	8
2005	302	76	5	13	-	1	9
2006	358	62	3	7	-	-	2
2007	348	62	1	11	-	-	4
2008	337	59	2	15	-	1	8
2009	465	91	1	10	-	3	7
2010	561	120	-	13	-	6	8
2011	401	60	-	9	-	5	8
2012	237	29	2	7	-	16	14

Table A8. Guam boat- based interviews by fishing method: Agat harbor

Year	Trolling	Bottom fishing	Spear Scuba	Spear Snorkel	Spear Mixed	Atulai	Other
1982	1	-	-	-	-	-	-
1991	1	-	-	-	-	-	-
1994	34	9	2	1	-	-	-
1995	232	87	18	11	-	18	12
1996	227	107	23	17	1	6	18
1997	190	94	9	16	2	8	12
1998	199	111	4	15	-	10	12
1999	204	97	19	10	-	2	17
2000	103	65	20	11	-	2	14
2001	92	47	11	4	-	3	5
2002	72	40	6	10	-	1	5
2003	65	40	6	3	-	1	2
2004	71	28	8	6	-	-	4
2005	67	30	2	10	-	-	2
2006	45	28	2	9	-	-	5
2007	37	15	-	2	-	-	2
2008	1	-	-	-	-	-	-
2009	1	-	-	-	-	-	-
2010	34	9	2	1	-	-	-
2011	232	87	18	11	-	18	12
2012	227	107	23	17	1	6	18

Table A9. Guam boat-based interviews by fishing method: Merizo pier

Year	Trolling	Bottom fishing	Spear Scuba	Spear Snorkel	Spear Mixed	Atulai	Other
1983	7	1	-	-	-	-	-
1988	4	2	-	-	-	-	-
1989	9	9	1	4	-	1	4
1990	14	13	3	6	-	1	10
1991	15	19	1	6	-	-	12
1992	10	16	2	4	-	-	10
1993	15	31	1	13	-	-	14
1994	21	31	5	11	-	1	15
1995	33	67	5	22	-	5	35
1996	38	70	5	25	-	2	27
1997	30	45	1	9	-	1	34
1998	28	53	4	34	-	6	31
1999	14	51	1	11	-	1	17
2000	19	26	4	17	-	3	47
2001	28	62	4	8	-	-	19
2002	17	36	1	12	-	-	9
2003	12	19	-	12	-	-	10
2004	13	16	-	6	-	2	9
2005	8	11	-	1	-	-	11
2006	10	15	-	3	-	1	6
2007	6	6	1	-	-	-	4
2008	10	16	-	-	-	-	18
2009	11	20	-	9	-	-	9
2010	13	15	1	4	-	-	3
2011	6	11	-	1	-	3	6
2012	24	8	-	1	-	-	2

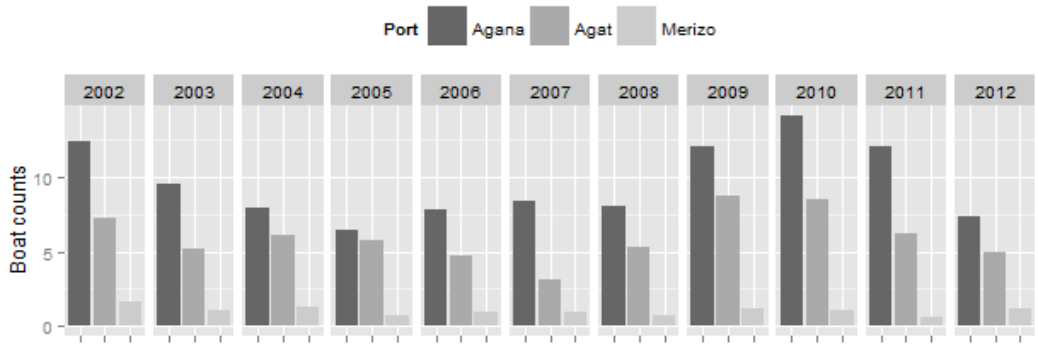

Figure A1. Daily boat count estimates of Guam non-charter trolling trips by port (2002 – 2012)

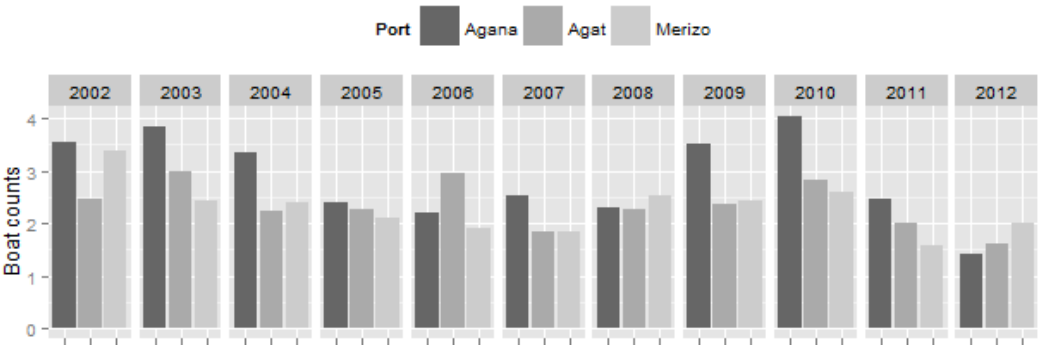

Figure A2. Daily boat count estimates of Guam non-charter bottomfishing trips by port (2002 – 2012)

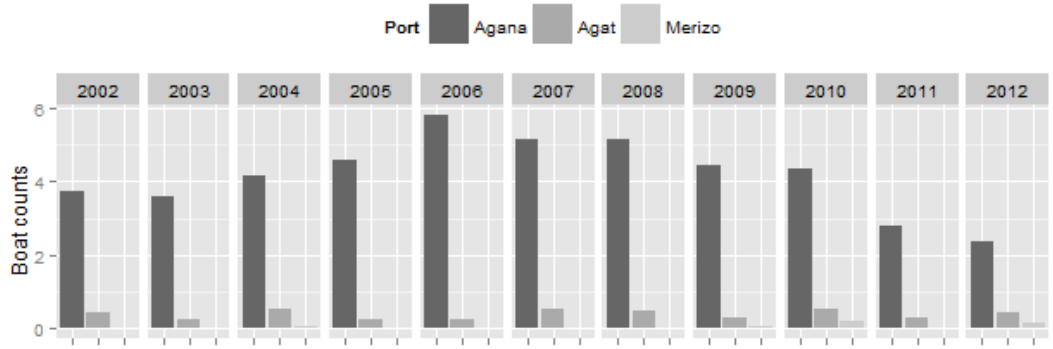

Figure A3. Daily boat count estimates of Guam charter trolling trips by port (2002 – 2012)

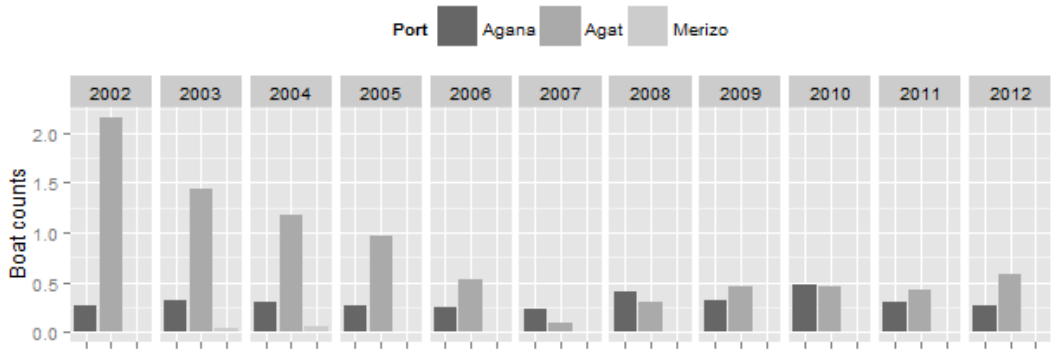

Figure A4. Daily boat count estimates of Guam charter bottomfishing trips by port (2002 – 2012)

Table A10. Daily boat count estimates of Guam non-charter trolling trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	385	-	-	46	-	-	8.4	-	-
1983	343	-	-	47	-	-	7.3	-	-
1984	435	-	-	52	-	-	8.4	-	-
1985	625	-	-	65	-	-	9.6	-	-
1986	516	-	-	47	-	-	11.0	-	-
1987	487	-	-	45	-	-	10.8	-	-
1988	716	-	4	47	-	3	15.2	-	1.3
1989	654	-	20	46	-	11	14.2	-	1.8
1990	523	-	22	48	-	12	10.9	-	1.8
1991	556	-	29	48	-	12	11.6	-	2.4
1992	554	-	16	46	-	11	12.0	-	1.5
1993	677	-	18	48	-	12	14.1	-	1.5
1994	661	34	32	48	5	15	13.8	6.8	2.1
1995	581	246	63	48	24	24	12.1	10.3	2.6
1996	526	265	49	47	24	23	11.2	11.0	2.1
1997	495	237	51	46	23	22	10.8	10.3	2.3
1998	675	280	51	47	25	24	14.4	11.2	2.1
1999	679	307	27	48	34	14	14.1	9.0	1.9
2000	757	157	38	48	24	24	15.8	6.5	1.6
2001	549	198	39	48	24	23	11.4	8.3	1.7
2002	420	138	37	34	19	23	12.4	7.3	1.6
2003	276	120	25	29	23	24	9.5	5.2	1.0
2004	351	141	28	44	23	22	8.0	6.1	1.3
2005	317	133	17	49	23	23	6.5	5.8	0.7
2006	360	108	21	46	23	23	7.8	4.7	0.9
2007	403	72	20	48	23	23	8.4	3.1	0.9
2008	384	127	18	48	24	24	8.0	5.3	0.8
2009	580	191	27	48	22	24	12.1	8.7	1.1
2010	679	204	26	48	24	24	14.1	8.5	1.1
2011	577	148	12	48	24	21	12.0	6.2	0.6
2012	354	119	27	48	24	24	7.4	5.0	1.1

Table A11. Daily boat count estimates of Guam charter trolling trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	8	-	-	46	-	-	0.2	-	-
1983	20	-	-	47	-	-	0.4	-	-
1984	51	-	-	52	-	-	1.0	-	-
1985	112	-	-	65	-	-	1.7	-	-
1986	113	-	-	47	-	-	2.4	-	-
1987	127	-	-	45	-	-	2.8	-	-
1988	311	-	1.0	47	-	3	6.6	-	0.3
1989	379	-	-	46	-	-	8.2	-	-
1990	552	-	1.0	48	-	12	11.5	-	0.1
1991	511	-	1.0	48	-	12	10.6	-	0.1
1992	600	-	-	46	-	-	13.0	-	-
1993	454	-	-	48	-	-	9.5	-	-
1994	480	17.0	-	48	5	-	10.0	3.4	-
1995	570	79.0	1.0	48	24	24	11.9	3.3	0.0
1996	649	54.0	-	47	24	-	13.8	2.3	-
1997	537	58.0	-	46	23	-	11.7	2.5	-
1998	446	25.0	-	47	25	-	9.5	1.0	-
1999	398	25.0	-	48	34	-	8.3	0.7	-
2000	366	19.0	1.0	48	24	24	7.6	0.8	0.0
2001	284	6.0	-	48	24	-	5.9	0.3	-
2002	127	8.0	-	34	19	-	3.7	0.4	-
2003	104	6.0	-	29	23	-	3.6	0.3	-
2004	183	12.0	1.0	44	23	22	4.2	0.5	0.0
2005	225	6.0	-	49	23	-	4.6	0.3	-
2006	268	6.0	-	46	23	-	5.8	0.3	-
2007	248	12.0	-	48	23	-	5.2	0.5	-
2008	248	11.0	-	48	24	-	5.2	0.5	-
2009	213	6.0	1.0	48	22	24	4.4	0.3	0.0
2010	208	13.0	5.0	48	24	24	4.3	0.5	0.2
2011	134	7.0	-	48	24	-	2.8	0.3	-
2012	113	10.0	4.0	48	24	24	2.4	0.4	0.2

Table A12. Daily boat count estimates of Guam non-charter bottomfishing trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	110	-	-	46	-	-	2.4	-	-
1983	124	-	-	47	-	-	2.6	-	-
1984	162	-	-	52	-	-	3.1	-	-
1985	290	-	-	65	-	-	4.5	-	-
1986	131	-	-	47	-	-	2.8	-	-
1987	151	-	-	45	-	-	3.4	-	-
1988	235	-	5	47	-	3	5.0	-	1.7
1989	231	-	16	46	-	11	5.0	-	1.5
1990	162	-	27	48	-	12	3.4	-	2.3
1991	167	-	31	48	-	12	3.5	-	2.6
1992	139	-	33	46	-	11	3.0	-	3.0
1993	191	-	71	48	-	12	4.0	-	5.9
1994	193	9	61	48	5	15	4.0	1.8	4.1
1995	195	122	158	48	24	24	4.1	5.1	6.6
1996	152	94	121	47	24	23	3.2	3.9	5.3
1997	133	88	116	46	23	22	2.9	3.8	5.3
1998	217	136	120	47	25	24	4.6	5.4	5.0
1999	211	118	88	48	34	14	4.4	3.5	6.3
2000	189	71	103	48	24	24	3.9	3.0	4.3
2001	159	95	123	48	24	23	3.3	4.0	5.3
2002	121	47	78	34	19	23	3.6	2.5	3.4
2003	111	69	58	29	23	24	3.8	3.0	2.4
2004	147	51	53	44	23	22	3.3	2.2	2.4
2005	117	52	48	49	23	23	2.4	2.3	2.1
2006	101	68	44	46	23	23	2.2	3.0	1.9
2007	121	42	42	48	23	23	2.5	1.8	1.8
2008	110	54	61	48	24	24	2.3	2.3	2.5
2009	168	52	58	48	22	24	3.5	2.4	2.4
2010	194	68	62	48	24	24	4.0	2.8	2.6
2011	118	48	33	48	24	21	2.5	2.0	1.6
2012	68	39	48	48	24	24	1.4	1.6	2.0

Table A13. Daily boat count estimates of Guam charter bottomfishing trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1983	1	-	-	47	-	-	0.0	-	-
1985	2	-	-	65	-	-	0.0	-	-
1986	5	-	-	47	-	-	0.1	-	-
1987	5	-	-	45	-	-	0.1	-	-
1988	16	-	-	47	-	-	0.3	-	-
1989	21	-	-	46	-	-	0.5	-	-
1990	14	-	1	48	-	12	0.3	-	0.1
1991	22	-	-	48	-	-	0.5	-	-
1992	30	-	-	46	-	-	0.7	-	-
1993	22	-	-	48	-	-	0.5	-	-
1994	13	15	-	48	5	-	0.3	3.0	-
1995	21	107	-	48	24	-	0.4	4.5	-
1996	13	98	-	47	24	-	0.3	4.1	-
1997	23	98	-	46	23	-	0.5	4.3	-
1998	23	95	1	47	25	24	0.5	3.8	0.0
1999	41	115	-	48	34	-	0.9	3.4	-
2000	28	79	1	48	24	24	0.6	3.3	0.0
2001	14	56	-	48	24	-	0.3	2.3	-
2002	9	41	-	34	19	-	0.3	2.2	-
2003	9	33	1	29	23	24	0.3	1.4	0.0
2004	13	27	1	44	23	22	0.3	1.2	0.0
2005	13	22	-	49	23	-	0.3	1.0	-
2006	11	12	-	46	23	-	0.2	0.5	-
2007	11	2	-	48	23	-	0.2	0.1	-
2008	19	7	-	48	24	-	0.4	0.3	-
2009	15	10	-	48	22	-	0.3	0.5	-
2010	23	11	-	48	24	-	0.5	0.5	-
2011	14	10	-	48	24	-	0.3	0.4	-
2012	13	14	-	48	24	-	0.3	0.6	-

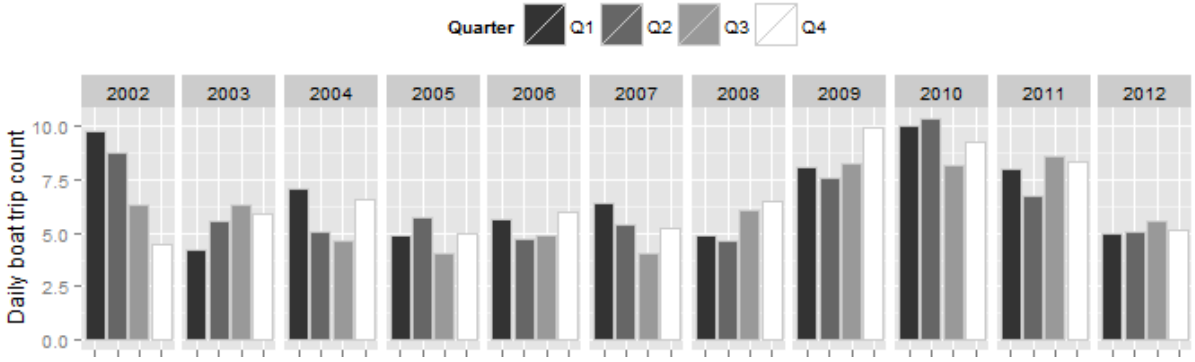

Figure A5. Daily boat count estimates of Guam non-charter trolling trips by quarter (2002 – 2012)

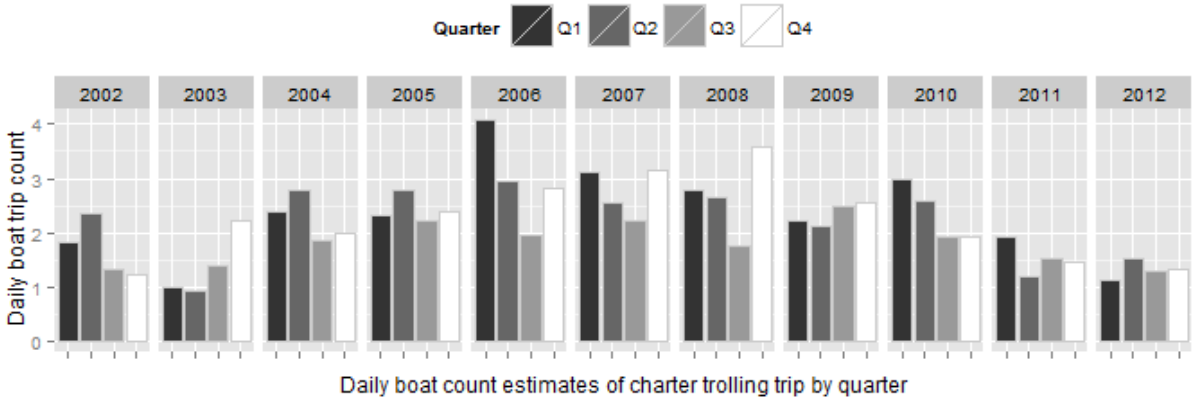

Figure A6. Daily boat count estimates of Guam charter trolling trips by quarter (2002 – 2012)

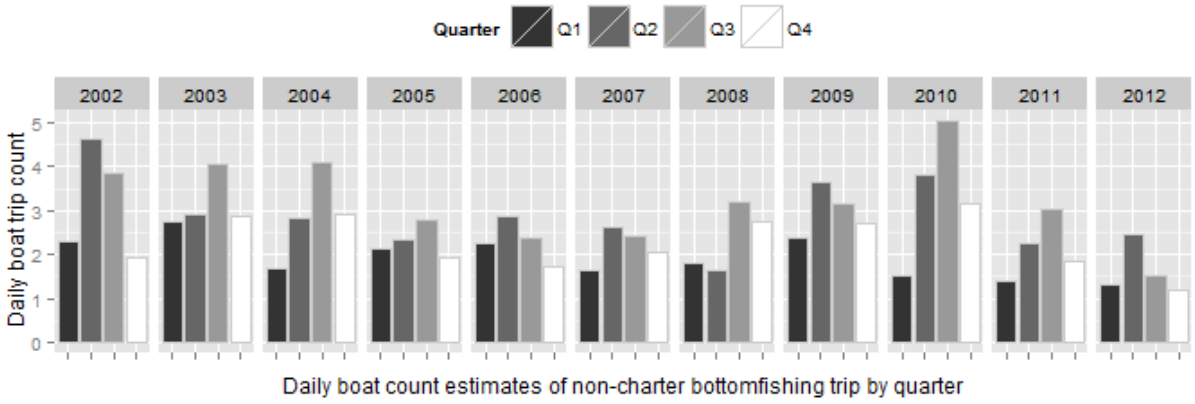

Figure A7. Daily boat count estimates of Guam non-charter bottomfishing trips by quarter (2002 – 2012)

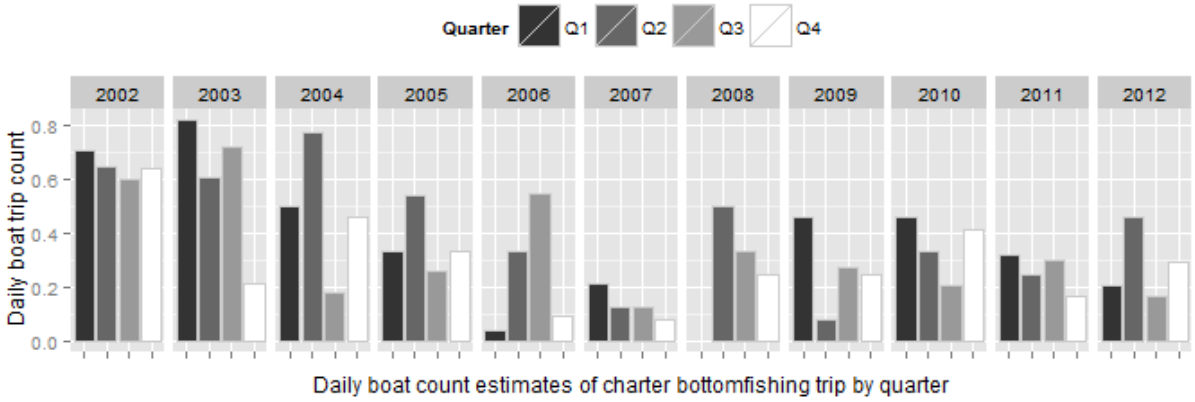

Figure A8. Daily boat count estimates of Guam charter bottomfishing trips by quarter (2002 – 2012)

Table A14. Daily boat count estimates of Guam non-charter trolling trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1982	111	97	77	100	12	12	10	12	9.3	8.1	7.7	8.3
1983	96	60	85	102	12	11	12	12	8.0	5.5	7.1	8.5
1984	80	127	119	109	10	12	12	18	8.0	10.6	9.9	6.1
1985	74	167	214	170	17	18	18	12	4.4	9.3	11.9	14.2
1986	105	155	138	118	12	12	11	12	8.8	12.9	12.5	9.8
1987	96	149	93	149	11	12	12	10	8.7	12.4	7.8	14.9
1988	171	173	186	190	12	12	11	12	14.3	14.4	16.9	15.8
1989	166	130	165	213	11	11	12	12	15.1	11.8	13.8	17.8
1990	117	169	153	106	12	12	12	12	9.8	14.1	12.8	8.8
1991	135	200	137	113	12	12	12	12	11.3	16.7	11.4	9.4
1992	172	143	117	138	12	12	11	11	14.3	11.9	10.6	12.5
1993	133	229	137	196	15	13	12	12	8.9	17.6	11.4	16.3
1994	211	204	162	150	12	12	12	19	17.6	17.0	13.5	7.9
1995	272	230	182	206	24	24	24	24	11.3	9.6	7.6	8.6
1996	234	250	175	181	24	24	24	22	9.8	10.4	7.3	8.2
1997	214	237	169	163	24	24	21	22	8.9	9.9	8.0	7.4
1998	238	272	251	245	24	24	24	24	9.9	11.3	10.5	10.2
1999	293	270	187	263	24	24	24	24	12.2	11.3	7.8	11.0
2000	203	204	260	285	24	24	24	24	8.5	8.5	10.8	11.9
2001	215	252	134	185	24	24	23	24	9.0	10.5	5.8	7.7
2002	235	202	95	63	24	23	15	14	9.8	8.8	6.3	4.5
2003	71	100	114	136	17	18	18	23	4.2	5.6	6.3	5.9
2004	170	91	102	157	24	18	22	24	7.1	5.1	4.6	6.5
2005	118	137	93	119	24	24	23	24	4.9	5.7	4.0	5.0
2006	136	114	107	132	24	24	22	22	5.7	4.8	4.9	6.0
2007	148	124	98	125	23	23	24	24	6.4	5.4	4.1	5.2
2008	117	111	145	156	24	24	24	24	4.9	4.6	6.0	6.5
2009	194	183	182	239	24	24	22	24	8.1	7.6	8.3	10.0
2010	240	249	197	223	24	24	24	24	10.0	10.4	8.2	9.3
2011	177	161	198	201	22	24	23	24	8.0	6.7	8.6	8.4
2012	120	122	134	124	24	24	24	24	5.0	5.1	5.6	5.2

Table A15. Daily boat count estimates of Guam charter trolling trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1982	5	-	2	1	12	-	10	12	0.4	-	0.2	0.1
1983	9	3	4	4	12	11	12	12	0.8	0.3	0.3	0.3
1984	14	13	6	18	10	12	12	18	1.4	1.1	0.5	1.0
1985	36	31	30	15	17	18	18	12	2.1	1.7	1.7	1.3
1986	24	38	17	34	12	12	11	12	2.0	3.2	1.5	2.8
1987	29	27	43	28	11	12	12	10	2.6	2.3	3.6	2.8
1988	94	70	74	74	12	12	11	12	7.8	5.8	6.7	6.2
1989	79	87	90	123	11	11	12	12	7.2	7.9	7.5	10.3
1990	147	166	103	137	12	12	12	12	12.3	13.8	8.6	11.4
1991	116	145	122	129	12	12	12	12	9.7	12.1	10.2	10.8
1992	180	193	117	110	12	12	11	11	15.0	16.1	10.6	10.0
1993	129	141	80	104	15	13	12	12	8.6	10.8	6.7	8.7
1994	118	137	112	130	12	12	12	19	9.8	11.4	9.3	6.8
1995	153	168	166	163	24	24	24	24	6.4	7.0	6.9	6.8
1996	178	195	153	177	24	24	24	22	7.4	8.1	6.4	8.0
1997	179	172	130	114	24	24	21	22	7.5	7.2	6.2	5.2
1998	122	151	98	100	24	24	24	24	5.1	6.3	4.1	4.2
1999	102	131	81	109	24	24	24	24	4.3	5.5	3.4	4.5
2000	95	107	98	86	24	24	24	24	4.0	4.5	4.1	3.6
2001	99	83	63	45	24	24	23	24	4.1	3.5	2.7	1.9
2002	44	54	20	17	24	23	15	14	1.8	2.3	1.3	1.2
2003	17	17	25	51	17	18	18	23	1.0	0.9	1.4	2.2
2004	57	50	41	48	24	18	22	24	2.4	2.8	1.9	2.0
2005	56	67	51	57	24	24	23	24	2.3	2.8	2.2	2.4
2006	98	71	43	62	24	24	22	22	4.1	3.0	2.0	2.8
2007	72	59	53	76	23	23	24	24	3.1	2.6	2.2	3.2
2008	67	64	42	86	24	24	24	24	2.8	2.7	1.8	3.6
2009	53	51	55	61	24	24	22	24	2.2	2.1	2.5	2.5
2010	72	62	46	46	24	24	24	24	3.0	2.6	1.9	1.9
2011	42	29	35	35	22	24	23	24	1.9	1.2	1.5	1.5
2012	27	37	31	32	24	24	24	24	1.1	1.5	1.3	1.3

Table A16. Daily boat count estimates of Guam non-charter bottomfishing trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1982	29	25	26	30	12	12	10	12	2.4	2.1	2.6	2.5
1983	29	19	39	37	12	11	12	12	2.4	1.7	3.3	3.1
1984	21	47	68	26	10	12	12	18	2.1	3.9	5.7	1.4
1985	36	87	113	54	17	18	18	12	2.1	4.8	6.3	4.5
1986	23	44	41	23	12	12	11	12	1.9	3.7	3.7	1.9
1987	11	68	34	38	11	12	12	10	1.0	5.7	2.8	3.8
1988	16	76	91	57	12	12	11	12	1.3	6.3	8.3	4.8
1989	62	60	73	52	11	11	12	12	5.6	5.5	6.1	4.3
1990	26	78	57	28	12	12	12	12	2.2	6.5	4.8	2.3
1991	20	58	79	41	12	12	12	12	1.7	4.8	6.6	3.4
1992	31	62	50	29	12	12	11	11	2.6	5.2	4.5	2.6
1993	35	71	96	60	15	13	12	12	2.3	5.5	8.0	5.0
1994	37	68	93	65	12	12	12	19	3.1	5.7	7.8	3.4
1995	70	120	187	98	24	24	24	24	2.9	5.0	7.8	4.1
1996	54	115	111	87	24	24	24	22	2.3	4.8	4.6	4.0
1997	57	111	79	90	24	24	21	22	2.4	4.6	3.8	4.1
1998	82	118	166	107	24	24	24	24	3.4	4.9	6.9	4.5
1999	68	134	128	87	24	24	24	24	2.8	5.6	5.3	3.6
2000	70	96	110	87	24	24	24	24	2.9	4.0	4.6	3.6
2001	103	142	86	46	24	24	23	24	4.3	5.9	3.7	1.9
2002	55	106	58	27	24	23	15	14	2.3	4.6	3.9	1.9
2003	47	52	73	66	17	18	18	23	2.8	2.9	4.1	2.9
2004	40	51	90	70	24	18	22	24	1.7	2.8	4.1	2.9
2005	51	56	64	46	24	24	23	24	2.1	2.3	2.8	1.9
2006	54	69	52	38	24	24	22	22	2.3	2.9	2.4	1.7
2007	38	60	58	49	23	23	24	24	1.7	2.6	2.4	2.0
2008	43	39	77	66	24	24	24	24	1.8	1.6	3.2	2.8
2009	57	87	69	65	24	24	22	24	2.4	3.6	3.1	2.7
2010	36	91	121	76	24	24	24	24	1.5	3.8	5.0	3.2
2011	31	54	70	44	22	24	23	24	1.4	2.3	3.0	1.8
2012	31	59	36	29	24	24	24	24	1.3	2.5	1.5	1.2

Table A17. Daily boat count estimates of Guam charter bottomfishing trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1985	1	1	-	-	17	18	-	-	0.1	0.1	-	-
1986	1	-	1	3	12	-	11	12	0.1	-	0.1	0.3
1987	1	1	3	-	11	12	12	-	0.1	0.1	0.3	-
1988	2	4	6	4	12	12	11	12	0.2	0.3	0.5	0.3
1989	5	5	6	5	11	11	12	12	0.5	0.5	0.5	0.4
1990	4	5	3	3	12	12	12	12	0.3	0.4	0.3	0.3
1991	3	5	9	5	12	12	12	12	0.3	0.4	0.8	0.4
1992	9	6	8	7	12	12	11	11	0.8	0.5	0.7	0.6
1993	4	11	5	2	15	13	12	12	0.3	0.8	0.4	0.2
1994	2	5	4	17	12	12	12	19	0.2	0.4	0.3	0.9
1995	35	35	35	23	24	24	24	24	1.5	1.5	1.5	1.0
1996	20	30	31	30	24	24	24	22	0.8	1.3	1.3	1.4
1997	36	35	25	25	24	24	21	22	1.5	1.5	1.2	1.1
1998	23	22	38	36	24	24	24	24	1.0	0.9	1.6	1.5
1999	51	43	32	30	24	24	24	24	2.1	1.8	1.3	1.3
2000	28	34	22	24	24	24	24	24	1.2	1.4	0.9	1.0
2001	21	23	14	12	24	24	23	24	0.9	1.0	0.6	0.5
2002	17	15	9	9	24	23	15	14	0.7	0.7	0.6	0.6
2003	14	11	13	5	17	18	18	23	0.8	0.6	0.7	0.2
2004	12	14	4	11	24	18	22	24	0.5	0.8	0.2	0.5
2005	8	13	6	8	24	24	23	24	0.3	0.5	0.3	0.3
2006	1	8	12	2	24	24	22	22	0.0	0.3	0.5	0.1
2007	5	3	3	2	23	23	24	24	0.2	0.1	0.1	0.1
2008	-	12	8	6	-	24	24	24	-	0.5	0.3	0.3
2009	11	2	6	6	24	24	22	24	0.5	0.1	0.3	0.3
2010	11	8	5	10	24	24	24	24	0.5	0.3	0.2	0.4
2011	7	6	7	4	22	24	23	24	0.3	0.3	0.3	0.2
2012	5	11	4	7	24	24	24	24	0.2	0.5	0.2	0.3

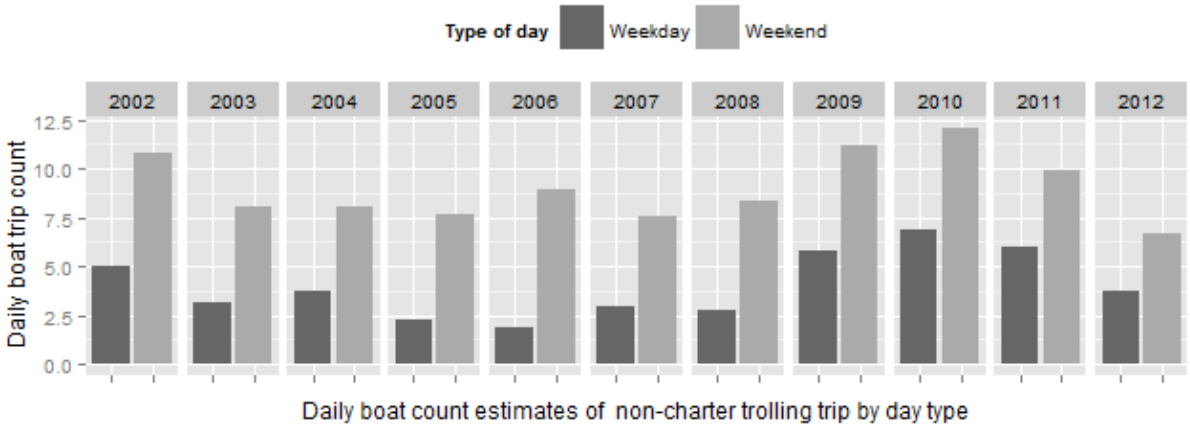

Figure A9. Daily boat count estimates of Guam non-charter trolling trips by day type (2002 – 2012)

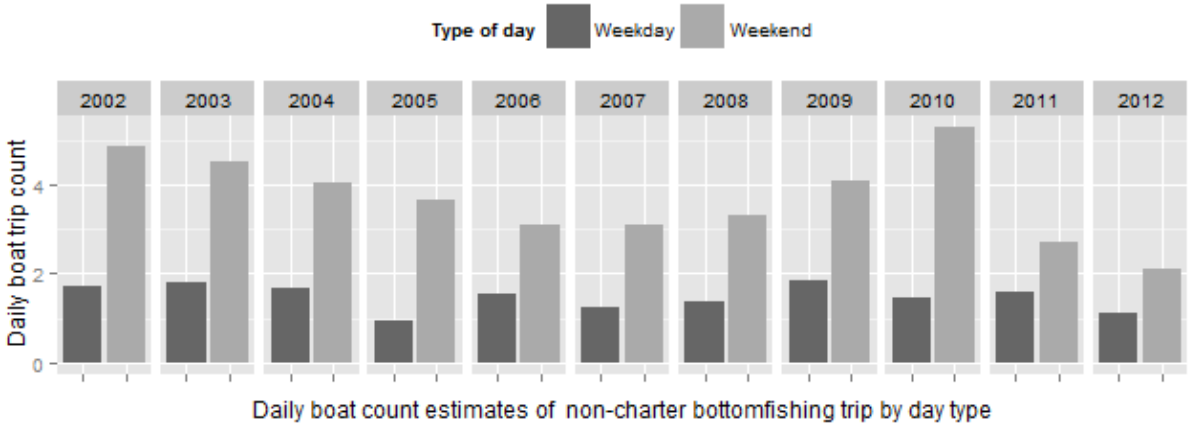

Figure A10. Daily boat count estimates of Guam non-charter bottomfishing trips by day type (2002 – 2012)

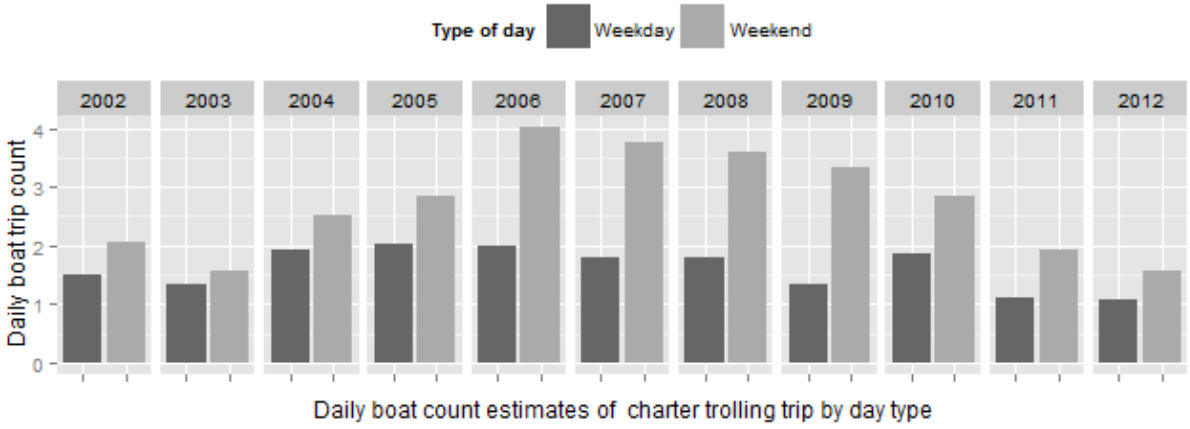

Figure A11. Daily boat count estimates of Guam charter trolling trips by day type (2002 – 2012)

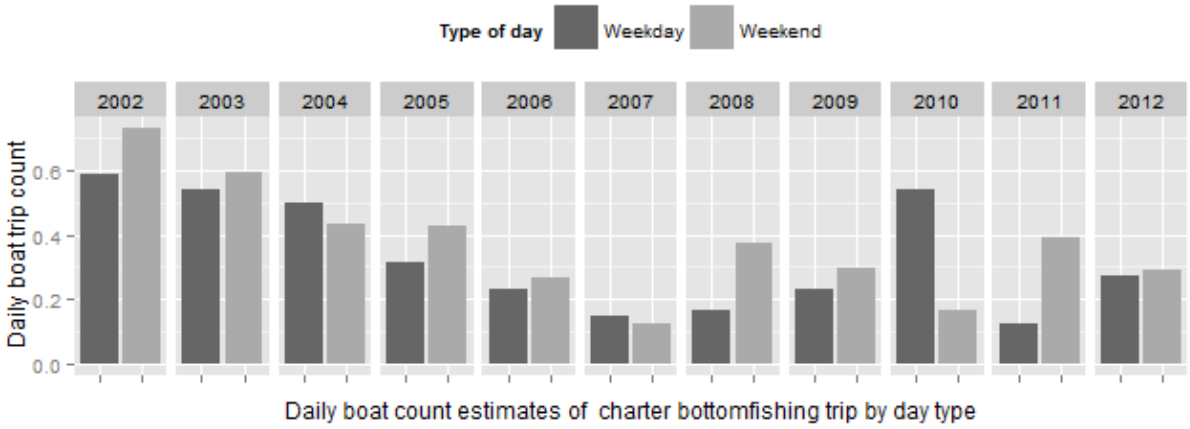

Figure A12. Daily boat count estimates of Guam charter bottomfishing trips by day type (2002 – 2012)

Table A18. Daily boat count estimates of Guam non-charter trolling trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
1982	128	257	22	24	5.8	10.7
1983	104	239	25	22	4.2	10.9
1984	171	264	30	22	5.7	12.0
1985	239	386	41	24	5.8	16.1
1986	132	384	24	23	5.5	16.7
1987	110	377	22	23	5.0	16.4
1988	184	536	23	24	8.0	22.3
1989	166	508	22	24	7.5	21.2
1990	130	415	24	24	5.4	17.3
1991	121	464	24	24	5.0	19.3
1992	134	436	23	23	5.8	19.0
1993	188	507	27	25	7.0	20.3
1994	210	517	28	27	7.5	19.1
1995	250	640	48	48	5.2	13.3
1996	241	599	48	46	5.0	13.0
1997	223	560	45	46	5.0	12.2
1998	259	747	48	48	5.4	15.6
1999	266	747	48	48	5.5	15.6
2000	322	630	49	48	6.6	13.1
2001	253	533	47	48	5.4	11.1
2002	197	398	39	37	5.1	10.8
2003	123	298	39	37	3.2	8.1
2004	166	354	44	44	3.8	8.0
2005	109	358	48	47	2.3	7.6
2006	88	401	47	45	1.9	8.9
2007	138	357	47	47	2.9	7.6
2008	130	399	48	48	2.7	8.3
2009	272	526	47	47	5.8	11.2
2010	329	580	48	48	6.9	12.1
2011	281	456	47	46	6.0	9.9
2012	180	320	48	48	3.8	6.7

(WD = Weekday; WE = Weekend)

Table A19. Daily boat count estimates of Guam charter trolling trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
1982	3	5	22	24	0.1	0.2
1983	8	12	25	22	0.3	0.5
1984	25	26	30	22	0.8	1.2
1985	65	47	41	24	1.6	2.0
1986	35	78	24	23	1.5	3.4
1987	53	74	22	23	2.4	3.2
1988	111	201	23	24	4.8	8.4
1989	111	268	22	24	5.0	11.2
1990	194	359	24	24	8.1	15.0
1991	171	341	24	24	7.1	14.2
1992	252	348	23	23	11.0	15.1
1993	185	269	27	25	6.9	10.8
1994	201	296	28	27	7.2	11.0
1995	277	373	48	48	5.8	7.8
1996	303	400	48	46	6.3	8.7
1997	218	377	45	46	4.8	8.2
1998	173	298	48	48	3.6	6.2
1999	169	254	48	48	3.5	5.3
2000	163	223	49	48	3.3	4.6
2001	159	131	47	48	3.4	2.7
2002	59	76	39	37	1.5	2.1
2003	52	58	39	37	1.3	1.6
2004	85	111	44	44	1.9	2.5
2005	98	133	48	47	2.0	2.8
2006	93	181	47	45	2.0	4.0
2007	84	176	47	47	1.8	3.7
2008	87	172	48	48	1.8	3.6
2009	63	157	47	47	1.3	3.3
2010	90	136	48	48	1.9	2.8
2011	53	88	47	46	1.1	1.9
2012	52	75	48	48	1.1	1.6

(WD = Weekday; WE = Weekend)

Table A20. Daily boat count estimates of Guam non-charter bottomfishing trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
1982	35	75	22	24	1.6	3.1
1983	43	81	25	22	1.7	3.7
1984	66	96	30	22	2.2	4.4
1985	107	183	41	24	2.6	7.6
1986	19	112	24	23	0.8	4.9
1987	36	115	22	23	1.6	5.0
1988	52	188	23	24	2.3	7.8
1989	58	189	22	24	2.6	7.9
1990	44	145	24	24	1.8	6.0
1991	42	156	24	24	1.8	6.5
1992	47	125	23	23	2.0	5.4
1993	105	157	27	25	3.9	6.3
1994	90	173	28	27	3.2	6.4
1995	157	318	48	48	3.3	6.6
1996	121	246	48	46	2.5	5.3
1997	108	229	45	46	2.4	5.0
1998	134	339	48	48	2.8	7.1
1999	130	287	48	48	2.7	6.0
2000	123	240	49	48	2.5	5.0
2001	135	242	47	48	2.9	5.0
2002	67	179	39	37	1.7	4.8
2003	71	167	39	37	1.8	4.5
2004	74	177	44	44	1.7	4.0
2005	45	172	48	47	0.9	3.7
2006	73	140	47	45	1.6	3.1
2007	59	146	47	47	1.3	3.1
2008	66	159	48	48	1.4	3.3
2009	87	191	47	47	1.9	4.1
2010	70	254	48	48	1.5	5.3
2011	74	125	47	46	1.6	2.7
2012	54	101	48	48	1.1	2.1

(WD = Weekday; WE = Weekend)

Table A21. Daily boat count estimates of Guam charter bottomfishing trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
1983	1	-	25	-	0.04	-
1985	1	1	41	24	0.02	0.0
1986	-	5	-	23	-	0.2
1987	-	5	-	23	-	0.2
1988	5	11	23	24	0.2	0.5
1989	3	18	22	24	0.1	0.8
1990	3	12	24	24	0.1	0.5
1991	2	20	24	24	0.1	0.8
1992	5	25	23	23	0.2	1.1
1993	6	16	27	25	0.2	0.6
1994	11	17	28	27	0.4	0.6
1995	57	71	48	48	1.2	1.5
1996	53	58	48	46	1.1	1.3
1997	57	64	45	46	1.3	1.4
1998	56	63	48	48	1.2	1.3
1999	76	80	48	48	1.6	1.7
2000	47	61	49	48	1.0	1.3
2001	31	39	47	48	0.7	0.8
2002	23	27	39	37	0.6	0.7
2003	21	22	39	37	0.5	0.6
2004	22	19	44	44	0.5	0.4
2005	15	20	48	47	0.3	0.4
2006	11	12	47	45	0.2	0.3
2007	7	6	47	47	0.1	0.1
2008	8	18	48	48	0.2	0.4
2009	11	14	47	47	0.2	0.3
2010	26	8	48	48	0.5	0.2
2011	6	18	47	46	0.1	0.4
2012	13	14	48	48	0.3	0.3

(WD = Weekday; WE = Weekend)

Table A22. CPUE summary statistics for Guam non-charter trolling trips by port, quarter and day type (2008 – 2012)

Port – Type of day	Quarter	N	Mean (kg/trip)	SE (kg/trip)	Min (kg/trip)	25% Q (kg/trip)	Median (kg/trip)	75% Q (kg/trip)	Max (kg/trip)
Agana - Weekday	1	137	43.8	4.1	0	9.2	29	59.8	241.5
	2	134	45.7	4.6	0	8.6	35	68.4	476.3
	3	152	38.6	3.1	0	4.9	28.6	67.7	163.4
	4	142	34.7	3.1	0	9.1	23.8	45.3	244.4
Agana - Weekend	1	192	40.7	3.4	0	7.7	25.5	54.3	267.3
	2	216	32.2	3.3	0	1.3	16	43.2	420.2
	3	248	24.5	2.5	0	0	7.2	34.4	328.6
	4	255	20.3	1.8	0	1.2	10.6	27	195
Agat - Weekday	1	36	45.2	10.4	0	10.9	29	57.5	358.4
	2	28	54.7	14.4	0	13.3	30.7	74	390
	3	25	39.6	10.8	0	0	30.7	42.1	209.8
	4	32	38.4	4.9	0	13.1	36.3	58.8	98.6
Agat - Weekend	1	101	38.6	4.1	0	8.9	27.1	51.2	235.9
	2	56	41.7	7.3	0	2.5	21.1	59.9	266.2
	3	64	23.2	4.0	0	2.5	11.2	33.5	197.4
	4	88	32.9	4.0	0	4.7	15.5	50.2	145.9
Merizo Weekday	1	3	87.2	44.1	0	59.5	119	130.8	142.5
	3	8	6.2	4.3	0	0	2.3	4.2	36.3
	4	8	44.2	17.0	0	6.1	33.3	66.7	141.3
Merizo - Weekend	1	14	30.6	9.5	0	5.5	22.6	42.2	136.1
	2	7	5.9	1.6	0	2.3	8.3	9.2	9.8
	3	3	9.4	3.3	3	7.2	11.5	12.7	13.8
	4	12	23.2	7.4	0	2.4	17.8	31.7	72.6

Table A23. CPUE summary statistics for Guam charter trolling trips by port, quarter and day type (2008 – 2012)

Port – Type of day	Quarter	N	Mean (kg/trip)	SE (kg/trip)	Min (kg/trip)	25% Q (kg/trip)	Median (kg/trip)	75% Q (kg/trip)	Max (kg/trip)
Agana - Weekday	1	52	20.7	5.0	0	5.4	12.1	22.5	257.8
	2	45	8.3	1.7	0	0	6.7	10	44.6
	3	33	11.9	4.1	0	0	4.1	8.8	99.6
	4	33	16.3	5.6	0	1.8	5.7	15.2	160.7
Agana - Weekend	1	101	17.9	2.1	0	4.1	12.5	25.8	154.2
	2	83	10.5	1.6	0	0	4.2	15.7	62.1
	3	80	10.4	2.6	0	0	0.2	6.9	134.6
	4	98	12	1.8	0	2.1	8.2	16.4	138
Agat - Weekday	1	3	24	14.0	0	11.7	23.3	35.9	48.6
	2	1	13.6	-	-	-	-	-	-
	3	1	0	-	-	-	-	-	-
	4	2	6.8	6.3	0.6	0.6	6.8	13.1	13.1
Agat - Weekend	1	6	32.5	13.0	3	3.8	30.2	38.1	89.7
	2	1	1.1	-	-	-	-	-	-
	3	3	2.4	2.4	0	0	0	3.6	7.3
	4	6	28.6	12.6	0	0	23.8	59.4	64.5
Merizo - Weekday	4	1	52.6	-	-	-	-	-	-
Merizo - Weekend	1	4	12.7	5.0	3.8	4.9	10.7	20.6	25.7
	2	3	28.1	6.5	20.1	21.7	23.2	32	40.8
	4	1	110.6	-	-	-	-	-	-

Table A24. CPUE summary statistics for Guam non-charter bottomfishing trips by port, quarter and day type (2008 – 2012)

Port – Type of day	Quarter	N	Mean (kg/trip)	SE (kg/trip)	Min (kg/trip)	25% Q (kg/trip)	Median (kg/trip)	75% Q (kg/trip)	Max (kg/trip)
Agana-Weekday	1	11	17.3	7.9	0.4	2.5	10.2	17.3	92.5
	2	21	18.2	6.4	1.2	2.9	9.3	20.5	134.3
	3	15	12.4	3.9	0.0	4.2	9.1	11.6	61.7
	4	13	4.2	1.1	0.0	1.1	2.5	8.6	9.3
Agana-Weekend	1	28	17.4	3.6	0.0	3.6	7.3	27.5	62.3
	2	73	15.9	2.4	0.0	1.4	8.0	22.7	82.0
	3	79	11.3	1.8	0.0	1.9	6.5	13.0	98.6
	4	56	12.2	3.0	0.0	2.5	5.9	13.1	136.1
Agat-Weekday	1	9	4.5	1.1	1.4	1.9	3.9	6.9	10.9
	2	5	4.4	1.8	0.0	1.4	3.3	7.9	9.3
	3	10	11.2	4.0	0.0	0.4	7.4	16.7	37.6
	4	2	2.5	1.6	1.0	1.0	2.5	4.1	4.1
Agat-Weekend	1	22	10.8	2.6	0.0	2.6	5.8	13.6	50.5
	2	18	11.4	3.6	0.0	1.8	6.2	13.6	58.0
	3	33	17.0	4.7	0.0	2.9	6.9	22.7	130.7
	4	26	13.4	3.7	0.0	2.5	8.9	14.6	90.3
Merizo-Weekday	1	7	6.0	2.2	0.8	1.3	4.9	8.6	16.3
	2	2	1.8	1.0	0.7	0.7	1.8	2.8	2.8
	3	13	6.8	2.1	0.0	1.7	5.0	9.1	21.7
	4	6	6.5	3.3	0.5	1.0	2.2	12.1	20.8
Merizo-Weekend	1	10	9.1	3.4	1.9	2.7	5.6	9.1	35.8
	2	10	3.6	2.6	0.0	0.0	0.9	2.5	26.7
	3	5	11.1	6.6	0.0	0.7	1.0	22.6	31.4
	4	17	8.0	1.9	0.0	2.2	6.1	9.1	27.2

Table A25. CPUE summary statistics for Guam charter bottomfishing trips by port, quarter and day type (2008 – 2012)

Port – Type of day	Quarter	N	Mean (kg/trip)	SD (kg/trip)	Min (kg/trip)	25% Q (kg/trip)	Median (kg/trip)	75% Q (kg/trip)	Max (kg/trip)
Agana - Weekday	1	11	4.6	0.9	0.5	2.4	5.0	5.4	10.1
	2	10	2.7	0.7	0.0	1.4	2.2	3.2	6.8
	3	4	2.3	0.6	1.0	1.3	2.4	3.2	3.3
	4	4	12.5	4.1	0.7	7.1	15.6	17.8	18.1
Agana - Weekend	1	7	2.1	1.0	0.0	0.5	1.2	2.7	7.4
	2	11	2.6	1.3	0.0	0.0	0.1	3.0	13.6
	3	7	0.6	0.4	0.0	0.1	0.2	0.7	2.6
	4	9	3.8	1.4	0.0	0.3	2.7	7.0	11.5
Agat - Weekday	1	1	2.6	-	2.6	2.6	2.6	2.6	2.6
	2	2	2.4	2.4	0.0	0.0	2.4	4.8	4.8
	3	2	0.3	0.1	0.2	0.2	0.3	0.4	0.4
Agat- Weekend	1	2	0.2	0.2	0.0	0.0	0.2	0.4	0.4
	3	2	0.1	0.1	0.0	0.0	0.1	0.1	0.1
	4	5	2.4	1.4	0.0	0.2	0.3	5.5	5.8

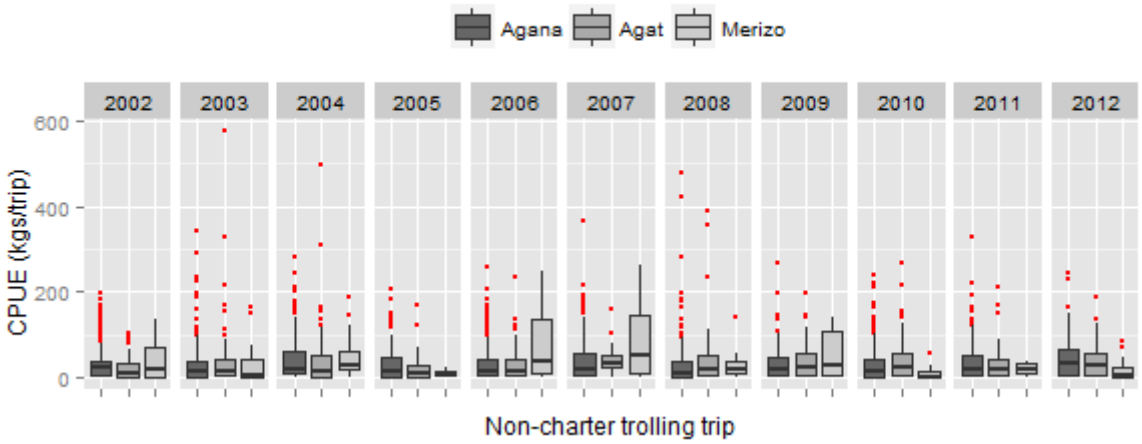

Figure A13. Boxplot of CPUE (kg/trip) for Guam non-charter trolling trips by port (2002-2012)

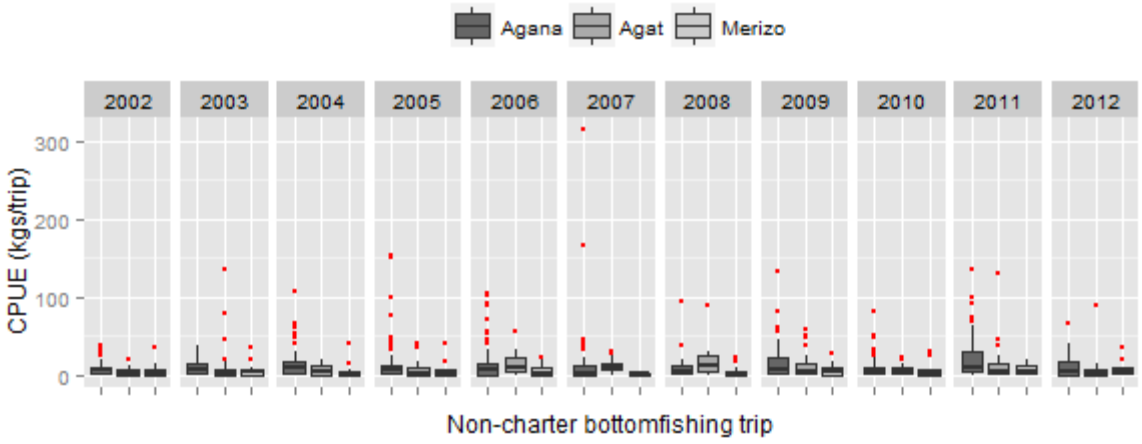

Figure A14. Boxplot of CPUE (kg/trip) for Guam non-charter bottomfishing trips by port (2002-2012)

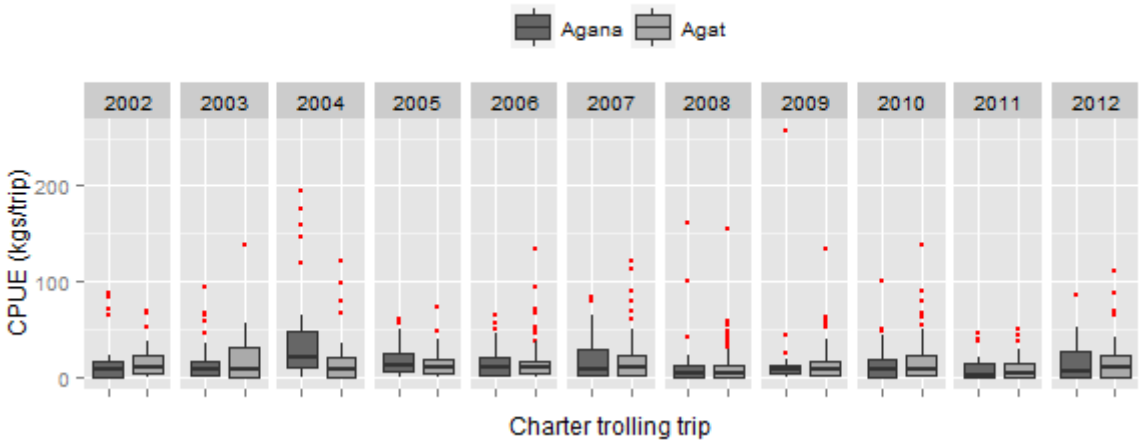

Figure A15. Boxplot of CPUE (kg/trip) for Guam charter trolling trips by port (2002-2012)

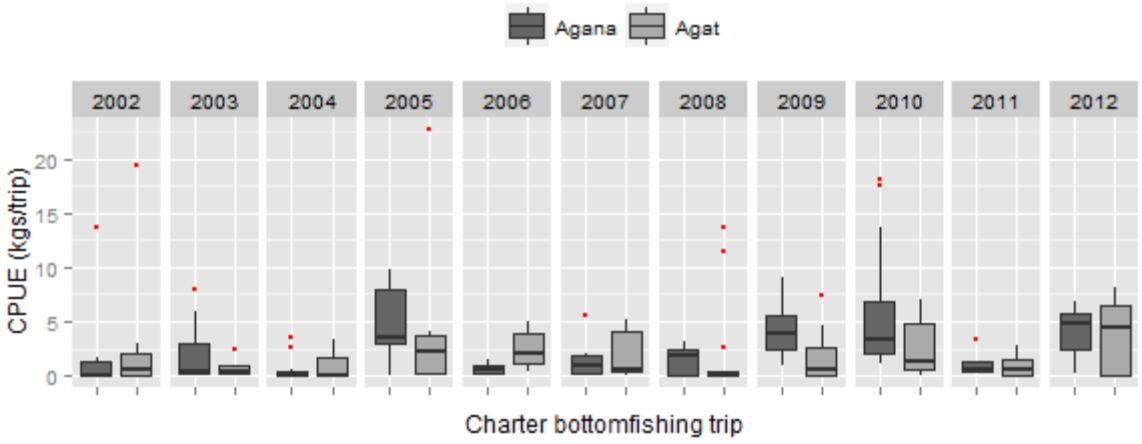

Figure A16. Boxplot of CPUE (kg/trip) for Guam charter bottomfishing trips by port (2002-2012)

Table A26. CPUE summary statistics for Guam non-charter trolling trips by port

	Mean			Median			Standard error		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	37.2	43.1	-	20.4	43.1	-	2.4	-	-
1983	35.7	-	13.8	23.2	-	7.6	2.8	-	9.1
1984	30.9	-	-	10.9	-	-	2.4	-	-
1985	28.8	-	-	10.7	-	-	2.1	-	-
1986	24.9	-	-	9.0	-	-	2.3	-	-
1987	25.0	-	-	7.7	-	-	2.4	-	-
1988	31.7	-	6.9	12.6	-	5.5	2.1	-	1.9
1989	22.4	-	35.1	6.8	-	10.5	1.8	-	19.7
1990	27.1	-	31.2	7.0	-	2.0	2.7	-	26.4
1991	32.1	-	104.1	13.7	-	19.9	2.3	-	52.3
1992	29.4	-	70.9	8.0	-	15.6	2.7	-	42.3
1993	26.5	-	16.0	8.8	-	2.9	2.2	-	10.7
1994	27.4	44.2	13.7	7.7	2.4	4.4	2.3	21.1	4.9
1995	29.4	25.8	9.0	10.6	8.2	1.4	2.4	3.8	2.9
1996	34.2	29.5	17.5	16.0	9.3	3.9	2.5	3.3	8.1
1997	31.9	21.8	34.0	12.7	9.3	2.1	2.6	2.7	16.9
1998	23.8	31.9	18.8	8.9	7.3	4.2	1.9	5.4	6.7
1999	15.5	25.4	6.8	5.5	4.7	3.9	1.3	3.9	2.7
2000	24.6	19.4	14.0	8.2	5.0	5.1	1.8	3.4	5.0
2001	33.8	33.4	19.2	14.1	13.7	4.4	2.7	4.5	7.9
2002	32.8	21.6	39.1	22.6	10.8	20.8	2.5	3.4	11.7
2003	35.7	43.5	37.1	12.7	13.0	5.5	4.6	11.5	17.5
2004	40.5	44.8	53.4	18.5	15.7	28.5	3.6	9.5	17.9
2005	31.7	20.5	10.5	13.6	9.2	7.5	3.4	3.6	3.1
2006	33.2	34.7	78.1	14.9	14.6	39.2	3.2	7.3	27.5
2007	40.5	38.2	90.0	18.8	31.2	49.8	3.8	6.1	43.2
2008	32.7	45.4	32.9	10.6	19.7	19.4	4.3	10.1	13.3
2009	31.2	34.6	53.4	20.8	24.7	26.4	1.9	3.3	18.6
2010	30.0	40.9	11.6	15.1	25.5	0.0	1.9	4.8	6.2
2011	35.0	29.2	19.4	20.5	18.1	17.8	2.3	3.9	5.8
2012	40.8	39.5	17.9	31.0	30.6	6.6	3.1	4.8	5.5

Table A27. CPUE summary statistics for Guam charter trolling trips by port

	Mean			Median			Standard error		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	72.8	-	-	53.6	-	-	26.9	-	-
1983	14.6	-	9.5	9.3	-	0.0	4.7	-	9.5
1984	28.2	-	-	9.1	-	-	9.5	-	-
1985	30.2	-	-	13.6	-	-	6.7	-	-
1986	13.4	-	-	4.1	-	-	2.3	-	-
1987	15.7	-	-	4.8	-	-	3.8	-	-
1988	15.3	-	3.0	8.9	-	3.0	1.5	-	-
1989	12.8	-	-	4.5	-	-	1.4	-	-
1990	14.3	-	2.7	5.3	-	2.7	1.1	-	-
1991	19.8	47.5	62.8	9.9	47.5	62.8	1.4	-	-
1992	11.8	-	-	4.3	-	-	0.9	-	-
1993	17.4	-	-	8.7	-	-	1.3	-	-
1994	13.1	9.5	-	6.8	4.4	-	1.1	3.6	-
1995	14.8	9.5	-	6.8	5.2	-	1.0	1.5	-
1996	18.8	13.7	-	10.5	6.2	-	1.1	2.7	-
1997	15.9	13.1	-	6.9	9.0	-	1.3	2.2	-
1998	15.9	8.6	-	8.4	5.0	-	1.1	3.4	-
1999	11.0	7.3	-	4.4	0.8	-	1.1	3.5	-
2000	13.3	16.0	0.0	5.4	5.2	0.0	1.2	7.1	-
2001	12.5	14.6	-	6.7	2.7	-	1.4	8.4	-
2002	14.9	23.9	-	9.7	2.3	-	2.3	16.9	-
2003	16.6	51.0	-	7.8	15.0	-	2.7	43.7	-
2004	29.6	10.9	0.0	16.8	10.2	0.0	4.3	4.7	-
2005	15.0	29.9	-	11.5	29.9	-	1.2	-	-
2006	15.3	3.2	-	10.5	3.2	-	1.5	-	-
2007	18.4	20.0	-	9.5	13.9	-	2.0	10.0	-
2008	11.2	36.5	-	3.8	36.5	-	1.9	22.9	-
2009	15.8	5.0	3.8	8.0	3.4	3.8	2.6	2.8	-
2010	15.0	26.4	24.9	7.9	7.3	21.7	1.8	12.8	5.5
2011	9.2	16.9	-	4.2	1.1	-	1.4	10.0	-
2012	15.8	22.4	48.7	6.9	23.3	39.1	3.2	11.8	22.7

Table A28. CPUE summary statistics for Guam non-charter bottomfishing trips by port

	Mean			Median			Standard error		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1982	12.1	-	-	7.6	-	-	1.6	-	-
1983	10.3	5.7	-	4.1	5.7	-	2.3	-	-
1984	12.8	-	-	8.2	-	-	1.3	-	-
1985	12.1	-	-	7.6	-	-	1.1	-	-
1986	10.7	-	-	5.8	-	-	2.3	-	-
1987	10.6	-	-	5.7	-	-	1.4	-	-
1988	10.0	4.6	-	5.7	4.6	-	1.5	3.3	-
1989	9.4	13.7	-	5.1	3.6	-	1.1	5.0	-
1990	10.7	4.2	-	5.6	3.8	-	1.2	1.2	-
1991	9.7	6.7	-	5.4	3.8	-	1.4	1.9	-
1992	8.4	9.1	-	4.5	1.1	-	1.1	5.3	-
1993	10.1	7.6	-	5.4	3.3	-	1.6	2.0	-
1994	14.4	6.8	5.4	5.0	1.7	3.7	2.5	2.2	2.8
1995	8.1	2.8	6.2	5.3	1.9	2.0	0.9	0.4	1.2
1996	8.5	7.0	13.2	6.1	3.5	6.0	1.1	1.7	2.6
1997	7.6	5.5	11.0	4.1	4.3	4.3	1.0	1.0	2.7
1998	8.3	2.9	7.2	4.5	1.8	2.8	1.1	0.4	1.3
1999	10.5	3.9	5.9	4.5	2.3	3.4	3.1	0.7	1.2
2000	9.4	4.7	13.7	3.6	3.9	4.6	2.0	0.9	4.8
2001	9.0	7.0	9.6	4.8	2.7	4.3	1.3	1.2	2.6
2002	8.5	6.1	5.1	6.8	3.6	3.1	1.1	1.4	1.1
2003	10.3	7.2	12.5	7.8	4.3	2.5	1.5	2.1	5.1
2004	14.9	6.2	7.6	9.2	2.1	6.0	2.4	2.8	1.7
2005	16.5	7.4	7.9	7.2	1.7	2.8	3.6	3.8	2.1
2006	18.1	6.0	14.6	7.7	3.7	10.1	3.7	1.9	2.8
2007	17.7	2.2	12.6	3.3	2.4	9.6	6.9	0.7	2.5
2008	9.5	5.9	16.7	5.1	1.7	12.2	2.2	2.1	3.8
2009	16.6	6.6	12.9	9.0	4.3	5.4	2.5	1.6	3.0
2010	8.7	6.3	6.7	4.6	2.0	5.5	1.2	2.5	1.2
2011	23.6	8.0	14.7	10.3	5.8	5.9	4.2	2.3	5.0
2012	11.8	10.2	9.8	4.1	5.4	3.9	3.4	4.2	5.2

Table A29. CPUE summary statistics for Guam charter bottomfishing trips by port

	Mean			Median			Standard error		
Year	Agana	Agat	Merizo	Agana	Agat	Merizo	Agana	Agat	Merizo
1983	8.0	-	-	8.0	-	-	-	-	-
1985	11.2	-	-	11.2	-	-	10.8	-	-
1986	4.3	-	-	2.0	-	-	2.5	-	-
1987	8.1	-	-	9.0	-	-	4.4	-	-
1988	4.3	-	-	4.2	-	-	0.7	-	-
1989	4.6	-	-	4.4	-	-	0.6	-	-
1990	3.0	-	-	2.0	-	-	0.7	-	-
1991	3.8	-	-	2.7	-	-	0.8	-	-
1992	4.6	-	-	2.9	-	-	0.7	-	-
1993	3.0	-	-	2.2	-	-	0.5	-	-
1994	3.6	-	4.6	2.2	-	3.3	1.2	-	2.5
1995	4.3	-	3.4	2.1	-	2.0	1.2	-	0.9
1996	10.3	-	2.4	2.3	-	1.8	6.0	-	0.3
1997	2.9	-	2.8	2.0	-	1.8	0.5	-	0.6
1998	6.3	-	2.4	4.4	-	1.9	2.6	-	0.4
1999	6.9	-	3.7	2.2	-	1.6	2.9	-	0.8
2000	2.6	-	1.1	2.1	-	0.6	0.5	-	0.2
2001	3.1	-	0.8	2.9	-	0.0	1.1	-	0.3
2002	6.9	-	1.6	1.3	-	0.1	6.2	-	1.0
2003	2.7	-	1.2	2.4	-	0.4	1.2	-	0.8
2004	1.5	0.0	0.7	1.5	0.0	0.0	1.0	-	0.4
2005	5.8	-	0.7	3.6	-	0.0	2.1	-	0.7
2006	2.4	-	0.7	1.7	-	0.3	0.8	-	0.5
2007	1.9	-	0.0	0.9	-	0.0	0.6	-	-
2008	2.5	-	0.1	0.3	-	0.2	1.2	-	0.1
2009	3.1	-	1.3	2.4	-	1.3	0.8	-	1.3
2010	5.2	-	3.1	3.1	-	3.1	1.2	-	2.7
2011	1.2	-	0.2	0.8	-	0.2	0.4	-	0.2
2012	4.5	-	2.6	5.6	-	2.5	1.5	-	1.5

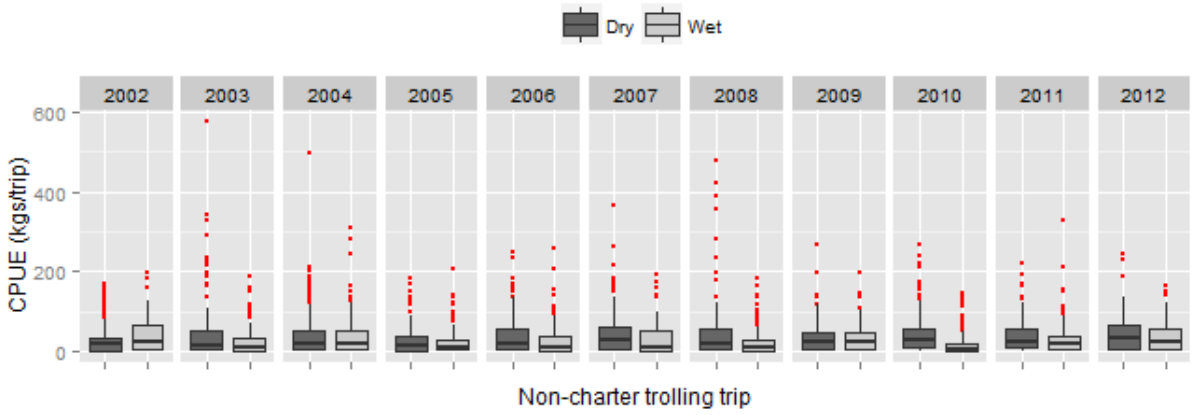

Figure A17. Boxplot of CPUE (kg/trip) for Guam non-charter trolling trips by season (2002-2012)

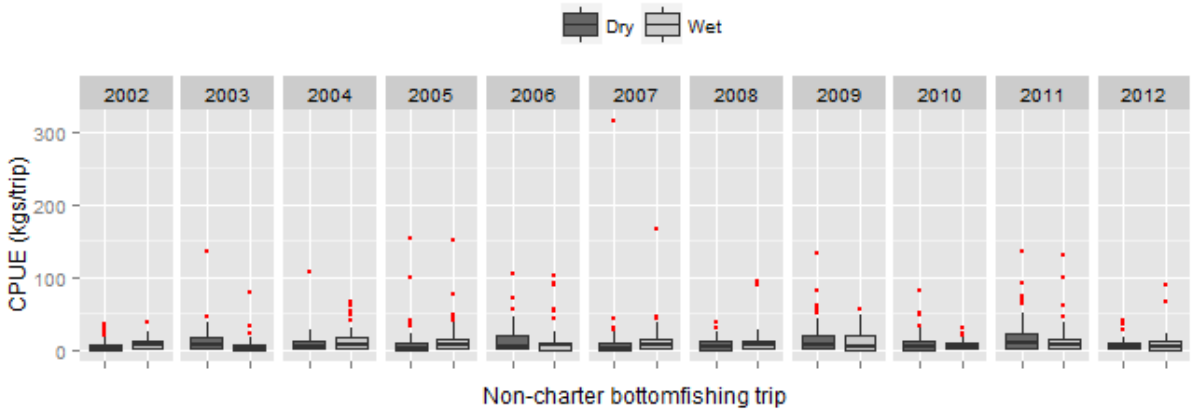

Figure A18. Boxplot of CPUE (kg/trip) for Guam non-charter bottomfishing trips by season (2002-2012)

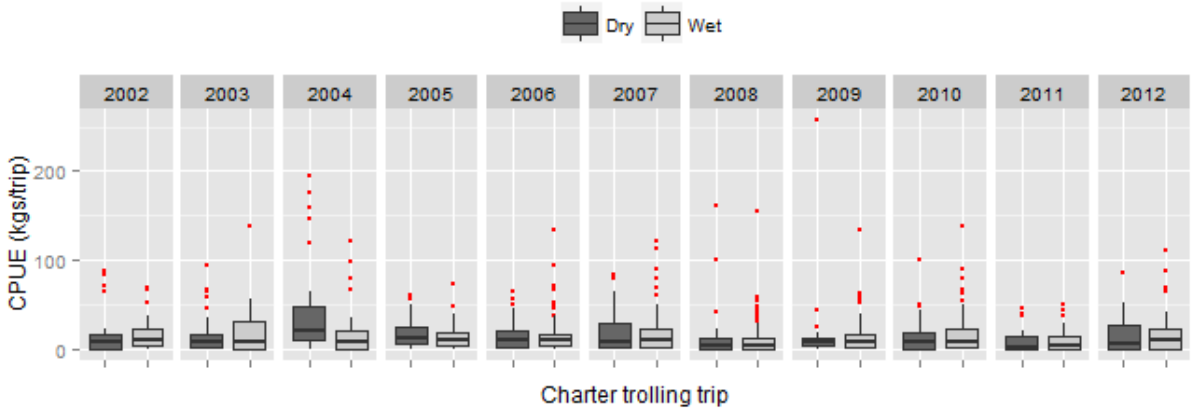

Figure A19. Boxplot of CPUE (kg/trip) for Guam charter trolling trips by season (2002-2012)

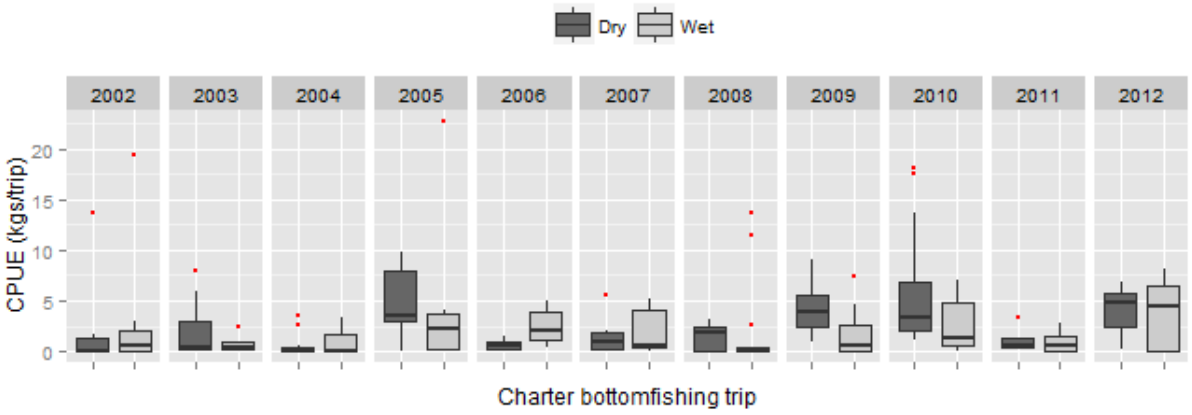

Figure A20. Boxplot of CPUE (kg/trip) for Guam charter bottomfishing trips by season (2002-2012)

Table A30. CPUE summary statistics for Guam non-charter trolling trips by season

	Mean		Median		Standard error	
Year	Dry	Wet	Dry	Wet	Dry	Wet
1982	36.5	38.4	23.6	17.8	2.9	4.1
1983	40.6	29.9	24.7	16.7	4.4	3.0
1984	33.4	27.5	13.1	9.7	3.3	3.6
1985	30.8	27.1	10.9	10.7	3.1	2.8
1986	29.1	19.4	11.3	6.0	3.4	2.7
1987	27.5	21.1	7.5	8.0	3.4	2.9
1988	37.0	24.9	16.6	9.7	3.1	2.8
1989	25.2	19.4	9.4	3.2	2.5	2.6
1990	29.9	23.3	7.5	4.7	3.9	3.8
1991	42.3	18.4	19.1	3.2	4.2	2.7
1992	28.7	33.3	9.8	6.1	3.5	4.8
1993	33.9	13.8	11.4	2.9	3.2	1.9
1994	30.3	22.1	9.8	2.7	2.8	3.8
1995	30.9	21.1	11.2	2.2	2.5	3.1
1996	31.2	32.1	11.3	12.4	2.3	3.6
1997	32.8	23.5	14.7	4.5	2.9	2.9
1998	32.2	16.7	11.0	5.9	3.0	1.9
1999	19.6	15.7	4.5	6.5	2.1	1.6
2000	21.0	26.0	7.1	7.8	2.1	2.4
2001	33.5	31.1	13.7	12.2	2.8	3.7
2002	28.2	39.1	17.2	23.2	2.2	5.2
2003	47.1	26.8	14.6	8.7	7.4	4.1
2004	41.5	43.0	18.7	18.4	4.6	5.6
2005	27.7	27.9	12.5	11.8	3.2	4.3
2006	41.2	26.7	17.9	10.9	4.2	4.2
2007	46.0	32.4	28.2	9.5	4.5	5.1
2008	47.7	24.2	18.3	9.1	7.3	3.2
2009	32.5	32.7	21.4	21.8	2.2	2.5
2010	40.6	16.9	27.7	4.7	2.4	2.0
2011	37.8	28.8	22.2	17.0	2.7	2.8
2012	42.5	34.3	31.8	21.8	3.6	3.4

Table A31. CPUE summary statistics for Guam charter trolling trips by season

	Mean		Median		Standard error	
Year	Dry	Wet	Dry	Wet	Dry	Wet
1982	110.0	23.0	83.3	32.9	37.3	11.6
1983	19.5	6.4	13.0	2.1	6.6	3.1
1984	33.3	0.8	13.8	0.0	10.8	0.8
1985	26.7	34.8	11.4	14.1	7.9	11.6
1986	14.3	11.7	6.0	3.0	2.6	4.6
1987	15.1	16.3	7.7	2.0	4.5	6.3
1988	16.6	13.3	12.0	5.4	1.6	2.8
1989	11.3	14.8	5.5	3.7	1.4	2.6
1990	13.0	16.1	4.9	5.5	1.3	2.0
1991	20.9	18.7	13.4	4.3	1.9	2.1
1992	13.1	9.4	5.8	2.7	1.3	1.2
1993	18.5	15.3	11.1	2.1	1.4	2.4
1994	14.2	11.1	8.2	4.2	1.4	1.4
1995	16.3	11.3	9.9	0.0	1.0	1.6
1996	17.8	19.5	10.3	9.8	1.2	1.9
1997	18.7	10.7	10.3	1.5	1.6	1.8
1998	17.7	11.6	10.7	4.6	1.3	1.7
1999	12.0	8.5	3.2	4.8	1.5	1.4
2000	13.2	13.5	7.4	3.3	1.4	2.1
2001	14.7	8.6	9.8	0.0	1.7	2.1
2002	12.7	22.3	9.1	14.9	2.3	5.7
2003	22.6	14.1	13.0	6.2	5.5	3.4
2004	27.8	29.6	16.5	13.5	4.8	7.5
2005	16.9	12.1	12.7	9.5	1.5	1.7
2006	16.7	11.6	11.4	5.2	1.8	2.4
2007	22.6	11.5	13.7	3.6	2.6	2.5
2008	14.4	6.0	4.8	2.4	2.7	1.5
2009	16.6	13.7	8.0	7.4	3.7	2.9
2010	17.2	12.8	12.5	0.0	1.7	4.1
2011	10.2	9.0	4.9	1.7	1.8	2.5
2012	19.3	17.9	12.6	0.0	4.0	6.6

Table A32. CPUE summary statistics for Guam non-charter bottomfishing trips by season

	Mean		Median		Standard error	
Year	Dry	Wet	Dry	Wet	Dry	Wet
1982	10.9	13.9	6.4	8.3	1.6	3.1
1983	7.2	13.6	2.5	5.6	1.8	4.2
1984	13.7	12.0	9.1	7.3	2.2	1.6
1985	11.5	12.6	8.9	7.0	1.2	1.7
1986	13.8	7.5	6.8	4.1	4.4	1.1
1987	9.5	12.3	4.1	9.0	2.0	1.9
1988	7.8	11.6	4.7	6.4	1.0	2.5
1989	8.8	10.5	4.5	5.4	1.2	1.9
1990	9.6	10.7	5.0	6.3	1.6	1.5
1991	6.9	11.3	3.4	5.2	1.0	2.0
1992	7.4	9.6	2.8	6.0	1.8	1.5
1993	7.2	11.4	4.5	5.5	1.2	2.1
1994	14.6	11.3	3.7	4.3	4.0	1.7
1995	5.8	6.6	2.6	3.4	0.9	0.7
1996	9.0	9.4	3.8	5.8	1.5	1.3
1997	8.8	6.9	4.2	4.4	1.4	0.9
1998	4.3	9.2	1.9	4.6	0.5	1.2
1999	7.6	8.1	3.3	3.7	2.4	2.3
2000	9.0	10.0	3.8	3.9	2.3	2.3
2001	8.3	8.9	4.1	4.2	1.0	1.6
2002	6.3	9.9	3.8	7.2	0.8	1.7
2003	12.8	7.3	7.9	3.2	2.9	2.1
2004	9.9	13.6	4.5	8.8	3.1	2.0
2005	12.2	14.6	2.7	8.9	3.5	3.5
2006	14.4	16.4	6.2	8.2	2.7	4.1
2007	14.3	17.0	2.8	7.5	7.3	6.0
2008	8.2	12.3	4.9	8.0	1.7	2.4
2009	15.0	12.3	7.0	6.1	2.3	2.3
2010	10.3	6.4	5.0	4.5	1.9	0.7
2011	21.9	16.5	10.2	7.3	4.7	3.6
2012	9.1	13.2	4.0	4.8	2.2	5.0

Table A33. CPUE summary statistics for Guam charter bottomfishing trips by season

	Mean		Median		Standard error	
Year	Dry	Wet	Dry	Wet	Dry	Wet
1983	-	8.0	-	8.0	-	-
1985	11.2	-	11.2	-	10.8	-
1986	1.5	5.2	1.5	2.0	-	3.2
1987	0.0	12.1	0.0	12.1	-	3.1
1988	5.6	3.6	6.5	3.4	1.3	0.7
1989	5.0	4.2	4.3	4.5	1.0	0.7
1990	1.9	4.5	1.6	5.7	0.8	1.0
1991	4.7	3.1	4.0	1.9	1.0	1.1
1992	4.5	4.9	2.8	3.3	1.0	1.1
1993	2.4	4.2	2.0	4.5	0.6	1.1
1994	3.1	4.9	1.7	3.9	1.6	1.4
1995	4.6	2.6	2.6	1.5	1.1	0.8
1996	2.4	5.0	1.7	2.0	0.5	2.0
1997	3.1	2.3	2.4	1.3	0.6	0.5
1998	2.3	4.0	2.1	2.1	0.4	1.1
1999	2.4	8.1	1.4	2.4	0.5	2.5
2000	1.8	1.3	1.0	0.6	0.4	0.4
2001	0.5	2.6	0.3	2.7	0.2	0.8
2002	3.3	1.0	0.2	0.7	2.0	0.5
2003	1.6	1.8	0.4	0.5	0.8	1.1
2004	0.8	0.0	0.1	0.0	0.4	-
2005	5.0	3.9	1.5	3.3	3.6	1.2
2006	2.5	1.4	2.0	0.7	1.1	0.7
2007	2.2	0.8	1.2	0.7	0.8	0.4
2008	2.7	0.9	0.1	0.3	1.5	0.5
2009	3.3	1.4	2.6	0.5	0.9	1.1
2010	3.5	8.3	3.1	5.8	0.7	3.0
2011	1.1	0.9	0.9	0.4	0.4	0.6
2012	4.0	3.3	4.6	2.8	1.4	1.9

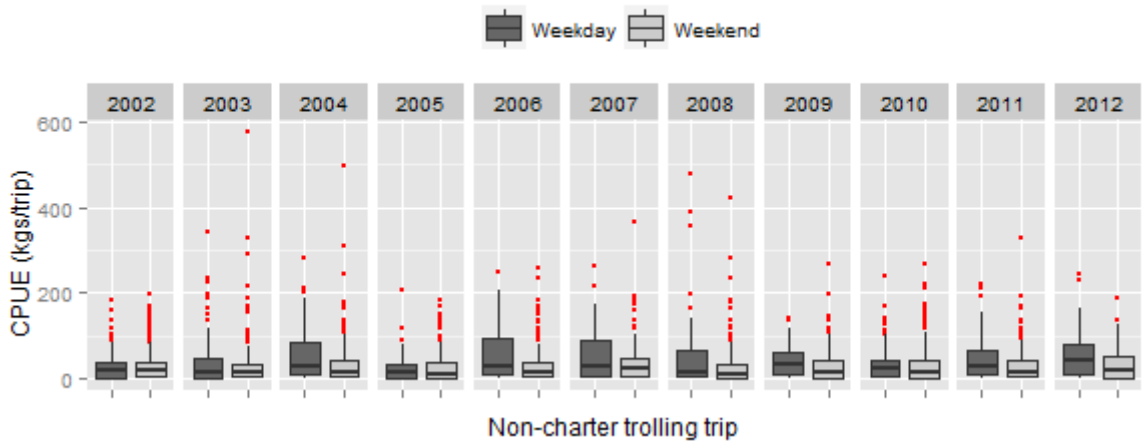

Figure A21. Boxplot of CPUE (kg/trip) for Guam non-charter trolling trips by day type (2002-2012)

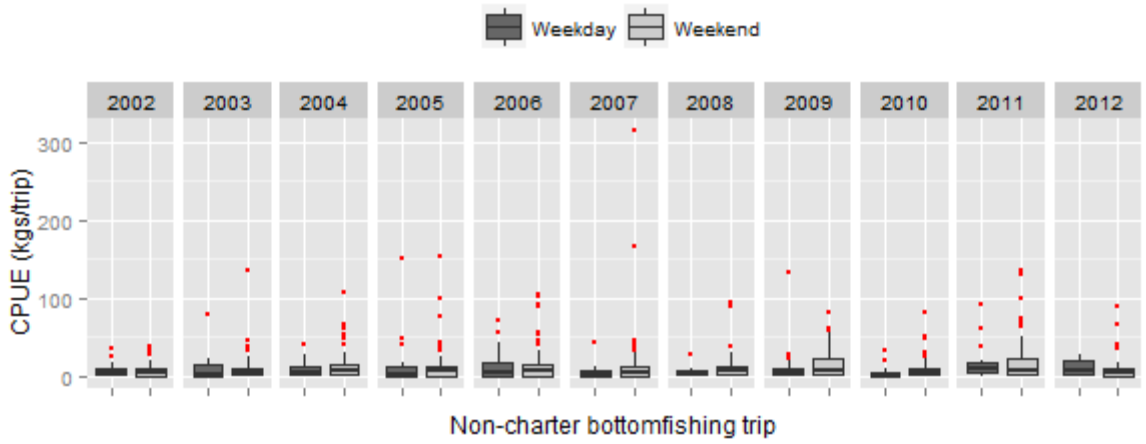

Figure A22. Boxplot of CPUE (kg/trip) for Guam non-charter bottomfishing trips by day type (2002-2012)

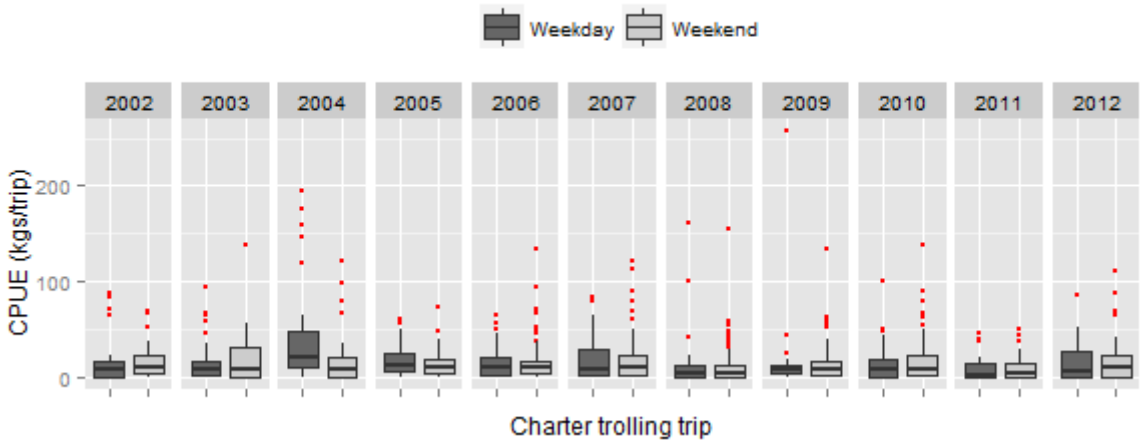

Figure A23. Boxplot of CPUE (kg/trip) for Guam charter trolling trips by day type (2002-2012)

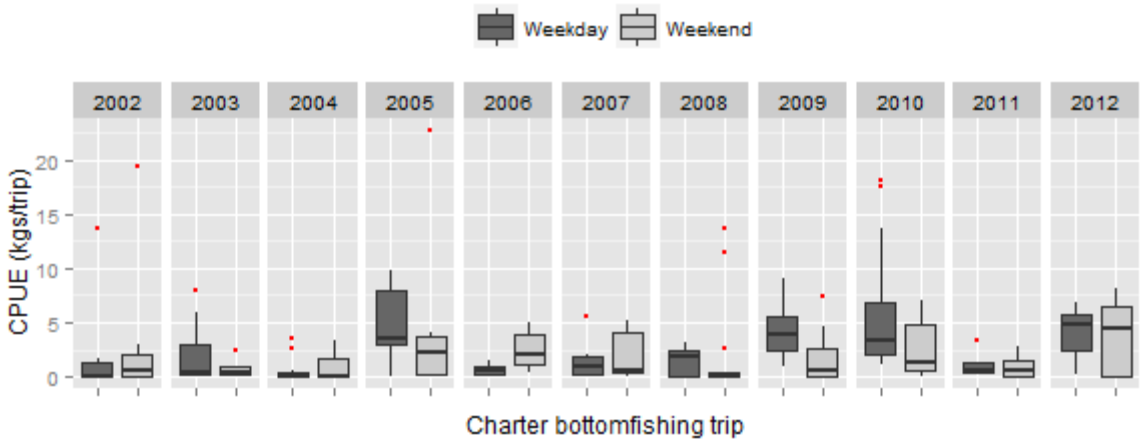

Figure A24. Boxplot of CPUE (kg/trip) for Guam charter bottomfishing trips by day type (2002-2012)

Table A34. CPUE summary statistics for Guam non-charter trolling trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1982	39.9	36.0	26.0	18.6	4.0	3.0
1983	44.4	32.3	28.5	18.6	6.1	3.0
1984	38.7	25.8	17.9	9.0	4.5	2.7
1985	37.2	22.9	19.3	6.8	3.7	2.4
1986	31.4	22.6	17.2	8.0	4.4	2.6
1987	20.4	26.3	6.5	7.8	3.5	2.9
1988	47.3	25.9	19.1	11.0	5.7	2.0
1989	29.1	20.4	8.8	6.0	4.0	2.0
1990	39.3	23.1	14.5	4.7	6.8	2.9
1991	54.5	29.2	24.2	12.6	10.5	2.5
1992	50.5	23.6	17.8	7.2	7.9	2.5
1993	31.4	23.9	11.5	6.5	4.0	2.6
1994	31.0	26.0	8.1	6.1	4.6	2.6
1995	36.0	23.6	16.5	6.5	4.4	2.1
1996	32.5	31.0	12.6	11.2	3.3	2.4
1997	33.4	27.0	10.6	10.9	4.6	2.2
1998	31.4	23.5	8.3	8.0	5.1	1.9
1999	30.3	13.2	8.2	4.5	4.1	1.1
2000	28.7	20.6	7.3	6.8	3.2	1.7
2001	37.8	29.7	14.0	12.3	4.3	2.5
2002	29.0	31.7	16.8	20.8	3.4	2.7
2003	40.3	36.4	14.8	12.1	6.9	6.0
2004	55.1	34.6	29.8	15.9	6.0	4.3
2005	25.2	28.7	12.1	12.0	4.8	3.0
2006	60.7	30.8	29.5	14.2	10.7	3.0
2007	53.6	35.7	29.6	23.9	7.0	3.8
2008	54.1	30.0	16.5	11.8	12.2	3.6
2009	38.9	29.2	32.9	15.9	2.7	2.1
2010	33.5	30.7	23.8	12.2	2.5	2.4
2011	42.7	27.5	29.0	16.0	3.3	2.3
2012	49.7	32.3	40.5	19.1	4.6	2.8

(WD = Weekday; WE = Weekend)

Table A35. CPUE summary statistics for Guam charter trolling trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1982	51.2	88.9	36.2	67.8	16.7	46.9
1983	18.9	9.4	13.0	2.7	7.1	4.6
1984	31.6	23.5	3.0	9.1	13.4	13.6
1985	31.0	29.3	11.4	19.6	11.2	6.9
1986	16.3	11.8	1.5	5.5	5.2	2.3
1987	11.7	19.1	5.2	4.0	3.7	6.3
1988	21.7	11.4	16.2	6.0	2.9	1.5
1989	10.8	13.6	3.8	5.3	2.2	1.7
1990	14.7	14.0	6.1	5.0	1.8	1.5
1991	18.1	21.0	8.2	11.4	2.0	1.8
1992	12.1	11.6	3.8	4.5	1.4	1.2
1993	19.6	15.8	12.8	6.0	1.7	1.8
1994	14.7	11.7	7.9	5.8	1.9	1.1
1995	12.9	15.2	6.6	6.9	1.2	1.3
1996	19.7	17.5	10.6	9.0	1.6	1.3
1997	18.6	14.1	10.1	5.7	2.3	1.4
1998	15.1	15.8	8.2	8.2	1.6	1.4
1999	11.0	10.6	4.4	4.2	1.7	1.4
2000	13.6	13.2	5.9	4.9	2.0	1.5
2001	15.0	8.9	8.2	5.3	2.1	1.3
2002	14.7	16.6	7.5	11.0	3.6	3.0
2003	16.7	20.3	7.8	8.5	3.7	5.8
2004	39.8	18.3	21.7	7.9	7.2	3.8
2005	16.6	13.8	12.6	11.1	1.8	1.5
2006	15.3	15.3	9.8	10.8	2.2	1.9
2007	18.9	18.1	8.6	9.9	2.9	2.6
2008	13.9	10.7	4.8	3.5	5.0	1.9
2009	19.5	14.3	7.7	8.0	9.3	2.0
2010	13.8	17.1	8.0	7.7	2.3	2.5
2011	10.8	9.2	2.7	4.2	2.8	1.7
2012	18.8	18.8	6.9	10.8	5.3	4.5

(WD = Weekday; WE = Weekend)

Table A36. CPUE summary statistics for Guam non-charter bottomfishing trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1982	12.6	11.9	7.7	7.4	3.4	1.7
1983	13.3	8.5	5.2	4.1	5.1	1.8
1984	10.6	14.1	6.3	9.1	1.8	1.8
1985	12.0	12.1	7.5	7.6	1.5	1.5
1986	6.9	11.2	4.9	6.3	2.5	2.6
1987	9.9	10.8	4.3	6.0	3.0	1.6
1988	6.0	10.9	4.5	6.4	1.1	1.8
1989	11.1	9.2	5.5	4.9	2.2	1.3
1990	11.9	9.5	4.9	5.3	2.5	1.2
1991	12.4	8.4	5.8	4.6	3.2	1.2
1992	16.0	6.2	7.6	3.7	3.9	0.8
1993	9.6	9.5	3.8	5.8	2.0	1.7
1994	13.3	12.5	4.1	4.1	2.4	2.8
1995	7.5	5.7	3.7	2.9	1.1	0.6
1996	7.9	9.8	5.8	4.5	1.2	1.3
1997	7.1	8.3	4.2	4.2	1.4	1.1
1998	6.9	7.0	2.4	3.7	1.3	0.8
1999	8.7	7.4	2.8	3.6	3.2	2.0
2000	11.1	8.8	3.7	3.9	3.7	1.7
2001	8.5	8.4	3.7	4.4	1.8	1.0
2002	7.5	7.1	5.2	4.5	1.3	0.9
2003	10.1	10.4	3.4	4.6	3.2	2.3
2004	8.7	13.5	5.3	7.4	2.0	2.2
2005	19.4	12.3	3.2	6.9	10.1	2.3
2006	13.8	15.9	6.0	7.7	3.5	3.0
2007	7.9	16.6	3.3	4.8	4.2	5.8
2008	5.7	12.2	2.7	8.9	1.6	2.1
2009	10.6	15.5	4.7	8.0	3.7	1.8
2010	5.0	8.7	2.6	5.6	1.5	1.1
2011	16.8	19.8	10.2	7.7	4.2	3.7
2012	12.9	10.2	8.8	4.1	3.2	3.1

(WD = Weekday; WE = Weekend)

Table A37. CPUE summary statistics for Guam charter bottomfishing trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1983	8.0	-	8.0	-	-	-
1985	22.0	0.5	22.0	0.5	-	-
1986	-	4.3	-	2.0	-	2.5
1987	-	8.1	-	9.0	-	4.4
1988	3.3	4.9	2.7	4.8	0.9	0.9
1989	3.1	4.9	3.3	4.6	0.8	0.7
1990	2.9	3.1	2.2	1.7	1.4	0.8
1991	6.2	3.5	6.2	2.7	5.9	0.7
1992	3.1	4.9	2.0	3.3	1.4	0.8
1993	2.2	3.2	1.7	2.6	0.7	0.7
1994	2.1	5.0	2.3	3.0	0.6	1.6
1995	2.9	4.5	2.1	2.0	0.6	1.3
1996	2.9	4.8	1.6	2.2	0.8	2.3
1997	2.2	3.3	1.5	2.2	0.4	0.8
1998	2.2	4.4	1.7	2.4	0.4	1.3
1999	2.0	8.3	1.4	2.8	0.3	2.4
2000	1.6	1.6	0.7	1.0	0.3	0.4
2001	1.1	2.0	0.2	0.8	0.5	0.8
2002	1.9	3.2	0.0	0.6	1.5	2.3
2003	2.0	0.8	0.4	0.3	0.8	0.5
2004	0.7	1.1	0.1	0.0	0.4	1.1
2005	4.9	4.0	3.6	2.2	1.8	2.4
2006	0.6	2.5	0.5	2.1	0.3	0.8
2007	1.5	2.0	0.9	0.6	0.7	1.1
2008	1.5	2.2	1.8	0.2	0.6	1.3
2009	4.3	1.8	3.8	0.5	1.2	0.9
2010	6.0	2.6	3.3	1.3	1.4	1.2
2011	1.2	1.0	0.6	0.6	0.7	0.4
2012	3.9	3.6	4.8	4.4	2.0	1.4

(WD = Weekday; WE = Weekend)

Table A38. Survey days for Guam shore-based participation count survey by quarter and day type

	Q1		Q2		Q3		Q4		
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
1985	6	6	6	6	6	6	6	6	48
1986	7	5	6	6	7	5	7	5	48
1987	6	6	6	6	6	6	6	5	47
1988	6	6	6	6	6	6	6	6	48
1989	5	7	5	6	6	6	6	6	47
1990	6	6	6	6	6	6	6	6	48
1991	6	6	6	6	6	6	6	6	48
1992	6	6	6	6	6	5	5	6	46
1993	6	6	6	6	7	5	6	6	48
1994	6	6	6	6	6	6	6	6	48
1995	6	6	6	6	6	6	6	6	48
1996	6	6	5	7	6	6	6	6	48
1997	6	6	6	6	6	6	6	6	48
1998	6	6	6	6	6	6	6	6	48
1999	6	6	6	6	6	6	6	6	48
2000	6	6	6	6	6	6	6	6	48
2001	5	5	4	2	1	1	2	1	21
2002	1	1	-	-	2	1	-	-	5
2003	1	-	2	-	-	1	-	-	4
2004	1	-	1	2	1	1	-	-	6
2005	1	2	-	1	-	-	-	1	5
2006	1	-	1	1	1	1	1	1	7
2007	2	2	2	3	1	4	3	1	18
2008	1	1	2	3	1	2	1	-	11
2009	2	-	-	-	1	1	-	-	4
2010	2	-	1	-	-	1	-	-	4
2011	-	-	1	1	1	1	1	-	5
2012	1	1	1	2	-	1	-	-	6

(WD = Weekday; WE = Weekend)

Table A39. Interview survey days with at least one recorded interview by quarter and day type

	Q1		Q2		Q3		Q4		
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
1985	7	6	7	7	7	6	6	6	52
1986	7	6	6	6	6	6	4	7	48
1987	7	6	8	2	7	4	6	6	46
1988	6	6	6	6	6	6	6	6	48
1989	6	6	7	6	6	6	6	6	49
1990	7	6	5	6	6	6	6	6	48
1991	6	6	6	6	6	6	6	6	48
1992	6	6	7	6	6	7	7	6	51
1993	6	6	6	6	7	7	7	6	51
1994	6	6	6	6	6	6	7	6	49
1995	6	6	6	7	6	6	6	6	49
1996	6	6	6	6	7	6	7	6	50
1997	6	6	6	6	6	7	6	6	49
1998	6	6	6	6	7	6	6	6	49
1999	6	6	6	6	6	6	6	6	48
2000	6	6	6	6	6	6	6	6	48
2001	6	6	6	6	6	6	6	6	48
2002	5	6	7	7	9	6	5	8	53
2003	6	6	6	6	6	6	7	8	51
2004	9	8	9	6	7	5	6	7	57
2005	6	6	7	6	7	6	6	6	50
2006	6	9	6	6	6	6	6	6	51
2007	9	10	21	17	12	11	6	7	93
2008	4	6	6	6	6	6	6	6	46
2009	6	5	6	6	6	6	6	6	47
2010	6	6	6	6	7	6	5	6	48
2011	5	5	6	5	5	6	6	5	43
2012	6	6	6	6	6	5	6	6	47

(WD = Weekday; WE = Weekend)

Table A40. Guam shore-based interviews by quarter and day type (1985-2012)

	Q1		Q2		Q3		Q4		
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
1985	49	55	47	37	44	40	46	49	367
1986	25	44	38	35	44	46	21	38	291
1987	33	31	49	11	38	19	35	29	245
1988	27	32	39	34	36	37	36	39	280
1989	33	45	30	43	30	39	35	42	297
1990	48	63	48	60	73	67	57	69	485
1991	41	79	47	66	65	68	51	80	497
1992	67	73	69	84	78	87	69	84	611
1993	58	81	48	79	66	109	69	88	598
1994	74	96	56	93	95	103	81	104	702
1995	80	100	69	107	96	115	87	110	764
1996	70	80	76	94	100	75	102	82	679
1997	100	134	118	117	113	130	103	100	915
1998	86	128	116	126	101	118	81	124	880
1999	91	135	128	126	123	127	96	114	940
2000	99	104	95	106	92	105	77	113	791
2001	82	87	96	119	107	110	63	89	753
2002	62	62	54	52	65	54	40	54	443
2003	63	61	63	64	87	78	36	76	528
2004	58	60	38	35	46	45	46	44	372
2005	51	54	37	50	63	53	24	42	374
2006	32	29	49	45	41	36	25	43	300
2007	41	41	54	64	44	68	19	30	361
2008	24	20	34	39	43	44	28	50	282
2009	43	32	35	53	40	55	28	36	322
2010	38	34	24	33	49	61	23	37	299
2011	23	19	35	39	23	37	26	48	250
2012	23	24	25	46	37	39	28	50	272

(WD = Weekday; WE = Weekend)

Table A41. Guam shore-based interviews by fishing method (1985-2012)

Year	Hook & line	Cast net	Gill net	Spear/ snorkel	Spear/ scuba	Hooks & Gaff	Drag net	Surround net	Other method
1985	153	49	55	56	4	10	12	8	20
1986	117	46	69	22	1	5	16	4	11
1987	78	53	50	30	-	20	11	3	-
1988	106	68	55	31	1	5	6	6	2
1989	123	91	47	20	1	6	6	-	3
1990	269	91	81	22	1	7	5	1	8
1991	287	86	71	20	3	13	7	-	10
1992	391	86	89	18	2	9	8	1	7
1993	391	84	71	17	2	16	7	-	10
1994	488	58	70	46	3	15	3	4	15
1995	467	112	107	34	12	10	6	3	13
1996	531	59	50	24	4	5	3	-	3
1997	615	119	87	38	4	12	5	-	35
1998	512	117	116	58	5	15	6	-	51
1999	601	99	99	76	2	11	15	-	37
2000	531	106	78	40	3	10	4	-	19
2001	510	106	60	35	3	10	3	-	26
2002	290	61	51	23	2	3	-	-	11
2003	344	119	24	18	2	6	-	1	14
2004	249	74	21	16	-	3	-	1	8
2005	249	84	18	9	-	4	1	-	9
2006	195	69	13	12	-	4	1	1	3
2007	294	37	13	8	-	4	-	1	2
2008	184	67	19	6	-	3	-	1	2
2009	242	55	9	6	-	7	-	-	3
2010	200	66	13	7	1	7	-	1	4
2011	170	58	14	4	-	2	-	1	1
2012	181	59	12	12	-	6	-	1	1

Table A42. Total number of gears recorded during shore-based participation count survey by fishing method

Year	Hook & line	Cast net	Gill net	Spear /snorkel	Spear /scuba	Hooks & gaffs	Drag net	Surround net	Other methods
1985	2147	438	310	360	17	83	8	44	307
1986	1542	309	371	325	-	65	26	22	101
1987	1529	308	354	236	-	47	31	20	52
1988	1400	304	271	336	45	140	3	29	55
1989	1846	355	198	154	21	95	13	2	8
1990	1455	302	212	155	10	53	7	5	49
1991	2726	437	356	180	2	70	8	5	221
1992	2417	416	439	229	4	51	8	7	175
1993	2141	389	261	210	11	99	21	34	15
1994	2613	324	239	198	26	44	7	13	16
1995	2804	368	264	238	35	123	4	29	20
1996	3193	254	185	193	20	120	-	39	20
1997	3036	375	189	165	5	47	3	22	121
1998	2651	564	364	371	17	121	9	43	155
1999	3290	349	339	572	7	164	11	13	106
2000	2466	324	212	301	5	73	4	33	66
2001	2660	388	199	274	4	87	5	12	99
2002	2017	363	136	165	2	27	5	25	33
2003	2095	458	176	262	3	21	-	11	47
2004	1817	276	166	222	2	15	1	10	42
2005	1840	357	142	165	7	73	2	6	23
2006	1661	446	189	267	9	74	-	11	26
2007	1647	251	137	183	2	93	1	6	26
2008	1660	299	106	172	-	50	-	14	10
2009	2067	362	137	137	-	90	1	9	22
2010	1688	286	121	178	-	57	-	5	41
2011	1778	303	99	135	6	51	5	3	18
2012	2208	301	200	165	6	57	1	4	14

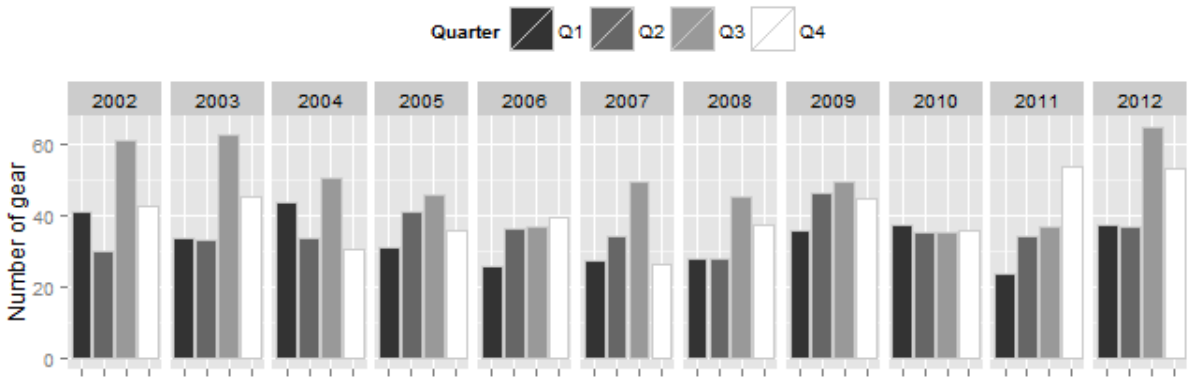

Figure A25. Daily gear count estimates for Guam hook & line by quarter (2002-2012)

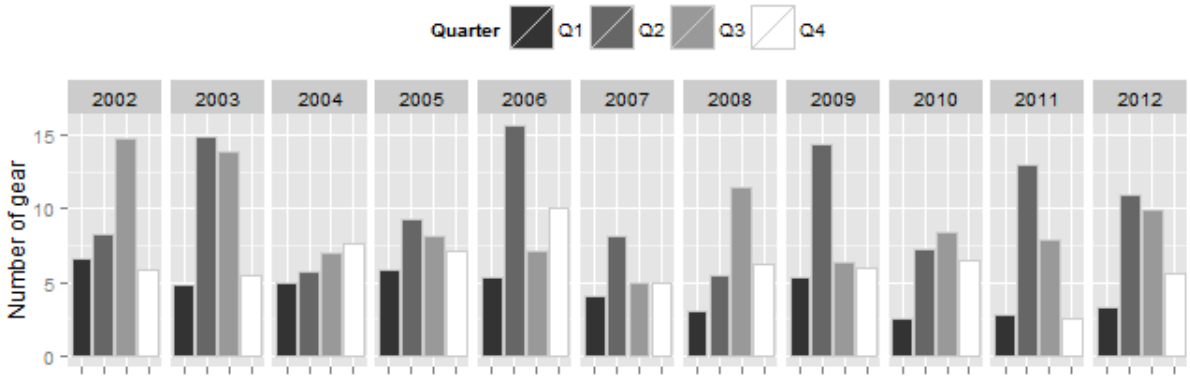

Figure A26. Daily gear count estimates for Guam cast net by quarter (2002-2012)

Table A43. Daily average number of gears for Guam hook & line by quarter

Year	Q1	Q2	Q3	Q4
1985	40.3	51.2	52.2	35.3
1986	30.3	29.8	38.7	29.7
1987	23.1	36.0	47.3	22.9
1988	20.1	29.1	48.8	18.7
1989	24.8	27.1	66.3	37.9
1990	27.8	26.8	36.0	30.7
1991	29.4	29.0	104.0	64.8
1992	37.6	54.8	66.9	52.0
1993	37.5	43.6	46.0	51.3
1994	45.7	38.5	71.0	62.6
1995	55.4	43.8	68.5	66.0
1996	55.2	52.5	88.8	69.6
1997	57.3	56.6	72.2	67.0
1998	52.7	61.9	59.6	46.8
1999	56.5	85.5	83.3	48.8
2000	48.7	44.6	64.3	47.9
2001	37.8	54.5	81.9	47.5
2002	40.9	29.8	61.0	42.4
2003	33.6	33.2	62.8	45.1
2004	43.8	33.5	50.5	30.7
2005	30.9	40.8	45.9	35.7
2006	25.9	36.5	36.8	39.3
2007	27.2	34.1	49.7	26.3
2008	27.7	27.9	45.2	37.6
2009	35.8	46.3	49.3	44.7
2010	37.5	35.1	35.4	35.6
2011	23.8	34.1	36.7	53.7
2012	37.5	36.9	64.7	53.3

Table A44. Daily average number of gears for Guam cast net by quarter

Year	Q1	Q2	Q3	Q4
1985	7.1	11.7	10.7	7.7
1986	5.8	5.8	5.8	8.4
1987	5.9	15.5	8.5	9.7
1988	3.0	11.1	5.5	7.8
1989	6.0	10.6	6.8	9.0
1990	5.6	7.0	7.2	6.0
1991	3.8	10.1	12.7	9.8
1992	6.7	16.5	8.5	6.2
1993	5.1	14.3	5.8	7.2
1994	6.2	10.1	6.4	5.9
1995	5.3	7.3	12.3	6.8
1996	2.2	7.0	6.8	7.3
1997	6.3	7.9	10.0	7.1
1998	4.6	10.5	14.4	18.3
1999	4.3	9.8	5.3	9.7
2000	4.6	5.8	9.8	7.2
2001	3.7	11.1	12.1	6.0
2002	6.6	8.3	14.8	5.9
2003	4.8	14.8	13.9	5.5
2004	5.0	5.7	7.0	7.6
2005	5.9	9.3	8.2	7.1
2006	5.4	15.7	7.2	10.0
2007	4.1	8.1	4.9	5.0
2008	3.0	5.5	11.4	6.3
2009	5.3	14.4	6.3	6.0
2010	2.6	7.3	8.4	6.5
2011	2.8	12.9	7.9	2.6
2012	3.4	10.9	9.9	5.6

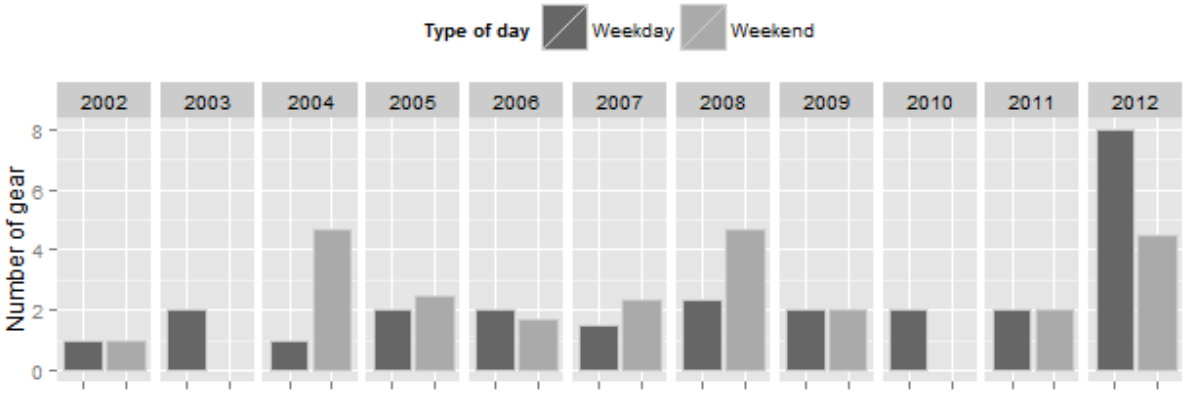

Figure A27. Daily count estimates of Guam hook & line by day type (2002-2012)

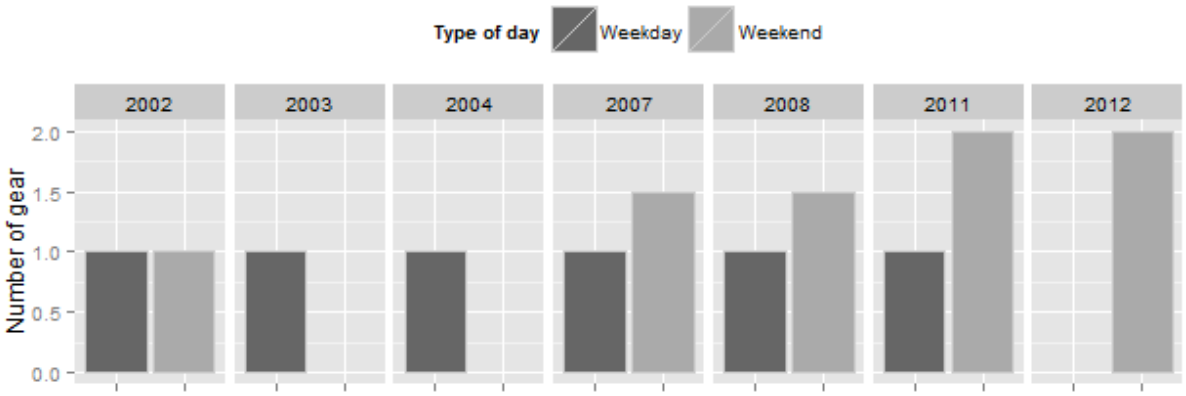

Figure A28. Daily count estimates of Guam cast net by day type (2002-2012)

Table A45. Daily average number of gears for Guam hook & line by day type

Year	Weekday	Weekend
1985	31.4	58.0
1986	26.0	40.0
1987	23.8	41.7
1988	18.9	39.4
1989	22.8	53.8
1990	19.3	41.4
1991	35.3	78.3
1992	35.8	69.3
1993	31.0	59.4
1994	39.9	69.0
1995	42.9	74.0
1996	46.8	84.6
1997	49.8	76.7
1998	39.9	70.6
1999	48.3	88.8
2000	39.6	63.1
2001	22.0	32.7
2002	1.0	1.0
2003	2.0	-
2004	1.0	4.7
2005	2.0	2.5
2006	2.0	1.7
2007	1.5	2.3
2008	2.3	4.7
2009	2.0	2.0
2010	2.0	-
2011	2.0	2.0
2012	8.0	4.5

Table A46. Daily average number of gears for Guam hook & line by day type

Year	Weekday	Weekend
1985	5.8	13.0
1986	6.0	7.0
1987	7.9	10.1
1988	6.3	7.5
1989	6.2	9.9
1990	5.3	7.5
1991	8.2	10.0
1992	8.1	10.8
1993	6.1	10.3
1994	5.0	9.5
1995	5.1	11.2
1996	4.8	7.0
1997	7.3	8.3
1998	10.0	13.9
1999	6.4	8.2
2000	5.8	8.1
2001	1.3	5.5
2002	1.0	1.0
2003	1.0	-
2004	1.0	-
2005	-	-
2006	-	-
2007	1.0	1.5
2008	1.0	1.5
2009	-	-
2010	-	-
2011	1.0	2.0
2012	-	2.0

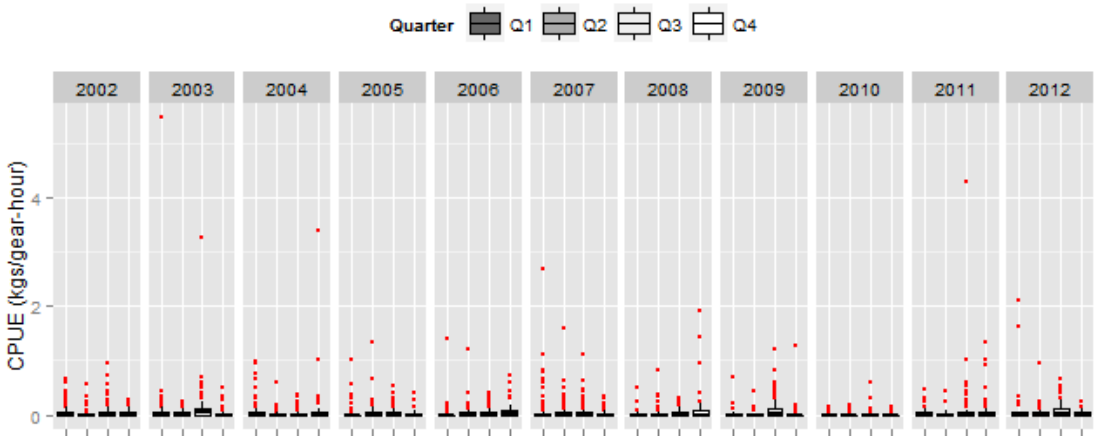

Figure A29. Boxplot of CPUE (kg/trip) for Guam hook & line by quarter (2002-2012)

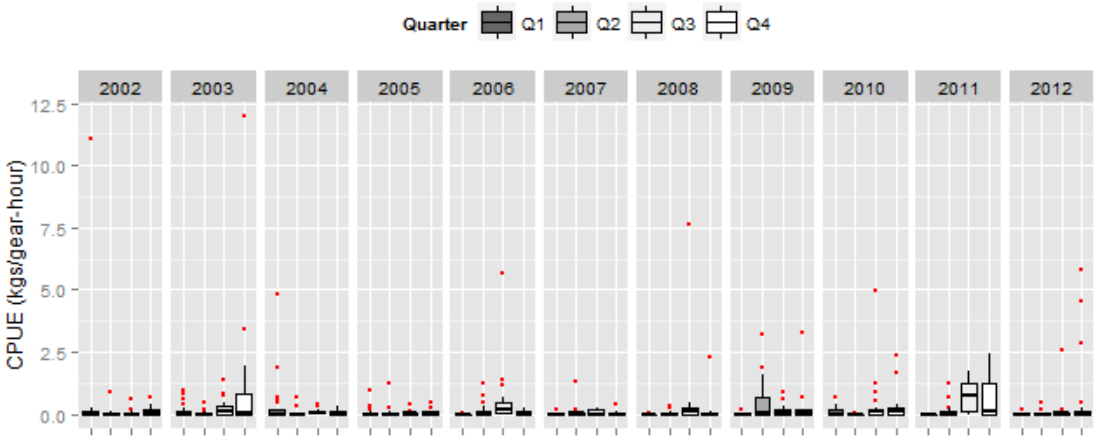

Figure A30. Boxplot of CPUE (kg/trip) for Guam cast net by quarter (2002-2012)

Table A47. CPUE summary statistics for Guam hook & line fishing trips by quarter

	Mean				Median				Standard error			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1985	0.1	0.2	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
1986	0.0	0.2	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1
1987	0.1	0.1	0.2	0.2	0.0	0.0	0.1	0.2	0.0	0.0	0.0	0.1
1988	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
1989	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.1	0.1	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2002	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0
2004	0.1	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
2005	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2006	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2007	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2011	0.1	0.0	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0
2012	0.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0

Table A48. CPUE summary statistics for Guam cast net fishing trips by quarter

	Mean				Median				Standard error			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1985	0.4	0.2	0.4	0.5	0.1	0.2	0.4	0.2	0.2	0.1	0.1	0.1
1986	0.5	0.4	0.2	0.3	0.5	0.2	0.2	0.4	0.1	0.1	0.1	0.1
1987	0.3	0.4	0.2	0.1	0.2	0.4	0.2	0.0	0.1	0.1	0.1	0.0
1988	0.4	0.3	0.9	0.3	0.1	0.2	0.2	0.1	0.2	0.1	0.5	0.1
1989	0.3	0.3	0.5	0.6	0.2	0.1	0.3	0.5	0.1	0.1	0.2	0.1
1990	0.5	0.8	0.4	0.3	0.2	0.5	0.1	0.1	0.2	0.2	0.2	0.1
1991	0.3	0.2	0.2	0.4	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.2
1992	0.1	0.4	0.2	0.4	0.0	0.0	0.0	0.1	0.0	0.2	0.1	0.2
1993	0.2	0.0	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.0
1994	0.7	0.3	0.3	0.3	0.0	0.1	0.2	0.1	0.4	0.1	0.1	0.1
1995	0.2	0.2	0.2	0.2	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1
1996	0.0	0.5	0.2	0.6	0.0	0.0	0.0	0.1	0.0	0.5	0.1	0.1
1997	0.2	0.2	0.2	0.3	0.0	0.0	0.0	0.2	0.1	0.1	0.1	0.1
1998	0.4	0.3	0.2	0.3	0.2	0.0	0.1	0.1	0.1	0.1	0.0	0.1
1999	0.2	0.1	0.5	0.5	0.0	0.0	0.2	0.1	0.1	0.0	0.2	0.1
2000	0.6	0.6	0.3	0.2	0.0	0.0	0.0	0.0	0.2	0.4	0.2	0.1
2001	0.6	0.3	0.1	0.4	0.0	0.0	0.1	0.1	0.4	0.1	0.0	0.2
2002	0.8	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.7	0.1	0.0	0.1
2003	0.1	0.0	0.2	1.5	0.0	0.0	0.1	0.1	0.1	0.0	0.1	1.0
2004	0.4	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
2005	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
2006	0.0	0.1	0.5	0.1	0.0	0.1	0.2	0.0	0.0	0.1	0.3	0.0
2007	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1
2008	0.0	0.0	0.5	0.2	0.0	0.0	0.1	0.0	0.0	0.0	0.4	0.1
2009	0.0	0.7	0.2	0.5	0.0	0.1	0.1	0.0	0.0	0.2	0.1	0.4
2010	0.1	0.0	0.4	0.3	0.0	0.0	0.1	0.1	0.1	0.0	0.2	0.2
2011	0.0	0.1	0.7	0.7	0.0	0.0	0.8	0.1	0.0	0.0	0.2	0.4
2012	0.0	0.1	0.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.3

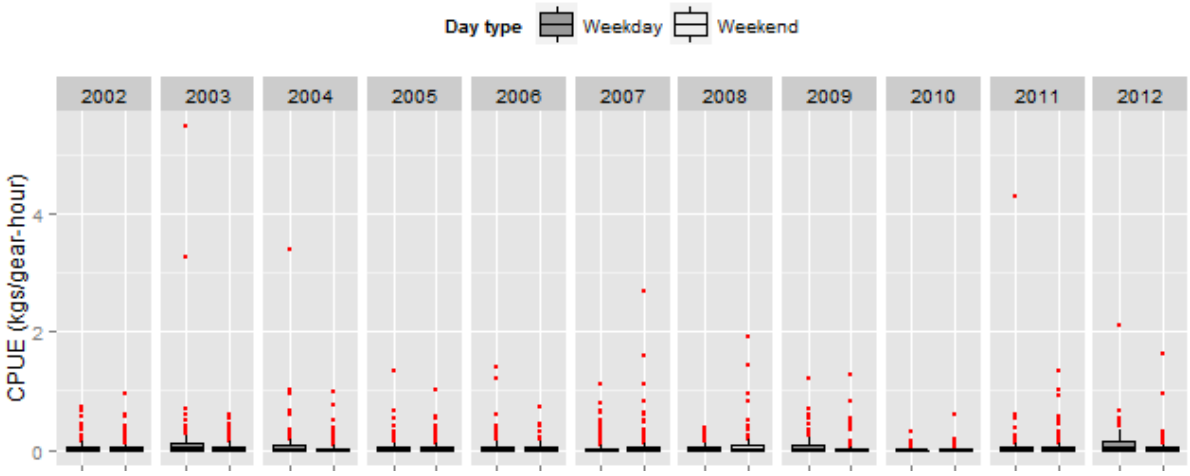

Figure A31. Boxplot of CPUE (kg/trip) for Guam hook & line by day type (2002-2012)

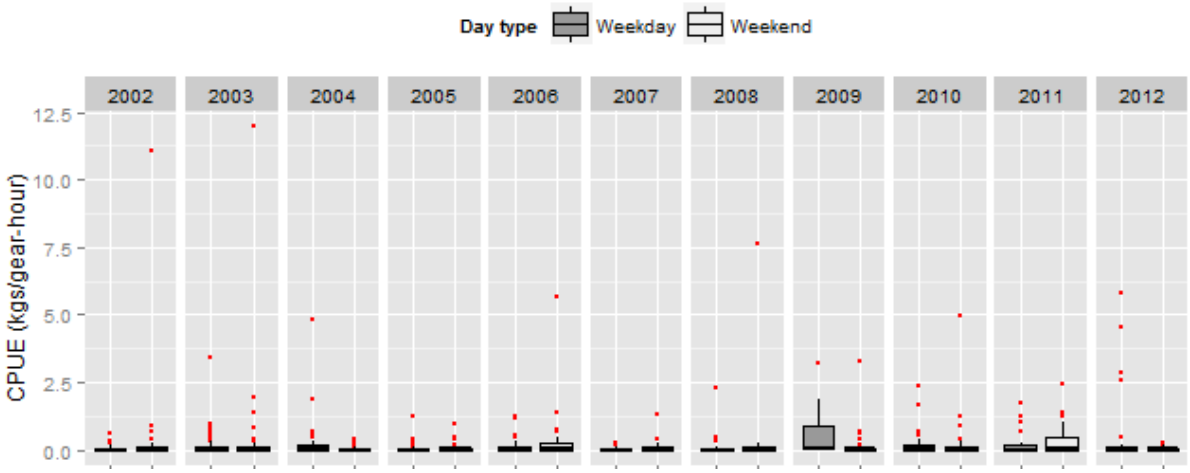

Figure A32. Boxplot of CPUE (kg/trip) for Guam cast net by day type (2002-2012)

Table A49. CPUE summary statistics for Guam hook & line fishing trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1985	0.22	0.06	0.07	0.02	0.05	0.01
1986	0.14	0.11	0.01	0.04	0.04	0.03
1987	0.13	0.16	0.03	0.12	0.03	0.04
1988	0.10	0.07	0.02	0.01	0.02	0.01
1989	0.11	0.08	0.00	0.03	0.04	0.01
1990	0.15	0.08	0.03	0.00	0.03	0.01
1991	0.19	0.07	0.07	0.01	0.03	0.01
1992	0.09	0.06	0.01	0.00	0.02	0.01
1993	0.08	0.05	0.00	0.00	0.04	0.01
1994	0.07	0.09	0.01	0.00	0.01	0.02
1995	0.10	0.10	0.01	0.00	0.02	0.01
1996	0.05	0.05	0.00	0.00	0.01	0.01
1997	0.09	0.08	0.00	0.00	0.01	0.01
1998	0.14	0.06	0.00	0.00	0.03	0.01
1999	0.11	0.08	0.01	0.00	0.02	0.01
2000	0.09	0.07	0.00	0.01	0.02	0.01
2001	0.06	0.07	0.00	0.00	0.01	0.01
2002	0.06	0.05	0.00	0.00	0.01	0.01
2003	0.12	0.05	0.02	0.00	0.04	0.01
2004	0.10	0.05	0.00	0.00	0.03	0.01
2005	0.06	0.05	0.00	0.00	0.01	0.01
2006	0.08	0.06	0.01	0.00	0.02	0.01
2007	0.07	0.08	0.00	0.00	0.01	0.02
2008	0.04	0.10	0.00	0.00	0.01	0.03
2009	0.08	0.05	0.00	0.00	0.02	0.01
2010	0.01	0.02	0.00	0.00	0.00	0.01
2011	0.11	0.10	0.00	0.00	0.06	0.02
2012	0.13	0.05	0.02	0.00	0.04	0.02

(WD = Weekday; WE = Weekend)

Table A50. CPUE summary statistics for Guam cast net trips by day type

	Mean		Median		Standard error	
Year	WD	WE	WD	WE	WD	WE
1985	0.37	0.53	0.25	0.18	0.08	0.16
1986	0.43	0.25	0.29	0.19	0.10	0.05
1987	0.27	0.25	0.15	0.21	0.05	0.07
1988	0.53	0.29	0.19	0.15	0.15	0.12
1989	0.44	0.37	0.26	0.13	0.07	0.08
1990	0.52	0.47	0.16	0.10	0.12	0.12
1991	0.30	0.25	0.09	0.10	0.08	0.08
1992	0.24	0.35	0.02	0.01	0.07	0.18
1993	0.22	0.11	0.07	0.03	0.06	0.03
1994	0.26	0.52	0.07	0.12	0.08	0.23
1995	0.23	0.18	0.07	0.03	0.06	0.07
1996	0.38	0.52	0.01	0.00	0.10	0.46
1997	0.27	0.20	0.06	0.04	0.07	0.05
1998	0.24	0.35	0.05	0.07	0.06	0.08
1999	0.26	0.35	0.07	0.06	0.06	0.11
2000	0.56	0.22	0.05	0.01	0.19	0.10
2001	0.42	0.28	0.05	0.05	0.17	0.07
2002	0.07	0.47	0.00	0.02	0.02	0.37
2003	0.18	0.32	0.00	0.00	0.06	0.20
2004	0.29	0.05	0.05	0.00	0.13	0.02
2005	0.08	0.08	0.01	0.02	0.03	0.03
2006	0.15	0.35	0.05	0.06	0.05	0.19
2007	0.05	0.12	0.00	0.02	0.02	0.06
2008	0.11	0.32	0.00	0.01	0.06	0.25
2009	0.67	0.20	0.05	0.02	0.22	0.11
2010	0.23	0.30	0.04	0.03	0.08	0.17
2011	0.21	0.37	0.00	0.04	0.08	0.11
2012	0.52	0.06	0.02	0.02	0.23	0.02

(WD = Weekday; WE = Weekend)

Table A51. CNMI boat-based survey days allocated by quarter, port, and day type

		Q1		Q2		Q3		Q4		
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
Sugar Dock	2000	-	-	3	2	2	2	3	2	14
	2001	3	3	3	3	3	2	3	3	23
	2002	3	3	2	3	3	2	4	3	23
	2003	5	2	6	3	6	2	5	3	32
	2004	3	2	6	3	2	4	3	3	26
	2005	5	3	3	3	3	3	4	3	27
	2006	3	3	2	3	3	3	1	2	20
	2007	3	2	3	3	3	1	1	2	18
	2008	3	2	3	1	-	3	3	2	17
	2009	3	3	2	2	3	2	2	3	20
	2010	3	1	3	2	2	4	1	2	18
	2011	2	2	3	3	2	2	3	3	20
	2012	3	3	3	3	2	3	3	2	22
Fishing Base	2000	-	-	3	2	2	3	3	3	16
	2001	3	1	2	3	3	3	3	3	21
	2002	5	1	3	3	4	2	3	3	24
	2003	4	4	6	3	5	2	3	1	28
	2004	6	3	5	1	3	2	4	3	27
	2005	6	3	3	3	3	2	3	3	26
	2006	3	3	3	3	3	3	3	2	23
	2007	2	2	3	3	3	3	4	1	21
	2008	2	3	4	3	2	2	2	1	19
	2009	3	3	2	2	3	3	3	2	21
	2010	3	4	3	4	3	1	2	2	22
	2011	2	3	3	2	3	3	2	4	22
	2012	3	2	3	3	4	3	3	3	24
Smiling Cove	2000	-	-	3	2	3	3	2	1	14
	2001	3	3	3	2	4	1	3	3	22
	2002	3	3	3	3	4	2	4	3	25
	2003	5	2	4	4	4	3	2	4	28
	2004	3	3	5	2	2	1	6	2	24
	2005	8	2	2	3	3	3	2	2	25
	2006	4	2	3	3	3	3	3	3	24
	2007	3	2	3	3	3	2	2	3	21
	2008	3	2	2	1	2	2	3	3	18
	2009	3	3	2	2	3	3	3	1	20
	2010	1	2	3	3	2	2	5	-	18
	2011	3	2	3	3	3	3	3	2	22
	2012	3	4	3	3	3	3	3	3	25

Table A52. CNMI boat counts from boat-based participation count survey by quarter, port, and day type

		Q1		Q2		Q3		Q4		
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
Sugar Dock	2000	-	-	75	33	28	30	29	35	230
	2001	39	36	41	36	42	19	38	33	284
	2002	23	22	19	28	14	19	32	26	183
	2003	72	9	67	32	67	19	37	25	328
	2004	33	17	43	31	18	33	21	16	212
	2005	46	30	31	30	27	39	36	17	256
	2006	9	14	8	11	30	27	4	7	110
	2007	13	5	15	17	21	9	9	17	106
	2008	28	11	19	3	-	29	20	17	127
	2009	24	26	11	15	13	8	2	7	106
	2010	9	2	7	6	9	14	3	6	56
	2011	5	6	11	14	6	12	25	12	91
	2012	21	21	24	12	6	14	9	13	120
Fishing Base	2000	-	-	54	85	49	81	41	28	338
	2001	23	10	12	40	20	47	16	27	195
	2002	46	8	14	20	22	17	19	29	175
	2003	21	28	28	19	34	13	22	5	170
	2004	49	24	40	4	18	9	27	24	195
	2005	49	24	26	31	36	22	43	56	287
	2006	54	44	29	54	37	32	37	15	302
	2007	36	35	30	40	41	47	37	13	279
	2008	33	28	52	46	27	23	45	23	277
	2009	40	44	29	12	50	49	32	2	258
	2010	26	49	29	45	28	13	30	26	246
	2011	28	16	29	15	23	22	18	51	202
	2012	41	34	16	39	57	39	19	22	267
Smiling Cove	2000	-	-	67	58	29	45	21	7	227
	2001	34	51	34	14	51	12	28	32	256
	2002	24	29	29	21	34	28	25	18	208
	2003	34	10	26	32	36	26	17	39	220
	2004	24	26	46	43	20	14	78	16	267
	2005	88	25	16	50	48	66	26	24	343
	2006	58	21	52	63	42	71	41	50	398
	2007	46	43	28	39	42	31	27	41	297
	2008	47	26	21	12	25	22	32	45	230
	2009	44	62	27	20	43	61	17	18	292
	2010	14	24	32	30	20	25	50	-	195
	2011	23	19	27	35	31	49	32	10	226
	2012	19	42	20	36	29	31	30	20	227

Table A53. CNMI boat-based interviews by quarter, port, and day type

		Q1		Q2		Q3		Q4		
Port	**Year**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**Total**
Sugar Dock	2001	26	24	27	25	29	15	27	24	197
	2002	17	13	15	17	9	13	17	23	124
	2003	46	5	47	25	46	14	27	13	223
	2004	17	13	29	23	11	25	13	9	140
	2005	28	14	17	20	18	27	24	9	157
	2006	6	13	7	9	11	13	4	4	67
	2007	12	5	6	14	13	5	4	8	67
	2008	18	5	8	1	-	13	11	5	61
	2009	13	18	7	10	9	4	2	6	69
	2010	8	2	2	5	6	10	3	5	41
	2011	4	2	10	6	6	5	12	8	53
	2012	11	10	18	7	3	7	5	6	67
Fishing Base	2001	5	2	2	10	1	17	5	9	51
	2002	11	3	1	4	8	7	3	10	47
	2003	2	8	2	2	7	2	14	-	37
	2004	14	11	15	1	6	3	14	8	72
	2005	19	8	11	16	16	12	17	38	137
	2006	31	27	11	23	15	16	19	5	147
	2007	28	20	18	15	20	26	10	9	146
	2008	16	8	17	17	10	8	25	13	114
	2009	16	19	12	7	18	17	13	1	103
	2010	14	18	12	16	12	7	7	9	95
	2011	11	5	13	5	9	13	5	16	77
	2012	13	9	5	12	17	11	3	5	75
Smiling Cove	2001	9	10	-	5	5	4	2	2	37
	2002	12	4	5	-	10	11	7	4	53
	2003	21	2	16	1	14	5	8	12	79
	2004	11	2	11	17	9	7	15	4	76
	2005	27	11	13	27	15	26	24	9	152
	2006	38	3	22	19	15	23	10	20	150
	2007	21	20	6	6	10	4	8	10	85
	2008	9	5	9	2	11	5	7	5	53
	2009	6	19	7	7	32	12	5	3	91
	2010	1	3	47	20	1	2	27	5	106
	2011	29	11	40	18	8	9	4	2	121
	2012	4	6	-	4	-	7	2	2	25

Table A54. CNMI boat-based interviews by fishing method

	Number of interviews											
Fishing Method	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**
Trolling	215	163	278	211	294	222	220	193	141	115	105	129
Bottomfishing	50	40	34	53	124	103	95	71	106	116	132	18
Spear/snorkel	14	12	8	17	25	27	38	9	19	9	4	14
Atulai	2	1	17	7	1	11	7	19	8	1	1	2
Gillnet	2	5	-	-	-	-	-	1	-	-	-	-
Drag net	-	1	-	-	-	-	-	-	-	-	-	-
Octopus hooking	-	1	-	-	1	-	-	-	-	-	-	-
Surround net	-	1	-	-	-	-	-	-	-	-	-	-
Cast net	-	-	1	-	1	1	1	3	1	1	3	-
Spear/scuba	-	-	1	-	-	-	-	-	-	-	-	-
Shallow bottom	-	-	-	-	-	-	-	1	-	-	3	7
Hook & line	-	-	-	-	-	-	-	-	-	5	1	1
Deep bottomfish	-	-	-	-	-	-	-	-	-	-	2	5
Other	2	1	-	-	-	-	-	1	-	-	-	-
Unknown	-	-	-	-	-	-	-	-	-	-	-	1
Total	**285**	**225**	**339**	**288**	**446**	**364**	**361**	**298**	**275**	**247**	**251**	**177**

Table A55. CNMI boat-based interviews by port and fishing method

Port	Year	Trolling	Bottom Fishing	Spear/ Snorkel	Atulai	Other
Sugar Dock	2001	165	27	4	-	1
	2002	111	10	2	1	0
	2003	202	15	4	2	0
	2004	122	17	1	-	0
	2005	128	22	7	-	0
	2006	46	13	7	-	1
	2007	55	12	12	-	0
	2008	67	8	2	-	2
	2009	64	14	3	-	0
	2010	31	8	1	-	1
	2011	41	10	-	-	2
	2012	57	3	2	-	5
Fishing Base	2001	24	14	9	1	3
	2002	18	15	7	-	7
	2003	15	2	4	15	1
	2004	39	14	12	7	0
	2005	78	43	16	-	0
	2006	99	31	16	1	0
	2007	109	59	18	-	0
	2008	90	36	5	15	0
	2009	59	33	11	-	0
	2010	74	18	8	-	0
	2011	54	14	4	-	5
	2012	56	12	8	-	9
Smiling Cove	2001	26	9	1	1	0
	2002	33	15	3	-	2
	2003	61	17	-	-	1
	2004	50	22	4	-	0
	2005	88	59	2	1	2
	2006	77	59	4	10	0
	2007	56	24	8	7	1
	2008	36	27	2	4	4
	2009	18	59	5	8	1
	2010	10	90	-	1	5
	2011	10	108	-	1	2
	2012	16	3	4	2	0

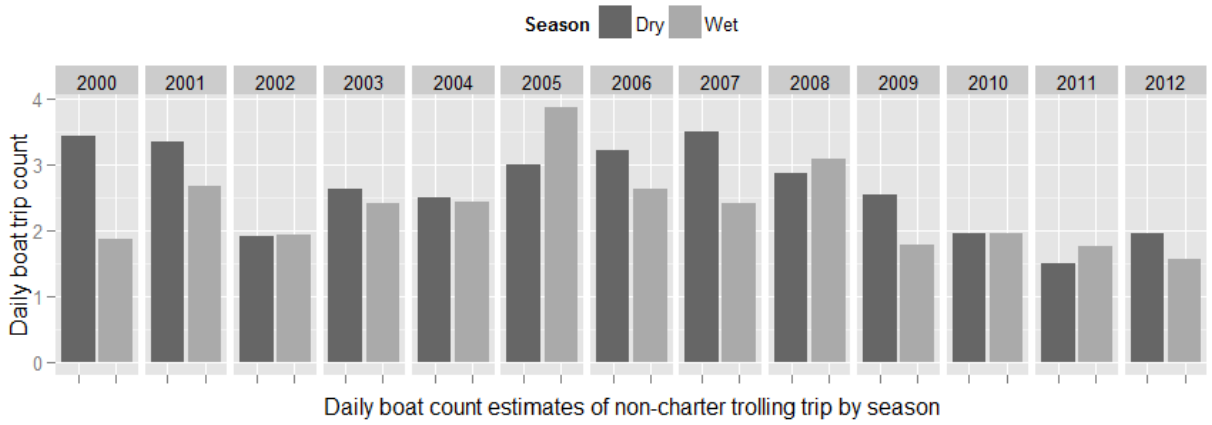

Figure A33. Daily boat count estimates for CNMI non-charter trolling trips by season

Table A56. Daily boat count estimates for CNMI non-charter trolling trips by season

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2000	72	43	21	23	3.4	1.9
2001	127	75	38	28	3.3	2.7
2002	78	60	41	31	1.9	1.9
2003	142	82	54	34	2.6	2.4
2004	123	68	49	28	2.5	2.4
2005	147	112	49	29	3.0	3.9
2006	122	76	38	29	3.2	2.6
2007	140	53	40	22	3.5	2.4
2008	92	68	32	22	2.9	3.1
2009	89	48	35	27	2.5	1.8
2010	76	43	39	22	1.9	2.0
2011	57	49	38	28	1.5	1.8
2012	80	47	41	30	2.0	1.6

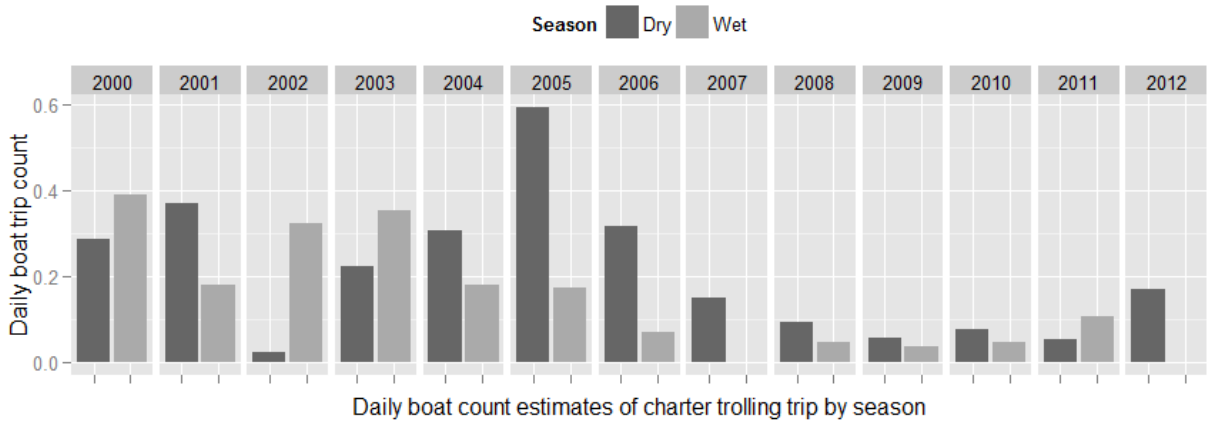

Figure A34. Daily boat count estimates for CNMI charter trolling trips by season

Table A57. Daily boat count estimates for CNMI charter trolling trips by season

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	Dry	Wet	Dry	Year	Dry	Wet
2000	6	9	21	23	0.3	0.4
2001	14	5	38	28	0.4	0.2
2002	1	10	41	31	0.0	0.3
2003	12	12	54	34	0.2	0.4
2004	15	5	49	28	0.3	0.2
2005	29	5	49	29	0.6	0.2
2006	12	2	38	29	0.3	0.1
2007	6	-	40	-	0.2	-
2008	3	1	32	22	0.1	0.0
2009	2	1	35	27	0.1	0.0
2010	3	1	39	22	0.1	0.0
2011	2	3	38	28	0.1	0.1
2012	7	-	41	-	0.2	-

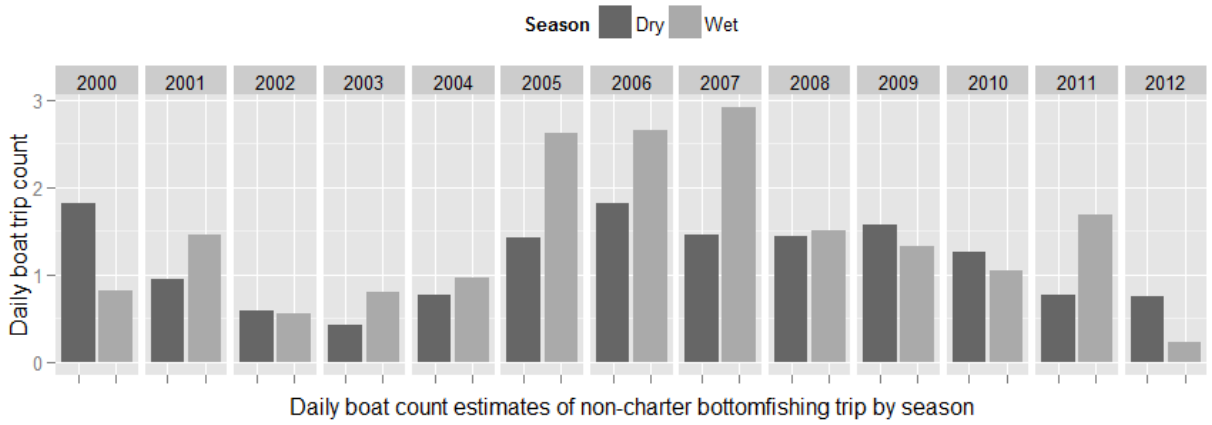

Figure A35. Daily boat count estimates for CNMI non-charter bottomfishing trips by season

Table A58. Daily boat count estimates for CNMI non-charter bottomfishing trips by season

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	Dry	Wet	Dry	Year	Dry	Wet
2000	38	19	21	23	1.8	0.8
2001	36	41	38	28	0.9	1.5
2002	24	17	41	31	0.6	0.5
2003	23	27	54	34	0.4	0.8
2004	38	27	49	28	0.8	1.0
2005	70	76	49	29	1.4	2.6
2006	69	77	38	29	1.8	2.7
2007	58	64	40	22	1.5	2.9
2008	46	33	32	22	1.4	1.5
2009	55	36	35	27	1.6	1.3
2010	49	23	39	22	1.3	1.0
2011	29	47	38	28	0.8	1.7
2012	31	7	41	30	0.8	0.2

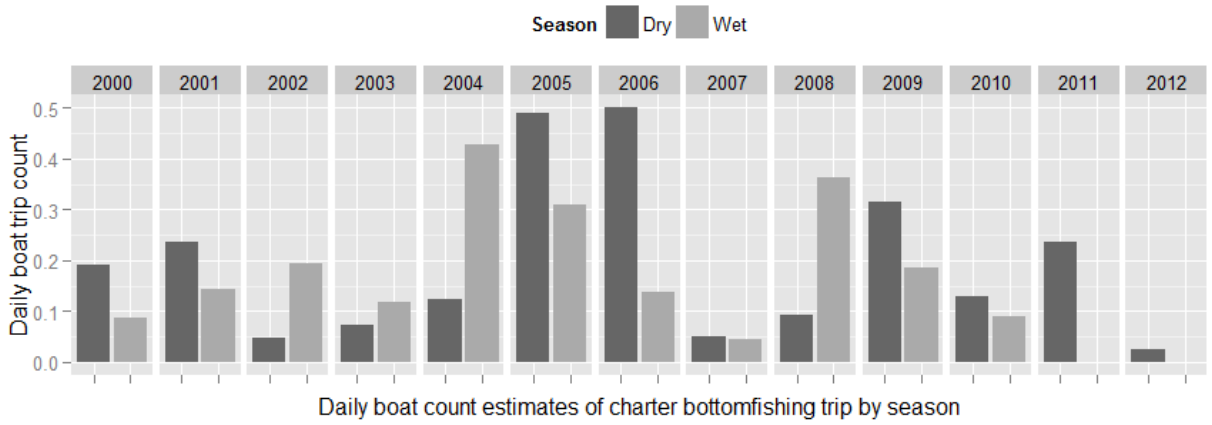

Figure A36. Daily boat count estimates for CNMI charter bottomfishing trips by season

Table A59. Daily boat count estimates for CNMI charter bottomfishing trips by season

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	Dry	Wet	Dry	Year	Dry	Wet
2000	4	2	21	23	0.2	0.1
2001	9	4	38	28	0.2	0.1
2002	2	6	41	31	0.0	0.2
2003	4	4	54	34	0.1	0.1
2004	6	12	49	28	0.1	0.4
2005	24	9	49	29	0.5	0.3
2006	19	4	38	29	0.5	0.1
2007	2	1	40	22	0.1	0.0
2008	3	8	32	22	0.1	0.4
2009	11	5	35	27	0.3	0.2
2010	5	2	39	22	0.1	0.1
2011	9	-	38	-	0.2	-
2012	1	-	41	-	0.0	-

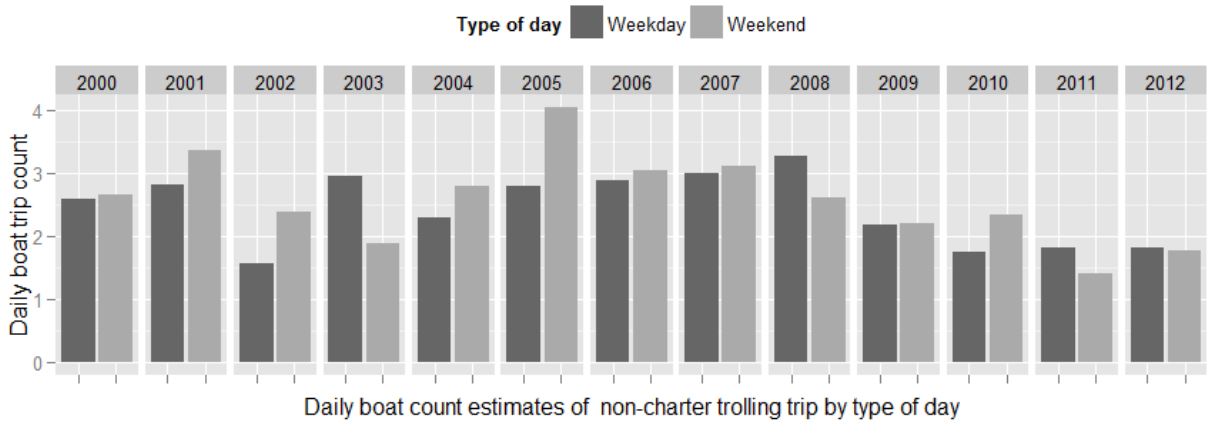

Figure A37. Daily boat count estimates for CNMI non-charter trolling trips by day type

Table A60. Daily boat count estimates for CNMI non-charter trolling trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2000	62	53	24	20	2.6	2.7
2001	101	101	36	30	2.8	3.4
2002	64	74	41	31	1.6	2.4
2003	162	62	55	33	2.9	1.9
2004	110	81	48	29	2.3	2.8
2005	126	133	45	33	2.8	4.0
2006	98	100	34	33	2.9	3.0
2007	99	84	33	27	3.0	3.1
2008	95	65	29	25	3.3	2.6
2009	70	64	32	29	2.2	2.2
2010	54	63	31	27	1.7	2.3
2011	58	45	32	32	1.8	1.4
2012	65	62	36	35	1.8	1.8

WD : Weekday; WK: Weekend

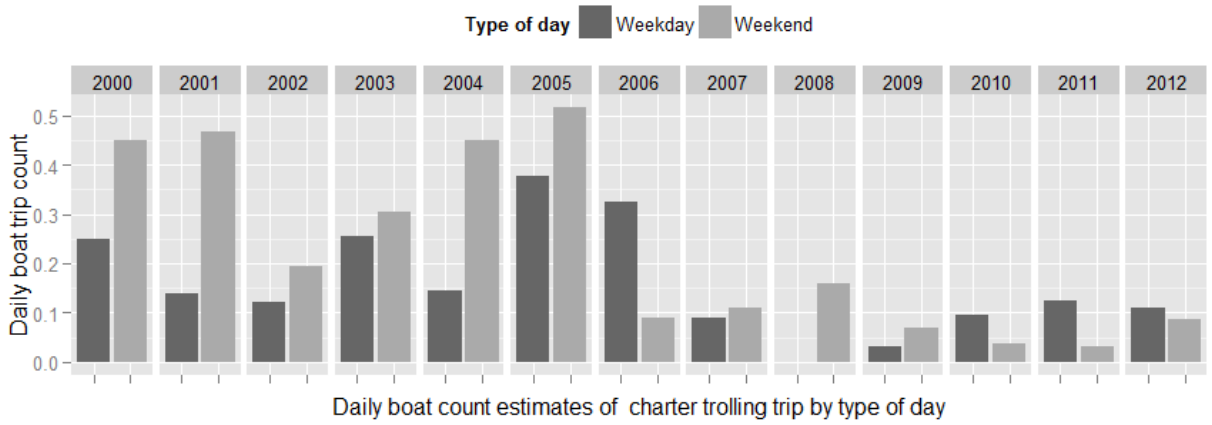

Figure A38. Daily boat count estimates for CNMI charter trolling by day type

Table A61. Daily boat count estimates for CNMI charter trolling trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2000	6	9	24	20	0.3	0.5
2001	5	14	36	30	0.1	0.5
2002	5	6	41	31	0.1	0.2
2003	14	10	55	33	0.3	0.3
2004	7	13	48	29	0.1	0.4
2005	17	17	45	33	0.4	0.5
2006	11	3	34	33	0.3	0.1
2007	3	3	33	27	0.1	0.1
2008	-	4	-	25	-	0.2
2009	1	2	32	29	0.0	0.1
2010	3	1	31	27	0.1	0.0
2011	4	1	32	32	0.1	0.0
2012	4	3	36	35	0.1	0.1

WD : Weekday; WE: Weekend

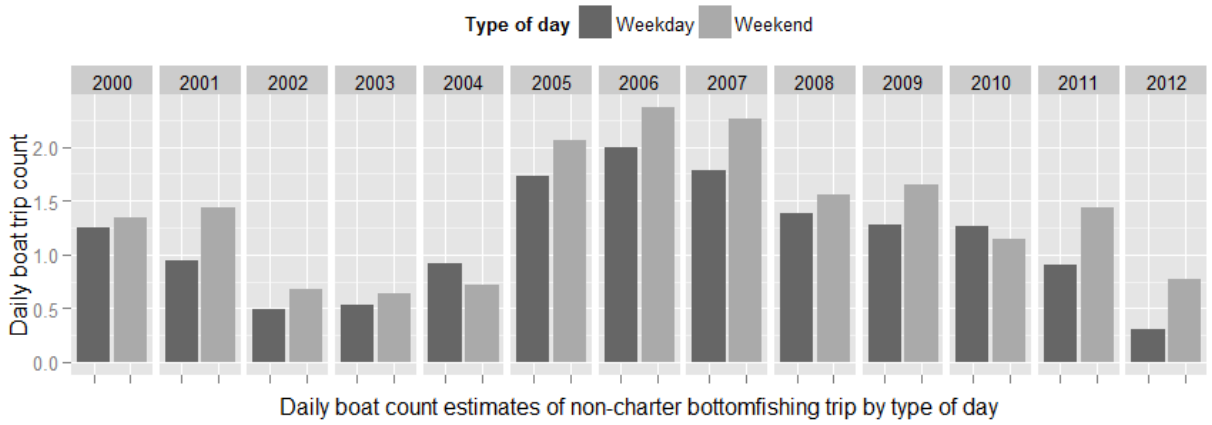

Figure A39. Daily boat count estimates for CNMI non-charter bottomfishing trips by day type

Table A62. Daily boat count estimates for CNMI non-charter bottomfishing trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2000	30	27	24	20	1.3	1.4
2001	34	43	36	30	0.9	1.4
2002	20	21	41	31	0.5	0.7
2003	29	21	55	33	0.5	0.6
2004	44	21	48	29	0.9	0.7
2005	78	68	45	33	1.7	2.1
2006	68	78	34	33	2.0	2.4
2007	59	61	33	27	1.8	2.3
2008	40	39	29	25	1.4	1.6
2009	41	48	32	29	1.3	1.7
2010	39	31	31	27	1.3	1.1
2011	29	46	32	32	0.9	1.4
2012	11	27	36	35	0.3	0.8

WD : Weekday; WE: Weekend

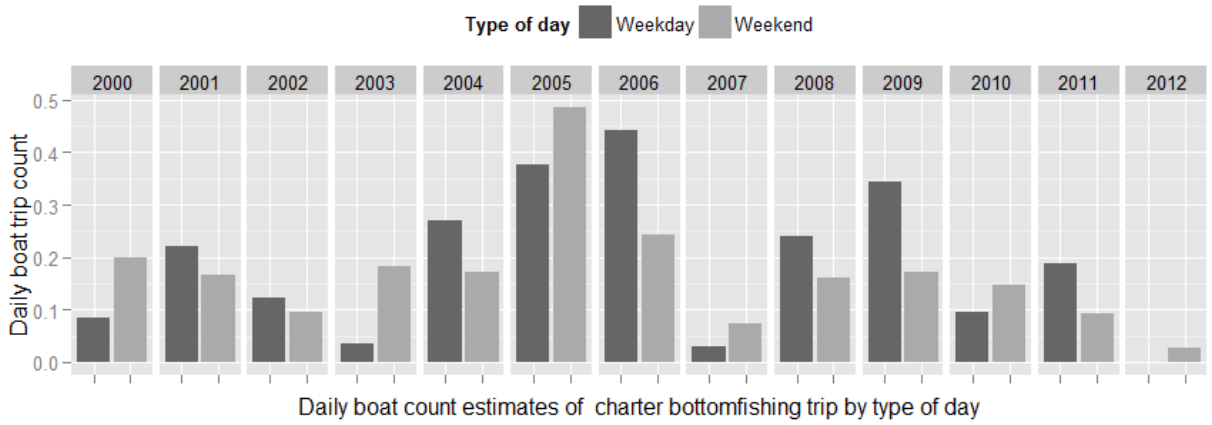

Figure A40. Daily boat count estimates for CNMI charter bottomfishing trips by day type

Table A63. Daily boat count estimates for CNMI charter bottomfishing trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2000	2	4	24	20	0.1	0.2
2001	8	5	36	30	0.2	0.2
2002	5	3	41	31	0.1	0.1
2003	2	6	55	33	0.0	0.2
2004	13	5	48	29	0.3	0.2
2005	17	16	45	33	0.4	0.5
2006	15	8	34	33	0.4	0.2
2007	1	2	33	27	0.0	0.1
2008	7	4	29	25	0.2	0.2
2009	11	5	32	29	0.3	0.2
2010	3	4	31	27	0.1	0.1
2011	6	3	32	32	0.2	0.1
2012	-	1	-	35	-	0.0

WD : Weekday; WE: Weekend

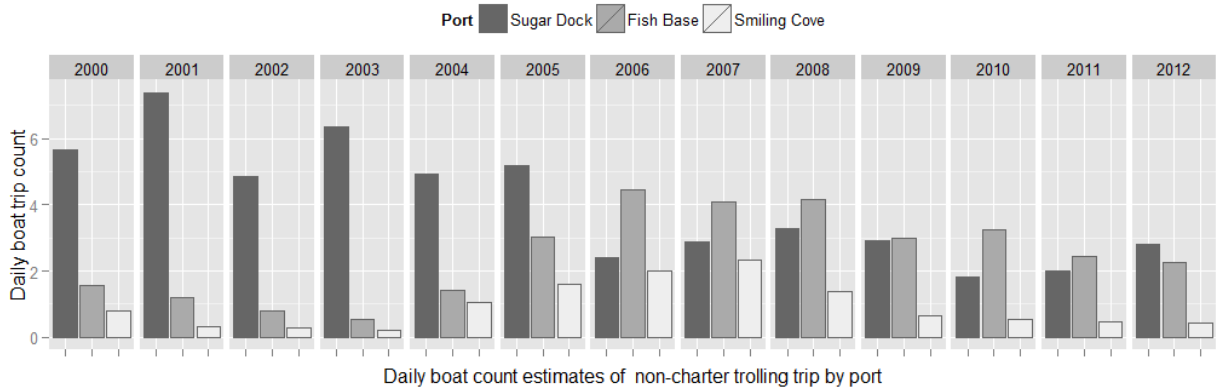

Figure A41. Daily boat count estimates for CNMI non-charter trolling trips by port

Table A64. Daily boat count estimates for CNMI non-charter trolling trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2000	79	25	11	14	16	14	5.6	1.6	0.8
2001	170	25	7	23	21	22	7.4	1.2	0.3
2002	112	19	7	23	24	25	4.9	0.8	0.3
2003	203	15	6	32	28	28	6.3	0.5	0.2
2004	128	38	25	26	27	24	4.9	1.4	1.0
2005	140	79	40	27	26	25	5.2	3.0	1.6
2006	48	102	48	20	23	24	2.4	4.4	2.0
2007	52	90	51	18	22	22	2.9	4.1	2.3
2008	56	79	25	17	19	18	3.3	4.2	1.4
2009	61	63	13	21	21	20	2.9	3.0	0.7
2010	33	75	10	18	23	19	1.8	3.3	0.5
2011	40	56	10	20	23	22	2.0	2.4	0.5
2012	62	54	11	22	24	25	2.8	2.3	0.4

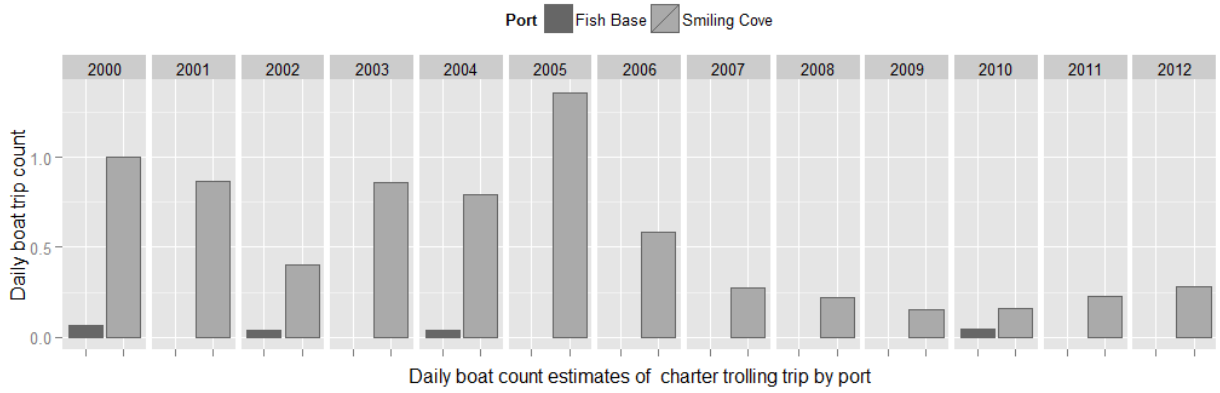

Figure A42. Daily boat count estimates for CNMI charter trolling trips by port

Table A65. Daily boat count estimates for CNMI charter trolling trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2000	-	1	14	-	16	14	-	0.1	1.0
2001	-	-	19	-	-	22	-	-	0.9
2002	-	1	10	-	24	25	-	0.0	0.4
2003	-	-	24	-	-	28	-	-	0.9
2004	-	1	19	-	27	24	-	0.0	0.8
2005	-	-	34	-	-	25	-	-	1.4
2006	-	-	14	-	-	24	-	-	0.6
2007	-	-	6	-	-	22	-	-	0.3
2008	-	-	4	-	-	18	-	-	0.2
2009	-	-	3	-	-	20	-	-	0.2
2010	-	1	3	-	23	19	-	0.0	0.2
2011	-	-	5	-	-	22	-	-	0.2
2012	-	-	7	-	-	25	-	-	0.3

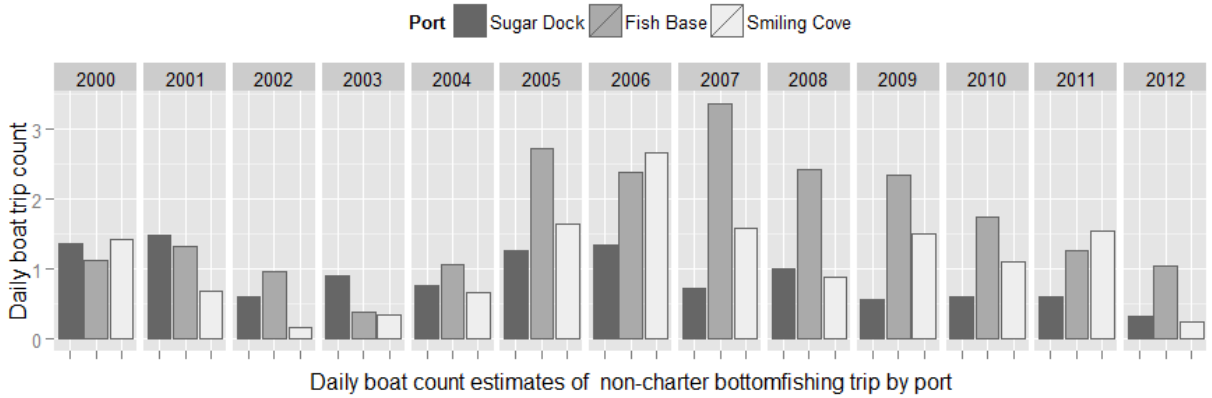

Figure A43. Daily boat count estimates for CNMI non-charter bottomfishing trips by port

Table A66. Daily boat count estimates for CNMI charter non-bottomfishing trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2000	19	18	20	14	16	14	1.4	1.1	1.4
2001	34	28	15	23	21	22	1.5	1.3	0.7
2002	14	23	4	23	24	25	0.6	1.0	0.2
2003	29	11	10	32	28	28	0.9	0.4	0.4
2004	20	29	16	26	27	24	0.8	1.1	0.7
2005	34	71	41	27	26	25	1.3	2.7	1.6
2006	27	55	64	20	23	24	1.4	2.4	2.7
2007	13	74	35	18	22	22	0.7	3.4	1.6
2008	17	46	16	17	19	18	1.0	2.4	0.9
2009	12	49	30	21	21	20	0.6	2.3	1.5
2010	11	40	21	18	23	19	0.6	1.7	1.1
2011	12	29	34	20	23	22	0.6	1.3	1.5
2012	7	25	6	22	24	25	0.3	1.0	0.2

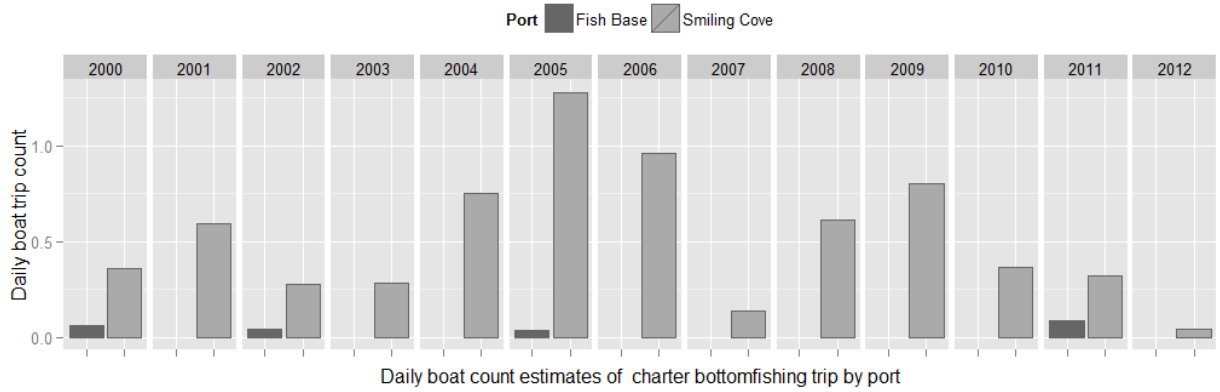

Figure A44. Daily boat count estimates for CNMI charter bottomfishing trips by port

Table A67. Daily boat count estimates for CNMI charter bottomfishing trips by port

	Actual boat counts			Number of survey days			Daily boat count estimates		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2000	-	1	5	-	16	14	-	0.1	0.4
2001	-	-	13	-	-	22	-	-	0.6
2002	-	1	7	-	24	25	-	0.0	0.3
2003	-	-	8	-	-	28	-	-	0.3
2004	-	-	18	-	-	24	-	-	0.8
2005	-	1	32	-	26	25	-	0.0	1.3
2006	-	-	23	-	-	24	-	-	1.0
2007	-	-	3	-	-	22	-	-	0.1
2008	-	-	11	-	-	18	-	-	0.6
2009	-	-	16	-	-	20	-	-	0.8
2010	-	-	7	-	-	19	-	-	0.4
2011	-	2	7	-	23	22	-	0.1	0.3
2012	-	-	1	-	-	25	-	-	0.0

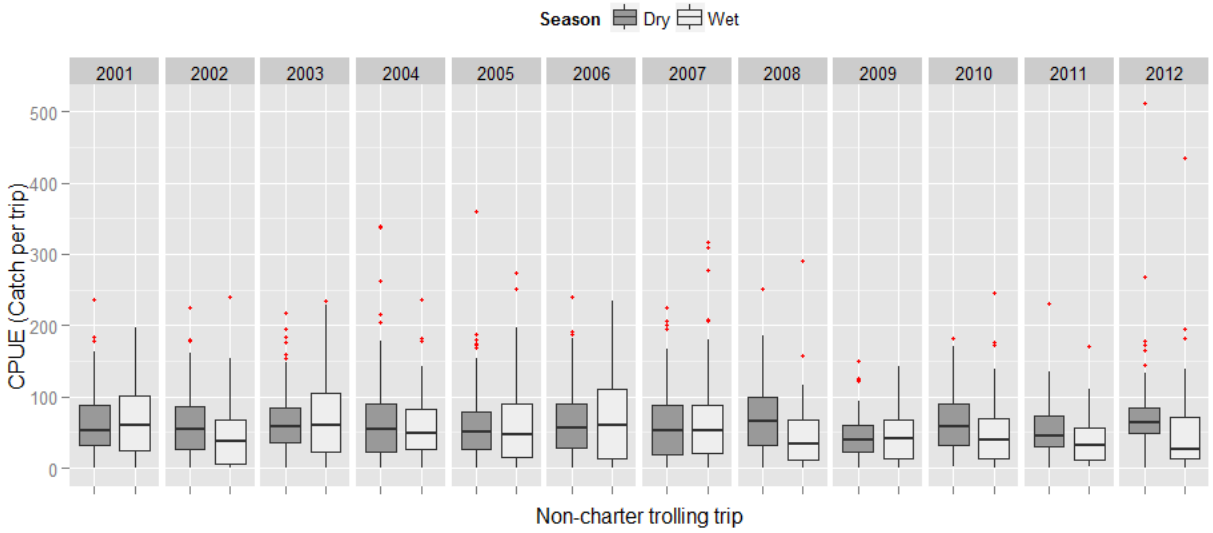

Figure A45. Boxplot of CPUE (kg/trip) for CNMI non-charter trolling trips by season

Table A68. CPUE summary statistics for CNMI non-charter trolling trips by season

	Mean		Median		Standard Deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	61.7	67.9	53.3	59.8	42.6	51.1
2002	63.5	44.4	54.3	37.4	47.5	46.2
2003	63.7	69.5	57.9	60.0	42.6	55.9
2004	64.4	57.6	55.1	49.5	60.6	48.9
2005	60.3	60.1	50.5	47.4	48.2	57.2
2006	65.1	70.1	57.4	60.1	45.9	61.5
2007	55.5	76.5	47.5	52.6	56.0	78.3
2008	59.3	34.8	50.6	20.9	51.5	44.9
2009	43.6	43.3	39.3	41.7	31.2	34.3
2010	62.2	53.1	58.8	39.4	39.0	53.6
2011	53.7	39.1	44.9	31.4	40.6	34.0
2012	71.9	55.1	63.5	27.0	68.5	76.1

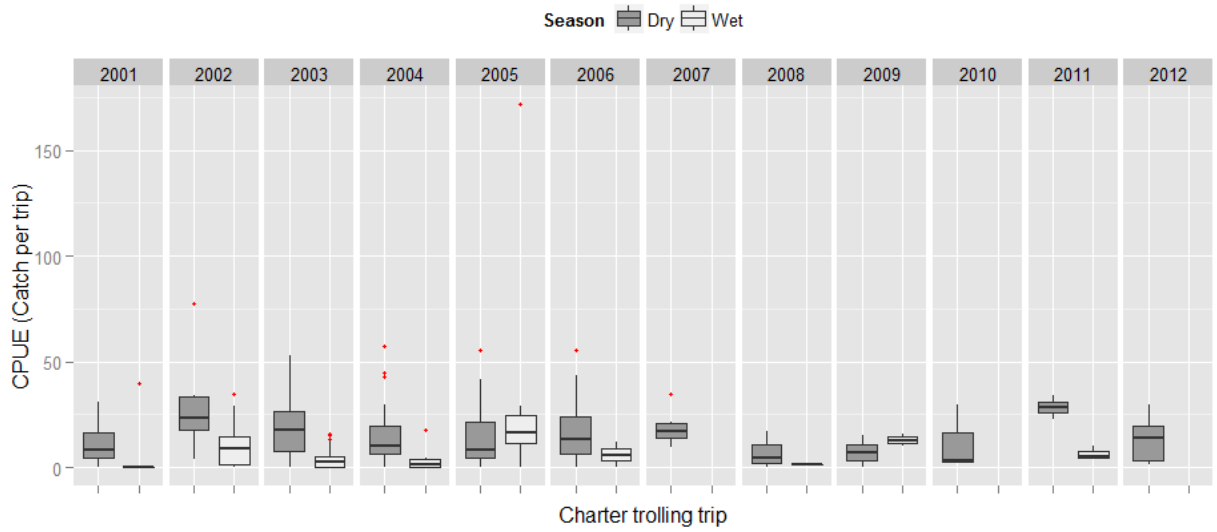

Figure A46. Boxplot of CPUE (kg/trip) for CNMI charter trolling trips by season

Table A69. CPUE summary statistics for CNMI charter trolling trips by season

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	12.1	8.0	8.6	0.0	11.0	17.8
2002	28.0	10.4	23.3	9.1	19.7	10.2
2003	19.5	4.6	17.6	2.8	13.5	5.6
2004	16.1	4.2	10.0	1.6	16.6	6.7
2005	14.0	32.0	8.4	16.2	13.6	53.1
2006	16.4	6.1	13.5	6.1	13.3	8.6
2007	14.8	-	14.7	-	10.6	-
2008	7.2	3.7	4.3	1.4	9.0	5.3
2009	7.4	12.9	7.1	12.9	7.6	3.9
2010	11.6	-	3.2	-	15.7	-
2011	28.5	6.6	28.5	5.1	7.8	3.2
2012	12.9	-	14.0	-	11.1	-

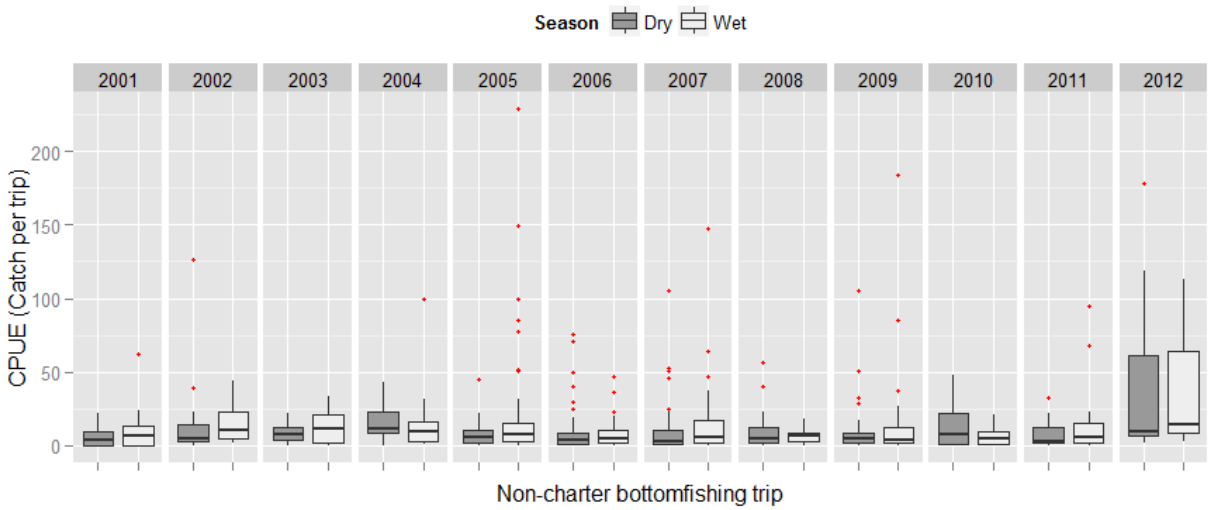

Figure A47. Boxplot of CPUE (kg/trip) for CNMI non-charter bottomfishing trips by season

Table A70. CPUE summary statistics for CNMI non-charter bottomfishing trips by season

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	5.9	9.9	3.8	6.6	6.5	13.7
2002	16.2	16.1	4.6	10.3	31.2	14.1
2003	9.0	12.7	7.5	11.9	7.5	12.0
2004	15.9	16.0	11.3	9.3	10.6	23.1
2005	8.3	20.4	5.5	7.6	9.5	40.2
2006	10.3	8.2	3.5	5.0	17.8	9.8
2007	8.2	14.6	1.6	5.7	17.6	27.1
2008	7.7	6.2	2.7	6.0	12.0	4.7
2009	8.9	18.4	4.6	3.9	17.6	40.6
2010	14.0	6.7	8.0	4.4	15.4	7.3
2011	8.7	14.3	2.9	6.0	10.4	23.2
2012	31.0	43.5	6.6	14.6	56.1	60.8

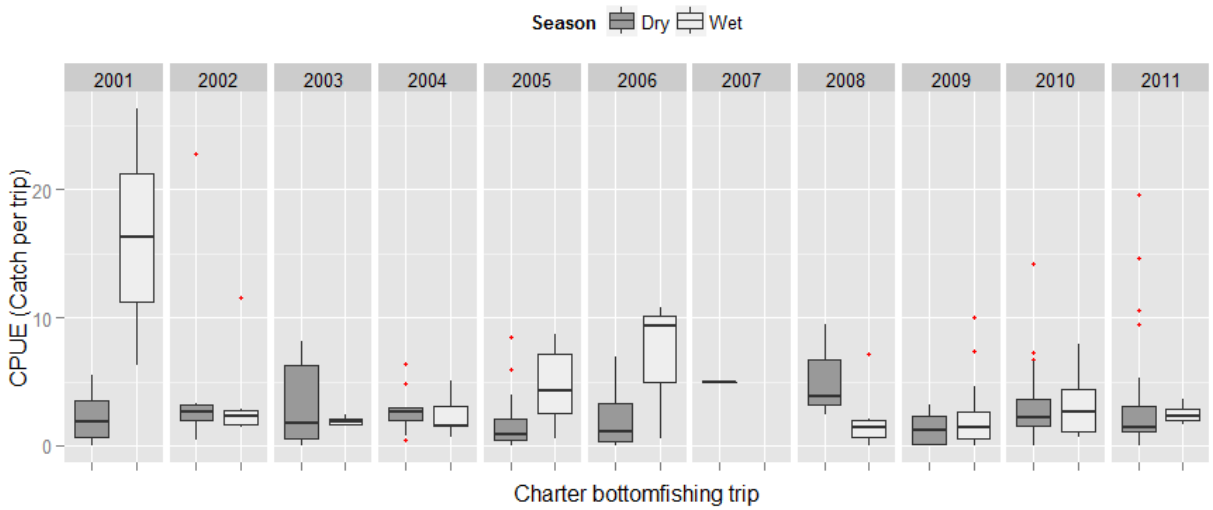

Figure A48. Boxplot of CPUE (kg/trip) for CNMI charter bottomfishing trips by season

Table A71. CPUE summary statistics for CNMI charter bottomfishing trips by season

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	2.3	16.3	1.9	16.3	2.4	14.2
2002	5.6	3.7	2.6	2.3	8.5	3.9
2003	3.3	1.9	1.7	1.8	3.2	0.4
2004	2.8	2.4	2.6	1.6	1.9	1.6
2005	1.6	4.8	0.9	4.3	2.0	2.8
2006	2.2	6.9	1.1	9.4	2.4	5.6
2007	5.0	-	5.0	-	-	-
2008	5.3	1.2	3.9	0.0	3.7	1.9
2009	1.4	2.2	1.2	1.5	1.2	2.4
2010	2.9	2.9	2.2	2.7	2.3	2.1
2011	2.3	2.5	1.5	2.3	2.8	0.7
2012	-	-	-	-	-	-

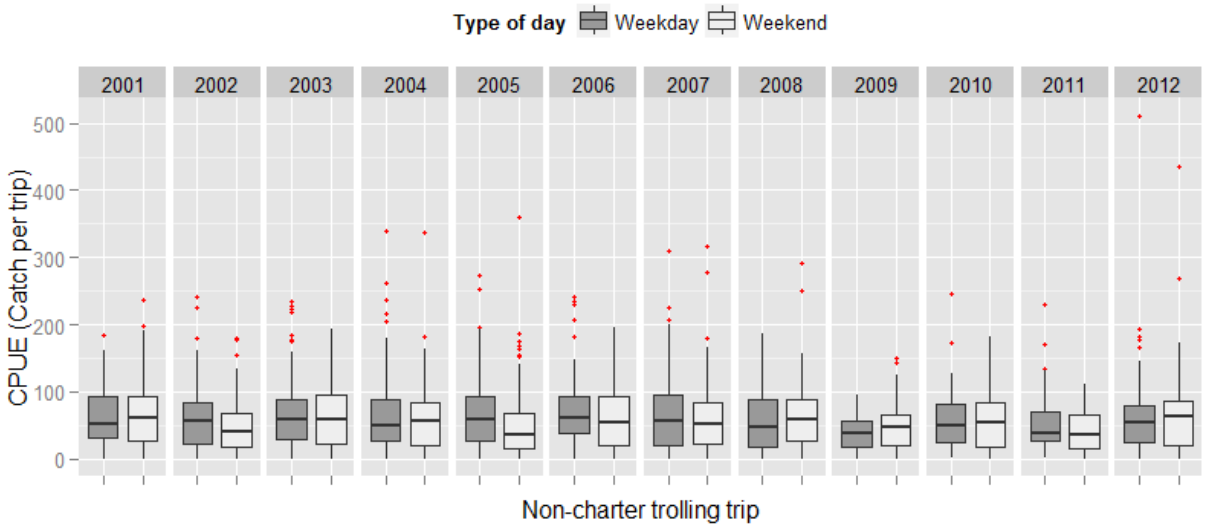

Figure A49. Boxplot of CPUE (kg/trip) for CNMI non-charter trolling trips by day type

Table A72. CPUE summary statistics for CNMI non-charter trolling trips by day type

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	62.4	65.6	52.2	61.8	40.3	51.2
2002	61.4	48.8	56.3	40.5	52.0	42.9
2003	67.1	62.4	58.8	59.4	48.5	46.2
2004	63.0	60.6	48.4	56.0	59.6	52.8
2005	69.7	51.4	57.6	36.8	51.5	51.9
2006	72.1	61.6	61.8	53.7	52.0	52.2
2007	66.9	60.6	56.2	51.0	58.4	58.3
2008	55.6	66.0	47.5	58.5	44.3	59.0
2009	40.5	48.3	37.4	46.2	25.9	36.6
2010	59.1	58.5	48.8	54.1	47.5	43.1
2011	51.7	40.9	37.1	36.2	43.5	28.9
2012	65.2	70.4	54.8	63.6	72.9	70.6

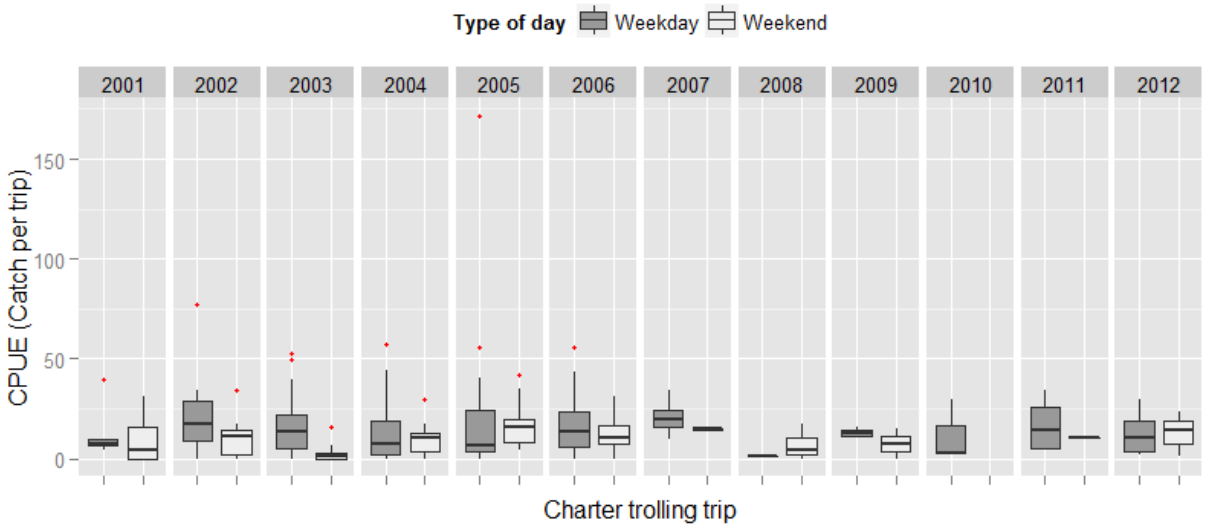

Figure A50. Boxplot of CPUE (kg/trip) for CNMI charter trolling trips by day type

Table A73. CPUE summary statistics for CNMI charter trolling trips by day type

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	13.5	10.1	7.5	4.5	14.8	12.3
2002	20.4	11.0	17.0	10.9	18.5	10.8
2003	16.2	3.0	13.5	0.9	13.4	5.0
2004	15.2	10.2	7.6	10.6	19.0	9.1
2005	18.1	16.2	6.4	15.5	31.7	10.7
2006	16.1	13.2	13.5	10.8	13.4	13.1
2007	20.9	14.7	19.9	14.7	10.3	1.7
2008	1.4	7.2	1.4	4.3	-	9.0
2009	12.9	7.4	12.9	7.1	3.9	7.6
2010	11.6	-	3.2	-	15.7	-
2011	16.6	10.3	14.0	10.3	14.4	-
2012	12.9	13.0	10.2	14.0	12.6	11.4

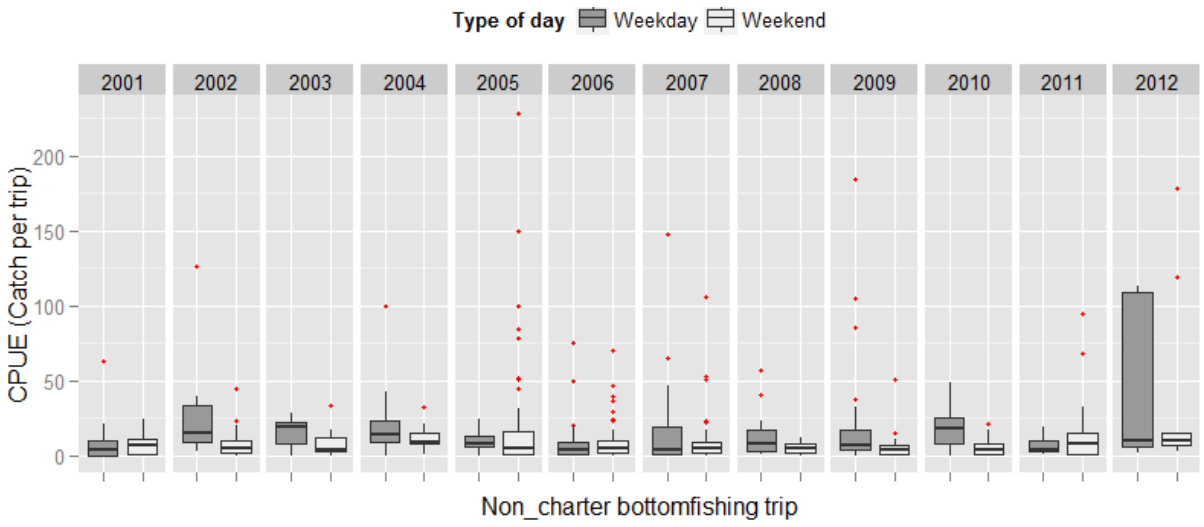

Figure A51. Boxplot of CPUE (kg/trip) for CNMI non-charter bottomfishing trips by day type

Table A74. CPUE summary statistics for CNMI non-charter bottomfish trips by day type

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	7.7	8.3	3.4	6.7	13.7	7.7
2002	26.2	8.7	14.8	4.7	33.9	11.5
2003	14.2	8.8	19.1	3.9	10.5	10.0
2004	19.1	11.7	13.6	9.2	21.8	8.1
2005	9.6	21.1	7.8	4.8	6.4	43.5
2006	8.3	10.1	4.2	4.3	14.9	14.2
2007	15.8	10.1	3.3	5.0	28.5	18.6
2008	12.8	5.1	7.4	5.0	14.9	3.7
2009	21.5	5.5	7.0	3.3	38.8	9.1
2010	19.6	5.2	18.2	3.5	16.2	6.2
2011	6.9	14.2	3.6	7.3	7.1	22.3
2012	47.9	39.5	9.6	9.4	57.9	63.8

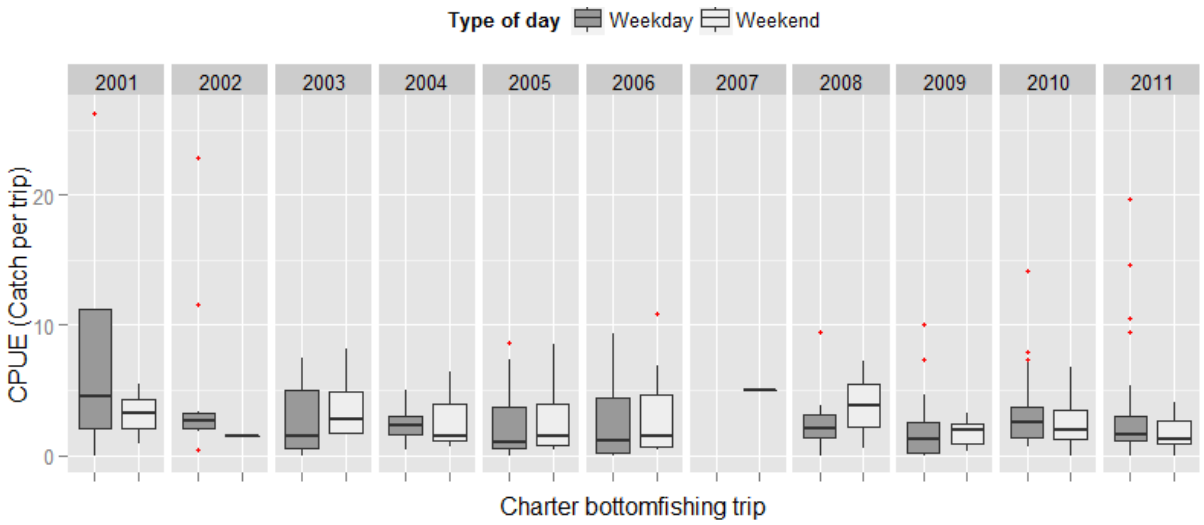

Figure A52. Boxplot of CPUE (kg/trip) for CNMI charter bottomfishing trips by day type

Table A75. CPUE summary statistics for CNMI charter bottomfishing trips by day type

	Mean		Median		Standard deviation	
Year	Dry	Wet	Dry	Wet	Dry	Wet
2001	8.8	3.2	4.5	3.2	11.9	3.2
2002	5.3	1.5	2.7	1.5	6.9	0.1
2003	2.7	3.9	1.5	2.8	2.9	3.1
2004	2.6	2.9	2.4	1.5	1.5	3.1
2005	2.4	2.8	1.0	1.5	2.6	2.8
2006	2.6	3.3	1.1	1.5	3.0	4.0
2007	-	5.0	-	5.0	-	-
2008	3.0	3.9	2.1	3.9	3.1	4.7
2009	2.0	1.8	1.2	1.9	2.4	1.0
2010	3.0	2.6	2.6	1.9	2.3	2.0
2011	2.6	1.7	1.7	1.3	3.1	1.2
2012	-	-	-	-	-	-

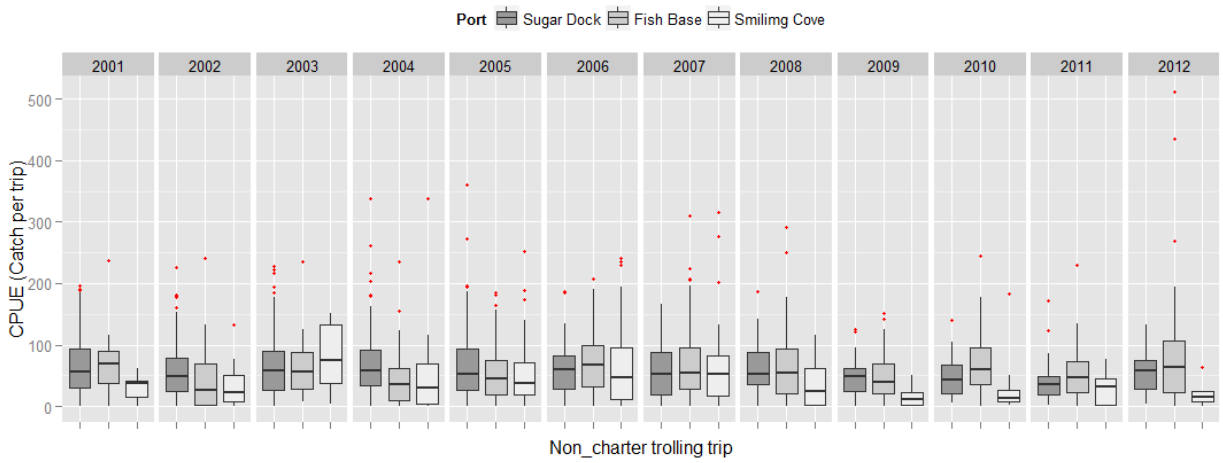

Figure A53. Boxplot of CPUE (kg/trip) for CNMI non-charter trolling trips by port

Table A76. CPUE summary statistics for CNMI non-charter trolling trips by port

	Mean			Median			Standard Deviation		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2001	64.9	67.7	30.7	56.0	69.8	38.0	49.7	45.6	22.5
2002	56.9	48.3	38.3	48.3	27.1	22.6	63.1	45.5	45.4
2003	65.2	68.0	80.0	58.5	57.2	74.8	58.6	46.8	61.0
2004	69.5	47.4	48.4	59.0	35.3	30.3	48.9	55.1	68.1
2005	67.6	50.6	55.4	53.4	45.3	38.3	43.3	55.7	55.4
2006	61.7	70.4	65.1	59.1	68.0	46.1	47.6	43.6	67.4
2007	54.7	62.5	62.0	49.2	45.3	53.2	68.8	43.4	65.7
2008	49.6	55.4	25.7	43.3	41.2	8.5	57.0	43.7	32.7
2009	44.7	48.0	16.8	48.4	39.6	10.8	34.6	29.9	16.6
2010	47.9	65.8	36.8	43.8	59.1	13.7	46.5	32.7	60.7
2011	41.0	53.4	31.9	36.0	46.6	32.7	42.1	32.8	31.7
2012	57.3	82.4	19.0	59.0	60.7	15.3	96.8	32.8	18.6

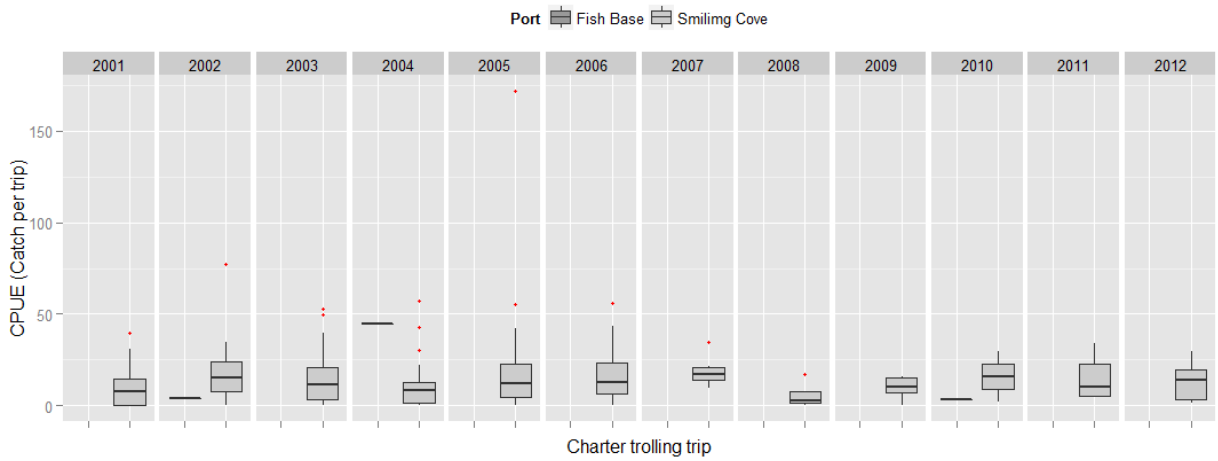

Figure A54. Boxplot of CPUE (kg/trip) for CNMI charter trolling trips by port

Table A77. CPUE summary statistics for CNMI charter trolling trips by port

	Mean			Median			Standard Deviation		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2001	-	-	11.0	-	-	7.5	-	-	12.7
2002	-	4.1	17.7	-	4.1	14.9	-	-	16.8
2003	-	-	13.8	-	-	11.4	-	-	13.3
2004	-	44.5	11.8	-	44.5	8.0	-	-	14.4
2005	-	-	17.4	-	-	11.7	-	-	26.3
2006	-	-	15.7	-	-	12.6	-	-	13.2
2007	-	-	14.8	-	-	14.7	-	-	10.6
2008	-	-	5.5	-	-	2.9	-	-	6.8
2009	-	-	9.6	-	-	10.2	-	-	6.5
2010	-	3.2	15.9	-	3.2	15.9	-	-	19.6
2011	-	-	15.3	-	-	10.3	-	-	12.8
2012	-	-	12.9	-	-	14.0	-	-	11.1

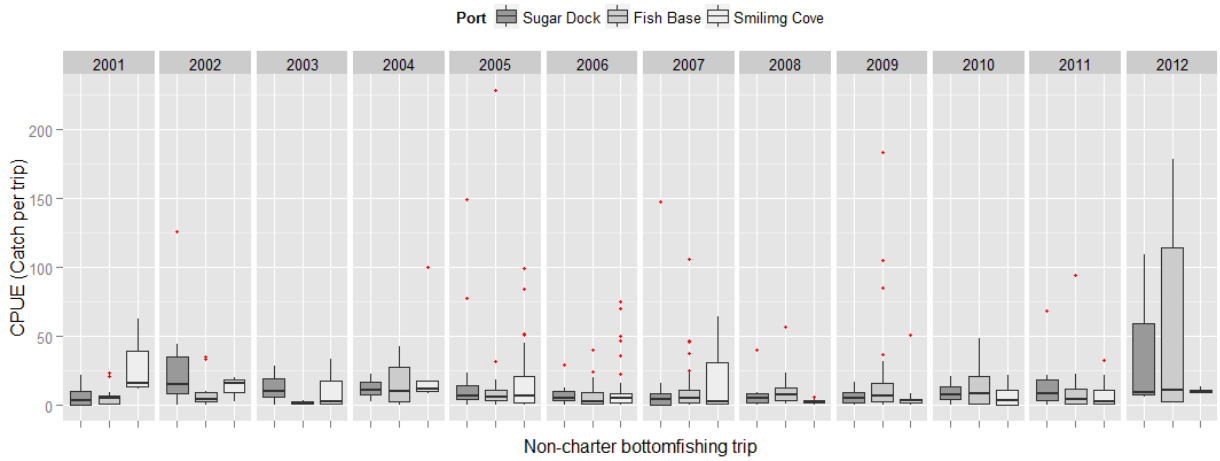

Figure A55. Boxplot of CPUE (kg/trip) for CNMI non-charter bottomfishing trips by port

Table A78. CPUE summary statistics for CNMI non-charter bottomfishing trips by port

	Mean			Median			Standard Deviation		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2001	6.3	6.6	29.9	3.8	5.4	15.8	7.4	7.1	28.4
2002	28.6	8.5	13.0	14.8	4.6	16.1	10.9	37.2	9.0
2003	12.4	1.5	12.0	10.3	1.5	2.5	2.2	8.9	18.7
2004	11.9	15.9	29.7	10.7	10.3	11.9	14.1	6.1	39.4
2005	17.6	12.7	19.6	6.6	5.6	7.2	34.8	33.7	28.0
2006	7.6	6.8	12.0	5.5	2.9	5.0	9.2	7.6	18.9
2007	16.5	9.3	11.0	4.2	3.2	1.1	16.6	41.7	19.8
2008	8.8	8.0	2.3	5.0	6.3	2.0	10.3	13.1	1.9
2009	4.1	19.8	5.4	1.3	7.0	3.3	37.4	5.7	10.7
2010	8.9	14.2	6.7	7.4	8.2	3.5	16.3	7.8	8.9
2011	14.9	12.8	9.0	8.1	4.1	2.9	24.4	20.2	11.1
2012	41.6	36.6	10.5	9.6	2.7	9.4	62.6	58.5	2.3

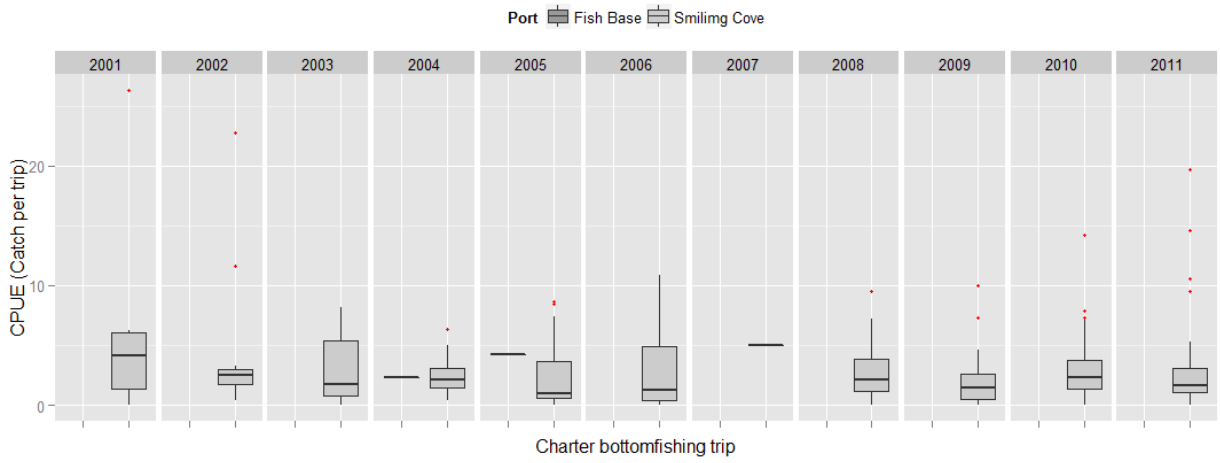

Figure A56. Boxplot of CPUE (kg/trip) for CNMI charter bottomfishing trips by port

Table A79. CPUE summary statistics for CNMI charter bottomfishing trips by port

	Mean			Median			Standard Deviation		
Year	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove	Sugar Dock	Fishing Base	Smiling Cove
2001	-	-	7.0	-	-	4.1	-	-	9.8
2002	-	-	4.6	-	-	2.5	-	-	6.4
2003	-	-	3.0	-	-	1.8	-	-	2.9
2004	-	2.4	2.6	-	2.4	2.1	-	-	1.8
2005	-	4.3	2.5	-	4.3	1.0	-	-	2.7
2006	-	-	2.8	-	-	1.3	-	-	3.2
2007	-	-	5.0	-	-	5.0	-	-	-
2008	-	-	1.9	-	-	0.8	-	-	2.7
2009	-	-	1.9	-	-	1.4	-	-	2.1
2010	-	-	2.9	-	-	2.3	-	-	2.2
2011	-	-	2.3	-	-	1.6	-	-	2.7

CNMI shore-based creel survey

Table A80. CNMI shore-based survey days by quarter and day type

	Q1		Q2		Q3		Q4		
Year	WD	WE	WD	WE	WD	WE	WD	WE	Total
2005	-	-	10	3	24	9	23	19	88
2006	23	18	24	21	24	16	35	19	180
2007	32	20	32	24	40	19	30	18	215
2008	39	24	32	15	31	12	29	19	201
2009	38	20	30	9	50	18	27	17	209
2010	29	11	41	13	37	11	35	23	200
2011	27	13	40	20	39	22	27	21	209
2012	27	16	28	16	29	13	32	15	176

Table A81. CNMI shore-based interviews by quarter and day type

	Q1		Q2		Q3		Q4		
Year	WD	WE	WD	WE	WD	WE	WD	WE	Total
2005	-	-	27	4	88	25	120	36	300
2006	150	86	79	77	172	105	97	79	845
2007	81	81	111	57	160	46	51	50	637
2008	109	77	143	52	216	49	157	132	935
2009	169	113	134	35	216	77	85	65	894
2010	65	17	88	30	95	8	64	36	403
2011	37	24	64	33	119	59	39	27	402
2012	28	22	24	8	73	27	44	14	240

Table A82. CNMI shore-based interviews by fishing method

Fishing method	2005	2006	2007	2008	2009	2010	2011	2012
Hook & Line	238	731	572	839	835	372	373	210
Spear/Snorkel	22	39	16	20	23	12	14	12
Cast Net	37	73	49	75	35	18	15	18
Gleaning	2	1	-	-	-	-	-	-
Octopus Hooking	1	1	-	-	1	-	-	-
Traps	-	-	-	1	-	1	-	-

Table A83. Total number of gears from CNMI shore-based participation count surveys by location

Location	2005	2006	2007	2008	2009	2010	2011	2012
3	-	-	-	-	-	-	2	-
4	94	133	158	87	145	81	107	100
5	139	427	518	451	266	112	207	144
6	102	175	206	121	89	68	82	71
7	70	245	240	313	137	72	140	82
8	148	342	427	397	314	157	133	75
9	20	89	75	131	109	30	28	7
10	58	190	128	166	122	40	52	42
11	81	318	255	290	247	90	113	59
12	135	390	421	343	293	108	149	86
13	57	181	180	115	75	45	52	50
14	169	251	328	398	402	86	227	123
15	114	290	213	235	203	83	64	58
16	61	148	102	178	111	51	102	50
17	84	301	190	303	118	48	189	41
18	109	308	414	504	387	178	190	161
19	88	223	311	203	98	57	43	56
22	-	-	-	4	-	-	-	-
23	107	189	158	311	119	52	145	80
24	105	199	211	367	233	141	196	53
25	74	140	130	114	94	44	67	32
26	54	86	108	139	82	47	34	30
27	26	94	18	34	24	8	13	9
28	35	73	5	16	6	1	6	4
29	103	219	187	172	101	43	55	39
30	29	103	98	104	50	15	33	14

Table A84. CNMI shore-based interviews by location

Location	2005	2006	2007	2008	2009	2010	2011	2012
1	-	-	-	2	1	3	1	-
3	-	-	-	1	1	4	-	1
4	31	32	5	7	21	9	30	23
5	14	65	59	78	64	34	27	26
6	5	8	9	7	8	7	9	9
7	10	28	14	27	18	12	22	18
8	51	119	93	93	104	63	42	16
9	1	8	9	20	19	4	4	2
10	12	40	20	25	28	9	10	1
11	14	56	51	84	72	42	22	7
12	14	78	49	72	66	20	24	14
13	10	44	46	20	23	17	13	17
14	43	91	68	120	177	37	63	29
15	10	68	33	53	67	10	13	6
16	8	23	14	14	12	8	14	10
17	9	23	16	26	3	3	-	-
18	9	62	54	126	126	60	46	26
19	3	16	15	27	12	11	8	6
20	-	-	-	-	-	-	1	-
23	16	33	36	53	21	12	29	11
24	14	10	17	33	23	22	17	6
25	4	7	1	6	3	2	2	2
26	10	10	7	14	16	4	4	7
27	-	-	-	-	1	-	-	-
28	3	1	2	2	-	-	-	1
29	5	18	16	17	5	4	-	-
30	3	5	3	5	2	-	1	2
36	-	-	-	-	1	6	-	-
50	-	-	-	2	-	-	-	-

Table A85. Total number of gears from CNMI shore-based participation count survey by fishing method

Fishing method	2005	2006	2007	2008	2009	2010	2011	2012
Hook &Line	1633	4020	4016	4681	3302	1274	1984	1143
Spear/Snorkel	253	650	648	400	306	206	152	171
Cast Net	169	397	328	347	203	140	228	139
Gill Net	1	3	30	40	-	26	46	-
Gleaning	6	35	44	10	8	2	-	-
-	0	8	15	8	4	3	18	13
Surround Net	-	1	-	1	-	-	-	-
Unknown	-	-	0	-	-	-	1	-
Octopus Hooking	-	-	-	4	-	-	-	-
Traps	-	-	-	5	2	6	-	-
Total	2062	5114	5081	5496	3825	1657	2429	1466

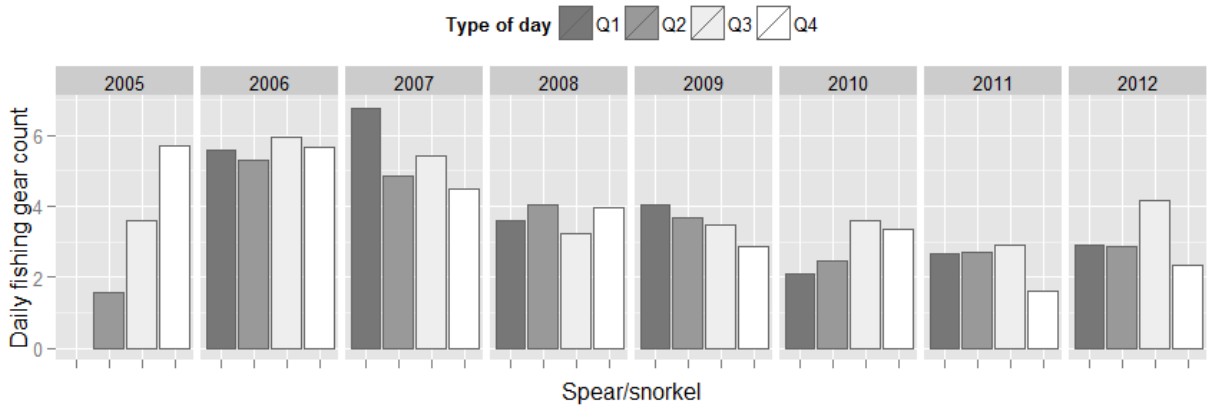

Figure A57. Daily gear count estimates for CNMI spear/snorkel by quarter

Table A86. Daily gear counts for CNMI spear/snorkel from shore-based participation count survey, by quarter

	Observed gear counts in fishing				Survey days				Daily gear count estimates used in fishing			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
2005	-	11	54	188	-	13	33	41	-	0.8	1.6	4.6
2006	128	175	149	198	41	45	39	54	3.1	3.9	3.8	3.7
2007	230	184	135	99	52	56	57	45	4.4	3.3	2.4	2.2
2008	122	109	74	95	62	47	43	48	2.0	2.3	1.7	2.0
2009	109	81	73	43	58	39	67	43	1.9	2.1	1.1	1.0
2010	25	49	72	60	40	54	48	58	0.6	0.9	1.5	1.0
2011	32	43	58	19	39	60	60	48	0.8	0.7	1.0	0.4
2012	32	46	58	35	43	44	42	46	0.7	1.0	1.4	0.8

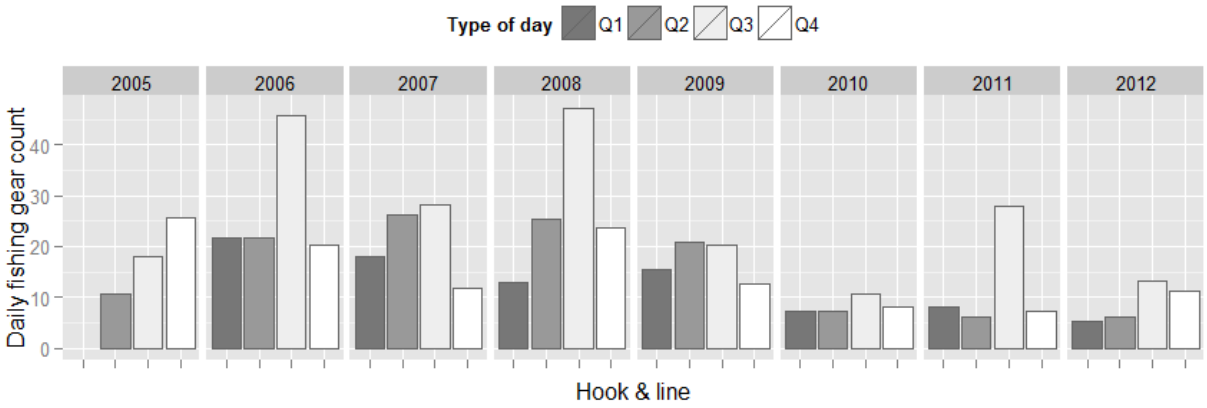

Figure A58. Daily gear count estimates for CNMI hook & line by quarter

Table A87. Daily gear counts for CNMI hook & line from shore-based participation count survey, by quarter

	Observed gear counts in fishing				Survey days				Daily gear count estimates used in fishing			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2005	-	105	580	948	-	13	33	41	-	8.1	17.6	23.1
2006	738	780	1552	950	41	45	39	54	18.0	17.3	39.8	17.6
2007	790	1265	1471	490	52	56	57	45	15.2	22.6	25.8	10.9
2008	730	1045	1890	1016	62	47	43	48	11.8	22.2	44.0	21.2
2009	853	792	1200	457	58	39	67	43	14.7	20.3	17.9	10.6
2010	206	278	448	342	40	54	48	58	5.2	5.1	9.3	5.9
2011	236	272	1227	249	39	60	60	48	6.1	4.5	20.5	5.2
2012	164	192	477	310	43	44	42	46	3.8	4.4	11.4	6.7

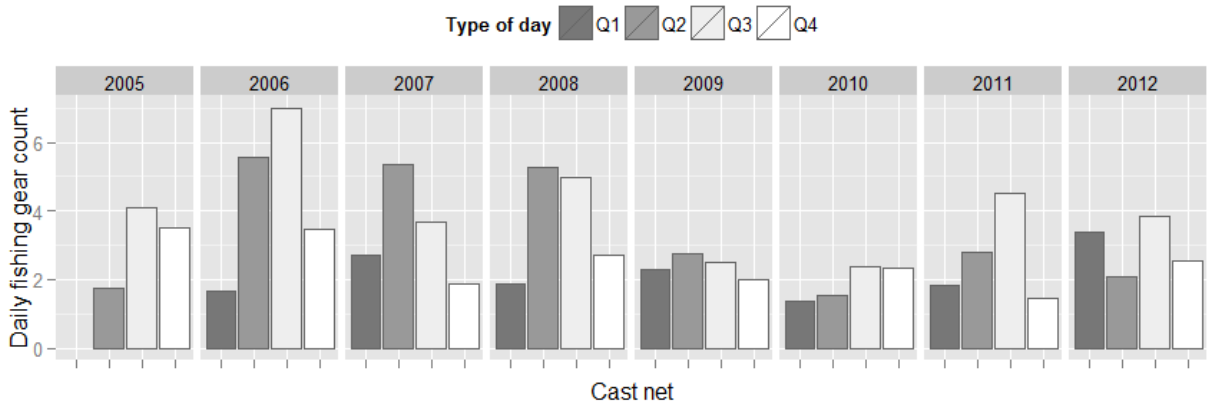

Figure A59. Daily gear count estimates for CNMI cast net by quarter

Table A88. Daily gear counts for CNMI cast net from shore-based participation count survey, by quarter

	Observed gear counts in fishing				Survey days				Daily gear count estimates used in fishing			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2005	-	7	78	84	-	13	33	41	-	0.5	2.4	2.0
2006	25	145	140	87	41	45	39	54	0.6	3.2	3.6	1.6
2007	49	134	106	39	52	56	57	45	0.9	2.4	1.9	0.9
2008	28	126	139	54	62	47	43	48	0.5	2.7	3.2	1.1
2009	39	72	78	14	58	39	67	43	0.7	1.8	1.2	0.3
2010	11	23	52	54	40	54	48	58	0.3	0.4	1.1	0.9
2011	11	59	145	13	39	60	60	48	0.3	1.0	2.4	0.3
2012	17	29	65	28	43	44	42	46	0.4	0.7	1.5	0.6

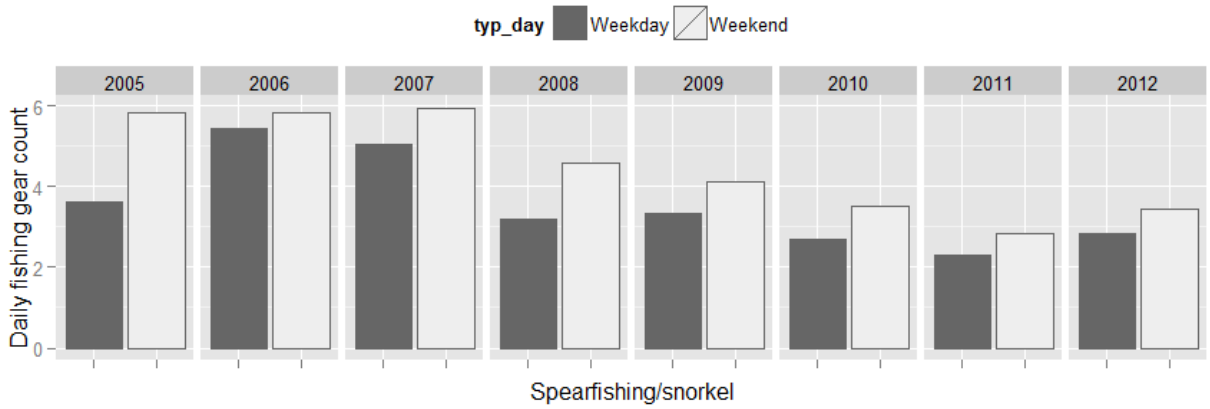

Figure A60. Daily gear count estimates for CNMI spear/snorkel fishing by day type

Table A89. Daily gear counts for CNMI spear/snorkel from shore-based participation count survey, by day type

	Observed gear counts in fishing		Survey days		Daily gear count estimates used in fishing	
Year	WD	WE	WD	WE	WD	WE
2005	119	134	57	31	2.1	4.3
2006	358	292	106	74	3.4	3.9
2007	357	291	134	81	2.7	3.6
2008	213	187	131	70	1.6	2.7
2009	187	119	145	64	1.3	1.9
2010	132	74	142	58	0.9	1.3
2011	76	76	133	76	0.6	1.0
2012	99	72	116	60	0.9	1.2

WD : Weekday; WK: Weekend

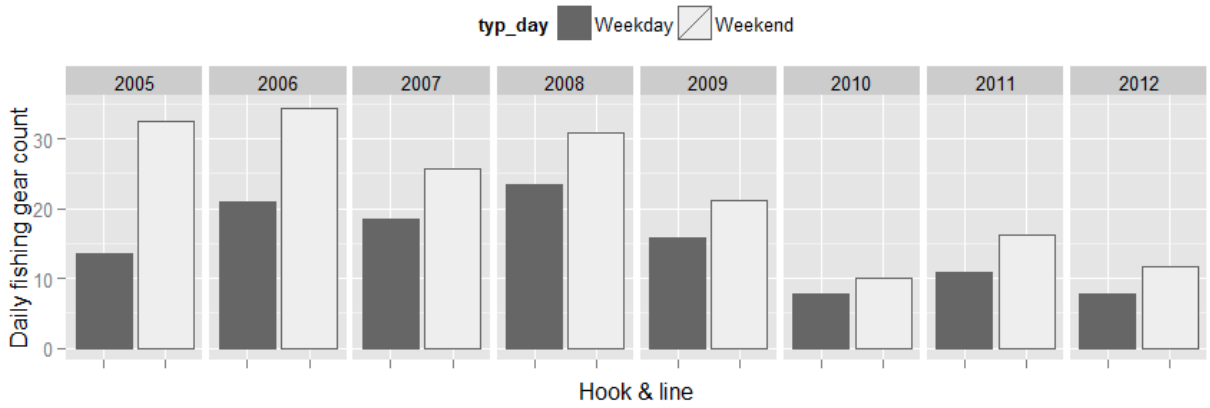

Figure A61. Daily gear count estimates for CNMI hook & line by day type

Table A90. Daily gear counts for CNMI hook & line from shore-based participation count survey, by day type

	Observed gear counts in fishing		Survey days		Daily gear count estimates used in fishing	
Year	WD	WE	WD	WE	WD	WE
2005	689	944	57	31	12.1	30.5
2006	1888	2132	106	74	17.8	28.8
2007	2135	1881	134	81	15.9	23.2
2008	2772	1909	131	70	21.2	27.3
2009	2078	1224	145	64	14.3	19.1
2010	817	457	142	58	5.8	7.9
2011	1007	977	133	76	7.6	12.9
2012	645	498	116	60	5.6	8.3

WD : Weekday; WK: Weekend

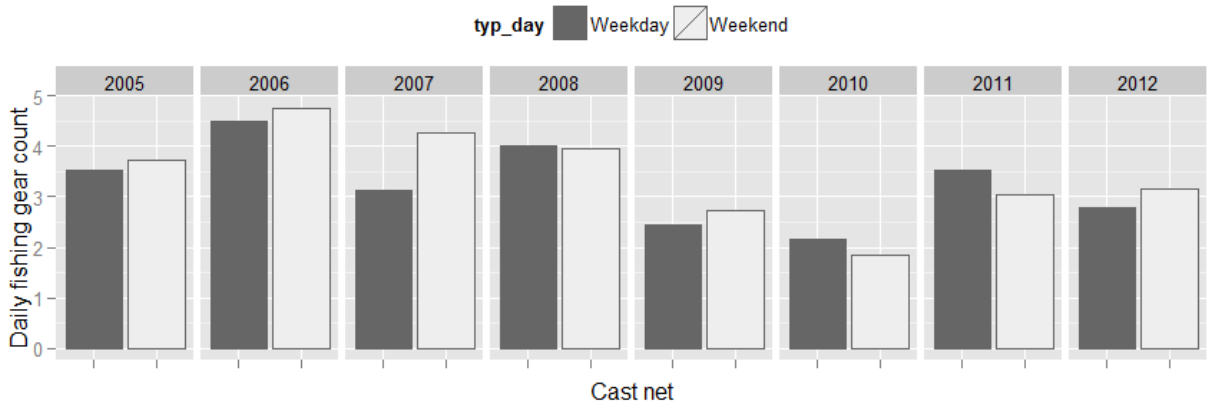

Figure A62. Daily gear count estimates for CNMI cast net by day type

Table A91. Daily gear counts for CNMI cast net from shore-based participation count survey, by day type

	Observed gear counts in fishing		Survey days		Daily gear count estimates used in fishing	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
2005	102	67	57	31	1.8	2.2
2006	216	181	106	74	2.0	2.4
2007	191	137	134	81	1.4	1.7
2008	224	123	131	70	1.7	1.8
2009	151	52	145	64	1.0	0.8
2010	103	37	142	58	0.7	0.6
2011	155	73	133	76	1.2	1.0
2012	95	44	116	60	0.8	0.7

WD : Weekday; WK: Weekend

Table A92. CPUE summary statistics for CNMI shore-based trips by fishing method and quarter

method	Quarter	N	Mean (kg/trip)	SE (kg/trip)	Min (kg/trip)	25% Q (kg/trip)	Median (kg/trip)	75% Q (kg/trip)	Max (kg/trip)
Spear/ snorkel	1	23	4.3	4.7	0.0	0.0	0.0	0.2	15.2
	2	23	2.3	2.6	0.0	0.0	0.0	0.2	11.6
	3	18	0.5	0.6	0.0	0.0	0.1	0.3	8.3
	4	14	3.5	7.0	0.0	0.0	0.0	0.2	24.5
Hook & line	1	508	0.1	0.4	0.0	0.0	0.0	0.2	15.2
	2	448	0.1	0.3	0.0	0.0	0.0	0.2	11.6
	3	663	0.2	0.4	0.0	0.0	0.1	0.3	8.3
	4	491	0.2	0.5	0.0	0.0	0.0	0.2	24.5
Cast net	1	25	0.7	1.0	0.0	0.0	0.0	0.2	15.2
	2	35	0.6	1.2	0.0	0.0	0.0	0.2	11.6
	3	44	0.7	1.6	0.0	0.0	0.1	0.3	8.3
	4	29	0.8	1.7	0.0	0.0	0.0	0.2	24.5

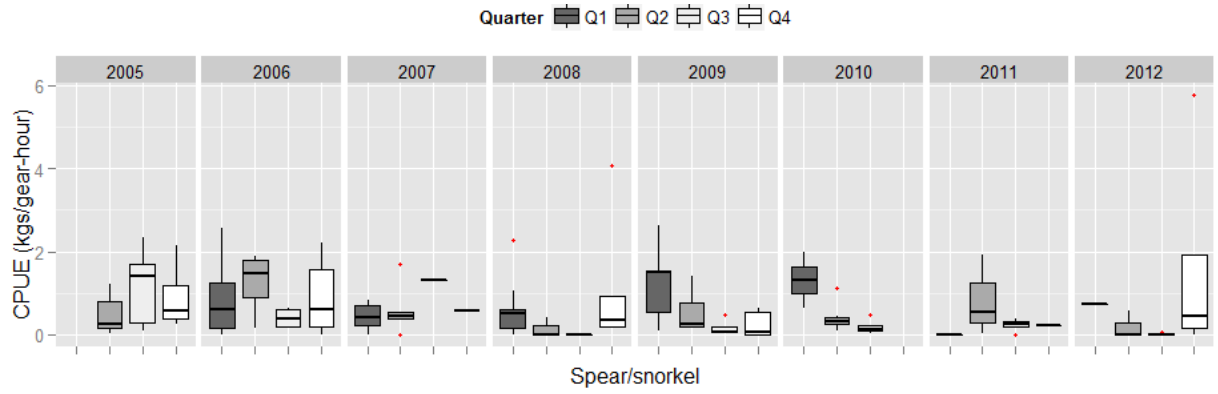

Figure A63. Boxplot of CPUE (kg/trip) for CNMI shore-based spear/snorkel fishing trips by quarter

Table A93. CPUE summary statistics for CNMI shore-based spear/snorkel fishing trips by quarter

	Mean				Median				Standard Deviation			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2005	-	0.5	1.1	0.9	-	0.3	1.4	0.6	-	0.5	0.9	0.7
2006	0.9	1.2	0.4	0.9	0.6	1.5	0.4	0.6	0.8	0.8	0.3	0.8
2007	0.4	0.6	1.3	0.6	0.4	0.5	1.3	0.6	0.3	0.6	-	0.0
2008	0.6	0.1	0.0	1.1	0.5	0.0	0.0	0.3	0.7	0.2	0.0	1.7
2009	1.2	0.6	0.2	0.2	1.5	0.2	0.1	0.1	0.9	0.5	0.2	0.3
2010	1.3	0.4	0.2	-	1.3	0.3	0.1	-	0.9	0.4	0.2	-
2011	0.0	0.8	0.2	0.2	0.0	0.5	0.3	0.2	0.0	0.7	0.1	-
2012	0.7	0.2	0.0	1.7	0.7	0.0	0.0	0.4	-	0.3	0.0	2.7

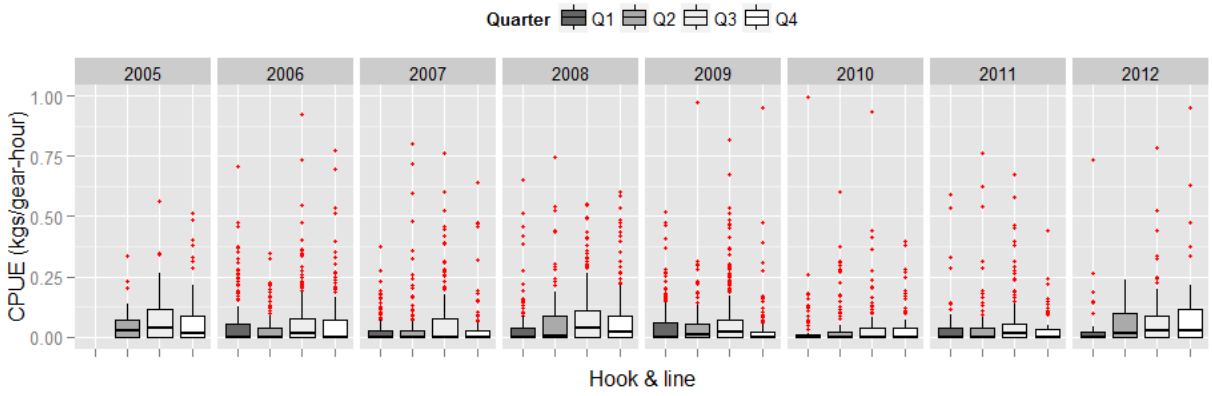

Figure A64. Boxplot of CPUE (kg/trip) for CNMI shore-based hook & line by quarter

Table A94. CPUE summary statistics for CNMI shore-based hook & line fishing trips by quarter

	Mean				Median				Standard Deviation			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2005	-	0.1	0.1	0.1	-	0.0	0.0	0.0	-	0.1	0.1	0.7
2006	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.2	0.1
2007	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.6	0.2	0.2
2008	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.2	0.1	0.2
2009	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.1	0.3	0.1
2010	0.1	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	0.1	0.2	0.2
2011	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
2012	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.1	0.1	0.1	0.2

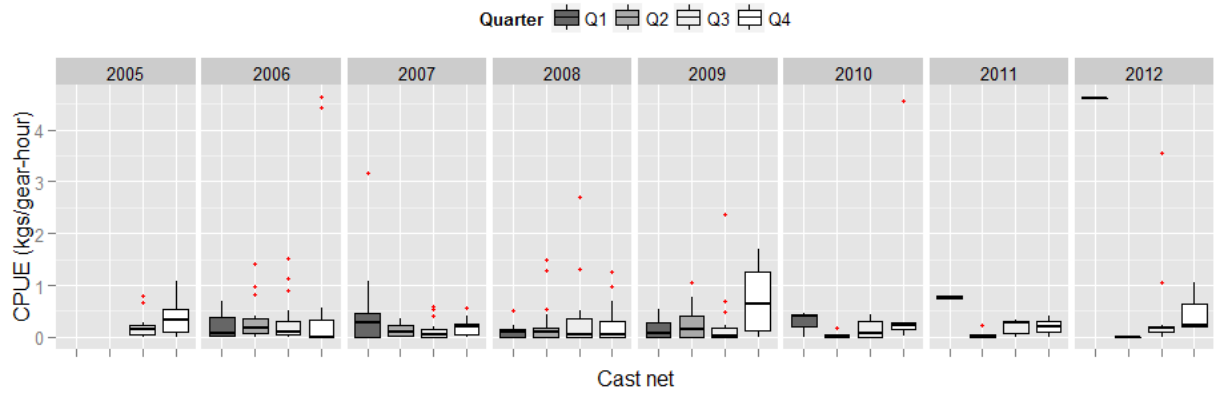

Figure A65. Boxplot of CPUE (kg/trip) for CNMI shore-based cast net by quarter

Table A95. CPUE summary statistics for CNMI shore-based cast net fishing trips by quarter

	Mean				Median				Standard Deviation			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
2005	-	-	0.2	0.4	-	-	0.1	0.3	-	-	0.2	0.4
2006	0.2	0.3	0.9	0.6	0.1	0.2	0.1	0.0	0.3	0.4	2.6	1.5
2007	0.6	0.1	0.9	0.2	0.3	0.1	0.1	0.2	1.0	0.1	3.8	0.2
2008	0.1	0.2	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.4	0.7	0.4
2009	0.2	0.3	0.3	0.7	0.1	0.2	0.0	0.6	0.2	0.4	0.6	0.8
2010	0.3	0.0	0.2	1.1	0.4	0.0	0.1	0.2	0.3	0.1	0.2	2.0
2011	0.8	0.1	0.2	0.2	0.8	0.0	0.3	0.2	0.0	0.1	0.2	0.3
2012	4.6	0.0	0.5	0.5	4.6	0.0	0.2	0.2	-	-	1.0	0.5

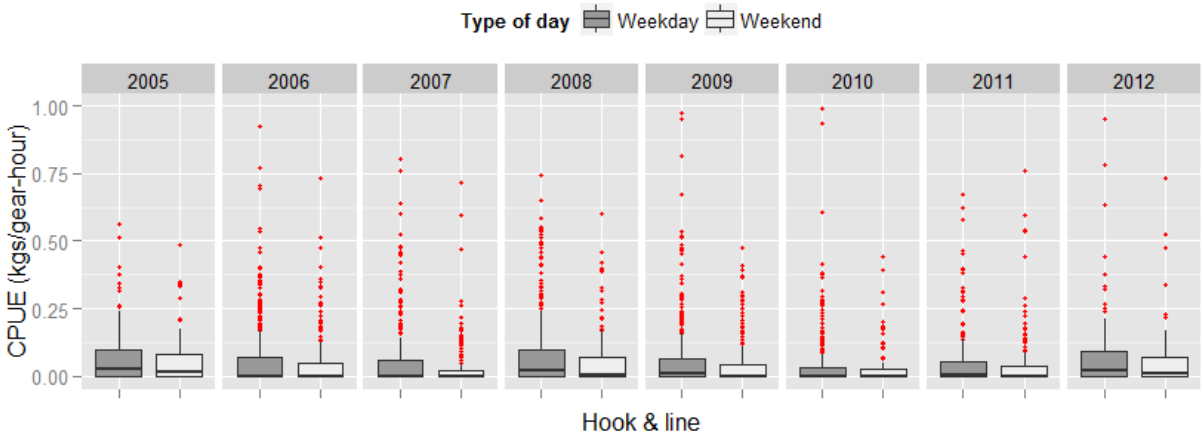

Figure A66. Boxplot of CPUE (kg/trip) for CNMI shore-based hook & line by day type

Table A96. CPUE summary statistics for CNMI shore-based hook & line fishing trips by day type

	Mean		Median		Standard Deviation	
Year	WD	WE	WD	WE	WD	WE
2005	0.1	0.1	0.0	0.0	0.6	0.1
2006	0.1	0.1	0.0	0.0	0.1	0.1
2007	0.1	0.1	0.0	0.0	0.2	0.5
2008	0.1	0.0	0.0	0.0	0.2	0.1
2009	0.1	0.1	0.0	0.0	0.2	0.1
2010	0.1	0.0	0.0	0.0	0.2	0.1
2011	0.1	0.0	0.0	0.0	0.1	0.1
2012	0.1	0.1	0.0	0.0	0.1	0.1

WD : Weekday; WK: Weekend

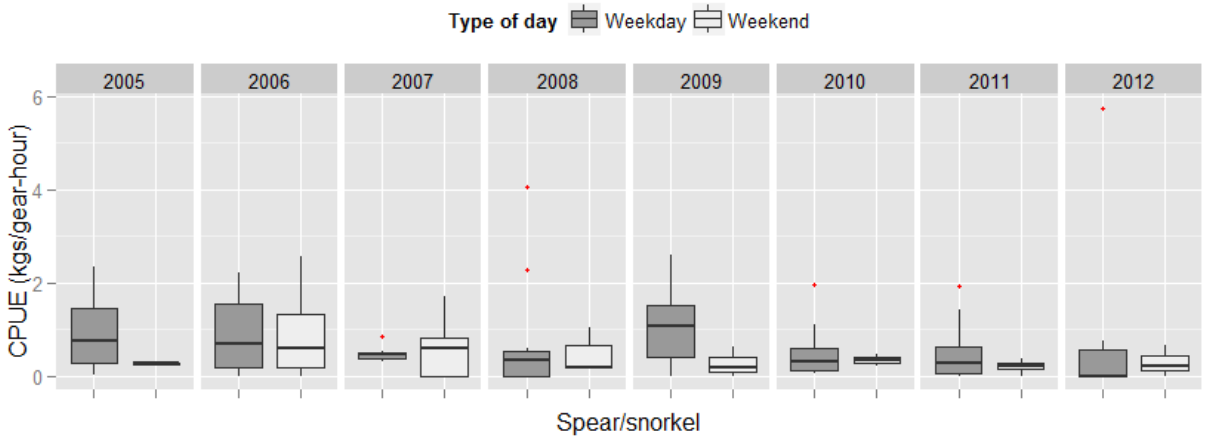

Figure A67. Boxplot of CPUE (kg/trip) for CNMI shore-based spear/snorkel trips by day type

Table A97. CPUE summary statistics for CNMI shore-based spear/snorkel trips by day type

	Mean		Median		Standard Deviation	
Year	WD	WE	WD	WE	WD	WE
2005	0.9	0.3	0.8	0.3	0.7	0.0
2006	0.9	0.9	0.7	0.6	0.7	0.9
2007	0.5	0.6	0.5	0.6	0.2	0.6
2008	0.7	0.4	0.3	0.2	1.2	0.4
2009	1.0	0.2	1.1	0.2	0.8	0.2
2010	0.5	0.3	0.3	0.3	0.6	0.2
2011	0.5	0.2	0.3	0.2	0.7	0.2
2012	0.8	0.3	0.0	0.2	1.9	0.3

WD : Weekday; WK: Weekend

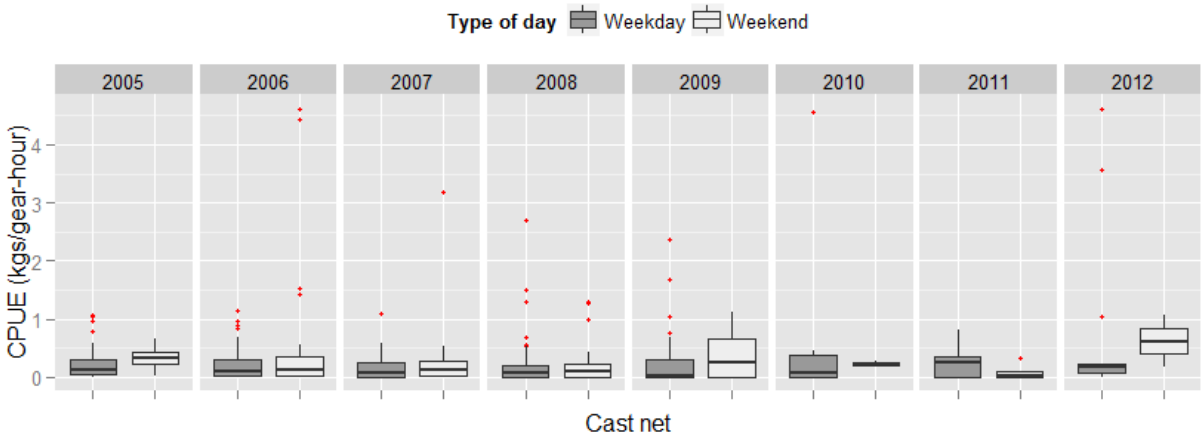

Figure A68. Boxplot of CPUE (kg/trip) for CNMI shore-based cast net by day type

Table A98. CPUE summary statistics for CNMI shore-based cast net fishing trips by day type

	Mean		Median		Standard Deviation	
Year	WD	WE	WD	WE	WD	WE
2005	0.3	0.3	0.1	0.3	0.3	0.2
2006	0.2	0.9	0.1	0.1	0.3	2.4
2007	0.7	0.4	0.1	0.1	3.1	0.8
2008	0.2	0.3	0.1	0.1	0.5	0.4
2009	0.3	0.4	0.0	0.3	0.5	0.5
2010	0.4	0.2	0.1	0.2	1.1	0.1
2011	0.3	0.1	0.3	0.0	0.3	0.2
2012	0.7	0.6	0.2	0.6	1.4	0.6

WD : Weekday; WK: Weekend

American Samoa boat-based creel survey

Table A99. American Samoa (excluding Manua) boat-based survey days by quarter and day type

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1986	36	18	38	11	31	13	35	13
1987	20	9	20	10	17	5	21	9
1988	28	15	24	11	25	12	33	16
1989	28	11	27	18	20	11	36	16
1990	22	7	33	14	28	14	32	16
1991	26	14	25	10	25	7	23	7
1992	21	8	23	9	18	10	31	7
1993	26	6	24	10	35	15	19	8
1994	37	13	41	15	46	15	30	15
1995	43	14	48	17	42	14	45	17
1996	39	14	42	15	42	17	48	12
1997	38	13	49	20	40	19	46	11
1998	46	13	52	9	45	12	39	16
1999	39	13	36	11	47	14	37	13
2000	54	12	33	7	37	14	40	11
2001	44	9	39	10	39	14	40	15
2002	42	13	36	12	41	11	32	11
2003	23	11	37	9	63	11	59	12
2004	56	10	55	9	51	12	48	5
2005	42	6	52	12	62	12	51	12
2006	55	10	55	13	54	9	36	9
2007	56	11	57	14	49	9	52	6
2008	54	6	57	3	51	4	47	5
2009	43	4	44	8	36	6	24	-
2010	40	1	37	1	51	1	57	-
2011	56	1	60	1	61	-	60	1
2012	64	7	56	6	69	2	64	2

WD : Weekday; WK: Weekend

Table A100. Manua boat-based survey days by quarter and day type

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1986	16	6	22	10	7	6	15	6
1987	-	-	6	2	-	-	-	-
1988	13	5	13	5	10	3	20	8
1989	12	6	15	10	3	3	27	11
1990	3	4	23	7	18	8	20	13
1991	16	8	13	8	17	6	9	4
1992	12	6	16	7	4	5	24	5
1993	17	4	18	8	26	11	12	7
1994	32	10	33	13	33	11	14	8
1995	30	7	38	10	26	10	32	11
1996	27	9	29	7	31	13	35	9
1997	20	8	28	14	30	9	32	8
1998	30	7	32	7	24	10	23	13
1999	25	9	20	5	40	11	20	10
2000	42	11	19	4	18	11	33	10
2001	30	8	24	7	23	10	24	13
2002	24	9	20	10	26	11	17	8
2003	3	5	17	2	38	8	25	11
2004	23	7	29	8	18	10	12	3
2005	8	2	36	10	33	7	22	7
2006	34	6	32	10	1	1	3	3
2007	10	5	31	9	1	2	-	-
2008	11	1	23	2	11	-	13	1
2009	5	-	6	2	4	2	-	-
2010	-	-	7	-	3	-	15	-
2011	20	-	-	-	-	-	10	-
2012	14	-	-	-	-	-	7	-

WD : Weekday; WK: Weekend

Table A101. American Samoa (excluding Manua) boat-based participation counts by fishing method

Year	Trolling	Bottom fishing	Bottom/ Trolling	Longline	Spear Snorkel	Atule Mixed	Other
1986	279	135	80	-	39	-	21
1987	211	19	57	-	51	-	12
1988	206	41	34	9	73	3	4
1989	284	30	34	1	40	-	13
1990	169	19	17	-	8	-	3
1991	114	32	19	6	2	-	2
1992	115	27	-	-	-	-	28
1993	85	40	5	5	1	-	2
1994	259	84	10	5	30	1	12
1995	401	41	71	66	10	-	195
1996	217	81	14	252	9	-	423
1997	205	116	20	904	102	-	417
1998	46	26	10	1168	5	-	605
1999	93	27	12	1161	7	3	582
2000	26	65	4	1242	1	7	223
2001	51	138	3	834	13	3	15
2002	56	213	-	753	20	2	3
2003	104	163	1	816	22	-	42
2004	93	282	5	475	23	-	8
2005	43	142	2	298	3	-	99
2006	60	98	-	180	21	13	199
2007	71	227	2	191	163	138	52
2008	62	315	11	112	61	208	16
2009	13	332	8	54	32	8	-
2010	12	149	2	110	111	1	2
2011	80	204	22	148	59	1	20
2012	56	225	6	129	73	103	54

Table A102. Manua boat-based participation counts by fishing method

Year	Trolling	Bottom fishing	Bottom/ Trolling	Longline	Spear Snorkel	Atule Mixed	Other
1986	122	12	16	-	-	-	-
1987	6	2	-	-	-	-	-
1988	80	13	11	-	-	-	-
1989	92	19	14	-	-	-	-
1990	124	13	2	-	-	-	-
1991	99	11	2	-	-	-	-
1992	91	15	-	-	-	-	-
1993	137	19	3	-	-	-	-
1994	210	60	7	-	5	-	-
1995	236	46	23	-	-	-	-
1996	197	52	16	-	-	-	-
1997	179	29	38	-	-	-	1
1998	181	14	7	12	-	-	1
1999	178	44	6	-	-	-	-
2000	195	40	12	-	3	22	-
2001	125	27	16	-	1	6	-
2002	113	22	11	-	-	-	-
2003	109	28	9	-	2	1	-
2004	128	24	17	-	2	-	-
2005	124	25	28	-	1	-	-
2006	100	24	12	4	1	-	-
2007	45	38	12	-	-	-	1
2008	51	20	6	-	-	-	-
2009	18	2	-	-	-	-	-
2010	24	1	-	-	-	-	-
2011	33	-	-	-	-	-	-
2012	16	2	4	-	-	-	-

Table A103. American Samoa boat-based interviews by quarter and day type

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1986	179	77	134	26	106	36	99	47
1987	83	35	53	31	46	16	63	31
1988	99	53	60	26	70	26	76	64
1989	71	41	76	67	61	38	125	48
1990	44	13	69	40	63	35	60	31
1991	59	35	40	29	48	22	37	17
1992	39	14	56	16	33	41	61	16
1993	33	16	43	24	94	26	38	23
1994	83	25	126	46	168	58	117	60
1995	248	100	192	118	160	43	168	60
1996	251	95	186	92	175	101	290	71
1997	264	98	358	132	356	191	533	77
1998	450	86	412	37	444	66	450	130
1999	427	104	370	131	458	107	404	112
2000	468	121	308	38	413	66	372	54
2001	252	35	256	32	309	43	274	31
2002	315	35	276	22	322	20	180	23
2003	143	37	177	29	455	21	409	26
2004	317	18	250	24	236	23	174	15
2005	170	16	157	31	179	32	156	24
2006	210	32	156	43	134	17	102	18
2007	196	36	259	54	154	18	212	11
2008	228	12	279	6	167	8	154	8
2009	126	9	180	18	84	8	42	-
2010	82	3	75	1	95	1	155	-
2011	140	1	135	1	132	-	157	1
2012	171	11	125	12	197	5	143	4

(Manua and Tutuila combined)

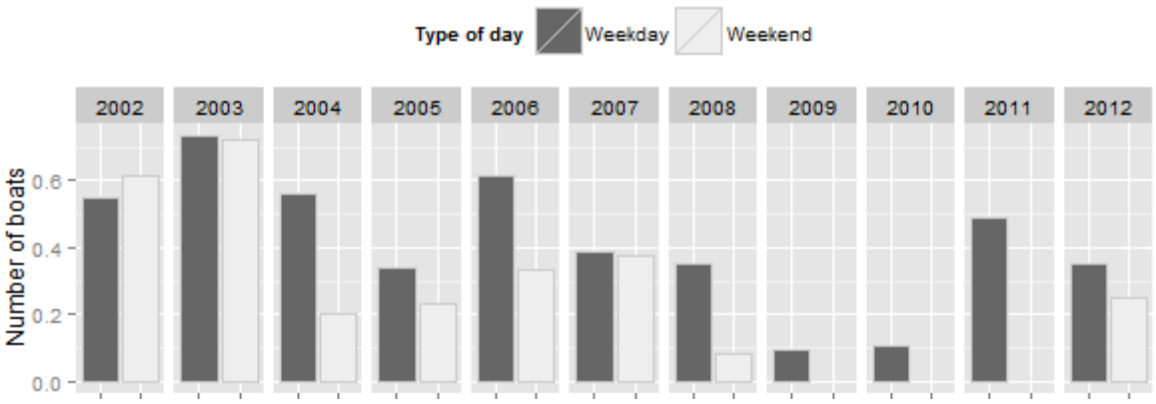

Figure A69. Daily boat-based participation count estimates for American Samoa (excluding Manua) trolling trips by day type: 2002-2012

Table A104. Daily boat-based participation count estimates for American Samoa (excluding Manua) trolling trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2012	54	1	153	4	0.4	0.3
2011	80	-	164	-	0.5	-
2010	12	-	110	-	0.1	-
2009	12	-	126	-	0.1	-
2008	60	1	170	12	0.4	0.1
2007	61	9	157	24	0.4	0.4
2006	51	4	83	12	0.6	0.3
2005	40	3	117	13	0.3	0.2
2004	88	2	157	10	0.6	0.2
2003	91	13	124	18	0.7	0.7
2002	45	11	82	18	0.5	0.6
2001	41	9	75	14	0.5	0.6
2000	20	6	52	11	0.4	0.5
1999	58	35	45	15	1.3	2.3
1998	32	14	37	11	0.9	1.3
1997	122	83	75	30	1.6	2.8
1996	152	65	77	25	2.0	2.6
1995	280	119	85	28	3.3	4.3
1994	187	71	75	24	2.5	3.0
1993	48	31	40	16	1.2	1.9
1992	81	30	46	13	1.8	2.3
1991	67	43	49	18	1.4	2.4
1990	101	49	54	21	1.9	2.3
1989	161	123	66	41	2.4	3.0
1988	117	89	62	33	1.9	2.7
1987	143	68	66	30	2.2	2.3
1986	191	87	90	32	2.1	2.7

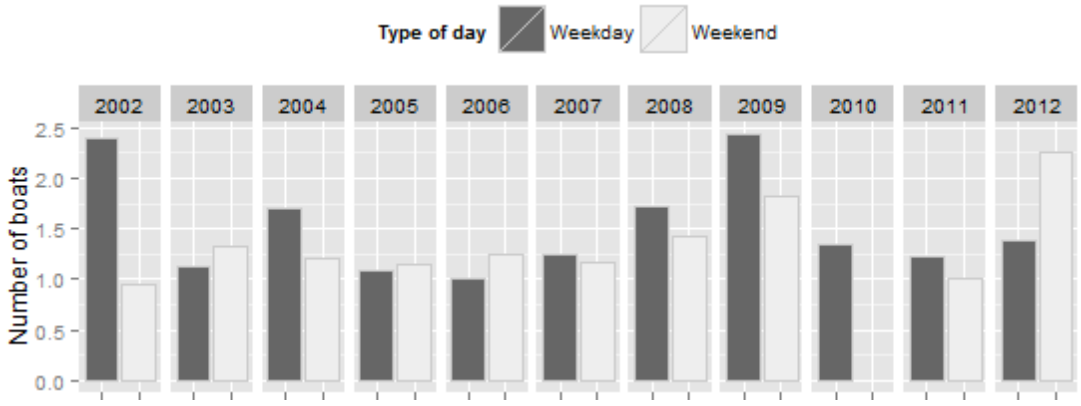

Figure A70. Daily boat-based participation count estimates for American Samoa (excluding Manua) bottomfishing trips by day type: 2002-2012

Table A105. Daily participation count estimates for American Samoa (excluding Manua) bottomfishing trips by day type

	Actual boat counts		Number of survey days		Daily boat count estimates	
Year	WD	WE	WD	WE	WD	WE
2012	213	9	153	4	1.4	2.3
2011	202	1	164	1	1.2	1.0
2010	149	-	110	-	1.4	-
2009	307	20	126	11	2.4	1.8
2008	294	17	170	12	1.7	1.4
2007	196	28	157	24	1.2	1.2
2006	83	15	83	12	1.0	1.3
2005	127	15	117	13	1.1	1.2
2004	268	12	157	10	1.7	1.2
2003	139	24	124	18	1.1	1.3
2002	196	17	82	18	2.4	0.9
2001	123	15	75	14	1.6	1.1
2000	58	7	52	11	1.1	0.6
1999	26	1	45	15	0.6	0.1
1998	23	3	37	11	0.6	0.3
1997	83	32	75	30	1.1	1.1
1996	67	12	77	25	0.9	0.5
1995	34	6	85	28	0.4	0.2
1994	70	11	75	24	0.9	0.5
1993	33	6	40	16	0.8	0.4
1992	22	5	46	13	0.5	0.4
1991	23	9	49	18	0.5	0.5
1990	14	5	54	21	0.3	0.2
1989	15	15	66	41	0.2	0.4
1988	27	14	62	33	0.4	0.4
1987	12	7	66	30	0.2	0.2
1986	114	21	90	32	1.3	0.7

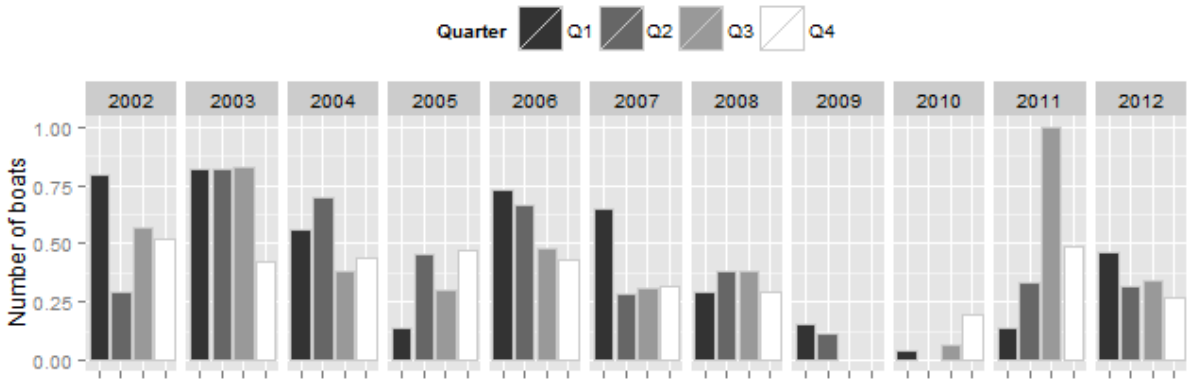

Figure A71. Daily boat-based participation count estimates for American Samoa (excluding Manua) trolling trips by quarter: 2002-2012

Table A106. Daily participation count estimates for American Samoa (excluding Manua) trolling trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2012	20	8	15	12	43	25	44	45	0.5	0.3	0.3	0.3
2011	6	14	42	18	44	42	42	37	0.1	0.3	1	0.5
2010	1	-	2	9	24	-	30	47	0	-	0.1	0.2
2009	7	5	-	-	46	45	-	-	0.2	0.1	-	-
2008	13	19	15	14	45	50	39	48	0.3	0.4	0.4	0.3
2007	28	13	14	15	43	46	45	47	0.7	0.3	0.3	0.3
2006	19	14	13	9	26	21	27	21	0.7	0.7	0.5	0.4
2005	5	14	9	15	37	31	30	32	0.1	0.5	0.3	0.5
2004	31	32	13	14	55	46	34	32	0.6	0.7	0.4	0.4
2003	23	23	44	14	28	28	53	33	0.8	0.8	0.8	0.4
2002	24	7	13	12	30	24	23	23	0.8	0.3	0.6	0.5
2001	17	8	13	12	21	20	24	24	0.8	0.4	0.5	0.5
2000	6	8	6	6	18	13	16	16	0.3	0.6	0.4	0.4
1999	47	17	19	10	25	11	15	9	1.9	1.5	1.3	1.1
1998	19	8	6	13	21	7	7	13	0.9	1.1	0.9	1
1997	67	89	33	16	27	32	30	16	2.5	2.8	1.1	1
1996	77	51	37	52	28	29	18	27	2.8	1.8	2.1	1.9
1995	131	108	91	69	31	27	28	27	4.2	4	3.3	2.6
1994	28	61	72	97	18	23	31	27	1.6	2.7	2.3	3.6
1993	14	21	29	15	12	12	21	11	1.2	1.8	1.4	1.4
1992	28	23	34	26	13	15	19	12	2.2	1.5	1.8	2.2
1991	49	22	21	18	21	13	14	17	2.3	1.7	1.5	1.1
1990	28	39	50	33	17	15	24	18	1.6	2.6	2.1	1.8
1989	68	89	47	80	25	28	26	27	2.7	3.2	1.8	3
1988	54	25	54	73	23	15	27	27	2.3	1.7	2	2.7
1987	75	42	35	59	28	23	18	26	2.7	1.8	1.9	2.3
1986	85	30	76	87	36	24	31	28	2.4	1.3	2.5	3.1

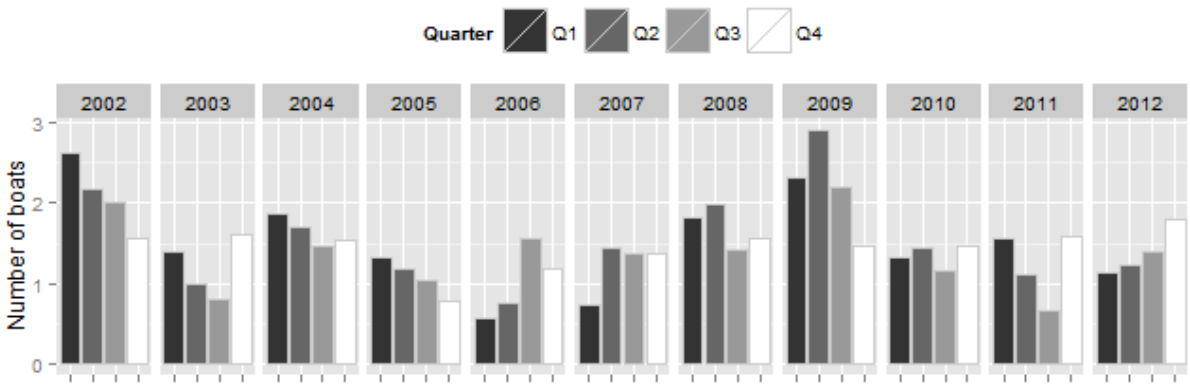

Figure A72. Daily boat-based participation count estimates for American Samoa (excluding Manua) bottomfishing trips by quarter: 2002-2012

Table A107. Daily participation count estimates for American Samoa (excluding Manua) bottomfishing trips by quarter

	Actual boat counts				Number of survey days				Daily boat count estimates			
Year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2012	49	31	61	81	43	25	44	45	1.1	1.2	1.4	1.8
2011	69	47	28	59	44	42	42	37	1.6	1.1	0.7	1.6
2010	32	13	35	69	24	9	30	47	1.3	1.4	1.2	1.5
2009	107	131	64	25	46	45	29	17	2.3	2.9	2.2	1.5
2008	82	99	55	75	45	50	39	48	1.8	2	1.4	1.6
2007	32	66	62	64	43	46	45	47	0.7	1.4	1.4	1.4
2006	15	16	42	25	26	21	27	21	0.6	0.8	1.6	1.2
2005	49	37	31	25	37	31	30	32	1.3	1.2	1	0.8
2004	103	78	50	49	55	46	34	32	1.9	1.7	1.5	1.5
2003	39	28	43	53	28	28	53	33	1.4	1	0.8	1.6
2002	79	52	46	36	30	24	23	23	2.6	2.2	2	1.6
2001	29	35	42	32	21	20	24	24	1.4	1.8	1.8	1.3
2000	16	11	24	14	18	13	16	16	0.9	0.8	1.5	0.9
1999	16	4	5	2	25	11	15	9	0.6	0.4	0.3	0.2
1998	14	2	2	8	21	7	7	13	0.7	0.3	0.3	0.6
1997	23	46	32	14	27	32	30	16	0.9	1.4	1.1	0.9
1996	22	26	4	27	28	29	18	27	0.8	0.9	0.2	1
1995	11	21	4	4	31	27	28	27	0.4	0.8	0.1	0.1
1994	9	11	41	20	18	23	31	27	0.5	0.5	1.3	0.7
1993	8	5	21	5	12	12	21	11	0.7	0.4	1	0.5
1992	3	10	6	8	13	15	19	12	0.2	0.7	0.3	0.7
1991	6	5	9	12	21	13	14	17	0.3	0.4	0.6	0.7
1990	7	6	5	1	17	15	24	18	0.4	0.4	0.2	0.1
1989	5	8	10	7	25	28	26	27	0.2	0.3	0.4	0.3
1988	12	9	6	14	23	15	27	27	0.5	0.6	0.2	0.5
1987	7	4	5	3	28	23	18	26	0.3	0.2	0.3	0.1
1986	80	36	15	4	36	24	31	28	2.2	1.5	0.5	0.1

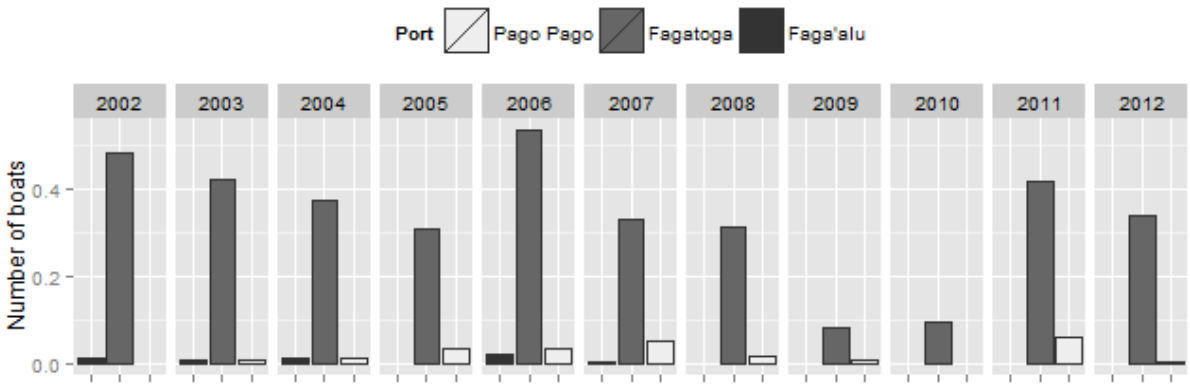

Figure A73. Daily boat-based participation count estimates for American Samoa trolling trips by port (3 most active locations): 2002-2012

Table A108. Daily boat-based participation count estimates for American Samoa trolling trips by port (3 most active locations)

	Actual boat counts			Daily boat count estimates		
Year	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**
2012	53	1	-	0.34	0.01	-
2011	69	10	-	0.42	0.06	-
2010	10	-	-	0.09	-	-
2009	11	1	-	0.08	0.01	-
2008	55	3	-	0.30	0.02	-
2007	59	9	1	0.33	0.05	0.01
2006	47	3	2	0.49	0.03	0.02
2005	37	4	-	0.28	0.03	-
2004	58	2	2	0.35	0.01	0.01
2003	45	1	1	0.32	0.01	0.01
2002	36	-	1	0.36	-	0.01
2001	43	2	-	0.48	0.02	-
2000	19	6	1	0.30	0.10	0.02
1999	88	4	-	1.47	0.07	-
1998	42	3	-	0.88	0.06	-
1997	196	2	2	1.87	0.02	0.02
1996	206	5	3	2.02	0.05	0.03
1995	374	23	-	3.31	0.20	-
1994	232	12	2	2.34	0.12	0.02
1993	75	4	-	1.34	0.07	-
1992	111	-	-	1.88	-	-
1991	110	-	-	1.69	-	-
1990	150	-	-	2.03	-	-
1989	284	-	-	2.68	-	-
1988	206	-	-	2.24	-	-
1987	211	-	-	2.22	-	-
1986	278	-	-	2.34	-	-

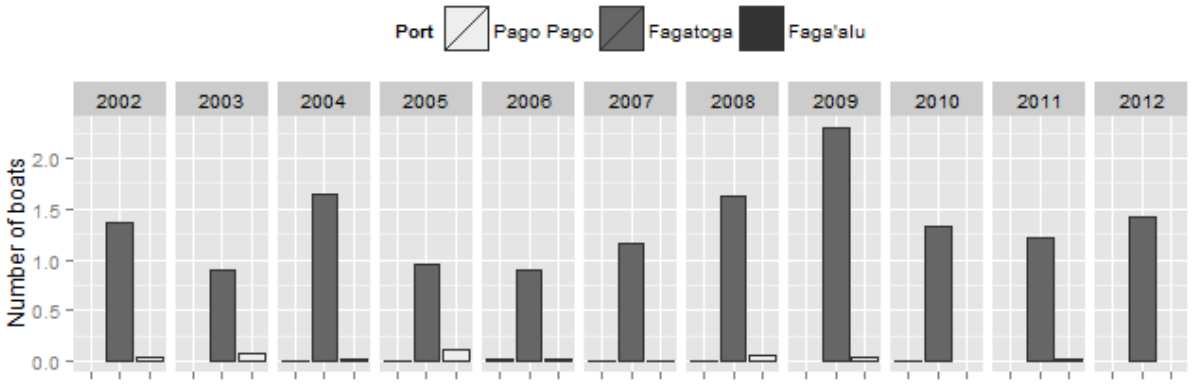

Figure A74. Daily boat-based participation count estimates for American Samoa bottomfishing trips by port (3 most active locations): 2002-2012

Table A109. Daily boat count estimates for American Samoa bottomfishing trips by port (3 most active locations)

	Actual boat counts			Daily boat count estimates		
Year	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**
2012	222	-	-	1.41	-	-
2011	200	2	-	1.21	0.01	-
2010	138	-	1	1.25	-	0.01
2009	311	6	-	2.27	0.04	-
2008	288	11	1	1.58	0.06	0.01
2007	206	1	1	1.14	0.01	0.01
2006	79	2	2	0.83	0.02	0.02
2005	115	13	1	0.88	0.10	0.01
2004	258	4	1	1.54	0.02	0.01
2003	97	8	-	0.68	0.06	-
2002	103	3	-	1.03	0.03	-
2001	111	8	4	1.25	0.09	0.04
2000	33	26	3	0.52	0.41	0.05
1999	16	7	-	0.27	0.12	-
1998	16	-	-	0.33	-	-
1997	62	-	-	0.59	-	-
1996	58	9	-	0.57	0.09	-
1995	30	7	-	0.27	0.06	-
1994	45	28	4	0.45	0.28	0.04
1993	29	10	-	0.52	0.18	-
1992	27	-	-	0.46	-	-
1991	32	-	-	0.49	-	-
1990	19	-	-	0.26	-	-
1989	30	-	-	0.28	-	-
1988	41	-	-	0.45	-	-
1987	19	-	-	0.20	-	-
1986	135	-	-	1.13	-	-

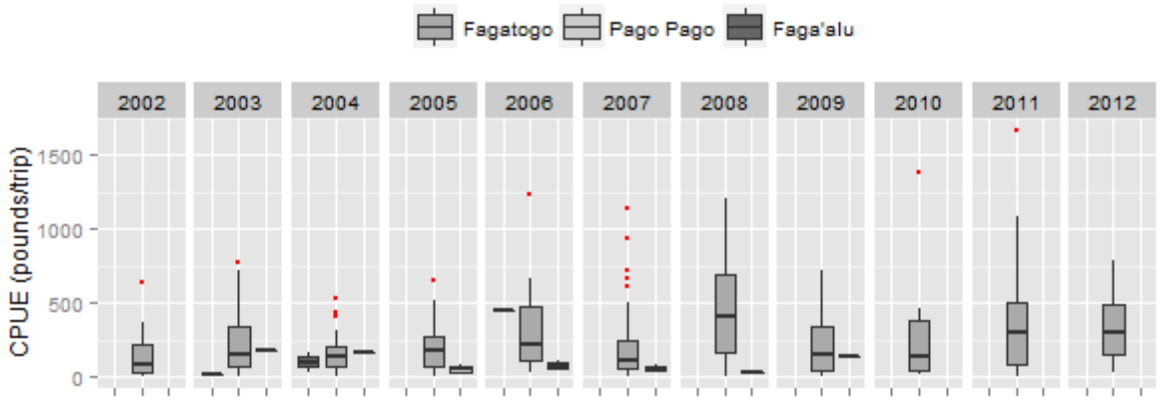

Figure A75. Boxplot of CPUE (kg/trip) for American Samoa trolling trips by port (3 most active locations): 2002-2012

Table A110. CPUE summary statistics for American Samoa trolling trips by port (3 most active locations)

	Mean (pounds/trip)			Median (pounds/trip)			Standard Error (pounds/trip)		
Year	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**
2012	334.2	-	-	299.5	-	-	53.5	-	-
2011	366.4	-	-	294.5	-	-	61.3	-	-
2010	338.2	-	-	131.7	-	-	183.8	-	-
2009	232.9	133.5	-	148.3	133.5	-	91.6	-	-
2008	437.6	21.7	-	402.1	21.7	-	51.9	-	-
2007	215.8	60.8	-	112	60.8	-	42.1	27.3	-
2006	319.4	75.1	449.8	223	67	449.8	54.4	21.2	-
2005	206.2	49.4	-	172	49.4	-	44.6	30.4	-
2004	156.9	159.6	95.7	138.3	159.6	95.7	19.3	-	67.7
2003	225.6	170.6	15.5	150.3	170.6	15.5	42.1	-	-
2002	164.2	-	-	88.4	-	-	43.9	-	-
2001	135.4	110	-	83.5	110	-	19.1	44	-
2000	46.7	177	-	0	145	-	21.3	57.2	-
1999	161.2	93	-	95	64	-	21.8	38.1	-
1998	129.2	103.7	-	108	74	-	22.5	54.9	-
1997	124.2	41.5	-	78	41.5	-	10.9	0.5	-
1996	163.9	148.3	-	135.5	48	-	11	103.9	-
1995	194	125.5	-	161	125.5	-	11	125.5	-
1994	191.5	-	300	155.5	-	300	11.9	-	-
1993	150	159.8	-	100	152	-	16.5	82.4	-
1992	244.7	-	-	208	-	-	18.7	-	-
1991	168	-	-	111.8	-	-	16.9	-	-
1990	168.5	-	-	108.5	-	-	14	-	-
1989	159.3	-	-	104	-	-	10.5	-	-
1988	281	-	-	186.5	-	-	20.1	-	-
1987	207.1	-	-	155	-	-	13.7	-	-
1986	183.3	-	-	140	-	-	8.9	-	-

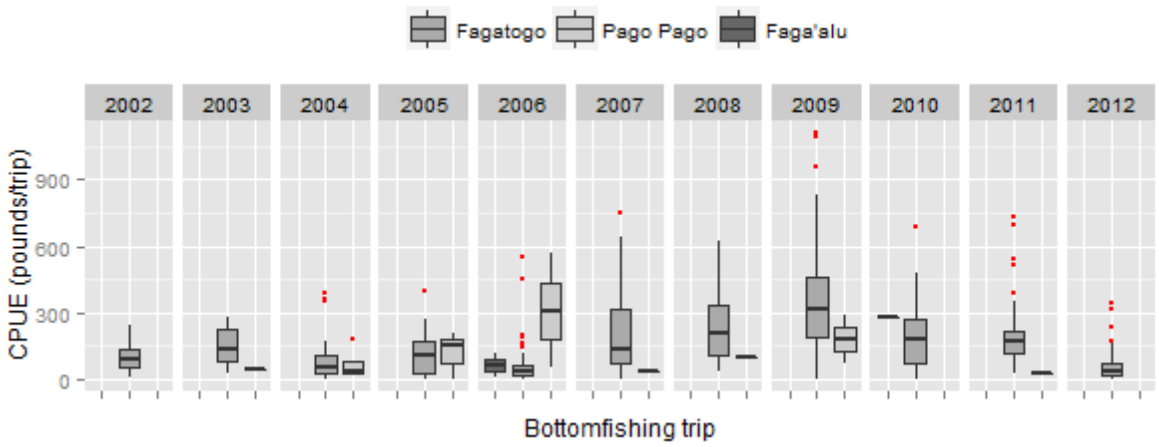

Figure A76. Boxplot of CPUE (kg/trip) for American Samoa bottomfishing trips by port (3 most active locations): 2002-2012

Table A111. CPUE summary statistics for American Samoa bottomfishing trips by port (3 most active locations)

	Mean (pounds/trip)			Median (pounds/trip)			Standard Error (pounds/trip)		
Year	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**	**Fagatogo**	**Pago Pago**	**Faga'alu**
2012	54.2	-	-	34	-	-	6.6	-	-
2011	198.3	30.1	-	170.2	30.1	-	19.5	-	-
2010	190.7	-	282.8	182.7	-	282.8	27.9	-	-
2009	354.7	179.6	-	314.8	179.6	-	24	105.9	-
2008	240.1	99.3	-	210	99.3	-	17.8	-	-
2007	204	40.5	-	134.8	40.5	-	20.5	-	-
2006	74.5	310	64	37.7	310	64	15.7	255.2	54.7
2005	127	119	-	110.9	151.4	-	29.6	61.5	-
2004	79.1	70.2	-	58.4	40	-	10.8	37	-
2003	148.1	43.4	-	132	43.4	-	21.6	-	-
2002	97.6	-	-	87.5	-	-	10.4	-	-
2001	138.9	201.3	-	95.5	201.3	-	20	201.3	-
2000	85.9	190.6	40.5	55.5	191.3	40.5	34.4	31.1	-
1999	161.8	94.8	-	140.5	94.8	-	35.1	8.3	-
1998	188.4	-	-	148	-	-	28.9	-	-
1997	137.9	-	-	112.5	-	-	13.9	-	-
1996	135.4	216.1	-	134.8	164	-	14.6	77.1	-
1995	129.5	134.5	-	126	134.5	-	18.6	43.5	-
1994	143.7	109.2	-	103.3	106.8	-	31.6	17.1	-
1993	110.4	153.4	-	94	141	-	15.5	28.4	-
1992	142.4	-	-	97.5	-	-	20.2	-	-
1991	121.4	-	-	130.2	-	-	11.9	-	-
1990	127.4	-	-	106.5	-	-	14	-	-
1989	158.9	-	-	139.8	-	-	19	-	-
1988	175.5	-	-	143.8	-	-	17.1	-	-
1987	138.4	-	-	106	-	-	25.8	-	-
1986	135.9	-	-	110	-	-	9.7	-	-

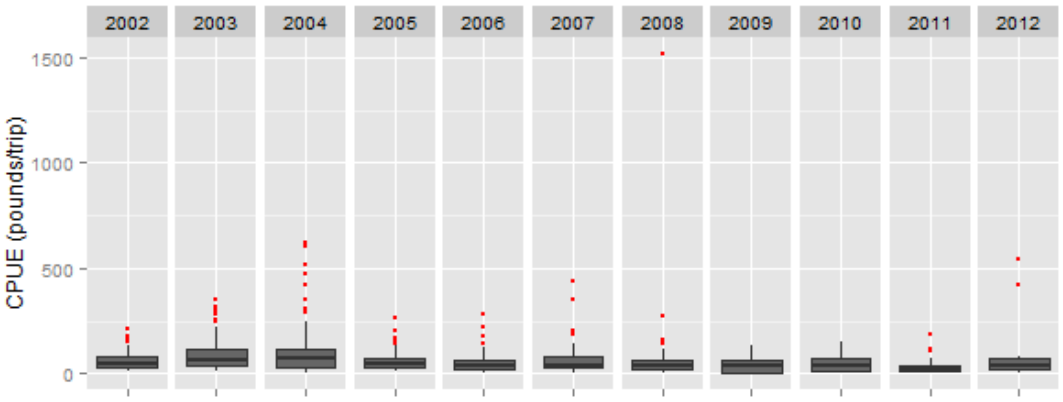

Figure A77. Boxplot of CPUE (kg/trip) for Manua trolling trips: 2002-2012

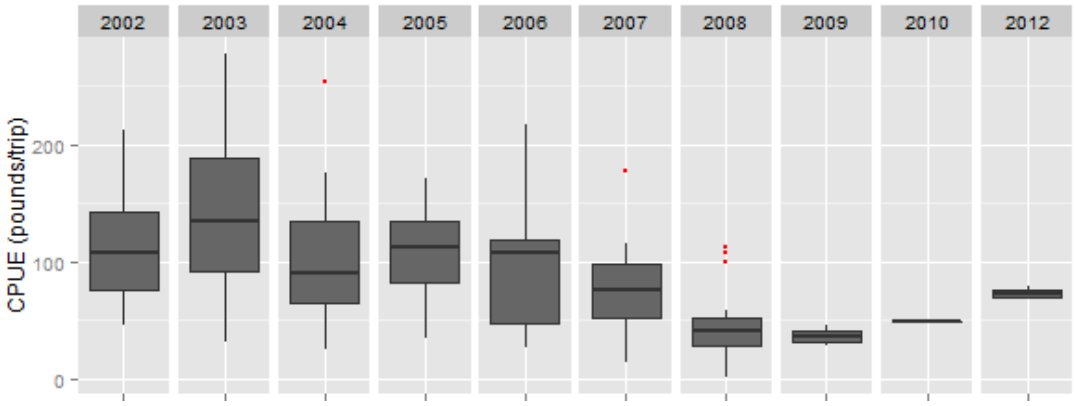

Figure A78. Boxplot of CPUE (kg/trip) for Manua bottomfishing trips: 2002-2012

Table A112. CPUE summary statistics for Manua trolling and bottomfishing trips

	Trolling				Bottomfishing			
Year	Mean (lbs/trip)	Median (lbs/trip)	SE (lbs/trip)	N	Mean (lbs/trip)	Median (lbs/trip)	SE (lbs/trip)	N
1986	155.4	145.0	7.1	122	212.1	221.0	18.5	12
1987	148.2	141.5	18.6	6	160.0	160.0	26.0	2
1988	138.1	117.0	11.2	80	210.0	185.0	34.2	13
1989	145.4	135.0	7.2	92	119.9	101.0	13.0	19
1990	101.9	93.0	5.1	124	70.6	75.0	5.2	13
1991	82.1	74.0	4.7	99	105.5	86.0	17.9	11
1992	78.3	65.0	6.2	91	64.9	47.0	13.3	15
1993	104.8	87.0	5.6	137	132.4	150.0	17.2	19
1994	111.9	95.0	5.3	210	138.0	108.0	9.8	60
1995	103.7	70.0	5.6	236	154.6	130.5	11.4	46
1996	99.2	81.0	5.3	197	127.7	127.5	6.5	52
1997	60.4	55.0	3.4	179	111.4	91.0	12.4	29
1998	69.2	55.0	3.7	181	88.4	65.5	11.8	14
1999	77.4	51.0	6.9	178	101.3	100.5	6.1	44
2000	71.1	49.0	5.1	195	96.2	74.0	11.1	40
2001	50.3	36.0	4.2	125	95.6	94.0	7.3	27
2002	59.6	49.0	3.7	113	115.4	107.0	10.6	22
2003	96.5	67.0	7.8	109	147.5	135.0	13.7	28
2004	102.9	70.0	9.9	128	98.5	90.5	10.8	24
2005	61.8	51.5	3.8	124	108.1	112.0	7.3	25
2006	53.0	41.0	4.5	100	99.5	108.0	10.5	24
2007	70.5	41.7	12.7	45	76.8	75.9	5.3	38
2008	75.9	36.3	29.6	51	46.4	41.3	6.6	20
2009	42.0	41.9	9.9	18	36.8	36.8	9.0	2
2010	45.6	39.5	8.4	24	49.7	49.7	-	1
2011	36.1	25.1	7.2	33	-	-	-	-
2012	94.7	39.8	38.8	16	72.7	72.7	5.5	2

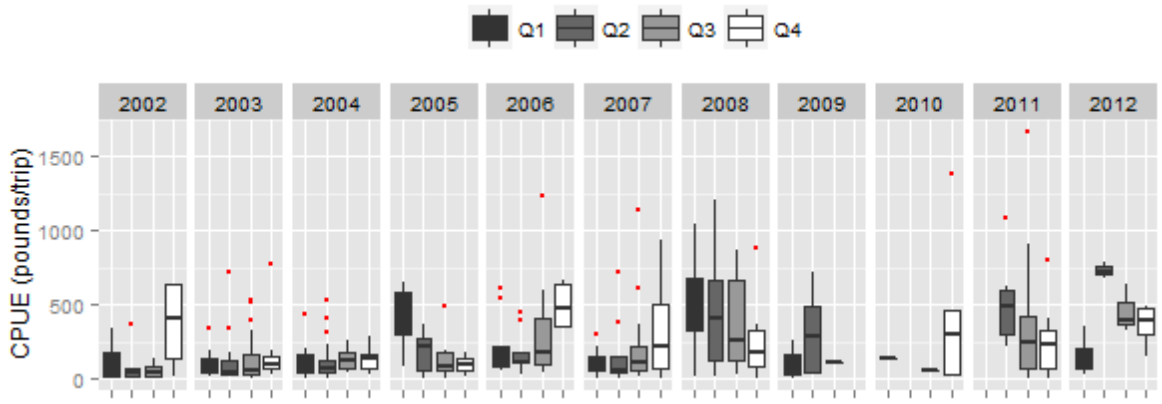

Figure A79. Boxplot of CPUE (kg/trip) for American Samoa (excluding Manua) trolling trips by quarter: 2002-2012

Table A113. CPUE summary statistics for American Samoa (excluding Manua) trolling trips by quarter

	Mean (pounds/trip)				Median (pounds/trip)				Standard Error (pounds/trip)			
year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2012	143.9	727.9	456.8	364.5	137.9	724.3	396.0	393.4	36.3	30.5	95.1	55.0
2011	-	503.7	353.9	257.1	-	484.1	245.6	231.7	-	99.1	98.1	92.3
2010	131.7	-	58.2	435.5	131.7	-	58.2	293.5	-	-	-	250.1
2009	107.5	313.4	109.1	-	86.9	290.3	109.1	-	56.9	131.4	-	-
2008	507.5	432.3	372.5	274.7	593.8	409.3	259.4	178.3	92.6	90.2	113.5	131.1
2007	114.0	175.4	237.3	328.4	88.1	58.3	108.2	214.1	23.4	77.6	96.0	106.8
2006	225.4	172.4	320.0	494.7	123.9	109.5	175.9	480.3	69.8	50.1	116.7	69.4
2005	417.9	183.0	150.7	93.1	510.6	224.3	79.9	91.8	170.8	59.5	73.3	24.2
2004	112.4	116.9	131.8	134.3	81.9	74.6	124.8	138.9	20.6	25.0	22.9	22.2
2003	95.1	111.0	113.9	157.5	64.2	44.1	49.9	99.6	19.4	40.1	22.9	58.2
2002	108.8	101.1	50.7	369.1	47.2	40.7	34.7	407.2	31.7	65.5	16.7	158.3
2001	125.8	120.5	125.0	178.0	83.5	107.2	76.0	155.0	34.9	32.6	34.3	48.8
2000	88.3	195.3	57.0	22.8	72.0	205.5	0.0	0.0	29.2	76.5	40.1	17.4
1999	115.0	224.0	177.0	189.8	67.0	98.5	105.5	145.0	21.2	63.0	53.6	70.7
1998	81.3	153.7	197.0	146.1	20.0	142.5	96.0	132.5	26.8	52.6	128.8	26.5
1997	165.3	114.3	95.2	70.8	115.0	62.0	72.5	47.5	22.7	17.2	14.2	21.9
1996	168.3	221.2	131.4	122.1	139.0	171.0	117.0	92.0	18.3	27.7	17.9	18.0
1995	175.9	138.9	196.6	360.2	170.5	111.0	169.5	400.0	16.8	15.0	20.2	42.0
1994	195.7	161.9	153.1	252.7	130.5	140.0	132.0	215.0	32.6	22.0	16.3	23.8
1993	159.6	180.0	127.3	147.9	129.5	111.0	86.3	91.5	30.3	34.7	28.4	34.0
1992	214.4	152.9	317.6	271.0	129.0	147.0	320.0	258.0	49.8	24.4	31.9	31.9
1991	171.1	141.7	145.3	217.9	132.8	110.0	116.3	89.5	24.7	25.3	29.5	63.6
1990	278.5	121.5	144.9	168.4	176.0	68.3	102.5	111.3	48.4	18.0	16.3	30.0
1989	169.1	169.4	78.9	186.8	106.5	105.0	54.0	138.0	25.0	19.4	13.1	18.9
1988	229.9	307.3	332.4	271.7	125.0	253.0	243.5	165.0	32.4	61.2	41.1	35.6
1987	191.3	167.1	245.0	233.3	150.0	148.5	190.0	140.0	17.5	17.8	33.6	36.7
1986	120.6	217.4	162.7	250.0	100.0	182.5	129.0	207.5	9.4	24.3	14.5	19.9

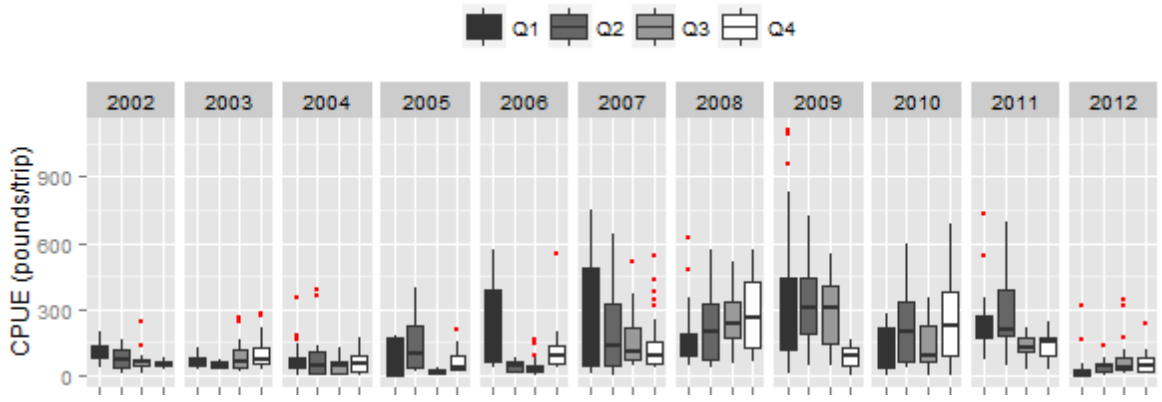

Figure A80. Boxplot of CPUE (kg/trip) for American Samoa (excluding Manua) bottomfishing trips by quarter: 2002-2012

Table A114. CPUE summary statistics for American Samoa (excluding Manua) bottomfishing trips by quarter

	Mean (pounds/trip)				Median (pounds/trip)				Standard Error (pounds/trip)			
year	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2012	32.9	44.7	75.0	54.9	0.0	43.3	38.4	42.9	17.2	11.3	17.8	6.8
2011	259.9	284.9	134.0	133.7	219.0	206.7	129.3	150.9	41.9	69.6	15.2	14.7
2010	134.3	237.9	147.0	260.7	135.6	197.3	93.2	225.3	25.5	73.9	49.1	59.7
2009	344.1	338.6	291.7	87.4	286.2	310.9	306.1	94.5	47.2	29.2	36.8	48.5
2008	176.6	215.3	264.3	268.5	145.1	203.6	237.9	259.9	27.0	32.4	43.2	33.9
2007	263.3	208.1	165.3	137.8	139.8	134.8	112.9	86.5	84.3	41.0	25.7	22.6
2006	233.0	43.7	39.9	137.2	151.5	42.6	31.7	89.0	90.9	8.9	5.5	48.7
2005	99.5	140.7	16.1	70.2	151.2	99.5	16.2	40.3	40.8	40.1	5.4	19.8
2004	76.9	77.0	47.0	62.7	64.0	42.5	43.0	51.5	11.1	23.6	13.0	13.7
2003	68.3	48.1	93.9	103.8	60.8	41.3	61.5	73.3	8.2	5.1	26.6	16.8
2002	112.6	77.6	76.1	50.6	106.0	69.0	59.3	47.5	16.2	13.9	17.5	6.6
2001	131.9	152.6	135.4	117.8	99.0	96.8	84.0	106.0	47.0	31.9	37.9	39.0
2000	226.2	107.3	131.5	33.5	240.0	139.0	131.5	45.0	18.2	33.4	-	17.0
1999	177.9	115.3	82.3	185.0	153.5	115.3	86.5	185.0	45.0	12.3	13.3	-
1998	208.5	125.0	33.0	163.1	175.8	125.0	33.0	137.5	44.4	-	-	30.9
1997	163.1	143.3	147.1	45.1	131.0	122.0	149.0	38.5	31.2	15.3	20.2	18.1
1996	139.5	165.7	125.3	131.9	128.0	166.5	160.0	135.0	27.9	34.6	61.4	21.3
1995	122.3	123.1	62.3	164.1	143.0	91.8	62.3	138.3	27.3	28.6	62.3	50.3
1994	98.7	114.4	182.7	110.5	103.0	95.0	114.6	99.5	20.5	16.3	60.8	21.5
1993	103.9	108.2	118.6	174.6	64.9	91.5	123.5	172.5	32.9	43.0	18.3	35.1
1992	92.5	218.6	90.5	104.8	54.0	207.0	84.4	90.0	57.4	40.1	21.3	16.2
1991	143.7	114.5	107.1	123.9	141.8	131.5	87.0	126.9	37.0	22.8	26.7	15.7
1990	116.6	128.3	154.4	63.5	103.0	122.3	157.0	63.5	18.4	32.8	24.0	-
1989	94.4	149.6	201.6	154.9	97.0	131.5	144.8	189.0	32.7	33.2	41.8	28.2
1988	136.7	214.5	157.4	191.4	113.1	216.0	141.3	135.0	18.9	31.2	53.3	36.1
1987	150.6	101.4	119.0	191.7	92.8	105.8	70.0	204.0	58.7	7.4	56.6	15.4
1986	128.6	140.6	145.8	202.5	103.5	106.3	132.0	202.5	12.6	19.8	26.4	60.6

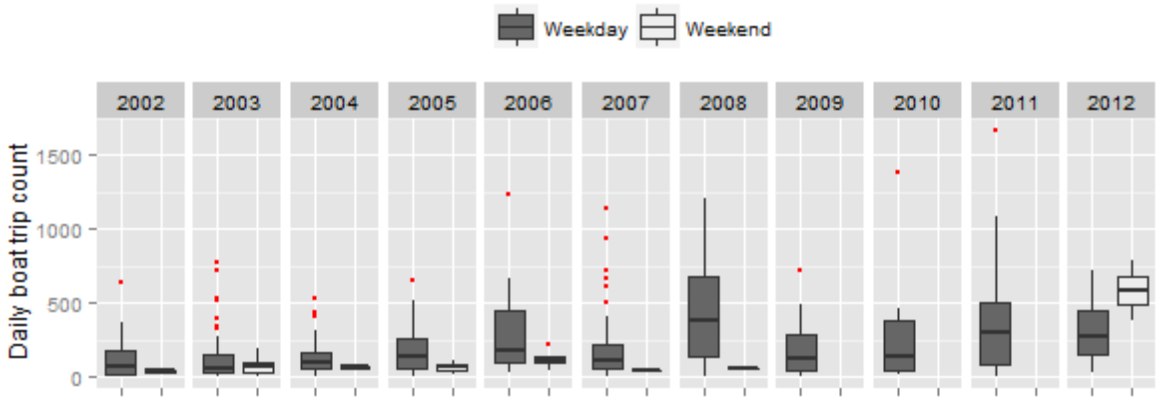

Figure A81. Boxplot of CPUE (kg/trip) for American Samoa (excluding Manua) trolling by day type: 2002-2012

Table A115. CPUE summary statistics for American Samoa (excluding Manua) trolling by day type

	Mean (lbs/trip)		Median (lbs/trip)		Standard Error (lbs/trip)		N	
Year	WD	WE	WD	WE	WD	WE	WD	WE
2012	309.1	582.1	267.8	582.1	50.5	200.4	19	2
2011	366.4	-	294.5	-	61.3	-	34	-
2010	338.2	-	131.7	-	183.8	-	7	-
2009	210.6	-	121.3	-	73.8	-	10	-
2008	426.6	52.2	384	52.2	51.7	-	38	1
2007	209.9	46.6	108.9	46.6	40.3	-	42	1
2006	302.7	118.9	183.1	109.4	50.8	38.1	29	4
2005	189.2	62.5	132.6	62.5	41.7	42.6	20	2
2004	122.3	63.2	91.8	63.2	12.5	14	68	2
2003	122	75.9	58.4	63.1	18	18.8	73	12
2002	141	34.1	69.6	37	35.2	6.7	26	4
2001	129	153.2	80.5	146	20.5	41.7	30	8
2000	100.1	36	80	36	33	15.5	13	4
1999	182.2	119	108	69.5	27.9	30.7	47	32
1998	124.2	124.3	91	99	26.6	30.1	28	11
1997	139	105.5	100	65	15.3	14.9	84	75
1996	158.2	176.8	122	146	12.6	21	123	57
1995	207.8	169.3	173.5	138	14.8	15.4	159	94
1994	216.4	135.4	192.3	119	15	15.5	124	53
1993	146.5	157.3	115.8	94	20.5	26.1	54	31
1992	252.3	226.5	211	192	23.9	27.6	81	34
1991	166.6	170.1	111.8	115.5	21.3	28.1	70	44
1990	180.9	143.5	112	80	18.5	19.3	113	56
1989	179.9	132.3	120	84	14.7	14.3	161	123
1988	335.1	209.9	250	110	28.1	26.6	117	89
1987	227.6	164	165	132.5	18.7	15.5	143	68
1986	200.6	145.1	157.5	119	11.3	13.1	192	87

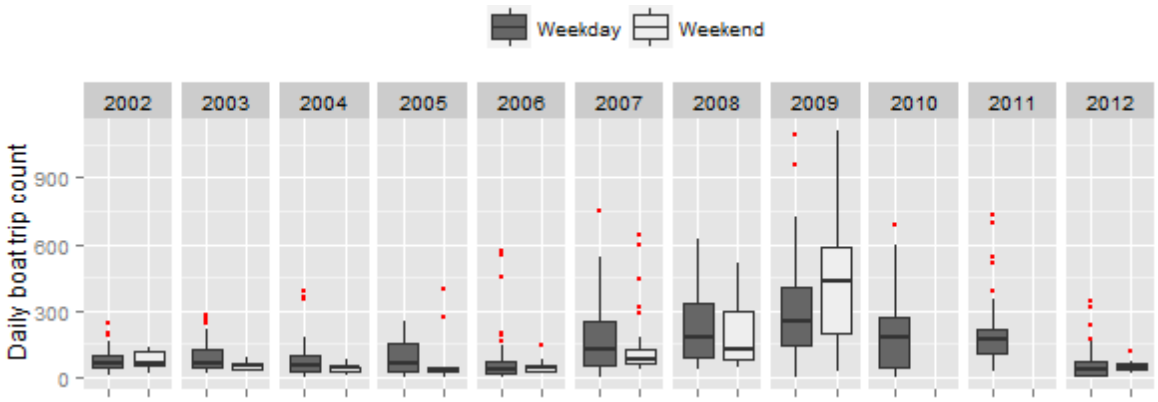

Figure A82. Boxplot of CPUE (kg/trip) for American Samoa (excluding Manua) bottomfishing by day type: 2002-2012

Table A116. CPUE summary statistics for American Samoa (excluding Manua) trolling by day type

	Mean (lbs/trip)		Median (lbs/trip)		Standard Error (lbs/trip)	
Year	WD	WE	WD	WE	WD	WE
2012	54.4	51.6	32.5	44.3	7.3	8.2
2011	195.2	-	168.8	-	19.4	-
2010	193.7	-	182.6	-	26.2	-
2009	302.5	437.9	255.8	436.1	22.7	68.9
2008	230.2	198.2	184.9	127.9	18.5	40.2
2007	185.4	155.0	123.0	81.0	20.7	35.7
2006	80.4	49.9	36.7	41.8	17.3	9.1
2005	86.3	89.2	60.0	34.6	16.8	42.0
2004	72.1	42.7	52.1	45.5	8.7	11.2
2003	95.5	53.8	67.8	55.5	11.9	4.4
2002	82.2	79.3	65.0	67.5	9.6	13.6
2001	152.9	93.4	106.0	57.3	22.3	46.3
2000	123.7	122.2	139.0	131.5	36.7	42.1
1999	156.7	70.0	129.8	70.0	30.0	-
1998	185.5	123.5	175.8	136.0	30.8	13.3
1997	142.8	133.4	136.3	99.4	14.1	23.4
1996	162.7	82.4	156.5	56.0	16.9	26.5
1995	102.7	190.0	103.0	191.3	19.2	24.2
1994	107.0	314.3	103.6	106.1	9.5	150.7
1993	132.0	63.6	126.0	55.1	15.4	13.7
1992	139.9	153.1	98.0	80.0	20.7	66.1
1991	141.3	70.4	146.0	53.0	12.2	21.3
1990	132.1	114.3	106.3	136.5	15.8	31.7
1989	142.8	175.1	136.0	148.5	20.8	32.0
1988	168.9	188.1	140.0	147.9	20.5	31.4
1987	140.7	134.5	106.0	105.5	34.4	41.3
1986	140.5	110.7	110.0	105.0	11.2	14.8

Table A117. American Samoa shore-based interview survey days with at least one recorded interview by quarter and day type

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1987	-	-	-	-	-	-	19	5
1988	24	8	30	8	21	11	15	7
1989	25	8	25	9	19	6	26	9
1990	18	3	24	7	36	17	35	10
1991	26	11	32	10	24	8	12	7
1992	17	8	13	3	13	1	22	7
1993	25	10	23	7	28	13	26	10
1994	37	13	35	13	29	11	25	7
1995	28	7	33	15	32	7	31	6
1996	28	6	29	10	32	6	23	3
1997	12	4	22	8	13	4	15	4
1998	22	7	18	6	20	6	19	6
1999	19	5	6	4	-	-	-	-
2000	12	2	2	1	10	2	18	5
2002	3	1	15	4	5	1	2	1
2003	7	1	2	-	4	1	-	-
2005	10	3	8	1	6	2	3	1
2006	14	2	11	1	24	4	6	2
2007	27	6	42	8	32	5	17	6
2008	37	6	18	2	20	2	7	-
2009	17	9	34	12	28	7	-	-
2010	2	-	15	5	36	4	38	3
2011	39	1	36	3	42	3	31	1
2012	16	2	21	1	12	-	-	-

WD : Weekday; WK: Weekend

Table A118. American Samoa shore-based interviews by quarter and day type

	Q1		Q2		Q3		Q4	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1987	-	-	-	-	-	-	20	6
1988	32	15	39	11	29	15	26	12
1989	42	11	36	11	24	8	37	15
1990	23	7	37	14	121	82	80	29
1991	52	37	105	24	70	29	21	11
1992	24	9	13	5	25	1	45	11
1993	50	50	49	8	57	19	36	22
1994	105	36	90	33	50	19	38	11
1995	53	11	70	37	56	15	48	12
1996	58	11	38	31	40	7	29	4
1997	13	7	35	9	17	5	17	5
1998	29	8	25	7	25	10	31	8
1999	34	7	6	4	-	-	-	-
2000	32	2	2	1	12	3	27	6
2002	3	1	57	6	5	2	2	4
2003	8	3	2	-	4	1	-	-
2005	21	5	10	1	9	5	3	1
2006	30	5	21	2	37	6	7	2
2007	60	11	88	17	56	7	26	12
2008	59	8	25	5	32	3	8	-
2009	32	12	51	26	47	15	-	-
2010	3	-	21	8	57	14	72	6
2011	73	2	66	7	78	5	53	1
2012	24	5	32	1	15	-	-	-

WD : Weekday; WK: Weekend

Table A119. American Samoa shore-based interviews by fishing method

Year	Rod and reel	Throw net	Gleaning	Hand line	Bamboo	Gillnet	Scuba spear	Snorkel spear	Others
1987	3	7	6	-	7	-	1	-	2
1988	27	30	44	5	33	-	11	-	32
1989	30	30	45	5	26	-	26	-	24
1990	85	63	58	70	31	-	47	-	53
1991	113	39	37	62	21	-	33	-	49
1992	18	33	31	6	19	-	17	-	12
1993	56	43	44	3	27	-	41	-	90
1994	100	45	72	23	30	-	53	-	71
1995	65	39	88	18	14	3	48	-	37
1996	50	43	56	16	13	4	17	-	21
1997	13	32	32	-	7	-	9	-	18
1998	21	25	31	7	8	-	25	-	32
1999	10	9	8	3	-	-	8	-	18
2000	11	14	17	-	3	-	6	-	38
2002	52	9	9	1	1	2	1	4	1
2003	8	3	4	-	-	-	-	3	0
2005	18	16	1	1	5	2	-	12	0
2006	39	33	9	1	1	7	-	20	0
2007	97	47	36	3	9	22	-	45	18
2008	46	31	17	3	3	5	-	32	3
2009	75	35	18	5	7	6	-	37	0
2010	42	57	10	4	6	4	-	57	1
2011	93	48	19	6	4	12	-	102	1
2012	32	16	6	2	-	4	-	17	0

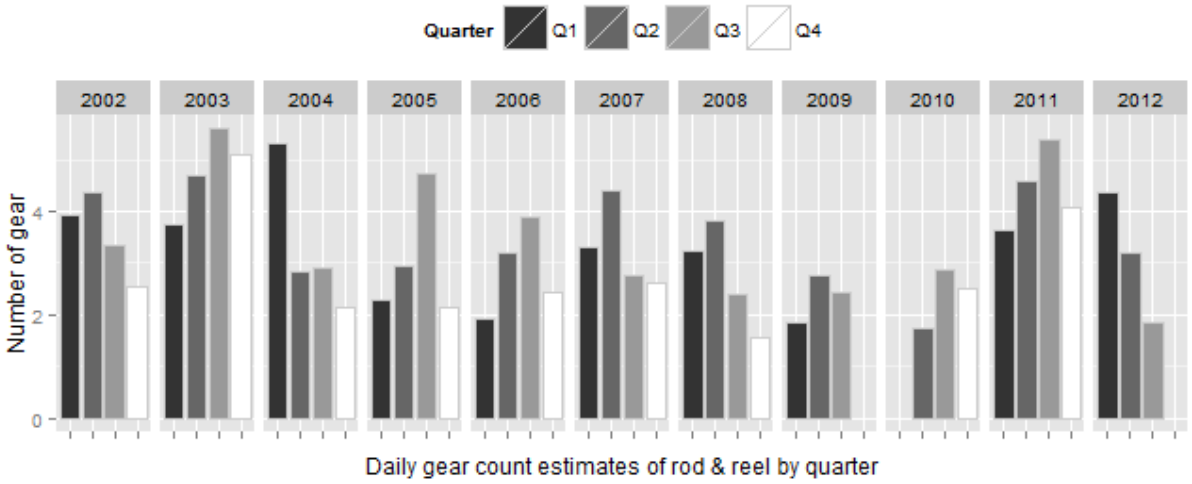

Figure A83. Daily gear count estimates for American Samoa rod & reel from shore-based participation count survey, by quarter: 2002-2012

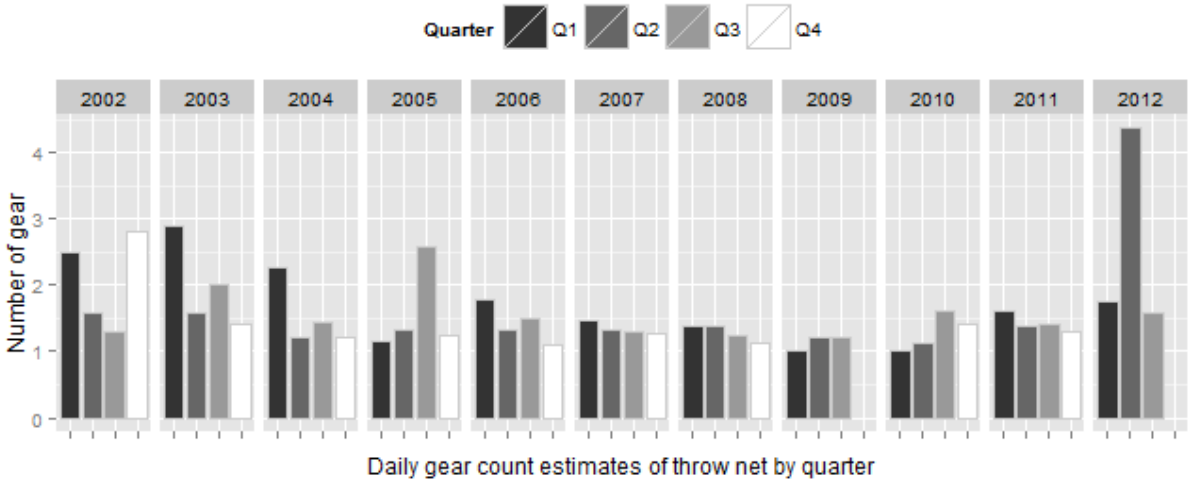

Figure A84. Daily gear count estimates for American Samoa throw net from shore-based participation count survey, by quarter: 2002-2012

Table A120. Daily average number of gears for American Samoa rod & reel from shore-based participation count survey, by quarter

Year	Q1	Q2	Q3	Q4
1990	-	-	13.1	4.8
1991	11.7	23.1	11.3	5.2
1992	9.1	4.4	2.0	2.4
1993	20.0	5.8	6.9	5.4
1994	6.5	15.3	10.4	5.2
1995	7.9	7.0	5.3	4.3
1996	6.5	23.5	-	-
2002	3.9	4.4	3.3	2.5
2003	3.8	4.7	5.6	5.1
2004	5.3	2.8	2.9	2.2
2005	2.3	2.9	4.7	2.1
2006	1.9	3.2	3.9	2.4
2007	3.3	4.4	2.8	2.6
2008	3.2	3.8	2.4	1.5
2009	1.9	2.8	2.4	-
2010	-	1.7	2.9	2.5
2011	3.6	4.6	5.4	4.1
2012	4.4	3.2	1.8	-

Table A121. Daily average number of gears for American Samoa throw net from shore-based participation count survey, by quarter

Year	Q1	Q2	Q3	Q4
1990	-	-	5.1	1.9
1991	2.4	2.5	3.1	2.2
1992	3.0	3.2	2.2	1.3
1993	4.2	1.9	2.5	2.3
1994	2.1	2.4	1.9	1.8
1995	2.3	1.6	1.7	1.3
1996	2.1	1.2	-	-
2002	2.5	1.6	1.3	2.8
2003	2.9	1.6	2.0	1.4
2004	2.3	1.2	1.4	1.2
2005	1.2	1.3	2.6	1.3
2006	1.8	1.3	1.5	1.1
2007	1.5	1.3	1.3	1.3
2008	1.4	1.4	1.3	1.1
2009	1.0	1.2	1.2	-
2010	1.0	1.1	1.6	1.4
2011	1.6	1.4	1.4	1.3
2012	1.8	4.4	1.6	-

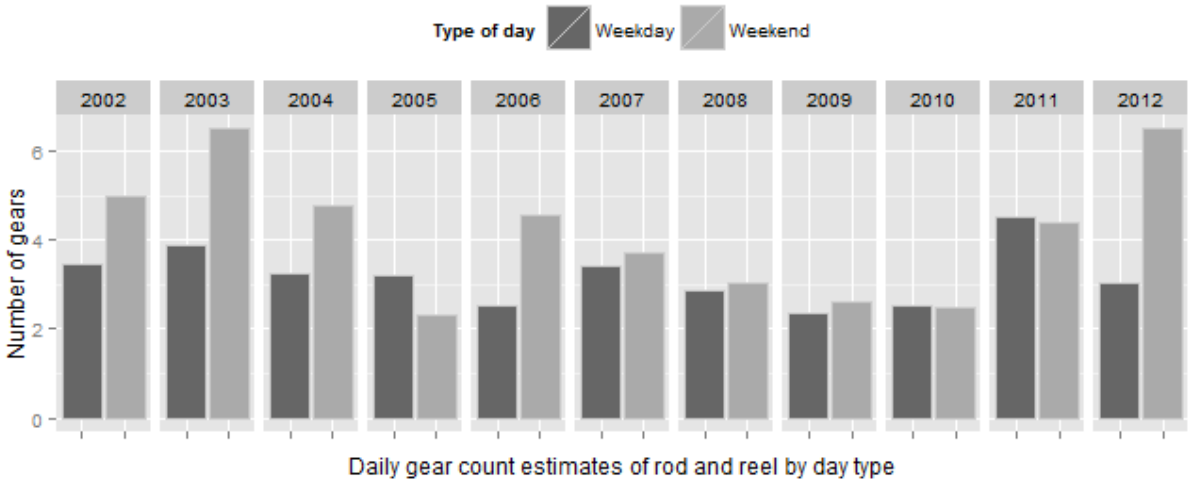

Figure A85. Daily gear count estimates for American Samoa rod and reel from shore-based participation count survey, by day type: 2002-2012

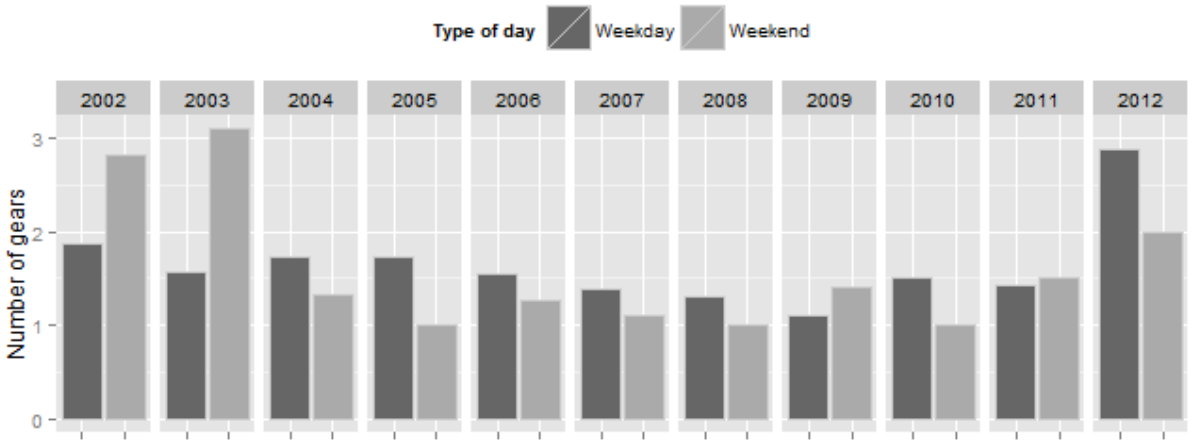

Figure A86. Daily gear count estimates for American Samoa throw net from shore-based participation count survey, by day type: 2002-2012

Table A122. Daily average number of gears for American Samoa rod and reel from shore-based participation count survey, by day type

Year	Weekday	Weekend
1990	8.9	10.0
1991	12.7	16.0
1992	3.5	9.6
1993	5.3	13.1
1994	7.9	12.7
1995	5.2	8.0
1996	8.5	30.1
2002	3.4	5.0
2003	3.9	6.5
2004	3.3	4.8
2005	3.2	2.3
2006	2.5	4.6
2007	3.4	3.7
2008	2.9	3.1
2009	2.3	2.6
2010	2.5	2.5
2011	4.5	4.4
2012	3.0	6.5

Table A123. Daily average number of gears for American Samoa throw net from shore-based participation count survey, by day type

Year	Weekday	Weekend
1990	2.8	8.0
1991	2.3	3.2
1992	1.9	5.0
1993	1.9	4.3
1994	1.8	2.7
1995	1.8	1.8
1996	1.9	1.4
2002	1.9	2.8
2003	1.6	3.1
2004	1.7	1.3
2005	1.7	1.0
2006	1.6	1.3
2007	1.4	1.1
2008	1.3	1.0
2009	1.1	1.4
2010	1.5	1.0
2011	1.4	1.5
2012	2.9	2.0

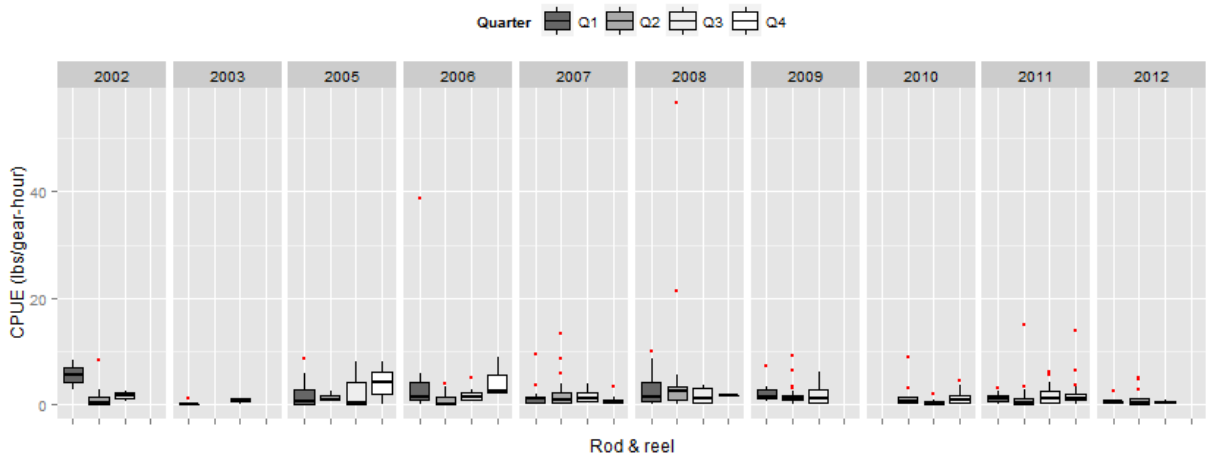

Figure A1. Boxplot of CPUE (lbs/gear-hour) for American Samoa rod & reel from shore-based participation count survey, by quarter: 2002-2012

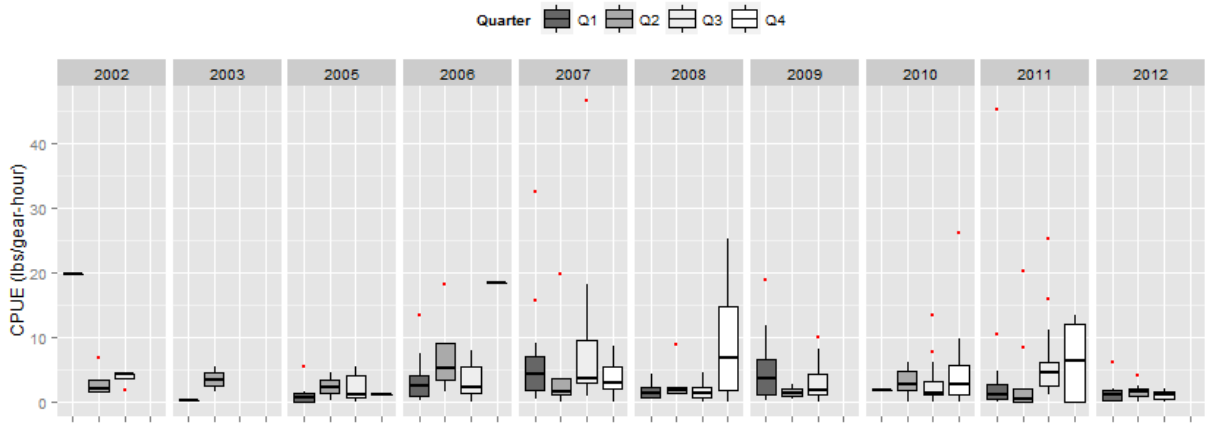

Figure A87. Boxplot of CPUE (lbs/gear-hour) for American Samoa thrownet from shore-based participation count survey, by quarter: 2002-2012

Table A124. CPUE summary statistics for American Samoa rod & reel fishing trips by quarter

	Mean				Median				Standard error			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1987	-	-	-	4.1	-	-	-	4.2	-	-	-	0.6
1988	4.2	5.4	3.7	4.6	3.9	4.7	5.0	4.0	1.0	1.3	1.2	1.2
1989	5.9	4.0	3.5	4.2	4.2	2.5	3.7	3.3	1.4	0.9	0.6	1.1
1990	16.5	9.1	3.3	2.9	16.5	5.5	2.0	1.4	-	3.5	0.5	1.1
1991	3.9	3.1	2.3	2.0	4.0	1.5	1.4	1.6	0.6	0.5	0.4	0.3
1992	3.8	2.9	0.9	4.3	2.0	2.9	1.2	3.3	1.8	1.4	0.4	1.2
1993	2.9	4.8	1.8	3.3	1.3	3.7	0.8	2.9	0.7	1.5	0.5	1.0
1994	1.5	2.4	1.9	3.2	0.5	0.4	1.3	2.8	0.4	0.5	0.4	0.8
1995	1.8	3.3	1.8	3.5	0.9	1.8	0.9	1.0	0.6	0.7	0.5	1.3
1996	2.1	1.7	5.2	6.2	1.3	0.9	5.0	6.2	0.6	0.4	0.9	3.4
1997	8.1	6.8	0.4	-	7.7	5.5	0.4	-	1.7	2.0	-	-
1998	10.6	4.6	6.4	5.2	10.6	1.7	4.4	3.5	1.2	1.9	2.2	1.5
1999	2.6	-	-	-	2.0	-	-	-	0.6	-	-	-
2000	1.3	-	1.5	3.0	1.3	-	1.1	2.5	-	-	0.7	0.6
2002	5.5	0.9	1.6	-	5.5	0.4	1.6	-	2.8	0.2	1.0	-
2003	0.2	-	0.7	-	0.0	-	0.8	-	0.2	-	0.3	-
2005	2.1	1.3	2.7	4.1	0.6	0.9	0.2	4.1	0.9	0.6	2.6	4.1
2006	6.4	0.8	1.7	4.4	1.4	0.0	1.3	2.3	4.1	0.4	0.3	2.3
2007	1.6	1.6	1.5	0.9	1.0	0.9	1.1	0.6	0.7	0.3	0.2	0.3
2008	2.5	8.0	1.5	1.8	1.4	2.5	1.1	1.8	0.6	4.7	0.5	-
2009	2.5	1.4	1.7	-	1.4	1.0	1.0	-	1.0	0.2	0.4	-
2010	-	1.6	0.4	1.1	-	0.5	0.0	0.9	-	1.0	0.2	0.2
2011	1.1	1.3	1.7	2.2	1.0	0.2	1.2	1.2	0.2	0.6	0.4	0.7
2012	0.6	1.0	0.4	-	0.5	0.3	0.3	-	0.3	0.4	0.1	-

Table A125. CPUE summary statistics for American Samoa throw net fishing trips by quarter

	Mean				Median				Standard error			
Year	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
1987	-	-	-	6.9	-	-	-	6.5	-	-	-	1.0
1988	8.5	6.9	4.9	7.7	5.4	7.4	4.7	7.5	2.7	0.8	0.5	1.5
1989	9.0	8.5	9.3	10.2	7.8	7.3	5.9	10.5	1.6	1.2	2.0	1.4
1990	17.6	7.9	6.2	5.2	18.1	8.0	4.1	5.3	2.2	1.0	1.3	0.9
1991	3.4	7.2	6.7	5.5	2.5	7.0	3.7	4.1	0.9	1.2	2.7	2.1
1992	5.7	5.6	7.9	5.4	5.9	6.3	7.1	3.3	1.1	1.4	2.7	1.3
1993	2.5	4.3	4.1	2.7	1.9	4.1	3.0	2.9	0.6	1.1	1.0	0.4
1994	3.0	3.2	3.3	3.6	1.1	1.6	1.6	2.2	1.0	1.0	1.2	1.7
1995	2.1	2.3	2.2	1.7	2.4	1.5	1.7	1.1	0.5	0.7	0.5	0.4
1996	2.5	3.1	3.0	3.5	2.3	2.9	2.9	3.3	0.5	0.7	0.2	0.4
1997	4.8	2.8	2.8	2.8	5.2	2.9	2.6	2.9	1.2	0.1	0.5	0.2
1998	3.2	3.4	5.4	5.5	3.2	2.8	2.6	4.5	0.2	0.9	2.8	0.9
1999	5.1	2.8	-	-	4.4	2.6	-	-	1.0	0.5	-	-
2000	3.4	1.0	-	3.3	2.9	1.0	-	3.1	0.7	-	-	0.7
2002	19.8	3.1	3.7	-	19.8	2.0	4.3	-	-	1.3	0.6	-
2003	0.1	3.5	-	-	0.1	3.5	-	-	-	1.9	-	-
2005	1.4	2.3	2.3	1.2	0.6	2.3	1.0	1.2	0.9	2.1	0.8	-
2006	3.4	7.5	3.4	18.5	2.5	5.1	2.4	18.5	0.9	3.7	0.7	-
2007	6.9	3.9	8.5	3.7	4.3	1.5	3.6	3.0	2.1	2.0	3.0	1.0
2008	1.7	3.1	1.6	9.7	1.3	1.7	1.3	6.8	0.5	1.5	0.4	5.7
2009	5.4	1.5	3.1	-	3.6	1.3	1.7	-	1.9	0.3	0.7	-
2010	1.9	3.1	2.8	4.3	1.9	2.7	1.3	2.8	-	0.7	0.6	1.2
2011	4.3	3.7	6.4	6.4	1.2	0.5	4.5	6.3	2.4	2.3	1.7	2.9
2012	1.8	1.6	1.1	-	1.1	1.6	1.1	-	0.9	0.5	1.1	-

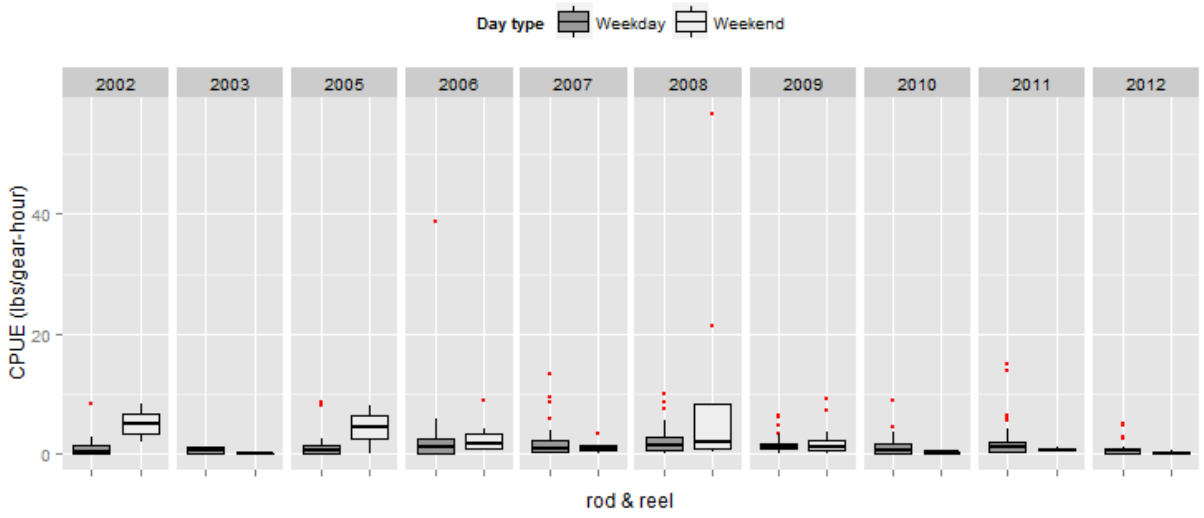

Figure A88. Boxplot of CPUE (lbs/trip) for American Samoa rod & reel by day type: 2002-2012

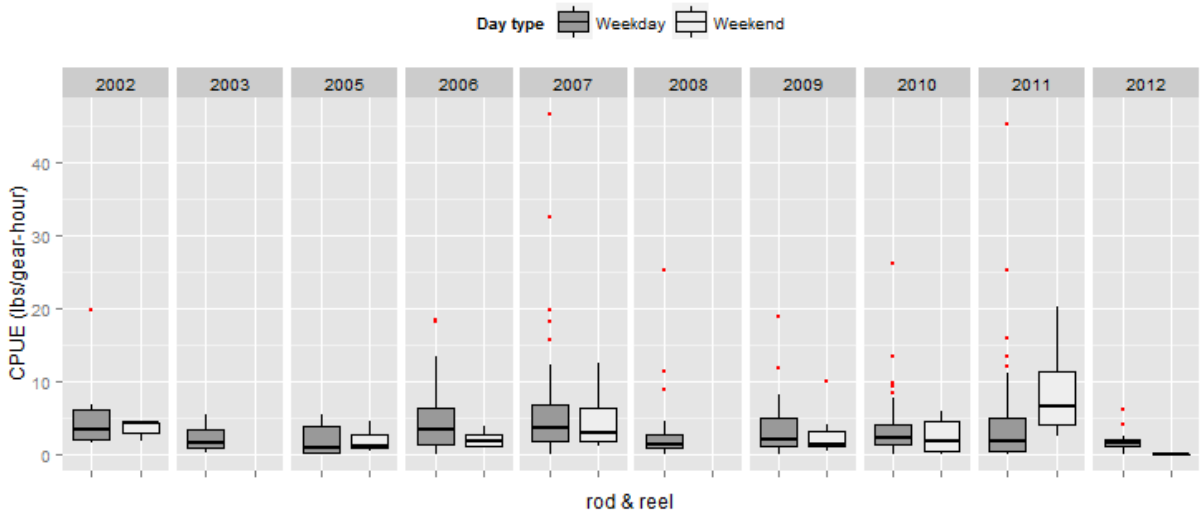

Figure A89. Boxplot of CPUE (lbs/trip) for American Samoa thrownet by day type: 2002-2012

Table A126. CPUE summary statistics for American Samoa rod & reel fishing trips by day type

	Mean		Median		Standard error	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1987	3.5	5.1	3.5	5.1	0.7	-
1988	4.5	4.6	4.5	3.7	0.6	1.5
1989	4.9	4.2	3.9	3.0	0.8	1.1
1990	4.0	3.5	2.2	1.9	0.8	0.9
1991	3.2	2.2	2.2	1.0	0.3	0.8
1992	3.8	1.3	2.8	1.4	1.0	0.2
1993	3.6	1.6	2.9	0.8	0.6	0.4
1994	2.4	1.0	1.0	0.4	0.3	0.4
1995	2.8	2.2	1.1	0.6	0.4	0.9
1996	3.3	1.4	2.6	0.8	0.5	0.5
1997	6.7	7.7	5.9	7.7	1.5	2.9
1998	6.1	5.3	4.4	3.7	1.2	1.8
1999	2.8	1.2	2.4	1.2	0.7	-
2000	2.6	1.3	2.5	1.3	0.5	-
2002	0.9	5.1	0.4	5.1	0.2	3.3
2003	0.5	0.0	0.5	0.0	0.2	0.0
2005	1.7	4.2	0.6	4.5	0.8	1.7
2006	2.7	2.8	1.2	1.5	1.2	1.1
2007	1.6	1.0	0.9	0.7	0.2	0.3
2008	2.2	11.0	1.4	1.9	0.4	7.0
2009	1.5	1.8	1.0	1.0	0.2	0.4
2010	1.1	0.2	0.6	0.2	0.3	0.2
2011	1.6	0.7	1.0	0.7	0.2	0.5
2012	0.8	0.2	0.4	0.1	0.3	0.1

(WD = Weekday; WE = Weekend)

Table A127. CPUE summary statistics for American Samoa throw net trips by day type

	Mean		Median		Standard error	
Year	**WD**	**WE**	**WD**	**WE**	**WD**	**WE**
1987	6.9	6.9	5.2	6.9	1.5	0.4
1988	7.4	6.2	6.0	5.1	1.0	0.9
1989	8.9	11.0	7.2	12.4	0.9	1.7
1990	6.9	7.4	4.7	6.3	1.1	1.4
1991	4.9	6.9	4.5	2.3	0.6	3.0
1992	5.4	7.3	4.1	6.7	0.9	2.5
1993	2.9	4.2	2.6	3.5	0.4	0.9
1994	3.3	3.0	1.3	2.1	0.8	0.7
1995	1.8	2.7	1.4	2.1	0.3	0.7
1996	3.1	2.4	3.0	2.5	0.3	0.4
1997	2.8	3.4	2.6	3.2	0.2	0.4
1998	4.4	3.7	3.2	3.9	0.9	0.6
1999	3.9	4.5	3.2	4.2	0.9	1.2
2000	3.4	1.0	2.9	1.0	0.5	-
2002	6.1	3.5	3.3	4.3	2.9	0.9
2003	2.4	-	1.6	-	1.6	-
2005	1.9	2.0	0.9	1.2	0.6	1.2
2006	4.7	2.2	3.4	1.9	0.9	0.6
2007	6.5	4.7	3.6	3.0	1.4	1.8
2008	2.9	-	1.4	-	0.9	-
2009	3.6	2.8	2.1	1.4	0.8	1.1
2010	3.6	2.4	2.3	1.8	0.6	0.8
2011	4.7	9.0	1.9	6.5	1.2	4.0
2012	1.8	0.1	1.6	0.1	0.4	0.0

(WD = Weekday; WE = Weekend)

Appendix 2. R-code

Creel data summary code

```
## SUMMARY STATISTICS FOR CREEL SURVEY DATA
## THIS CODE INCLUDES GUAM BOAT-BASED CREEL SURVEY DATA SUMMARY
library(reshape)
library(ggplot2)
library(scales)

#File names
intfile <- "GOF_Int_Cleaned.csv"
catfile <- "GOF_Cat_Cleaned.csv"
blgfile <- "GOf_BLD_Cleaned.csv"

# Upload data files
intv <- read.csv(file=intfile, sep=",", header=TRUE)
cat <- read.csv(file=catfile, sep=",", header=TRUE)
blg <- read.csv(file=blgfile, sep=",", header=TRUE)

# Upload fishing method file
fmethod <- read.csv(file="guam_method_bbs.csv", header=TRUE)

# Lower case for names
names(intv) <- tolower(names(intv))
names(cat) <- tolower(names(cat))
names(blg) <- tolower(names(blg))

# Attach method names to the files
intv<-join(intv, fmethod, by="method")
cat <- join (cat, fmethod, by="method")
blg <- join(blg, fmethod, by="method")

#entire
year <- c(1982:2012)

sintv <- intv[intv$year %in% year,]
sblg <- blg[blg$year %in% year,]
scat <- cat[cat$year %in% year,]

# Add
# Data: blg
season1 <- rep(0, nrow(blg))
season2 <- rep(0, nrow(blg))
blg <- cbind(blg,season1, season2)

#wet and dry season addition
blg[blg$month %in% c(12, 1:6),]$season1 = 1
blg[blg$month %in% c(7:11),]$season1 = 2

#quarter season addition
blg[blg$month %in% c(1:3),]$season2 = 1
blg[blg$month %in% c(4:6),]$season2 = 2
blg[blg$month %in% c(7:9),]$season2 = 3
```

```
blg[blg$month %in% c(10:12),]$season2 = 4

# Data: int
season1 <- rep(0, nrow(intv))
season2 <- rep(0, nrow(intv))
alt_meth <- rep(0, nrow(intv))
intv <- cbind(intv,season1, season2, alt_meth)

#wet&dry season
intv[intv$month %in% c(12, 1:6),]$season1 = 1
intv[intv$month %in% c(7:11),]$season1 = 2

#alt_meth
#TROLLING 1
#BOTTOM 2
#SPEAR/SNORKEL 5
#SPEAR/SCUBA 6
#mixed gear 4
#ATULAI NIGHT LIGHT 3

intv[intv$method ==1,]$alt_meth = "Trolling"
intv[intv$method ==2,]$alt_meth = "Bottomfishing"
intv[intv$method ==3,]$alt_meth = "Atulai"
intv[intv$method ==4,]$alt_meth = "Mixed spear"
intv[intv$method ==5,]$alt_meth = "Spear/snorkel"
intv[intv$method ==6,]$alt_meth = "Spear/scuba"
intv[intv$method >6,]$alt_meth = "Other"

#quarters
intv[intv$month %in% c(1:3),]$season2 = 1
intv[intv$month %in% c(4:6),]$season2 = 2
intv[intv$month %in% c(7:9),]$season2 = 3
intv[intv$month %in% c(10:12),]$season2 = 4

## NUMBER OF SURVEY DAYS (YEAR, QUARTER, TYPE OF DAY)
tmp1 <-ddply(blg, .( year,season2, typ_day ), summarize,
             sdays = length(unique(date)))

## NUMBER OF SURVEY DAYS (YEAR, QUARTER, TYPE OF DAY, PORT)
tmp1 <-ddply(blg, .( port, year,season2, typ_day ), summarize,
             sdays = length(unique(date)))

## NUMBER OF INTERVIEWS (YEAR, QUARTER, TYPE OF DAY, PORT)
tmp1 <-ddply(intv, .(port, year, season2, typ_day), summarize,
             sdays = length(date))

## NUMBER OF INTERVIEWS (YEAR, PORT, FISHING METHOD)
tmp1 <-ddply(intv, .(year, port, meth_name), summarize,
             sdays = length(date))
```

```
##################################################
##    TROLLING DAILY EFFORT BY PORT             ##
##################################################

### The following code can be used for other fishing method and other strata
### (day type (typ_day), quarter (season2))

tmp3 <- ddply(blg[blg$method==1,], .(port, year, charter), summarize,
effort = length(date))
#weight
tmp5 <-ddply(blg, .(port, year), summarize,
             sdays = length(unique(date))
)

tmp6 <- join(tmp3, tmp5, by=c("port", "year") )
daily <- tmp6$effort/tmp6$sdays


##################################################
##    TROLLING CPUE COMPUTATION                 ##
##################################################

### The following code can be used for other fishing method and other strata
### (day type (typ_day), quarter (season2))
### Data from 2008 to 2012 were combined to compute CPUE summary

## SUBSET THE CATCH DATA (2008 – 2012)

dat <- intv[intv$year %in% c(2008:2012) & intv$method ==1,]

## COMPUTE MEAN, NUM OF INTERVIEW (N), STANDARD ERROR OF CPUE
## BY CHARTER, DAY TYPE, PORT, QUARTER
cpue <- ddply(dat, .(charter, typ_day, port, season2), summarize,
              mcpue = mean(tot_k),
              no_int = length(tot_k),
              se = sd(tot_k)/sqrt(no_int))

## GENERATE DESCRIPTIVE STATISTICS (MIN, Q1, Q2, MEDIAN, Q3, MAX)
## BY CHARTER, DAY TYPE, PORT, QUARTER
cpue_summ <- aggregate(dat=dat, tot_k~charter*typ_day*port*season2,
FUN=fivenum)


##################################################
##    CATCH DATA SUMMARY                        ##
##################################################

## COMPUTE TOTAL CATCH WEIGHT AND NUMBER OF CATCH BY
## SPECIES AND FISHING METHOD (ENTIRE DATASET)
tmp <- ddply(scat[scat$method %in% c(1,2),], .(species, spec_name, method),
summarize,
             cweight = sum(cat_k),
             ccount = sum(cat_num))

## SORT THE RESULT FROM MOST CAUGHT (IN K) TO THE LEAST
tmp2 <- tmp[order(tmp$method, -tmp$cweight),]
```

```
## COMPUTE TOTAL CATCH WEIGHT AND NUMBER OF CATCH BY
## SPECIES AND FISHING METHOD (THE MOST RECENT 5 YEAR DATASET)
tmp <- ddply(scat[scat$method %in% c(1,2) & scat$year %in%
c(2008:2012),], .(species, spec_name, method), summarize,
             cweight = sum(cat_k),
             ccount = sum(cat_num))
tmp2 <- tmp[order(tmp$method, -tmp$cweight),]


#####################################################
##    CPUE COMPARISON (KRUSKAL0-WALLIS TEST     ##
#####################################################

## SUBSET DATA FOR TROLLING AND BOTTOMFISHING OF 2008-2012
dat <- intv[intv$year %in% c(2008:2012) & intv$method %in% c(1,2),]

#KRUSKAL-WALLIS TEST TO COMPARE DIFFERENCE IN CPUE ACROSS STRATUM (TYP_DAY,
QUARTER, PORT)
tmp1 <- ddply(dat, .(charter, method), summarize,
a=kruskal.test(tot_k~port)
)
```

WPacFIN Expansion Algorithm of the boat-based creel survey data

```
## EXPANSION ALGORITHM LIBRARY
##
## Code Author: Sunny Bak Hospital
## Last Updated: 1/2/2014
## Description: This file includes all the functions necessary
##              to compute cpue estimates of expansion algorithm
##
## Usage :  functions are called to compute
##          each component of expansion algorithm
##
## Expansion Algorithm steps (Total effort) :
## 1. compute total effort (boat counts) from boat log
## 2. adjust total effort (adj_t) with the following factors
##    a1 : ratio of unknown trip to known trip (fishing or non-fishing)
##    a2 : ratio of unknown method to known methods
##    a3 : spatial adjustment (applied only for unsurveyed ports)
##    p1 : temporal adjustment (file with data entered by local staff)
## 3. obtain sample day (M)
## 3. compute: estimated total effort = (adj_t) / M
##
## Requirement:
##    (a) g_sampda.csv file must be in the working directory
##

library(reshape)

## Function: get_sampday(yr)
## Descrdiption: extracts total number of sample days
##          from g_sampda file
## Input values (1): yr (YYYY)
## Returned values: total number of sample days (sday) from g_sampda file
## Returned value format(port, typ_day, sday)

get_sampday <- function(yr, sampfile)
{
 temp<- read.csv(file=sampfile, sep=",", header=TRUE)
 samp <- temp[temp$year==yr,]
 samp1 <- ddply(samp, .(port, typ_day), summarize, count=length(date))
 samp1
}


## Function: get_p1(dfile, yr)
## Description: returns mean of p1 for each port and method
## Input values (2): p1 file name (dfile), year (YYYY)
## Returned values: p1 values by port, method and charter
## Returned value format (port, method, charter, p1 value)

get_p1 <- function(yr, dfile)
{
  p1<- get_dat(dfile, yr)
  # (p1) computing mean estimates for p1 for port and method
  p1_mean <- (ddply(p1[,3:6], .(port, method), colMeans))

  # reformatting p1
```

```
  p1_mean1 <- melt(p1_mean,id=c("port", "method"),variable_name="charter")
  p1_mean1$charter <- ifelse(p1_mean1$charter=="non_ch_p1", "FALSE", "TRUE")
  p1_mean1
}

get_dat <- function(dfile, yr)
{
  yr2 <- as.character(sprintf("%02d", yr%%100))
  substr(dfile, 4,5) <- yr2
  temp<-read.csv(file=dfile, sep=",", header=TRUE)
  temp
}

## Function: get_adj_t(dat)
## adjusts sample total effort by ratio of unknown
## to known fishing methods

get_adj_t <- function(x)
{
  a1 = 1+length(which(x$fished=="U"))/length(which(x$fished=="Y" | x=="N"))
  adj_est<- a1*count(x$log_num)
  adj_est
}

# Function: estimate_cpue_
# estimates Guam boat-based cpue from the creel survey data
# argument:
# intdat          raw interview data
# ref             reference dat
# values:
# list of values including the stratum levels (port, typ_day, method, charter)
# and the estimates: tot_k (cpue) and int_num (number of interviews)
#
### Pooling priority
## 1) day type
## 2) method: for mixed-spearfishing, combine scuba and snorkel (ignored)
## 3) for agana boat basin (P1) and agat marina (P2), combine data
## 4) for meritzo + trolling or atuali, combine data from agana or agat
## 5) borrow data from refer.dbf


## This function computes initial (sample) cpue
get_sample_cpue <- function(int.dat, ref.dat) {

 intv <- int.dat
 ref <- ref.dat
 init_dat<- ddply(intv, .(port, typ_day, method, charter),
                  summarize,  int_num=length(date), cpue=mean(tot_k))
 init_dat
}

## Computing CPUE estimates based on expansion algorithm
estimate_cpue <- function(int.dat, ref.dat) {

       # PRIORITY 1 : simple random sampling estimation
 int_dat <- get_sample_cpue(int.dat, ref.dat)
 int_bad <- int_dat[int_dat$int_num <3,]
```

```
 #int_pooled contains all
 int_pooled <- int_dat

 # PRIORITY 2 :combine day type
 tmp_dat1 <- ddply(int_dat, .(port, method ,charter), summarize,
                   int_num1=sum(int_num),
                   cpue1 = mean(cpue))

 # Combine previous dat with pooled data (1)
 # int_pooled <- merge(int_pooled, tmp_dat1, all.x=TRUE)
 int_pooled <- merge(int_pooled, tmp_dat1 , by=c("port", "method", "charter"),
all.x=TRUE)
 int_pooled[int_pooled$int_num1 <3, ]$cpue1 = int_pooled[int_pooled$int_num1
<3, ]$cpue
 int_pooled[int_pooled$int_num1 <3, ]$int_num1 =
int_pooled[int_pooled$int_num1 <3, ]$int_num


 # PRIORITY 3: mixed spear (ignored for the analysis)
 # PRIORITY 4-1 (combine port 1 and 2)
 tmp <- int_pooled[int_pooled$port %in% c(1,2),]
 tmp_dat2 <- ddply(tmp, .(method, charter, typ_day), summarize,
                   int_num2= sum(int_num1),
                   cpue2 = mean(cpue1))

 # merging int_pooled data of port 1 and 2 and the combined (1 and 2) cpue
 tmp1 <- merge(tmp, tmp_dat2, by=c("method", "charter", "typ_day"),
all.x=TRUE)
 #1-4: method, charter, typ_day, port;9, 10 : int_num2 and cpue2
 int_pooled <- merge(int_pooled, tmp1[,c(1:4,9,10)], by=c("method", "charter",
"port", "typ_day"), all.x=TRUE)
 int_pooled[is.na(int_pooled)]<-0
 int_pooled[int_pooled$int_num2 <3, ]$cpue2 = int_pooled[int_pooled$int_num2
<3, ]$cpue1
 int_pooled[int_pooled$int_num2 <3, ]$int_num2 =
int_pooled[int_pooled$int_num2 <3, ]$int_num1

 ##PRIORITY 4-2
 tmp <- int_pooled[int_pooled$port %in% c(1,2),]
 tmp_dat3 <- ddply(tmp, .(method, charter, typ_day), summarize,
                   int_num3= sum(int_num2),
                   cpue3 = mean(cpue2))

 # merging int_pooled data of port 1 and 2 and the combined (1 and 2) cpue
 tmp <- merge(int_pooled[int_pooled$port %in% c(1,2),], tmp_dat3,
by=c( "method", "charter", "typ_day"), all.x=TRUE)
 int_pooled <- merge(int_pooled, tmp[,c(1:4,11,12)], by=c("method", "charter",
"port", "typ_day"), all.x=TRUE)
 int_pooled[is.na(int_pooled)]<- 0
 int_pooled[int_pooled$int_num3 == 0, ]$cpue3 =
int_pooled[int_pooled$int_num3 ==0, ]$cpue2
 int_pooled[int_pooled$int_num3 == 0, ]$int_num3 =
int_pooled[int_pooled$int_num3 ==0, ]$int_num2

 # PRORITY 5: Borrow data from Refer.dbf
 ref <- ref.dat[,c(1,2)]
```

```
 names(ref) <- c("method", "cpue4")
 tmp <- merge(int_pooled[(int_pooled$int_num3) <3,], ref, by=c("method"),
all.x=TRUE)
 int_pooled <- merge(int_pooled, tmp[,c(1:4,13)], by=c("method", "charter",
"port", "typ_day"), all.x=TRUE)
 int_pooled[is.na(int_pooled)]<-0

 int_pooled
}

get_nstrata <- function(int.dat) {
 tmp <- aggregate(tot_k~port*typ_day*method*charter, dat=int.dat, FUN=mean)
 nrow(tmp)
}
```

Computing WPacFIN estimates, and bootstrap standard errors and bias for CPUE

```
## BOOTSTRAPPING SE AND BIAS FOR CATCH ESTIMATE (CPUE)
##
## Code Author: Sunny Bak Hospital
## Last Updated: 12/30/2013
## Description: This R code computes estimates of Guam boat-based CPUE at
##              at annual level using Expansion Algorithm.
##              It also computes the standard error (SE) and bias
##              of the CPUE by using non-parametric bootstrap techniques
##
## Requirement: must have interview data and ref data in the working
##              directory

##  SET THE WORKING DIRECTORY
setwd("exp_boot")

## CALL THE EXPANSION ALGORITHM LIRARY TO LOAD THE FUNCTIONS
source("wpac_exp_alg.R")
library(ggplot2)

# Annaul estimation
yr = 2011

## LOAD DATA
int <- read.csv("dat/GOf_Int.csv", header=TRUE)
ref.dat <- read.csv("dat/g_refer.csv", header=TRUE)
names(int) <- tolower(names(int))

## COMPUTE WPAC CPUE ESTIMATES ("true" value) USING EXPANSION ALGORITHM
int.dat <- int[int$year==2011,]
# expansion algorithm
wpac_cpue <- estimate_cpue(int.dat, ref.dat
# expansion algorithm report (step by step)
pooled_cpue <- get_pool_report(int.dat, ref.dat)

#####################################################
###         BOOT STRAP MATHEOD                    ###
#####################################################

## No of replicates
B=500
cpue_boot <- data.frame(port=character(), tpy_day=character(), method=integer,
                            charter=logical(), tot_k=numeric(),
int_num=numeric())
boot.dat <- NULL

nobs = nrow(int.dat)

for(i in 1:B){
   boot_dat <- int.dat[sample(1:nobs, nobs, replace=TRUE),]
   a <- estimate_cpue(boot_dat, ref.dat)
   cpue_boot<-rbind(cpue_boot, a)
}

#bootstrap bias
# mean(cpue_boot) - cpue_wpac
```

```
# mean of the cpue estimates
mean_cpue_boot <- aggregate(tot_k~port*typ_day*method*charter, dat=cpue_boot,
FUN=mean)

#boostrap SE
# sd(cpue_boot)
boot_se<- aggregate(tot_k~port*port*typ_day*method*charter, dat=cpue_boot,
FUN=sd)

par(mfrow=c(1,2))
boot <- cpue_boot[cpue_boot$port==1 & cpue_boot$typ_day==1 &
cpue_boot$method==6 & cpue_boot$charter=='FALSE',]
wpac <- wpac_cpue[wpac_cpue$port==1 &wpac_cpue$typ_day==1 &
wpac_cpue$method==3 & wpac_cpue$charter=='FALSE',]
hist(boot$tot_k, , xlab="CPUE (k/trip)", ylab="frequency", main="" )
abline(v=wpac$tot_k, col="red", lwd=2)
qqnorm(boot$tot_k, main="")
qqline(boot$tot_k, col="green")

#port & typ_day
b1 <- cpue_boot[ cpue_boot$method==13 & cpue_boot$charter==TRUE,]
a1 <- wpac_cpue[wpac_cpue$method==13 & wpac_cpue$charter==TRUE,]

c1 <- cpue_boot[cpue_boot$method>2  & cpue_boot$method<11,]
d1 <- aggregate(tot_k~port*method, dat=wpac_cpue[wpac_cpue$method>2 &
wpac_cpue$method<11,],FUN=mean)
#d1 <- wpac_cpue[wpac_cpue$method>2 & wpac_cpue$method<11,]

## GRAPHICAL REPRESENTATION OF THE REPLICATE DISTRIBUTION
## Day type vs Port
m <- ggplot(b1, aes(x=tot_k))+
geom_histogram(colour = '#cccccc', fill='#00B9EB', binwidth = 2) +
geom_vline(data = a1, aes(xintercept = tot_k), colour =
'red', size = 1) + facet_grid(port ~ typ_day)+xlab("Charter Spincasting trip
CPUE replicates from 2006-2011, B=500")+ylab("")

m+ theme(axis.title.x = element_text(size = 13),strip.text =
element_text(colour = "black", size=13) )


int.dat[int.dat$typ_day==2,]$typ_day="Weekend"
int.dat[int.dat$method==5,]$method="Spear/snorkel"

a <- ggplot(int.dat[int.dat$method=="Surround net",], aes(x=tot_k))+
geom_histogram(colour = '#cccccc', fill='#00B9EB', binwidth = 5)
+facet_grid(method~.)+xlab("Trip CPUE")+ylab("")
a+ theme(axis.title.x = element_text(size = 13),strip.text =
element_text(colour = "black", size=13))

a <- ggplot(int.dat, aes(x=tot_k))+ geom_histogram(colour = '#cccccc',
fill='#00B9EB', binwidth = 5) +facet_grid(method~.)+xlab("Trip CPUE")+ylab("")
a+ theme(axis.title.x = element_text(size = 13),strip.text =
element_text(colour = "black", size=13))
```