Archipelagic Fishery Ecosystem Annual Report

American Samoa and Marianas FEP Plan Team

2012

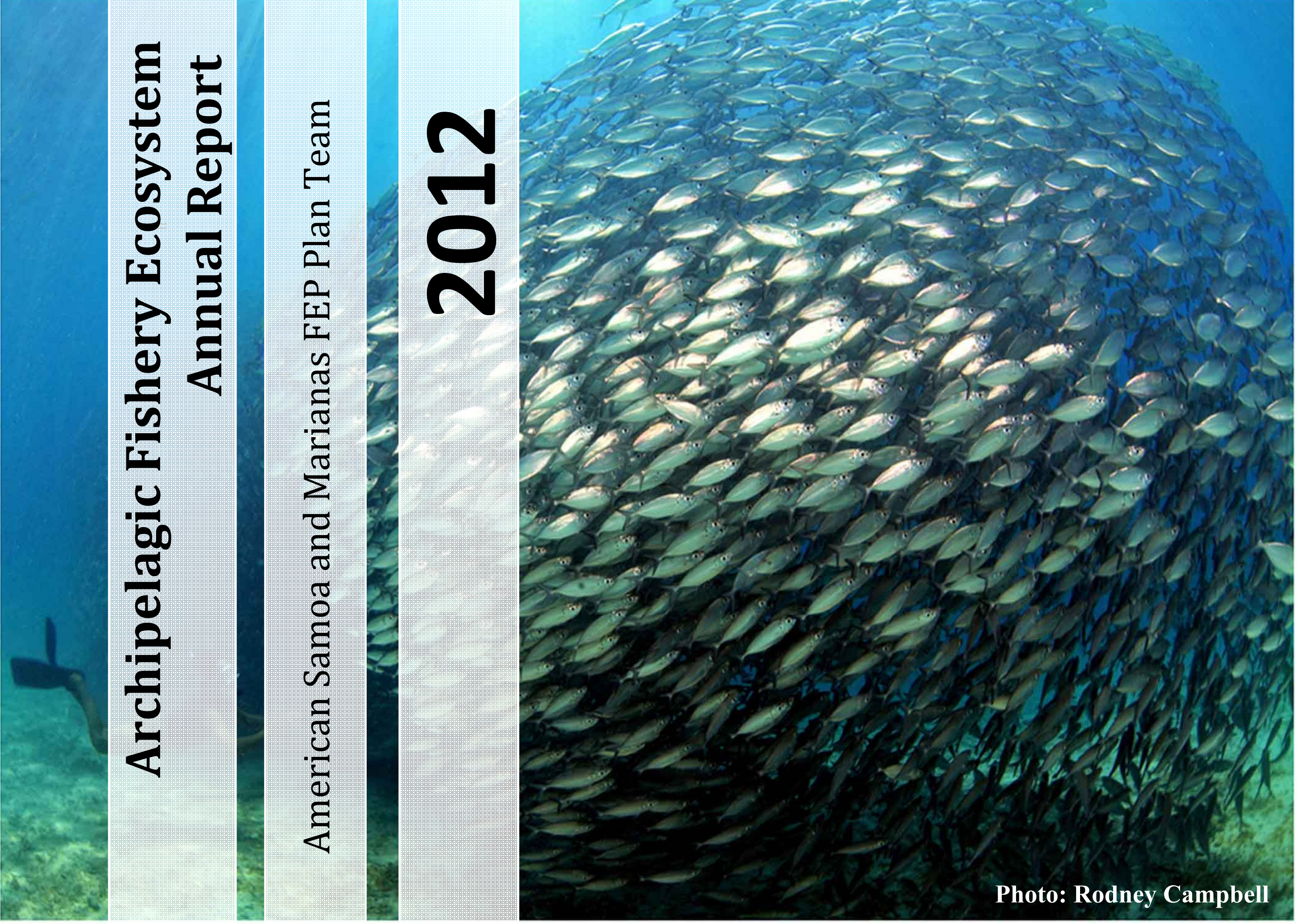

Photo: Rodney Campbell

The Western Pacific Archipelagic Fishery Ecosystem Annual Report for 2012 was drafted by the Fishery Ecosystem Plan Team from American Samoa (AS), Guam (GU), and Commonwealth of Northern Mariana Islands (CNMI). This is a collaborative effort primarily between the Western Pacific Regional Fishery Management Council, NMFS-Pacific Island Fisheries Science Center, Department of Marine and Wildlife Resources (AS), Division of Aquatic and Wildlife Resources (DAWR), and Division of Fish and Wildlife (CNMI). This report attempts to summarize annual fishery performance looking at trends in catch, effort and catch rates as well as provide a source document describing various projects and activities being undertaken on a local and federal level. This report provides a summary of annual catches relative to the Annual Catch Limits established by the Council in collaboration with the local fishery management agencies.

Western Pacific Regional Fishery Management Council
1164 Bishop St. Suite 1400, Honolulu, Hawaii, USA 96813
P: 808-522 8220
F: 808-522 8226

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Edited By: Marlowe Sabater

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Department of Marine and Wildlife Resources, American Samoa: Benjamin Carroll, Douglas Fenner, Nonu TuiSamoa, Tafito Aitaoto, Domingo Ochavillo
Division of Aquatic and Wildlife Resources, Guam: Brent Tibbats, Thomas Flores
Division of Fish and Wildlife, Commonwealth of Northern Mariana Islands: Sean MacDuff, Ray Roberto, Michael Tenorio
NMFS-Pacific Island Fisheries Science Center: Justin Hospital
NMFS-Pacific Island Regional Office: Adam Bailey, Andrew Torres
Pacific Island Fisheries Group

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INTRODUCTION AND OVERALL TRENDS

Photo Source: Sammy Chan -
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Introduction

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) require fishery management councils to draft fishery management plans (FMP) to manage fisheries in their respective regions. The Western Pacific Regional Fishery Management Council (Council) first developed the Fishery Ecosystem Plan (FEP) as an FMP, consistent with the MSA and the national standards for fishery conservation and management in 2009. The Council's archipelagic FEP represents the first step in order to implement an ecosystem-based approach to fishery management in American Samoa, Marianas, Hawaii, Pacific Remote Island Areas. This report is a requirement of the FEP that provides information on the status of the near-shore fisheries. The report encompasses trends in fisheries catch and catch-per-unit effort, fish and habitat monitoring data, and various initiatives that sustain the territory's fisheries (e.g. research and fisheries development projects).

The Archipelagic FEPs is the framework under which the Council manages the fishery resources, and seeks to integrate and implement an ecosystem approaches to management. The FEP has not established any new fisheries or fishery management regulations. The FEP has classified various species known to be present in waters around American Samoa in management unit species (MUS) units those species and incorporated all of the management provisions of the Bottomfish and Seamount Groundfish FMP, the Crustaceans FMP, the Precious Corals FMP, and the Coral Reef Ecosystems FMP currently applicable to the area.

Purpose of this Report

The purpose of this report is to provide local and federal managers, scientist, constituencies and the general public the most current nearshore and offshore fisheries information from the CNMI. This report will provide a comprehensive look at the catch landing information based on a long term catch time series to infer trends in stock removal and a long term catch per unit effort series to infer trends in catch rates as a function of catchability and stock abundance. Fishery dependent information provides managers information about fishery performance. Included in the report is an estimate of reef fish abundance or biomass to determine relative status of the stock by looking at the amount removed from the estimated standing stock. This report is also a compendium of projects and activities being implemented by the local fisheries management agencies, the Council, and the National Marine Fisheries Service – Pacific Islands Regional Office.

Fishery Information and Data Collection

American Samoa

American Samoa has been regularly conducting fishery dependent monitoring since 1982 for the boat-based fishery and 1990 for the shore-based fishery. The boat based fishery is mostly trolling for tuna, skipjacks and trevally and bottomfishing for snappers, emperor and groupers. The shore-based fishery is mostly gleaning for shellfish and octopus, rod and reel for groupers and jacks and spearfishing for surgeon and parrotfishes. Both the boat-based and shore-based data collection involves 2 runs; first is the participation run to determine the number of boats/fisherman went out to fish and identify the type of gear being used; while the second is the interview run where the fishermen are interviewed for the effort and economic data and concurrently measuring the length and weight of each fish identified to species level.

Boat-Based Creel Survey

The boat-based data collection focuses mostly on the main docks in Fagatogo and Pago Pago and opportunistically surveying off sites like Aunuu, Auasi, and Asili. The shore-based data collection conducts it run by randomly selecting eight hour periods and location 4 to 5 times per week. Survey locations are: west side of Tutuila from Poloa to Vaitogi; central Tutuila from Tafuna to Laulii; and eastern Tutuila from Laulii to Tula. Boat based and shore based data collection are also being conducted in Manua. The boat-based data collection in Ofu-Olosega and Tau are opportunistic since there is no set schedule for boat to go out and land their catches.

Shore-Based Creel Survey

The shore-based data collection follows the same scheme as the one in Tutuila. The following information are generated through these data collection programs: 1) catch landing; 2) effort; 3) CPUE; 4) catch composition; 5) length accurate to the nearest centimeter; 6) weights in pounds. Other fishery dependent data collection programs are also being conducted like the mandatory commercial receipt books where each retailers and buyer are required to submit the commercial receipt book to determine the market value of the fish as well as the amount and composition of fish being imported from Samoa and Tonga. An annual boat inventory is being conducted to determine and track down fishing boats and its ownership. This will provide information on how many boats are potentially available to engage in the fishery.

Guam

Guam currently has four fishery dependent collection programs which can be described as long-term data collection programs with different approaches for collecting important information on fishery collection methods performed by fishermen. The four programs are the offshore data program, the inshore data program, the commercial fishery program, and the volunteer program. Sportfish Restoration Grant from the US Fish and Wildlife Service provides the significant portion of the funding for these programs. Training of the fishery staff to collect information is rigorous, and year end totals are calculated by an expansion process done with in collaboration with NOAA's Pacific Islands Fishery Science Center (PIFSC). Identification of fish to the species level is the goal of Guam's fishery staff.

The offshore and inshore programs are long term programs that collect participation, effort, and catch data from fishermen. Collaboration with PIFSC has resulted in a reproducible computer database program that can analyze the data to produce various types of trends that describe status of the various fisheries, both charter and non charter, in federal and local waters. The volunteer data collection program's goal was to obtain volunteer data from fishermen; however, information for this program was minimal. The commercial receipt book program is an important source of information for fish that enter the commercial market; however, obtaining information from dealers has been sporadic, with less than three (3) dealers throughout the time series providing data.

Improving data collection programs to enable more accurate estimations of total catches was addressed at the November 2009 Western Pacific Region Fisheries Data Workshop One continuing challenge is refusals from fishermen to provide consistent data and persuading fishers that providing data is a way to ensure a sustainable harvest is an ongoing effort. Nonetheless, Guam's offshore, inshore, and commercial data programs are long-term and do provide an adequate picture of the fishery.

Significant data gaps currently being addressed include obtaining useful data from highliners such as commercial fishers (e.g. spear fishers, netters, non-GFCA members) and fishers from non-surveyed ports, and persuading commercial vendors to provide catch data with breakdown to the actual fish families rather than generic "reef fish" designations. The ability to overcome these challenges will provide better and more useful fishery data about fish species and families that may be at risk.

Commonwealth of Northern Mariana Islands

A majority of the information collected by the CNMI Division of Fish and Wildlife (DFW) are fishery dependent data. Since the early 1980's attempts were made to establish a data collection program for the near shore fisheries, but failed due to intergovernmental issues. Over the past ten years, significant time and effort has been made to further develop the fishery data section. This effort has resulted in the re-establishment of the Shore-based Creel Program. DFW in collaboration with other local and federal agencies have been working on expanding on these successes.

Creel Surveys

Currently the CNMI maintains a Boat- and Shore-based Creel Program for the island of Saipan, with plans to expand it to the neighboring populated islands. The programs were established in 2000 and 2005 respectively, in order to strengthen the Divisions capacity in providing sufficient information to the public regarding fishery information. Other programs such as the invoicing system and importation monitoring provide supplemental information on harvest and demand for the fishery.

Effective management of Saipan's marine fishery resources requires the collection of fishing effort, methods used and harvest. The CNMI Boat- and Shore-based Creel Surveys are some of the major data collection systems used by DFW to estimate the total annual boat-based participation, effort and harvest and to survey the near shore fishery resources. These surveys were formerly known as the "CNMI Offshore and Inshore Creel Survey." The term "offshore/inshore" were previously used when referring to these Creel Survey Programs. However, now the proper term that should be used is "boat- or shore-based" because it covers all the fishing done from a boat or from shore regardless of where the fishing occurred, e.g., inside or outside the reef or lagoon. This is an important distinction because where the fishing activity is initiated (shore vs. boat) determines how that type of activity will be accounted for in the survey systems. For instance, very small boats launched from non-standard launching areas, e.g., from the back of a pickup truck on a beach are not included in the Boat-based survey.

The objective of the Boat-based Creel Survey Program is to quantify fishing participation, effort and catch that are done on a vessel in CNMI's waters. DFW had an early creel survey data collection program from 1988 to 1996, however since the methods were not standardized, the data collected with that early program is not currently being used. The early program was terminated due to a lack of resources. On April 2, 2000, the DFW fishery staff reinitiated the boat-based creel survey program on the island's boat-based fishery following a three year hiatus. The fishery survey collects data on the island's boating activities, including commercial and noncommercial fishermen, and interviews returning fishermen at the three most active launching ramps/docks on the island: Smiling Cove; Sugar Dock; and Fishing Base. Essential fishery information is collected and processed from both commercial and noncommercial vessels and will be vital in the management process of one of the island's valuable natural resources.

Saipan's Boat-based Creel Survey Program utilizes a random scheduling protocol to survey at the three most active launching ramps/docks on the island: Smiling Cove, Sugar Dock, and Fishing Base to collect catch and effort data and to analyze participation levels in Saipan's boat-based fishery. The two types of data collection programs utilized by Saipan's Boat-based Creel Survey Program include: Boat-based Participation Count to collect participation data, and a Boat-based Access Point Survey to collect catch and effort data (through Survey Maps, Boat Logs and Interviews) at the three major boat ramp areas listed above. The data collected are then expanded at a stratum level (expansion period [quarterly or annually], charter or non-charter day type [weekday or weekend], and gear type) to create the estimated landings by gear type for CNMI's Boat-based fishery.

DFW had an early creel survey data collection program in 1984, and 1990 to 1994, however since the methods were not standardized, the data collected with that early program is not currently being used. The early program was terminated due to a lack of resources. In May 2005 the DFW fishery staff reinitiated the shore-based creel survey program on the island's shore based fishery following an 11-year hiatus. With the assistance of the Western Pacific Fisheries Information Network (WPacFIN) program at the Pacific Islands Fisheries Science Center (PIFSC), data processing software and a database were developed to process these survey data. In addition, expansion software was also developed to create annual expanded (estimated) landings for this fishery.

The Shore-based survey currently covers the Western Lagoon of Saipan. Some pilot surveys are being conducted on Saipan's Eastern beaches such as; Laolao Bay, Obyan Beach, and Ladder Beach. Other accessible areas are not covered at this time due to existing limited resource availability and logistical constraints. The Western Lagoon starts from the northwest (Wing Beach) and extends to the southwest (Agingan Point) of Saipan. This encompasses over twenty accessible and highly active shoreline access points.

Saipan's Shore-based Creel Survey is a stratified randomized data collection program. This program collects two types of data to estimate catch and effort information of the shore-based fishery. The two types of data collection are: Participation Count (P) and Interview (I). The Participation Count involves counting the number of people fishing on randomly selected days and their method of fishing along the shoreline. The Interview involves interviewing fishermen to determine catch, method used, length and weights of fish, species composition, catch disposition and if any fish were not kept (by-catch). The data collected from this program are used to expand and create annual estimated landings for this fishery.

Vendor Invoice

DFW has been collecting fishery statistics on the commercial fishing fleet of Saipan since the mid-1970s. With the assistance of the National Marine Fisheries Service WPacFIN program, DFW also expanded its fisheries monitoring programs to include Rota and Tinian, the other two major inhabited islands in the CNMI. DFW's principal method of collecting domestic commercial fisheries data is a dealer invoicing system, sometimes referred to as a "trip ticket" system. The DFW provides numbered two-part invoices to all purchasers of fresh fishery products (including hotels, restaurants, stores, fish markets, and roadside vendors). Dealers then complete an invoice each time they purchase fish directly from fishers; one copy goes to DFW and one copy goes to their records. Some advantages of this data collection method are that it is relatively inexpensive to implement and maintain and is fairly easy to completely cover the commercial fisheries. DFW can also provide feedback to dealers and fishers to ensure data accuracy and continued cooperation.

There are some disadvantages to the trip ticket system: (1) dependency on non-DFW personnel to identify the catch and record the data; (2) restrictions on the types of data that can be collected; (3) required education and cooperation of all fish purchasers; and (4) limited recordings of fish actually sold to dealers. Therefore, a potentially important portion of the total landings is unrecorded. Since 1982, DFW has tried to minimize these disadvantages in several ways: (1) maintain a close working relationship with dealers; (2) add new dealers to their list and educate them; and (3) implement a creel survey to help estimate total catch, including recreational and subsistence catch. The current system collects data from dealers in Saipan, where DFW estimates more than 90% of all CNMI commercial landings are made. The DFW also estimates that the proportion of total commercial landings that have been recorded in the Saipan database since 1983 is about 90%. Previous volumes of FSWP reported only recorded landings, but in recent volumes the data have been adjusted to represent 100% coverage and are referenced as "Estimated Commercial Landings" in the tables and charts.

These data elements are collected for all purchases of fishery products; however, species identification is frequently identified only to a group level, especially for reef fish.

Biosampling

The bio-sampling data base contains general and specific bio-data obtained from individual commercial spearfish catches landed on Saipan from six different vendors during 2011. The following data was captured for each fishing trip sampled: date sampled; fishing gear type; time/hours fished; location fished; number/names of fishers; lengths/weights of individual fish;

number/weight of octopus and squid; number/carapace size/weight of lobster; and whether boat- or shore-based fishing trip.

Although sampling effort was intended to be spread evenly among all participating vendors, smaller vendors were inherently much more difficult to sample within the time constraints allowed by the vendors. Therefore, a regular sampling schedule was implemented for the islands two largest vendors that included two weekdays and one weekend day each week since January/February 2011. Problems encountered in sampling the smaller vendors included: more days in any given month where no fish were purchased, the work area wasn't conducive for sampling, and communication problems. The bio-sampling data base focuses on night time spearfishing activities. Due to vendor imposed limitations, the other gear types that typically land their catch during normal business hours were not sampled.

Exemption netting

In 2003 the use of gill nets was prohibited in the CNMI. In 2005 the Department/Division decided to allow gill netting under special circumstances. With approval from DFW, gill netting is allowed under the strict conditions provided by DFW. All gill netting activities are to be monitored and recorded by DFW personnel.

On 2010, a law was passed allowing for the use of a gill net on the island of Rota, for the purpose of subsistence. The following year, a regulation allowing for subsistence net fishing was passed for the island of Tinian.

For a majority of the permitted gillnet activities, length and weight measurements were taken at the fishing site. Fork lengths were taken in millimeters and weights were taken in grams. If time did not permit for individual measurements, then length measurements were taken for each fish and total weight was taken for each species. Length weight ratios were used to estimate weights of sampled fish. Information is collected for activities conducted on the island of Saipan. No official collection of information is being conducted for the other two populated islands.

Life History

The CNMI Division of Fish and Wildlife life history program began in 1996 with the redgill emperors (*L. rubrioperculatus*). Since then, sampling has been conducted on other species such as; *A. lineatus, Myriprestinae (M. violacea, M. kuntee, M. pralinea, M. bernti, M. murdjan), L. harak, N. lituratus, C. sordidus,* and *C. undulatus*. Other lifehistory programs have also developed over the past years. DFW personnel in collaboration with NOAA NMFS collect lifehistory information on *S. rubroviolaceus, L. atkinsoni, P. barbarinus,* through funding provided by NOAA-NMFS. The life history survey captures biological information such as: reproductive cycle, age at length, and age at maturity. The DFW is continually working to improve the understanding of reef fish life history in the CNMI, through this program.

Monitoring of Imported Fish

The DFW Fisheries Data Sections collect fisheries related importation invoices from Department of Commerce at the end of every month. The data is then entered into the ticket receipt system and reviewed prior to being sent out for compilation by the Pacific Islands Fisheries Science Center (PIFSC). A majority of the information entered in the system can only be identified to the family taxa.

Overall Landing Trends Across Territories

The highest overall boat based nearshore fisheries landing is in CNMI followed by Guam and American Samoa having the least landing. With the exception of American Samoa, reef fish landing make up bulk of the commercial landing in Guam and CNMI throughout time series. American Samoa landed more reef fishes in the 90s with the onset of SCUBA spearfishing but subsequent ban of the method resulted in reverting back to bottomfishing. On average, American Samoa lands more bottomfish than Guam and CNMI. CNMI, however, lands more reef fishes on average than American Samoa and Guam. In 2011, Guam landed the most reef fish at 98,170 lbs followed by CNMI at 55,110 lbs and American Samoa at 24,794 lbs. Commercial bottomfish landing in 2011 was highest in American Samoa at 32,817 lbs followed by CNMI at 25,110 lbs and Guam at 16,050 lbs.

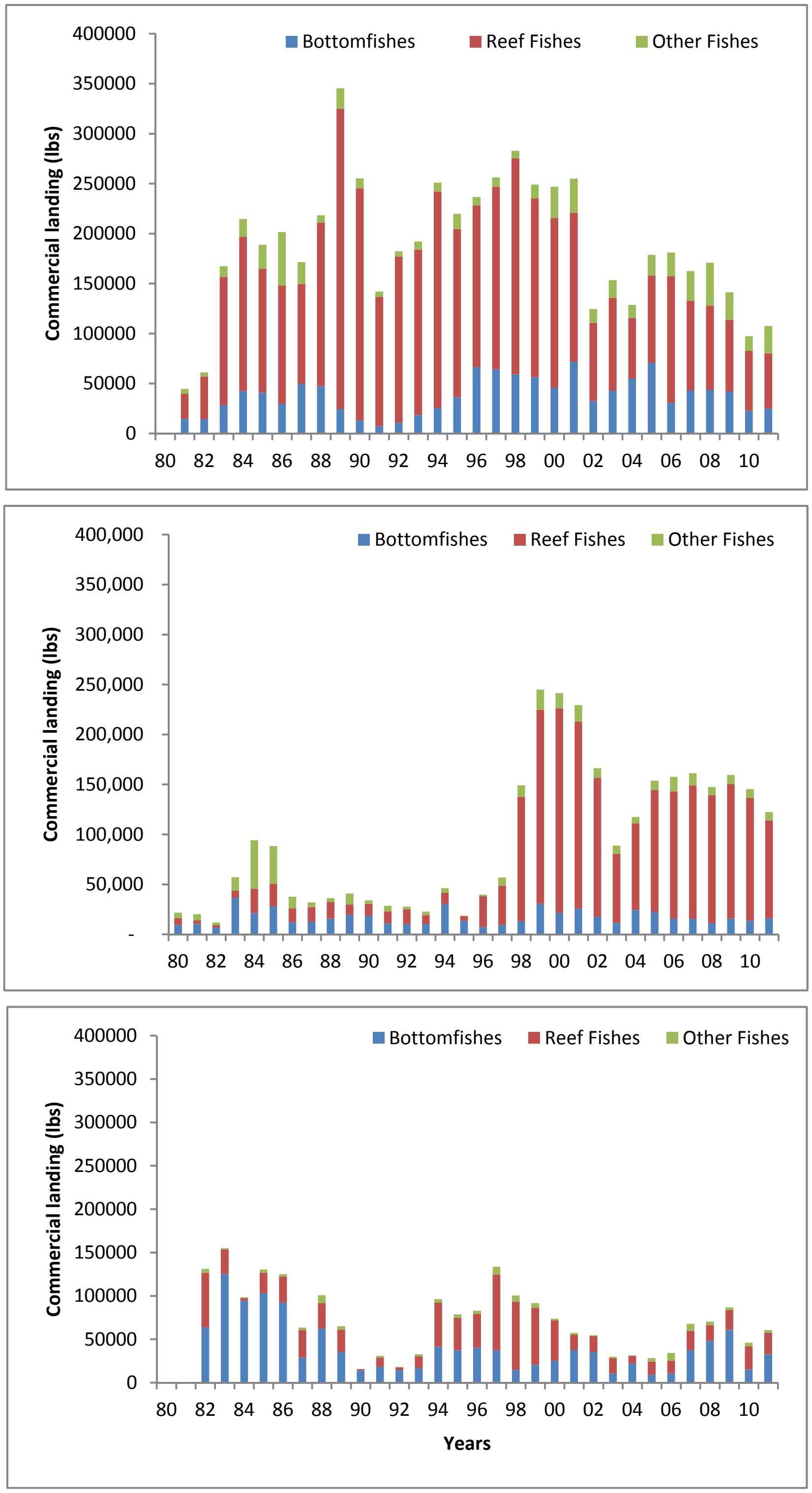


Figure 1. Total commercial landing of bottomfish, reef fish and other fishes in the Commonwealth of Northern Mariana Islands (Top), Guam, (Middle), and American Samoa (Bottom).

Table 1. Commercial landing data from 1980-2011 of bottomfish, reef fish and other fishes in American Samoa, Guam, and CNMI.

YEAR	Guam			CNMI			American Samoa		
	Bottomfishes	Reef Fishes	Other Fishes	Bottomfishes	Reef Fishes	Other Fishes	Bottomfishes	Reef Fishes	Other Fishes
80	9,381	7,037	5,324						
81	10,459	3,634	6,183	14,550	25,220	4,870			
82	6,617	2,598	2,635	14,180	42,650	4,240	63,892	62,709	4,484
83	36,689	7,222	13,218	28,350	128,300	10,800	125,233	28,413	1,500
84	21,314	24,281	48,534	42,410	154,620	17,540	94,164	3,408	949
85	27,952	22,569	37,879	40,980	123,660	24,180	103,084	23,702	3,571
86	12,077	13,732	11,871	29,910	118,190	53,460	92,277	30,138	2,636
87	12,639	14,565	4,737	49,710	99,910	21,920	29,094	31,641	2,777
88	15,858	16,786	3,589	47,310	163,900	7,170	62,582	29,461	8,783
89	19,442	10,399	11,023	24,440	300,540	20,380	35,298	25,607	4,210
90	18,390	12,036	3,578	12,930	232,430	9,930	14,133	1,400	150
91	10,733	12,119	5,634	7,090	129,530	5,430	18,016	10,927	1,935
92	10,344	14,933	2,530	10,600	166,600	5,170	14,529	3,129	684
93	10,125	9,095	3,510	18,460	165,680	7,940	16,762	13,532	2,388
94	30,237	11,576	4,377	25,470	216,630	8,840	41,401	50,717	4,141
95	13,411	4,643	666	36,100	168,620	15,060	37,390	37,095	4,175
96	7,240	30,897	1,618	66,390	161,890	8,330	40,277	38,752	3,800
97	9,535	38,977	8,332	64,140	182,870	9,290	37,230	87,211	9,217
98	13,098	124,747	11,218	59,020	216,440	7,410	14,802	78,501	7,226
99	30,488	194,373	20,183	56,220	179,170	13,710	20,590	65,657	5,504
00	21,435	205,031	14,932	45,700	170,040	31,200	25,294	46,446	2,078
01	25,913	187,128	16,387	71,660	149,240	34,180	37,803	17,513	1,912
02	17,579	139,101	9,542	32,580	78,100	13,950	35,378	18,281	1,029
03	11,544	69,109	8,224	42,680	93,270	17,400	10,704	17,345	1,945
04	24,231	86,913	6,262	55,030	60,650	13,020	21,947	8,897	713
05	22,458	121,918	9,506	70,670	87,470	20,570	9,001	15,284	4,091
06	15,692	127,420	14,473	30,410	126,900	23,780	10,635	14,850	8,814
07	15,628	133,554	12,000	43,170	89,770	29,600	37,784	21,886	8,113
08	11,268	128,059	8,279	43,650	84,170	43,000	48,178	18,154	3,980
09	15,745	134,768	8,943	41,690	72,210	27,320	60,697	22,977	3,028
10	13,797	122,832	8,675	22,710	59,900	14,730	15,301	26,366	4,481
11	16,050	98,170	8,210	25,110	55,110	27,380	32,817	24,794	2,919
Average	16,793	66,569	10,377	37,849	132,377	17,800	40,210	29,160	3,708
St Dev	7,435	65,680	9,842	18,241	62,287	11,819	29,892	21,463	2,537

CHAPTER 1: AMERICAN SAMOA FISHERY ECOSYSTEM REPORT

CHAPTER 1: American Samoa Fishery Ecosystem Report

Chapter Authors: Benjamin Carroll, Douglas Fenner, Nonu TuiSamoa, Tafito Aitaoto, Domingo Ochavillo. Department of Marine and Wildlife Resources, PO Box 3730, Pago-Pago, American Samoa 96799

SUMMARY: The American Samoa Fishery Ecosystem Annual Report is an assessment of the status of the territory's fisheries, coral reef habitats and a status report of ecosystem-based management initiatives, e.g. marine protected areas. The fisheries assessment is based on fisheries dependent-data (for both subsistence and commercial fisheries excluding the commercial long-line pelagic fisheries) and fisheries independent-data (underwater monitoring of coral reef fish resources only). The health status of the coral reefs is assessed by standard underwater survey techniques. The subsistence fisheries involve gleaning, spearfishing, rod and reef, bamboo pole, throw nets and gill nets. The commercial fisheries involve spearfishing using boat, bottomfishing, trolling and mix bottomfishing-trolling. The fisheries-dependent monitoring started in 1982 for the boat-based fishery and 1990 for the shore-based fishery.

Based on the multi-year data, the crustacean fishery (mostly of the spiny lobster) showed three peaks: (1) in the late 1980's; (2) early through late 1990's; and (3) a very recent one in 2010. The high landings in early and late 1990's were probably mostly due to fishing efficiency of SCUBA spearfishing. The peak in the late 1980's cannot be attributed to SCUBA spearfishing as the latter started in 1994. It can be real increase in the stocks. The lobster annual catch in 2010, however, was unusually very high, almost thrice the SCUBA spearfishing catch. There is a need to re-examine this trend as this might be a statistical artifact or a real figure that necessitates some management discussions. There is also a need to derive trends in CPUE to account for changes in the fishing effort.

Historical and current data and observations however, do not indicate any major changes in the composition of the bottomfish species landed. Of all bottomfish species, the humpback snapper (Lutjanus gibbus) Redgill emperor (Lethrinus rubrioperculatus) and other emperors, Onaga (Etelis corruscans) and blue lined snapper (Lutjanus kasmira) are the top landings in pounds, comprising about 77% of the total landings. Of the main unit species landings, Redgill emperor, onaga and blue lined snapper species dominate the landings, taking up 66% of the BMUS landings or 28% of the total landings. Forty two percent of total landings are of BMUS species. Landings have varied throughout the years as a result of shifts in the fisheries, natural events and modernization. From 1982-1985 bottomfish landings was at the highest ever due to it being a new fishery. The steep drop from 1985 to 1987 occurred as a result of the introduction of longlining, a much lucrative fishery compared to bottomfish. Hurricane Tusi in 1987, Ofa in 1990, Val in 1991 and Heta in 2004 caused severe damages to the fishery that echoed in the following years. There is general decline in bottomfishing catch that has also been concurrent with decline in effort (hours and number of boats) and catch-per-unit effort. However, the fisheries stock assessment of BMUS indicated below maximum sustainable yield. Surprisingly, adjusted price of fish also declined that may suggest declining fish consumption. The decline of

CPUE needs to be assessed as this is contrary to what is expected for a fishery where effort had declined and exploitation is below maximum sustainable yield.

There has been a trend of increase in the late 1990s and decline (especially the recent) in catch in the troll fishery. This could be attributed to the decline of catch of jacks and other finfish. The decline in CPUE was slighter that suggests that the decline of catch may be due to decreased stocks. There have been some fluctuations in boat-based spearfishing catch and some of the peaks in the 1990's were due to SCUBA spearfishing. However, the recent increases in catch (especially in the case of crustacean catch) seem to indicate increasing stock abundance due to increases in the catch-per-unit effort.

There were declines in the catch of several fish groups in the rod-and-reel. The decline was less steep in the catch-per-unit effort trend and the trend also suggests that the decline in stock was smaller compared to the previous decline in the 1990s. There were decline in the catch in shore-based fishery but no patterns apparent in the catch-per-unit effort. A similar pattern was observed in the throw net, gleaning, and shore-based handline methods. These suggest that the target stocks have not declined.

In summary, there was a mixture of trends in the CPUE (that may reflect target stock abundance) among the fisheries in the territory. There were fluctuations in the catch of crustaceans that could be attributed to SCUBA sperafishing. However, the very high catch in catch in 2010 may be a statistical artifact. SCUBA spearfishing increased CPUE in boat-based spearfishing in the 1990s but the recent increase in CPUE suggests stock abundance increase. There was a decline in bottomfishing CPUE although exploitation rate is below MSY. There was a decline in stocks targeted by troll but no apparent pattern in the catch of throw net, gleaning, and shore-based handline methods. The trends in the CPUE could not be attributed to the changes in habitat quality especially for coral reef fishery as hard coral cover has increased in the last seven years. Future effort should look at the impact of sever natural disturbances on stocks. There is also a need to assess the statistical expansions in the creel survey program as shown by the unusually high catch for crustaceans in 2010.

Background on American Samoa Insular Fishery

The Samoa Archipelago is a remote chain of 13 islands of varying sizes and an atoll, located 14^0 south of the equator near the International Date Line. The archipelago is approximately 4,200 km south of Hawai'i, in the central South Pacific Ocean. The archipelago is divided into two political entities: the Independent Samoa and American Samoa. The Independent Samoa has two large islands (Upolu and Savaii) and eight islets. American Samoa is comprised of five volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, and Ta'u), one low-island (Swains Island) and a coral atoll (Rose Atoll). The five volcanic islands that are part of the American Samoa territory are very steep with mountainous terrain and high sea cliffs and of various sizes. Tutuila Island, the largest (137 km^2) and most populated island, is the most eroded with the most extensive shelf area and has banks and barrier reefs. Aunuu is a small island very close to Tutuila. Ofu and Olosega (together as 13 km^2) are twin volcanic islands separated by a strait which is a shallow and narrow break in the reef flat between the islands. Tau is the easternmost island (45 km^2) with a more steeply sloping bathymetry.

The Samoa archipelago was formed by a series of volcanic eruptions from the “Samoan hotspot” (Hart et al. 2000). Based on the classic hotspot model, Savaii Island (the westernmost) in Samoa would be the oldest and Tau island (the easternmost) in American Samoa the youngest of the islands in the archipelago. Geological data indicate that Savaii is about 4-5 million years old, Upolu in Samoa about 2-3 million years old, Tutuila about 1.5 million years old, Ofu-Olosega about 300,000 years old and Tau about 100,000 years old. Swains and Rose are built on much older volcanoes but not part of the Samoan volcanic chain (Hart et al. 2004). The geological age and formation of Rose Atoll is not well-known and Swains is part of the Tokelau hot-spot chain which is about 59-72 million years old (Neal and Trewick 2008, Konter et al. 2008).

American Samoa experiences occasional cyclones due to its geographic location in the Pacific. Cyclones occur from 1-13 years intervals with the six strong occurrences during the last 30 years (Esau,1981; Tusi, 1987; Ofa, 1990; Val, 1991; Heta, 2004 and; Olaf, 2005). The territory had 2 tsunamis in the last 100 years due to its proximity to the geologically active Tonga Trench.

It is in this geological and physical setting that the Samoans have established their culture in the last 3,500 years. For three millennia, the Samoans have relied on the ocean for their sustenance. Fishing activity and fish constitute an integral part of the ‘fa’asamoa’ or the Samoan culture. Chiefly position entitlements and other cultural activities use fish during the fa’alalave or ceremonies. Traditional coral reef fishing in the lagoons and shallow reef areas and included methods such as gleaning and using bamboo poles with lines and baits or with a multi-pronged spear attached. The deepwater and pelagic fisheries have traditionally used wooden canoes, hand-woven sennit lines with shell hooks and stone sinkers, and lures made of wood and shell pieces.

Presumably, the change from traditional to present day methods of fisheries started with Western contact in the 18th century. Today the fisheries in American Samoa can be broadly categorized in terms of habitat and target species as pelagic fisheries, bottomfishing in mesophotic reefs and the nearshore coral reef fisheries. For creel monitoring program purposes, fisheries is either subsistence (or shore-based and mostly for personal consumption) or commercial (or boat-based and mostly sold). Bottomfishing is actually a combination of mesophotic reef fishing and/or pelagic fishing (trolling). The coral reef fishery involve gleaning, spearfishing (snorkel or free dive from shore or using boat), rod and reel using nylon lines and metal hooks, bamboo pole, throw nets and gillnets. SCUBA spearfishing was introduced in 1994, restricted for use by native American Samoans only around 1997–1998 and finally banned in 2002 following recommendations by the biologists from the Department of Marine and Wildlife Resources and local scientists.

The establishment of tuna canneries in the 1950s slowly changed the nature of fishing within the territory. Pelagic fishing for tuna and trevally had mostly been done by handline and troll. A shift to longline occurred in mid-1990s following the example of the neighboring Samoa. The domestic longline fishery employs aluminum catamarans called ‘alia’ usually around 40 feet in length and monofilament lines with 350 hooks per set deployed from hand-powered reels. Most of the participants in this small-scale fishery are native American Samoans. Most of the catches are sold to the local cannery while some are retained to supply the local markets and for personal use.

American Samoa's bottomfish fishery boomed between 1982 and 1985, after which catches declined as many skilled and full-time commercial bottomfish fishermen converted to troll. The result was a significant decrease in fishing effort and increasing catch rates for those remaining in the fishery until 1989. The trends in catch landing, effort and CPUE do not provide any conclusive evidence that catch decline was due to depletion of the stock as the catch trends were mostly driven by the migration from bottomfish to troll and longline. Bottomfish profits and revenues suffered devastating blows from four separate hurricanes: Tusi in 1987, Ofa in February of 1990, Val in December of 1991 and Heta in January of 2004. Fuel prices have gradually soared in the past four years causing yet another strain in the bottomfish fishery. The average price of local bottomfish has also declined due to the shift of demand to imported bottomfish, which competes closely with local prices. In 2004, 60% of coolers imported from the Samoa on the *Lady Naomi* ferry were designated for commercial purposes; the Commercial Invoice System identified 50% of these coolers as bottomfish. On the other hand, current levels of landing, effort and CPUE are similar to those in the early 1980s and bottomfish is starting to become a more lucrative fishery than pelagic fishing, due to closure of one of the local canneries and a limited market for pelagic fish.

Boat and Shore-based Crustacean Fishery

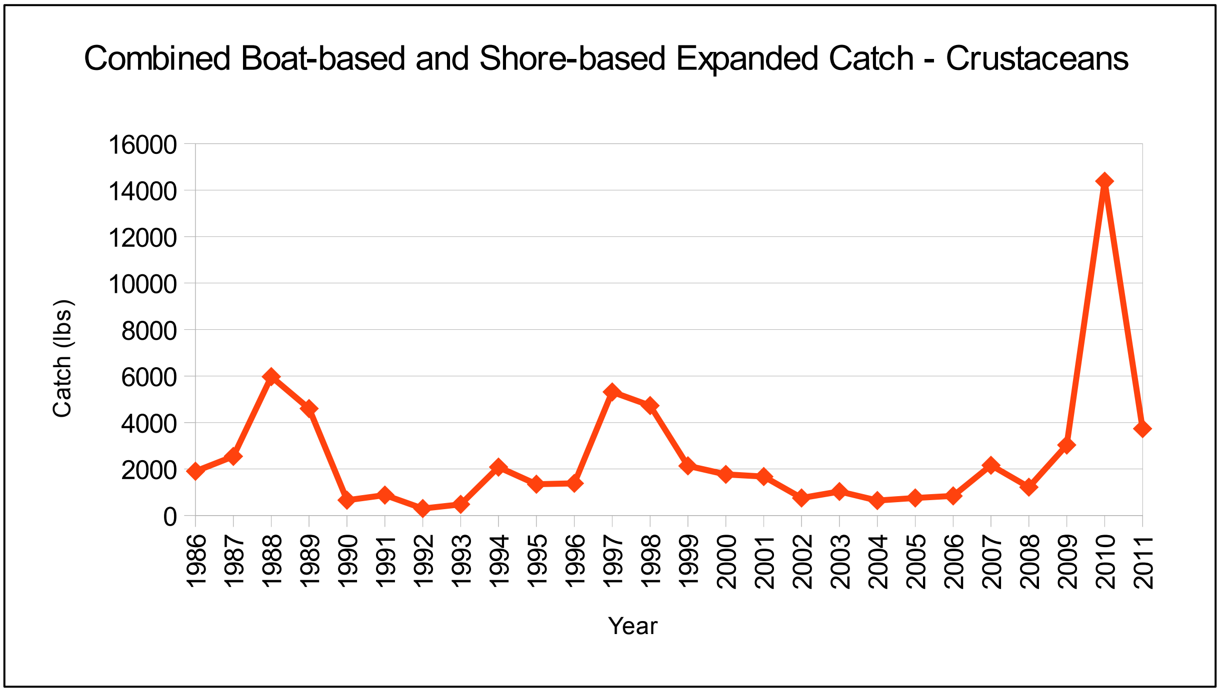


Figure 2. Combined boat-based and shore-based catches of crustaceans in American Samoa from 1986 to 2011.

Catch Trends: The catch of crustaceans in 2011 was 3,735 pounds, representing a moderate take for this year. Since 1986 when surveys started, crustacean catch has generally been low (<2000 lbs/year), with moderate catches occurring 1993-1995, and 1997-1998 (2000 - 6000 lbs/year), and low catches in every other year since 1990. The major exception to this was in 2010 when the catch was very high at 14,382lbs. The dramatic increase in crustacean catch as discussed in last year report may generally be a result of increased spearfishing that occurred in this year. Efforts were made to establish if this was an artifact of data collection and/or data expansion methods, however, no useful information or conclusions were forthcoming and this data-point remains. It therefore seems that without further examination of the data that this data point may likely be somewhat erroneous.

Boat-Based Fisheries

Bottomfish Fishery

Bottomfishing utilizing traditional canoes by the indigenous residents of American Samoa has been a subsistence practice since the Samoans settled into the Tutuila, Man'ua and Aunu'u islands. It was not until the early 1970's that the bottomfish fishery developed into a commercial scheme utilizing motorized boats. A government subsidized program, called the Dory Project, was initiated in 1972 to develop the offshore fisheries into a commercial venture, and resulted in an abrupt increase in the fishing fleet and total landings. In 1982, a fisheries development project aimed at exporting high-priced deep-water snappers to Hawaii caused another notable increase in bottomfish landings and revenues. Between 1982 and 1988, the botttomfish fishery comprised as much as 50% (by weight) of the total commercial landings. Beginning in 1988, the nature of American Samoa's fisheries changed dramatically with a shift in importance from bottomfish fishing towards trolling. In the past eight years, the dominant (by weight of fish landed) fishing method has been longlining.

During the early 1980's, fisheries data was collected from the bottomfish fishery by interviewing only commercial vessels. In the current Offshore Creel Survey on Tutuila that started on October 1, 1985, commercial, subsistence and recreational domestic fishing boats landing catch in five designated areas were interviewed and their catch recorded. Every two weeks a total of seven weekdays and one weekend of regular morning and evening shift surveys are conducted, with two days of regular office hours where opportunistic interviews are collected. In the past three years, the sampling period was increased and modified to encompass boats that come in earlier or after the normal sampling period. Two DMWR samplers based on Tau and Ofu collect fisheries data from the Manu'a islands fleet and one in Aunuu.

Boat-based fishing in American Samoa used to be mainly trolling and/or bottomfish. In the past six years, longline landings were recorded with revenues around the one million-dollar mark. Bigger foreign boats are entering the local fisheries but these are rigged for longlining and more of these are expected to enter the territory's longline fishery. Limited entry options have been initiated to check this increase.

The bottomfish fishery of American Samoa was typically commercial overnight bottomfish handlining using skipjack as bait, on 28-30 feet aluminum/plywood Alias. Imported bottomfish from the independent state of Samoa help satisfy the demand for bottomfish however it weakens the local bottomfish fishery. The adverse effects of four hurricanes that struck American Samoa in 1987, 1990, 1991 and the most recent one in 2004 can be seen throughout the various trends depicted in this report.

Recent changes in the fishery and improvements in the Offshore Creel Survey require modifications to algorithms used to process the data for this report. Hence the continuous improvements to DMWR's data processing systems by WPacFIN staff are warranted.

The following selected annual statistics dating back to 1982 provides a brief historical snapshot of American Samoa's bottomfish fishery.

Table 2. Selected historical statistics in the bottomfish fishery in American Samoa

Year	Total Landings (lb)	CPUE (lb/trip-hr)	Commercial Landings (lb)	Adjusted Revenue	Adjusted Price/Lb.	CPI	Number of Boats
1982	64942	8.5	62016	$306249	$4.93	100.0	27
1983	126327	10.0	125167	$719259	$5.75	100.8	38
1984	94104	10.7	92841	$437823	$4.72	102.7	48
1985	143225	8.1	102670	$367603	$3.59	103.7	47
1986	92283	8.3	91505	$297427	$3.24	107.1	37
1987	31214	11.9	30722	$109214	$3.57	111.8	21
1988	62851	17.3	60104	$226179	$3.76	115.3	32
1989	46476	16.7	35265	$121767	$3.45	120.3	34
1990	14759	9.3	12931	$44529	$3.45	129.6	25
1991	18699	8.6	17749	$59293	$3.34	135.3	23
1992	13777	9.3	13725	$54824	$4.00	140.9	14
1993	17719	7.3	15771	$58784	$3.72	141.1	26
1994	46064	7.8	42215	$148012	$3.50	143.8	25
1995	36254	9.8	35796	$112112	$3.13	147.0	35
1996	39495	15.2	38851	$125316	$3.23	152.5	35
1997	40544	14.7	38994	$144757	$3.72	156.4	37
1998	15782	14.0	14303	$60376	$4.22	158.4	30
1999	19345	12.9	17030	$71684	$4.21	159.9	34
2000	28597	10.4	26464	$89734	$3.39	166.7	34
2001	49201	15.2	38937	$147070	$3.77	169.9	27
2002	45220	8.1	35985	$118378	$3.29	172.1	18
2003	26759	15.3	12713	$38530	$3.03	176.0	19
2004	28861	7.6	16381	$45738	$2.79	188.5	25
2005	18577	6.9	5554	$18355	$3.30	198.3	14
2006	8054	9.3	6204	$19288	$3.11	204.3	21
2007	34601	9.6	32862	$97043	$2.95	215.5	26
2008	49646	8.1	47282	$143773	$3.04	231.5	23
2009	72143	9.3	70266	$203878	$2.90	240.7	21
2010	15142	5.6	14463	$43684	$3.02	249.4	16
2011	35808	9.3	35297	$101019	$2.86	269.4	12
Averages	44549	10.5	39669	$151057	$3.57		27.5
Std. Dev.	32436	3.1	29924	$146447	$0.65		9.03

Estimated Total Bottomfish Landings by Species

Interpretation: Historical and current data and observations however, do not indicate any major changes in the composition of the bottomfish species landed. Of all bottomfish species, unknown species humpback snapper (Lutjanus gibbus) Redgill emperor (Lethrinus rubrioperculatus) and other emperors, Onaga (Etelis corruscans) and blue lined snapper (Lutjanus kasmira) are the top landings in pounds, comprising about 77% of the total landings. Of the main unit species landings, Redgill emperor, onaga and blue lined snapper species dominate the landings, taking up 66% of the BMUS landings or 28% of the total landings. Forty two percent of total landings are of BMUS species.

Table 3. Estimated total landing by species caught in the bottomfish fishery in 2011.

Species	Pounds
BMUS	
Blue lined snapper	2755
Ruby snapper (ehu)	397
Flower snapper (gindai)	63
Gray jobfish	1930
Pink snapper (opakapaka)	507
Silverjaw jobfish (lehi)	1523
Longtail snapper (onaga)	3247
Goldflag jobfish	489
Blacktip grouper	5
Yellow-edged lyretail	19
Redgill emperor	3987
Black jack	312
BMUS SUBTOTALS	**15234**
OTHER	
Bottomfishes (unknown)	9435
Black snapper	82
Yellow margined snapper	2
Brown jobfish	20
Humpback snapper	4732
Onespot snapper	87
Stone's snapper	279
Twinspot/red snapper	347
Groupers	1518
Peacock grouper	42
Smalltooth grouper	1
Emperors	3346
Orangespot emperor	427
Longnose emperor	255
OTHER SUBTOTALS	**20574**
TOTAL BOTTOMFISH	**35808**

Source: DMWR Offshore Creel

Calculation: Catches are normally weighed by species either at landing sites or during the selling of fish to stores and restaurants. Trips missed by the Creel Survey are accounted for in a separate data collections system – the Commercial Invoice System. This analysis, as in the past, is for the Offshore Creel Survey catch only. Analysis of the bottomfish fishery presented in this report is for the whole bottomfish complex and not just for the BMUS.

Catch Trends: A total of 16 vessels participated and landed bottomfish species in 2010. Total catch was 15,648 pounds which represented a decrease of around 80% from the 82,188 pounds caught in 2009. In 2010, snapper accounted for 52% of the catch (8,178 lbs), emperors accounted for 26% of the catch (4,119 lbs), groupers and jacks accounted for 7% of the catch each (1,131 and 1,101 lbs respectively), while squirrelfish (470 lbs) and other finfish (464 lbs) each comprised 3% of the catch. The remaining 2% of the catch came from other invertebrates (178 lbs) and a very small amount from goatfish (7lbs).

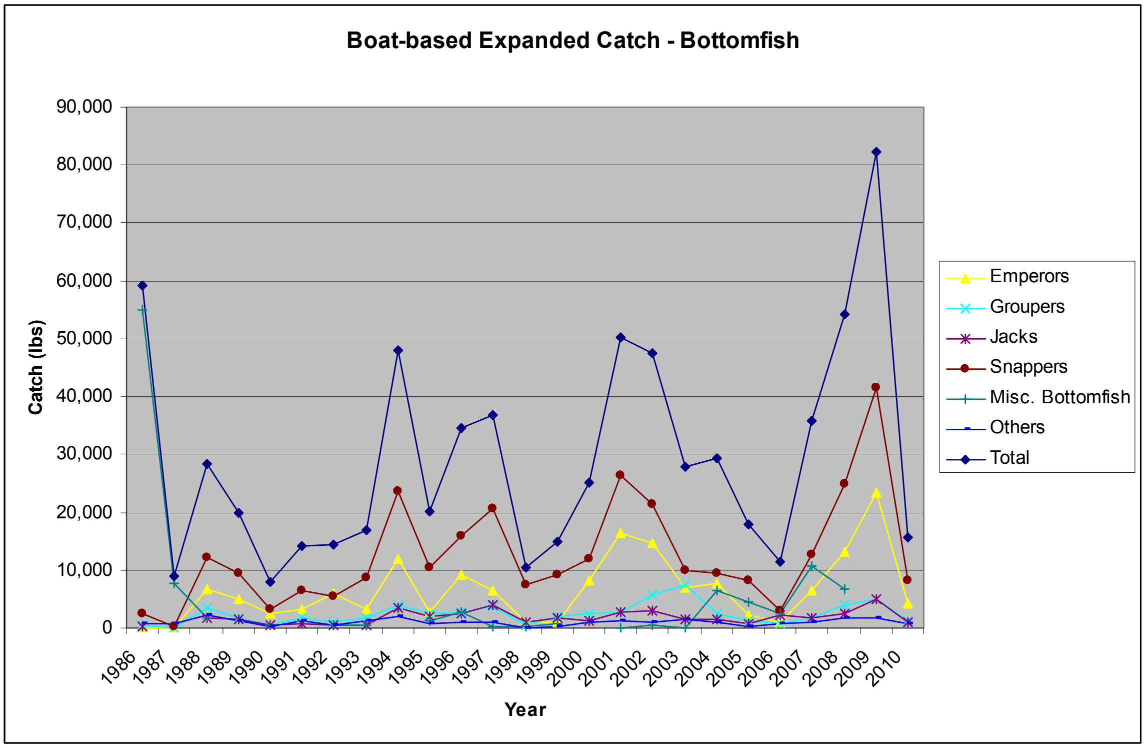


Figure 3. Expanded catch of the top six families landed in the bottomfish fishery from 1986-2011.

A typical catch from the bottomfish fishery dominated by snappers and emperors. (Photo: D.Ochavillo)

Estimated Commercial Landings by Species

Interpretation: There have been no major changes in individual species prices in the past 10 years. Price per pound ranged from $2.80 to $3.70 according to the Historic Annual Statistics table page 3. About 98.6 percent of the bottom fish total landings were for sale collecting an estimated value of about $101,000.

Source: DMWR Offshore Creel Survey and Commercial Invoice System

Calculation: During creel surveys, the disposition of the catch is recorded, and if sold, the price is obtained whenever possible. The average prices reported in this table are calculated by dividing the total revenue by the weight sold in pounds for each species.

Table 4. Estimated commercial landings of species harvested in the bottomfish fishery in American Samoa in 2011.

Species	Pounds	Price/Lb.	Value
BMUS			
Blue lined snapper	2489	$3.17	$7884
Ruby snapper (ehu)	397	$2.82	$1119
Flower snapper (gindai)	56	$2.89	$160
Gray jobfish	1922	$2.83	$5442
Pink snapper (opakapaka)	483	$2.93	$1415
Silverjaw jobfish (lehi)	1500	$2.94	$4410
Longtail snapper (onaga)	3247	$2.82	$9145
Goldflag jobfish	482	$2.81	$1355
Blacktip grouper	5	$2.95	$16
Yellow-edged lyretail	19	$2.95	$57
Redgill emperor	3927	$2.87	$11285
Black jack	312	$2.55	$796
BMUS SUBTOTALS	**14838**	**$2.90**	**$43084**
OTHER			
Bottomfishes (unknown)	9435	$2.73	$25781
Black snapper	82	$2.95	$243
Brown jobfish	20	$2.95	$59
Humpback snapper	4708	$2.91	$13697
Onespot snapper	87	$2.86	$248
Stone's snapper	279	$2.95	$824
Twinspot/red snapper	347	$2.95	$1025
Groupers	1511	$2.93	$4428
Peacock grouper	35	$2.95	$104
Smalltooth grouper	1	$2.95	$2
Emperors	3343	$2.92	$9763
Orangespot emperor	356	$2.95	$1049
Longnose emperor	255	$2.80	$712
OTHER SUBTOTALS	**20460**	**$2.83**	**$57935**
TOTAL BOTTOMFISH	**35297**	**$2.86**	**$101019**

Estimated Total Bottomfish Landings

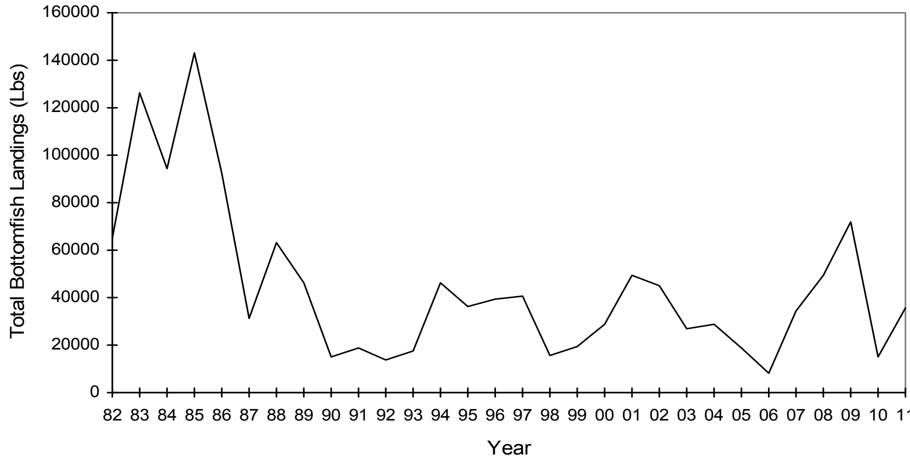


Figure 4. Estimated total bottomfish landings in American Samoa from 1982-2011. The data associated with the graph is shown on the right.

Year	Landings(lb)
1982	64942
1983	126327
1984	94104
1985	143225
1986	92283
1987	31214
1988	62851
1989	46476
1990	14759
1991	18699
1992	13777
1993	17719
1994	46064
1995	36254
1996	39495
1997	40544
1998	15782
1999	19345
2000	28597
2001	49201
2002	45220
2003	26759
2004	28861
2005	18577
2006	8054
2007	34601
2008	49646
2009	72143
2010	15142
2011	35808
Average	44549
Std. Dev.	32436

Interpretation: Landings have varied throughout the years as a result of shifts in the fisheries, natural events and modernization. From 1982-1985 bottomfish landings was at the highest ever due to it being a new fishery. The steep drop from 1985 to 1987 occurred as a result of the introduction of longlining, a much lucrative fishery compared to bottomfish. Hurricane Tusi in 1987, Ofa in 1990, Val in 1991 and Heta in 2004 caused severe damages to the fishery that echoed in the following years.

The 2011 landing show an increase of about 20,000 pounds from the previous year even though the number of boats landing bottomfish species decrease from 16 to 12. The increase in landing mirror the increase in efforts/fishing trips and fishing hours and the increase in the total landing also relates to the increase in interviews. More sampling interviews were collected from fishermen because of the biosampling project that started in 2011 which reguired fishermen participated in the project to come to the Office for sampling of their catches. This provides the creel survey an opportunity to interview most fishing trips which we had problem catching in past years.

Source: DMWR Offshore Creel Survey Database

Calculation: Bottomfish landings for 1982-84 were calculated by adjusting the sampled Tutuila data by the calculated annual percent coverage of the fleet, and then adding the similarly adjusted Manu'a landings. The landings from 1986 to Present were calculated by expanding the Offsfore Creel Survey Data for Tutuila for the species listed in Table 1. The sampled Manu'a landings were adjusted by adjusting for the monthly perecent coverage of the fleet and added to the Tutuila data. Since the Offshore Creel Survey started in October 1, 1985, The first nine month of the 1985 landings were calculated as it was in 1982-84 and the last three months of the 1985 landings were calculated as it is now.

Estimated Total Commercial Bottomfish Landings

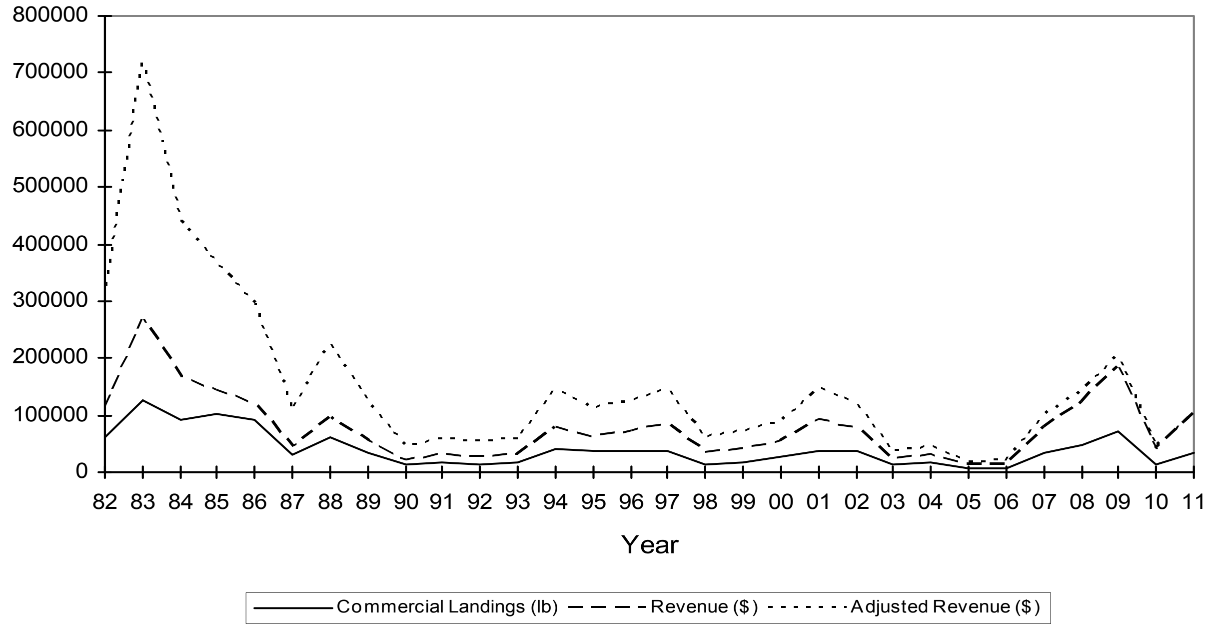


Figure 5. Estimated total commercial landings and associated revenues from the bottomfish fishery in American Samoa from 1982-2011.

Interpretation: Commercial landings increased by 59% in 2011,to more than double the number of pounds landed in 2010 and the total adjusted revenue earned follows the same trend which shows an increase of more than 50% from 2010. In all, commercial landings have been declining in years compared to the early eighties.

Source: DMWR Offshore Creel Survey Database

Calculation: A relatively complex set of algorithms are used to estimate the commercial landings from estimates of total landings created by the creel survey data expansion system. In short the percent sold by species and by fishing method is calculated annually and multiplied by the estimated total landings by that method for that year. For 1982-85 sampling was conducted on the commercial fleet only (which included nearly all of the fishing boats), whereas since the 1985 creel sampling has covered all boats (commercial and recreational). Analysis of creel data for 1986-87 indicates that over 98% of the landed bottomfish was being sold. Therefore is it believed to be valid to compare commercial data for years prior to 1986 to creel survey totals for years since 1986.

Table 5. Data associated with the total commercial landing and revenue generated by the bottomfish fishery in American Samoa from 1982-2011.

Year	Commercial Landings (lb)	Revenues	CPI Adj.	Adjusted Revenue
1982	62016	$113678	2.694	$306249
1983	125167	$269083	2.673	$719259
1984	92841	$166917	2.623	$437823
1985	102670	$141495	2.598	$367603
1986	91505	$118261	2.515	$297427
1987	30722	$45317	2.410	$109214
1988	60104	$96823	2.336	$226179
1989	35265	$54385	2.239	$121767
1990	12931	$21418	2.079	$44529
1991	17749	$29781	1.991	$59293
1992	13725	$28673	1.912	$54824
1993	15771	$30793	1.909	$58784
1994	42215	$79024	1.873	$148012
1995	35796	$61163	1.833	$112112
1996	38851	$70920	1.767	$125316
1997	38994	$84063	1.722	$144757
1998	14303	$35495	1.701	$60376
1999	17030	$42542	1.685	$71684
2000	26464	$55529	1.616	$89734
2001	38937	$92730	1.586	$147070
2002	35985	$75592	1.566	$118378
2003	12713	$25183	1.530	$38530
2004	16381	$32007	1.429	$45738
2005	5554	$13516	1.358	$18355
2006	6204	$14623	1.319	$19288
2007	32862	$77635	1.250	$97043
2008	47282	$123516	1.164	$143773
2009	70266	$182196	1.119	$203878
2010	14463	$40448	1.080	$43684
2011	35297	$101019	1.000	$101019
Average	39669	$77461		$151057
Std. Dev.	29924	$56455		$146447

Estimated Fishing Effort in the Bottomfish Fishery

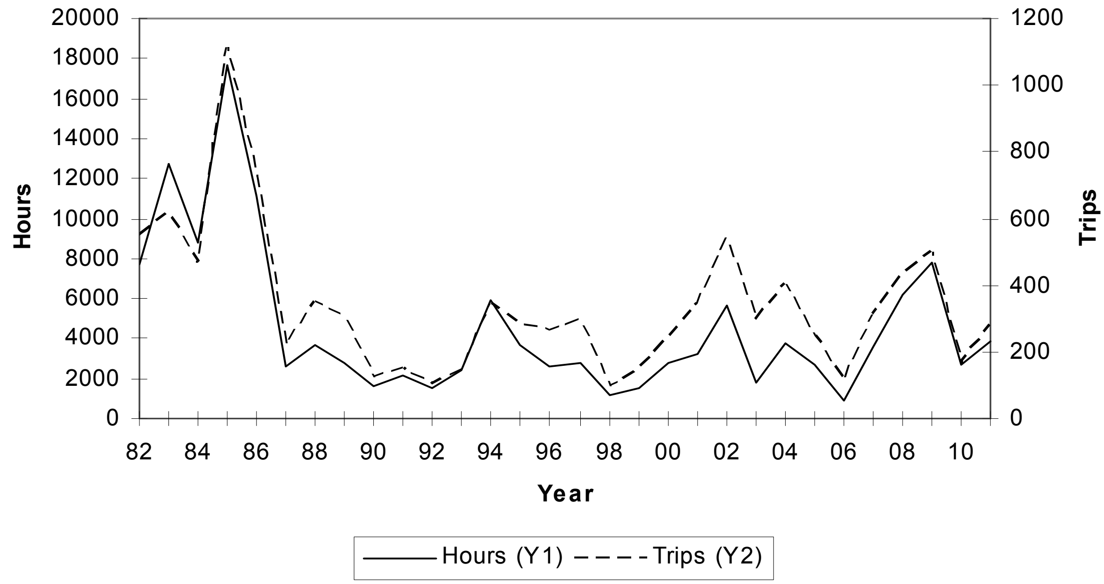


Figure 6. Estimated hours of fishing and number of trips in the bottomfish fishery from 1982 to 2011. The data associated with the chart is found in the next page.

Interpretation: The sharp decline in the bottomfish landings since 1986, noted in Fig.1 is mirrored in this figure by a sharp decline in the level of effort expended in that fishery. Rather than indicating a problem with the resources , this decline depicts an actual trend of commercial boat owners and fishermen seeking other more lucrative and stable work. The 1994-1996 estimated efforts were greater than those for the 1990-93 period due to the highliners increased efforts, with some boat owners employing teams (usually 2-3 fishermen) in continuous shifts during good weather. In 1997 and 1998 the number of boats participating in this fishery dropped significantly (see Figure 4) resulting in the notable declines in the number of trips and hours fished that period. The 1999 increase in effort can be attributed to some Alias that normally longline and troll, doing occasional bottomfishing. The 2006-2009 sharp increase attributes to more fishermen actively participated including local Asian residents taking up bottomfishing as main source of income. With the tsunami around the end of 2009, most of the boats were down for repair and it attributes to the drop in fishing trips and fishing hours. The 2011 fishing efforts/trips and fishing hours increased from 2010. The increase in efforts is due to the implementation of the biosampling project which offers free ice and pays fishermen for each species sampled and thus attracts more fishermen to participate in the program. Extra money and free ice thus incites these fishermen to go fishing in a daily or weekly basis.

Source: DMWR Offshore Creel Survey Database

Calculation: The annual estimated hours spent bottomfishing is calculated by dividing the annual total bottomfish catch by the average CPUE (pounds per hour) from trips doing only bottomfish fishing. The annual estimated number of trips is calculated by dividing the estimated annual hours by the average length of a bottomfish fishing trip. The average length of a bottomfish fishing trip (not shown) is calculated by using only trips which exclusively bottomfished and for which the trip length was recorded. The total hours fished from those trips is then divided by the number of trips. Recorded hours are trip hours.

Year	Hours	Trips
1982	7671	548
1983	12695	621
1984	8796	468
1985	17682	1116
1986	11093	725
1987	2631	219
1988	3637	351
1989	2785	306
1990	1586	126
1991	2176	152
1992	1480	104
1993	2437	144
1994	5936	345
1995	3694	283
1996	2605	265
1997	2751	295
1998	1127	99
1999	1502	144
2000	2752	243
2001	3227	344
2002	5610	546
2003	1750	295
2004	3783	406
2005	2708	249
2006	862	115
2007	3620	312
2008	6145	433
2009	7770	499
2010	2698	166
2011	3853	278
Average	4569	340
Std. Dev.	3765	214

Estimated Number of Boats Landing Bottomfish

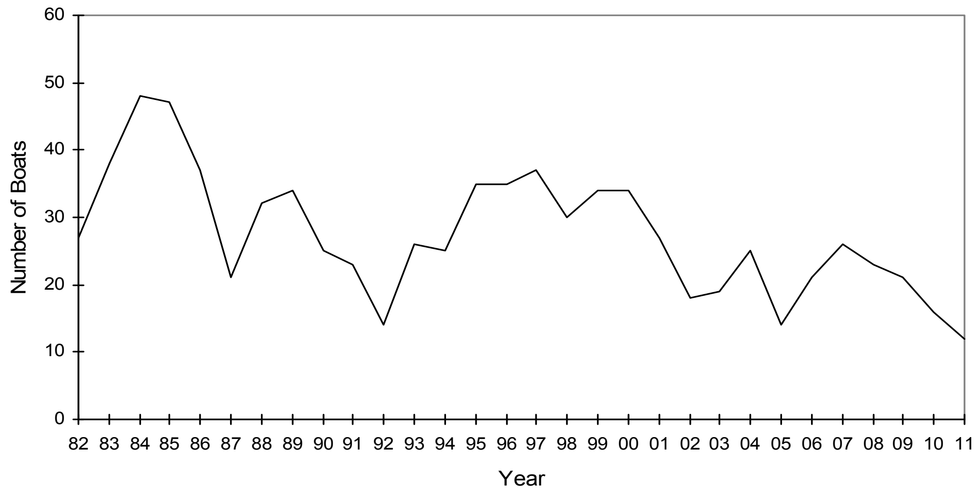


Figure 7. Estimated number of boats landing bottomfish in American Samoa from 1982-2011. The data associated with the graph is found on the side.

Year	Boats
1982	27
1983	38
1984	48
1985	47
1986	37
1987	21
1988	32
1989	34
1990	25
1991	23
1992	14
1993	26
1994	25
1995	35
1996	35
1997	37
1998	30
1999	34
2000	34
2001	27
2002	18
2003	19
2004	25
2005	14
2006	21
2007	26
2008	23
2009	21
2010	16
2011	12
Average	27
Std. Dev.	9

Interpretation: The decline in the fishery since 1985-86 is reflected by a decline in the number of boats participating in it. The 1987 hurricane caused the loss of the whole Manu'a fleet, plus some of the Tutuila fleet. Several Boats that contributed to the 1989 bottomfish annual landings did not land any bottomfish in 1990, due to much needed boat repairs and their participation in non-bottomfish chartered trips. About 90% of the domestic fishing fleet was affected by the December 1991 hurricane, hence the slight decline in 1992. The increase in 1993 is due mainly to the re-entry to this fishery of a few boats after repairs.

The continuous decline in the number of boats since 2000 is due to more skilled fishermen leaving the fishery and take up other employments and some left the islands to go back to their homelands. The increase in fuel costs also contributes to the decrease as more operators quit the fishery. The number of boats participated in the fishery in 2011 decreased by 4 from 2010. However fishing efforts and total landings increased. This is due to increased effort because of the incentives offered by DMWR through its Biosampling project that provides free ice to fishers and money per fish the fishers get when their catches are sampled.

Source: DMWR Offshore Creel Survey database

Calculation: The annual estimate of the number of boats in the bottomfish fishery is obtained from the data base by counting the unique boats sampled during the year which landed any bottomfish species regardless of fishing method.

Estimated Annual Bottomfish Catch Per Unit Effort

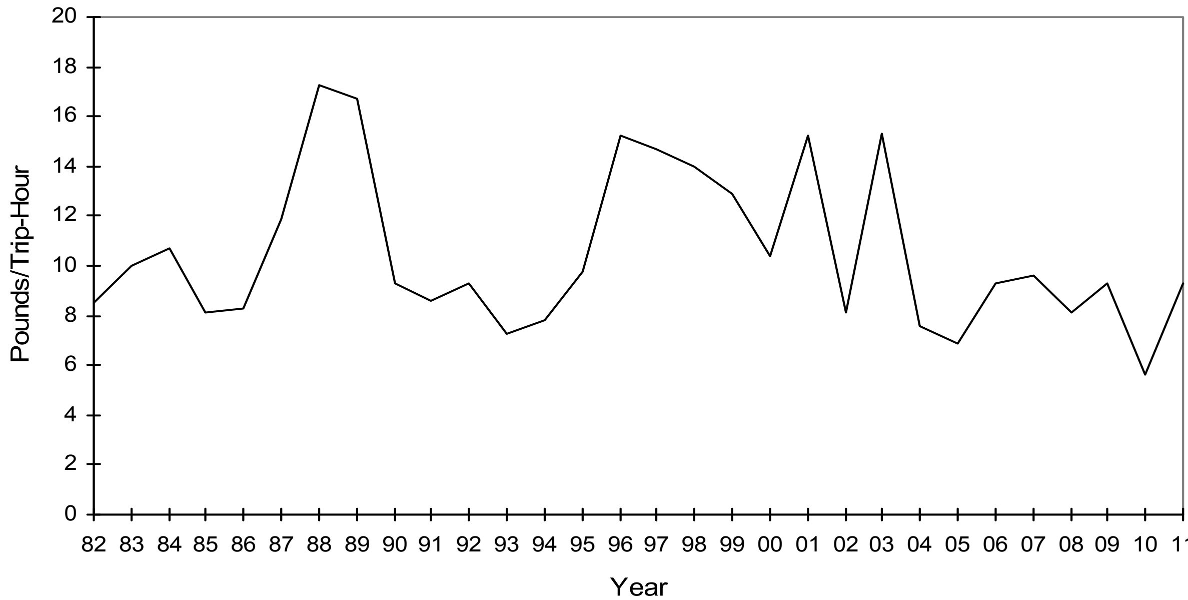


Figure 8. Estimated annual catch per unit effort associated with the bottomfish fishery.

Interpretation: The increased CPUE for 2011 can be attributed to improved sampling of more fishing trips. This is due to fishermen calling in to inform us of when they are going fishing, when they are expected back and where they are landing. It all happened because these fishermen participated in the BioSampling project and they were required to come to the Office to have their catches sampled and got paid for it plus getting free ice. The 2011 CPUE is about the same as 2006 to 2009. The 2010 CPUE is the lowest recorded CPUE ever in the history of the fishery in the past 29 years.

Source: DMWR Offshore Creel Survey database

Calculation: CPUE is calculated using only trips in which only the bottomfish method was used and trip hours were recorded. The average is calculated by using each CPUE from each trip as an observation and dividing by the number of trips.

CPUE Trends: For boat-based bottomfishing no clear trend is found when examining CPUE between 1986 and 2010. Catch was therefore plotted against effort and in examining the data this way a relatively clear linear relationship is found to exist between catch and effort. As more effort is expended, catches are also higher. When examining the effort and catch together again it is clear that effort seems to be dictating the level of catch as the plot lines of each follow a very similar trend throughout the years with only slight variations occurring.

Fishing Effort Trends: For boat-based bottomfishing a relatively clear linear relationship exists between catch and effort. As more effort is expended, catches are also higher. When examining the effort and catch together again it is clear that effort seems to be dictating the level of catch as the plot lines of each follow a very similar trend throughout the years with only slight variations occurring.

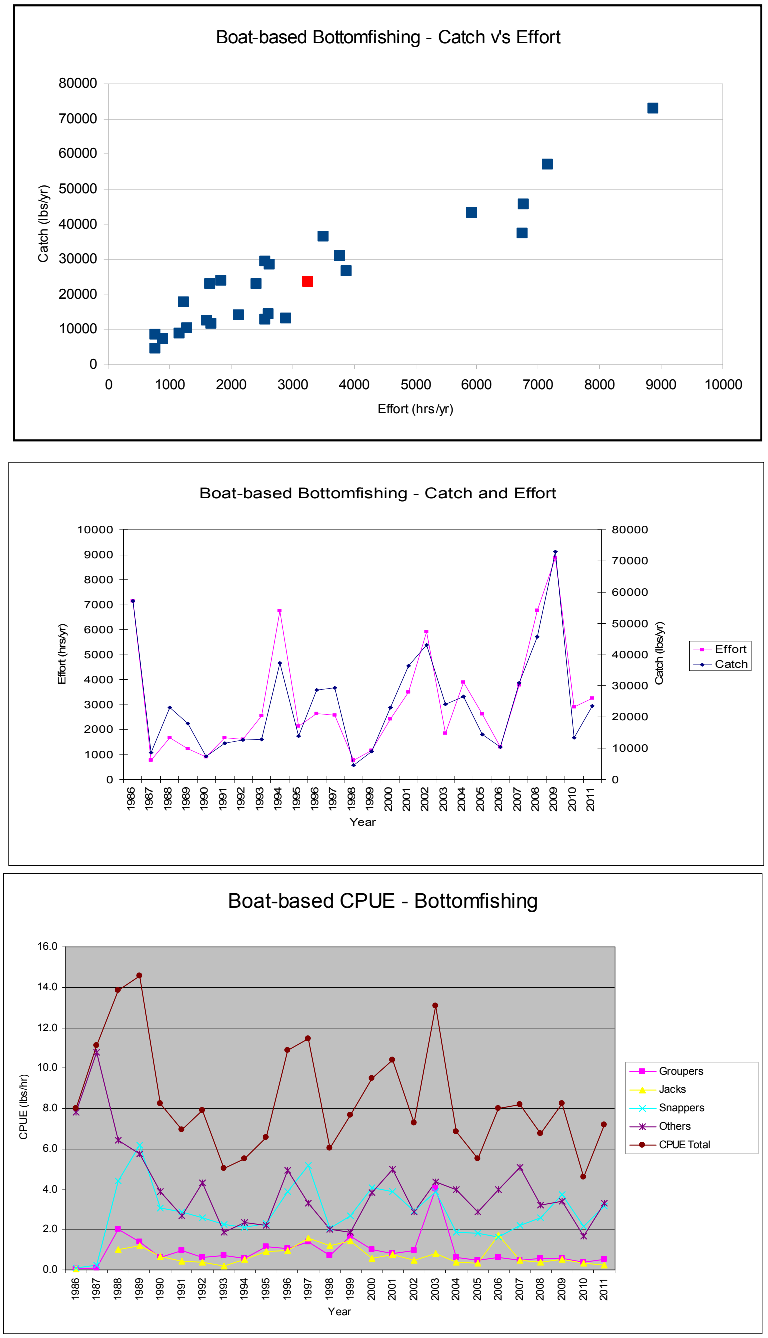


Figure 9. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top six families (Bottom) in the bottomfish fishery in American Samoa from 1986-2011.

Average Price of Bottomfish.

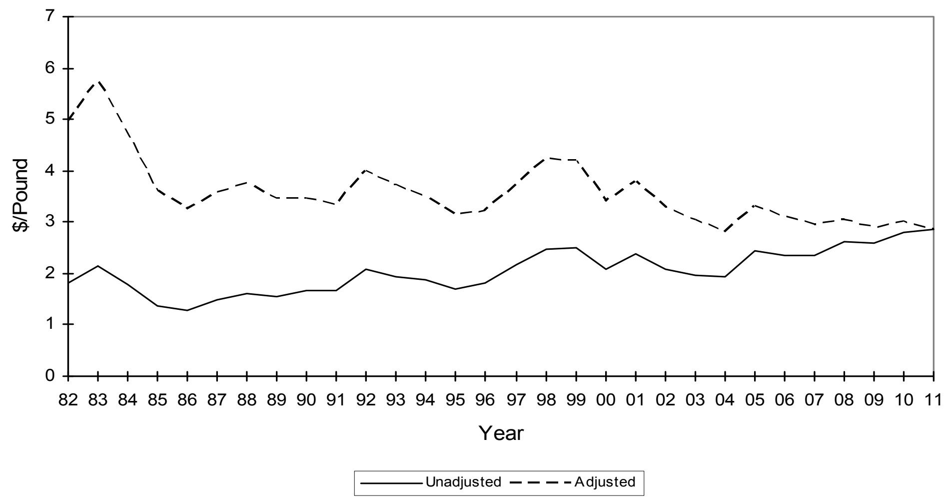


Figure 10. Consumer price index adjusted and unadjusted price of bottomfish in American Samoa from 1982 to 2011. The data associated with the graph is shown below.

Interpretation: Prices were generally higher between 1982 and 1984 during the exportation of high-priced deepwater snappers to Hawaii. After this period, inflation-adjusted local prices have generally been stable. Prices of locally caught bottomfish are generally higher than imported fish and imported fish from Samoa have always helped in meeting the demand for bottomfish.

A slightly low price/lb of bottomfish is recorded for 2011- a 15 cents drop from the 2010 price. But over all in the past ten years, the price per pound has been relatively the same.

Source: DMWR Offshore Creel Survey database

Calculation: The average price of all bottomfish species combined is calculated by dividing total bottomfish revenue by total sold weight. The inflation-adjusted price is calculated by multiplying the unadjusted annual average price by the annual calculated consumer price index (CPI) for American Samoa using the current year as base.

Year	Unadjusted Price/Lb	Adjusted Price/Lb
1982	$1.83	$4.93
1983	$2.15	$5.75
1984	$1.80	$4.72
1985	$1.38	$3.59
1986	$1.29	$3.24
1987	$1.48	$3.57
1988	$1.61	$3.76
1989	$1.54	$3.45
1990	$1.66	$3.45
1991	$1.68	$3.34
1992	$2.09	$4.00
1993	$1.95	$3.72
1994	$1.87	$3.50
1995	$1.71	$3.13
1996	$1.83	$3.23
1997	$2.16	$3.72
1998	$2.48	$4.22
1999	$2.50	$4.21
2000	$2.10	$3.39
2001	$2.38	$3.77
2002	$2.10	$3.29
2003	$1.98	$3.03
2004	$1.95	$2.79
2005	$2.43	$3.30
2006	$2.36	$3.11
2007	$2.36	$2.95
2008	$2.61	$3.04
2009	$2.59	$2.90
2010	$2.80	$3.02
2011	$2.86	$2.86
Average	$2.05	$3.57
Std. Dev.	$0.41	$0.65

Average CPI Adjusted Revenue per Bottomfishing Trip

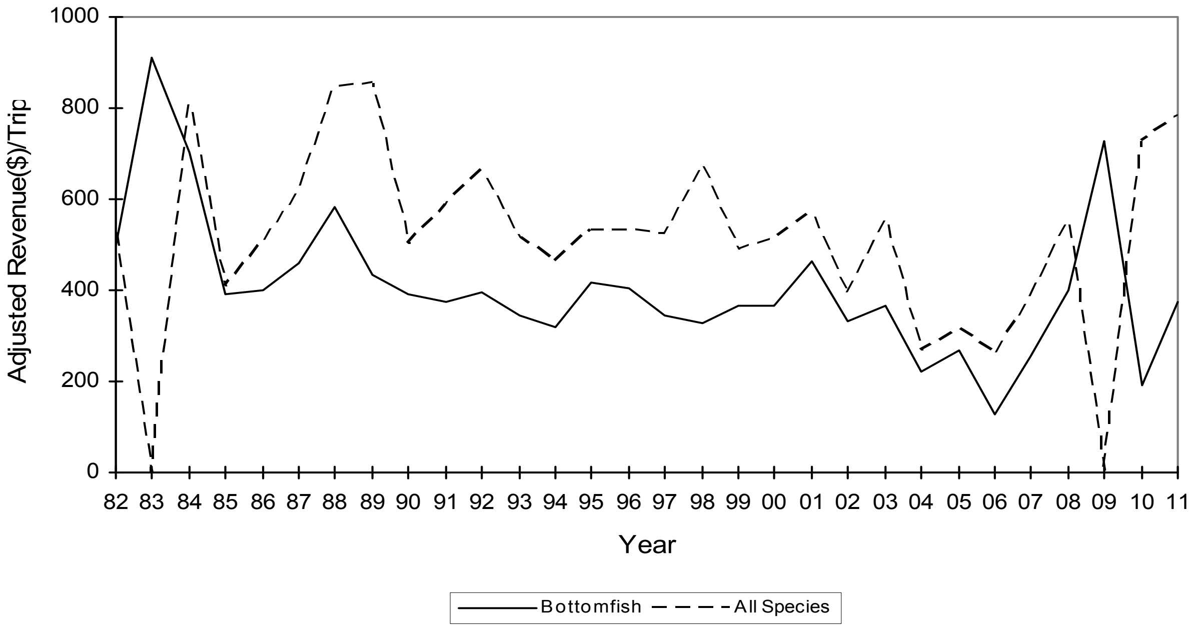


Figure 11. Average inflation adjusted revenue per trip landing bottomfish in American Samoa from 1982 to 2011. Data associated with the chart is shown on the next page.

Interpretation:. The distance between these two lines reflects the relative importance of bottomfish species in the total catch whenever any bottomfish are landed. The prominent importance of bottomfish between 1982 and 1985 occurred during the targeting of deepwater snappers (mainly ***Etelis*** and ***Pristipomoides***) for export to Hawaii.

From 2006 to 2009 both bottomfish and all species adjusted revenue per trip show an increased trend and then from 2009 to 2010 the bottomfish revenue per trip took a sharp drop while all species slightly decreased. Reasons for the sharp drop in the bottomfish revenue are unknown. In 2011 the bottomfish adjusted revenue increased twofold while all species increased slightly.

Bottomfish fishing is a more profitable method of fishing in terms of saving fuel, and most people seek out bottomfish species at the market and the stores. And because of the demand for bottomfish species, the supply of bottomfish species has been supplemented by bottomfish imported from Western Samoa.

Source: DMWR Offshore Creel Survey database

Calculation: The average revenue per trip for all species is calculated by summing the revenues of all sales for any trip which landed any bottomfish species and sold all or part of their catch commercially, and dividing by the number of such trips. The average bottomfish revenue per trip is calculated from those same trips by summing the sales of only bottomfish species and dividing by the number of trips that sold their catch. Figure 11 plots the inflation-adjusted bottomfish and all species revenue per trip for the period 1982-2001.

Year	Bottomfish Unadjusted	Bottomfish Adjusted	All Species Unadjusted	All Species Adjusted
1982	$ 185	$ 498	$ 196	$ 527
1983	$ 341	$ 912	$ 388	$ 1038
1984	$ 269	$ 704	$ 309	$ 810
1985	$ 151	$ 392	$ 157	$ 407
1986	$ 159	$ 401	$ 202	$ 507
1987	$ 191	$ 461	$ 257	$ 619
1988	$ 249	$ 582	$ 362	$ 846
1989	$ 193	$ 432	$ 382	$ 854
1990	$ 188	$ 391	$ 241	$ 501
1991	$ 188	$ 375	$ 295	$ 587
1992	$ 206	$ 394	$ 348	$ 665
1993	$ 181	$ 346	$ 271	$ 517
1994	$ 170	$ 318	$ 247	$ 463
1995	$ 229	$ 419	$ 289	$ 530
1996	$ 229	$ 405	$ 301	$ 532
1997	$ 201	$ 346	$ 303	$ 522
1998	$ 193	$ 329	$ 397	$ 675
1999	$ 218	$ 367	$ 291	$ 490
2000	$ 228	$ 368	$ 318	$ 514
2001	$ 293	$ 465	$ 360	$ 571
2002	$ 212	$ 331	$ 249	$ 390
2003	$ 238	$ 364	$ 365	$ 558
2004	$ 155	$ 222	$ 187	$ 267
2005	$ 196	$ 266	$ 232	$ 315
2006	$ 97	$ 127	$ 196	$ 259
2007	$ 203	$ 254	$ 310	$ 388
2008	$ 345	$ 402	$ 476	$ 554
2009	$ 649	$ 727	$ 935	$ 1046
2010	$ 177	$ 192	$ 673	$ 727
2011	$ 375	$ 375	$ 785	$ 785
Average	$ 230	$ 405	$ 344	$ 582
Std. Dev.	$97	$156	$170	$195

Bottomfish By-Catch

Species	Bycatch				Catch	%BC	Interviews		
	Alive	Dead Inj	Unk	Total			With BC	All	%BC
All Species (Comparison)					2751	0.000	0	194	0.00

Interpretation: No bycatch was reported in 2011. The local bottomfish fishery sell or take home any species caught.

Source: DMWR Offshore Creel Survey

Calculation: The Bottomfish Bycatch table is obtained from creel survey interviews. The Bycatch numbers are obtained by counting fish in the interviews for purely bottomfishing trips with a disposition of bycatch. The catch for all species included for comparison is obtained by counting all species of fish caught by purely bottomfishing interviews and the number of interviews is a count of purely bottomfishing interviews.

Status of the Guam Bottomfish Fishery

Moffitt et al. (2007) assessed the status of the bottomfish complexes in Guam, Commonwealth of Northern Mariana Island, and American Samoa using a surplus production model. The maximum sustainable yield for the American Samoa BMUS was estimated to be at 109,000 lbs per year. The BMUS biomass was above BMSY during 1982-2005 indicating that the stock is not overfished. Similarly, the estimates of relative exploitation rate indicate that the annual harvest rate has been below HMSY from 1985 - 2005 indicating that the bottomfish complex has not experienced overfishing. An updated stock assessment is scheduled to be released in June 2012.

Coral Reef Troll Fishery

Catch Trends: It should be noted that boats participating in this fishery even when involved in trolling predominantly target pelagic species which is as expected, however, pelagic species are not reported upon in this document as it is restricted to CREMUS species only. In 2011, the amount of CREMUS species actually caught while trolling remained at very low levels equating to only 124 pounds which was made up of 27 pounds of jacks (22%), 91 pounds of "Other CRE-Finfish" (73%), and 6 lbs of atulai (5%).

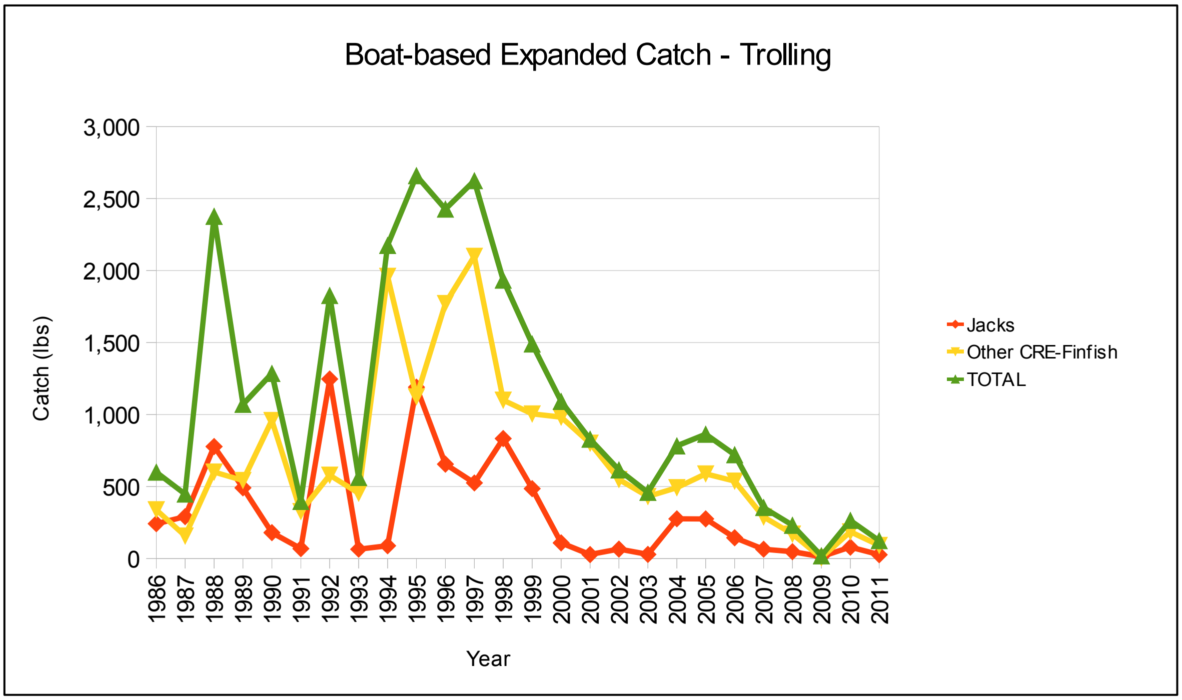
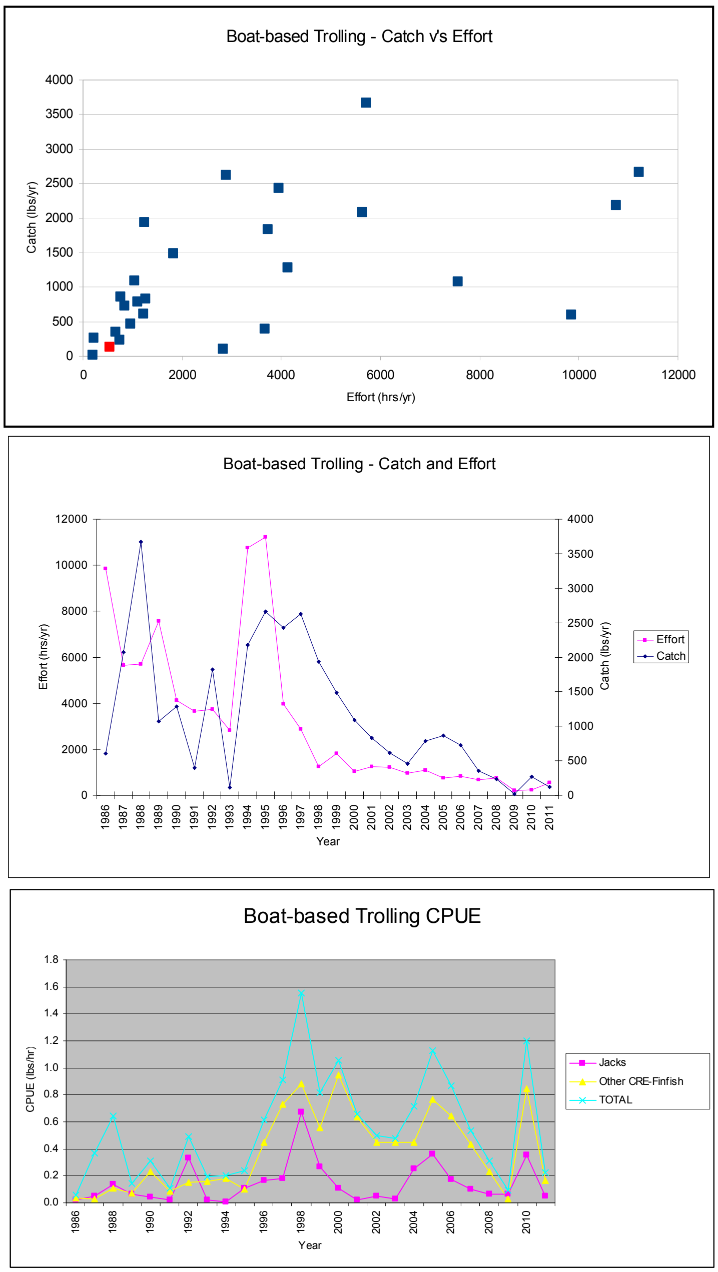


Figure 12. Expanded catch of families or species groups caught in the boat-based troll fishery in American Samoa from 1986 to 2011.

CPUE Trends: Again, no clear trend seems to exist when examining CPUE data for boat-based trolling. Unlike bottomfishing, however, and all other fishing methodologies examined (see below), boat-based trolling catch and effort data doesn't show a clear linear relationship. This may be somewhat expected however as this method is only the sole focus of two of the six boats known to participate in this fishery, while the other four of the six vessels merely troll on their way to and from their bottomfishing grounds. It would be interesting to examine data from the two dedicated troll fishing boats alone, however, such data wasn't available at the time of this report.



Alias in Pago Pago Harbor and lures for trolling in American Samoa (Photo: D.Hamm)

Figure 13. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top groups (Bottom) in the boat-based troll fishery in American Samoa from 1986-2011.

Coral Reef Spear Fishery

Catch Trends: Boat-based spearfishing catch in 2011 was 21,244 pounds representing a moderate catch, and a 47% decline in catch from 2010 when the catch was relatively high at 45,479 pounds. (Note: this 2010 figure has been adjusted slightly from the 59,867 pounds reported in the 2010 Annual Plan Team Report - presumably from scrutinization and correction of the data collected and the expansion process). 49% of the 2011 catch was of surgeonfish (10,475 lbs), 33% parrotfish (6,995 lbs), 7% miscellaneous reef fish (1,550 lbs), 4% squirrelfish (908 lbs), with the remaining 4% of the catch being comprised of all other reef fish species. While the catch in 2011 is moderate, the figure from 2010, even having been adjusted somewhat downward, is still unexpectedly high. As mentioned in the crustacean section above, it seems somewhat unlikely that spearfishing catch increased so dramatically in this year, and obviously the data needs to be further revisited.

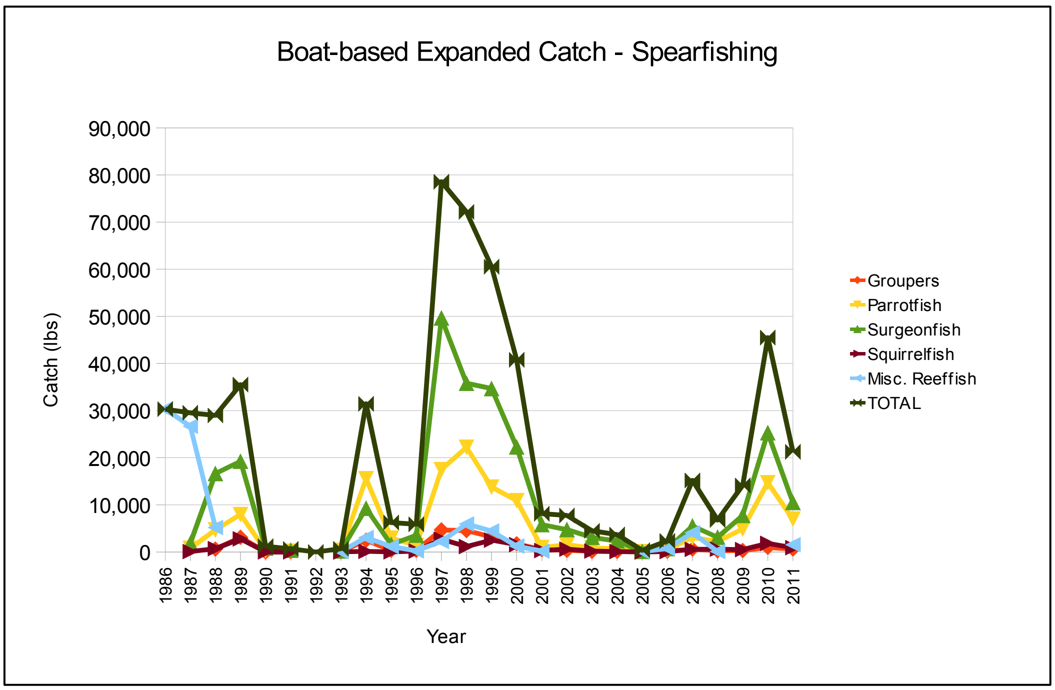
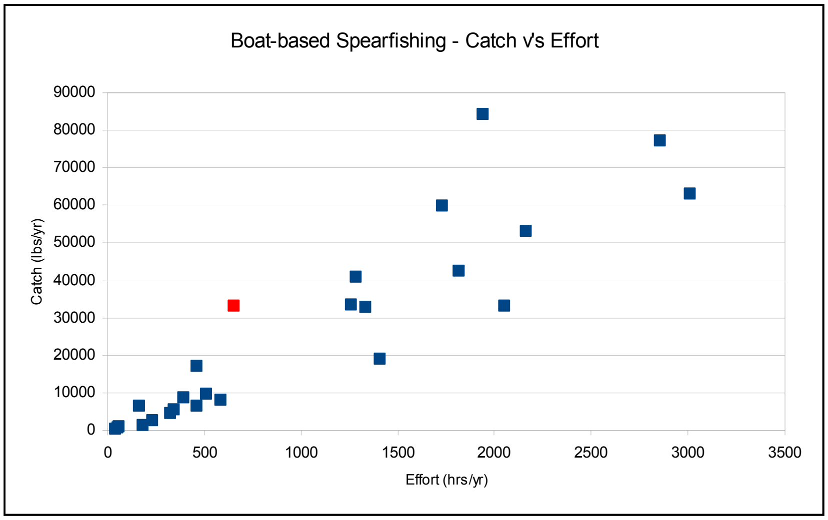
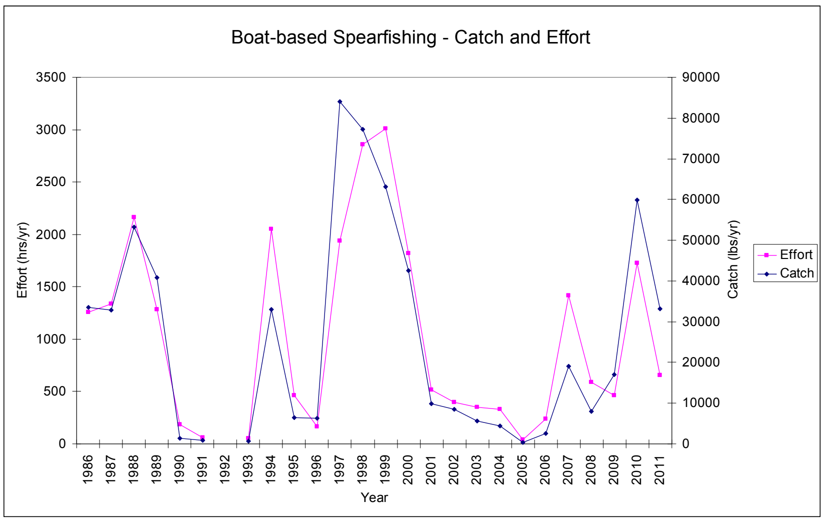
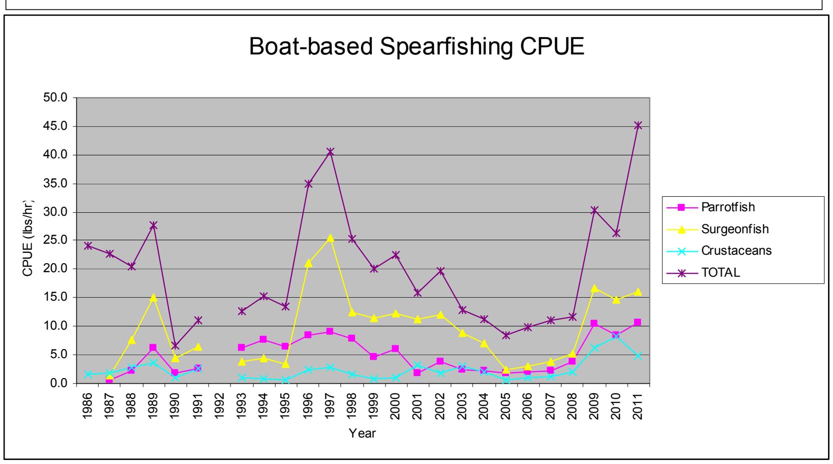


Figure 14. Expanded catch of families or species groups caught in the boat-based spear fishery in American Samoa from 1986 to 2011.

CPUE Trends: No clear trend seems to exist when examining CPUE data for boat-based spearfishing, although it should be noted that CPUE in 2011, 2010 and 2009 is as high as it was during the SCUBA-spearfishing years 1996-1999. However, similar to boat-based bottomfishing, a relatively clear linear relationship exists between catch and effort for boat-based spearfishing. As more effort is expended, catches are also higher. When examining the effort and catch together it is again clear that effort seems to be dictating the level of catch as the lines follow a very similar trend throughout the years with only slight variations occurring.







Spear fisherman offloading his gear and catch (Photo: D.Ochavillo)

Figure 15. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top groups (Bottom) in the boat-based spear fishery in American Samoa from 1986-2011.

Shore-Based Fisheries

Rod and Reel

Catch Trends: Total shore-based catch by rod and reel in 2011 was again very low totaling only 1,981 pounds. This continued a similar trend from recent previous years and it should be noted that the only time catches using this method have ever been moderate or high is when there have been considerable catches of atulai and/or jacks, although these larger catches are also a result of increased effort (see below). In 2011 31% of the catch was of jacks (623 lbs), 17% Other CRE finfish (341 lbs), 15% emperors (299 lbs), 15% grouper (307 lbs), 8% surgeonfish (152 lbs), and 14% all others (259 lbs).

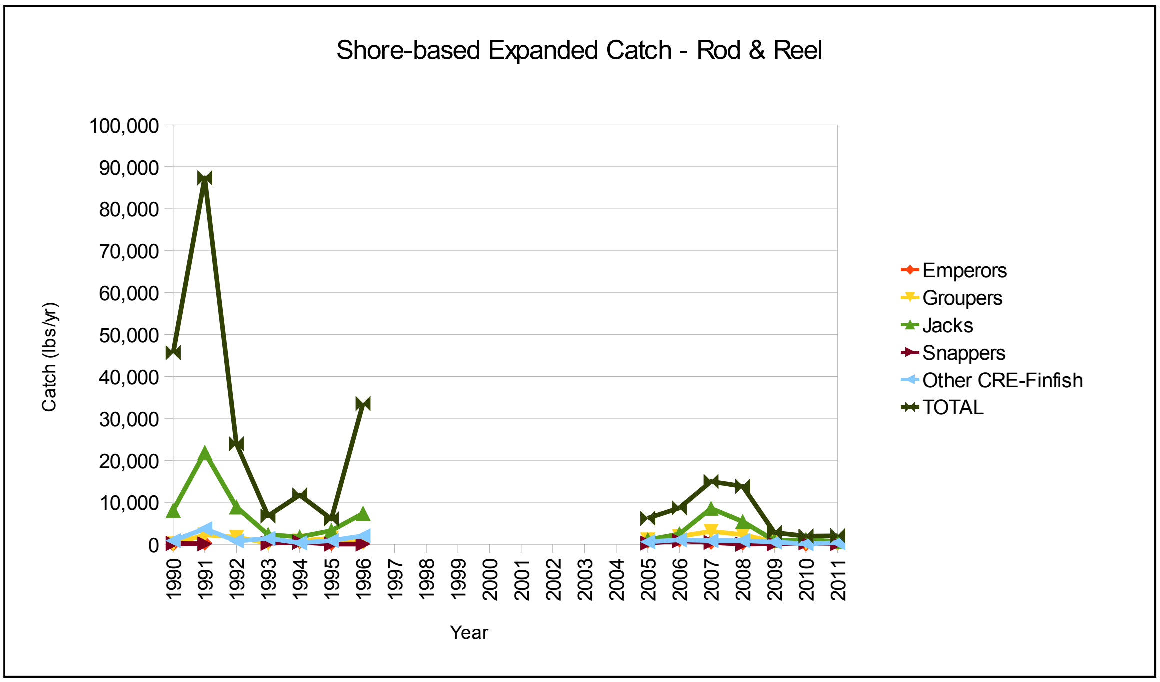


Figure 16. Expanded catch of families or species groups caught in the shore-based rod and reel fishery in American Samoa from 1990 to 2011.

CPUE Trends: No clear trend seems to exist when examining CPUE data for shore-based rod and reel, although it should be noted that higher CPUE figures exist in years when there were large catches of atulai and/or jacks. A more or less linear relationship between catch and effort again exists for the shore-based rod and reel method. The main outlier of 87,365 pounds catch, 24,404 hours effort, came in a year when there was a strong atulai run.

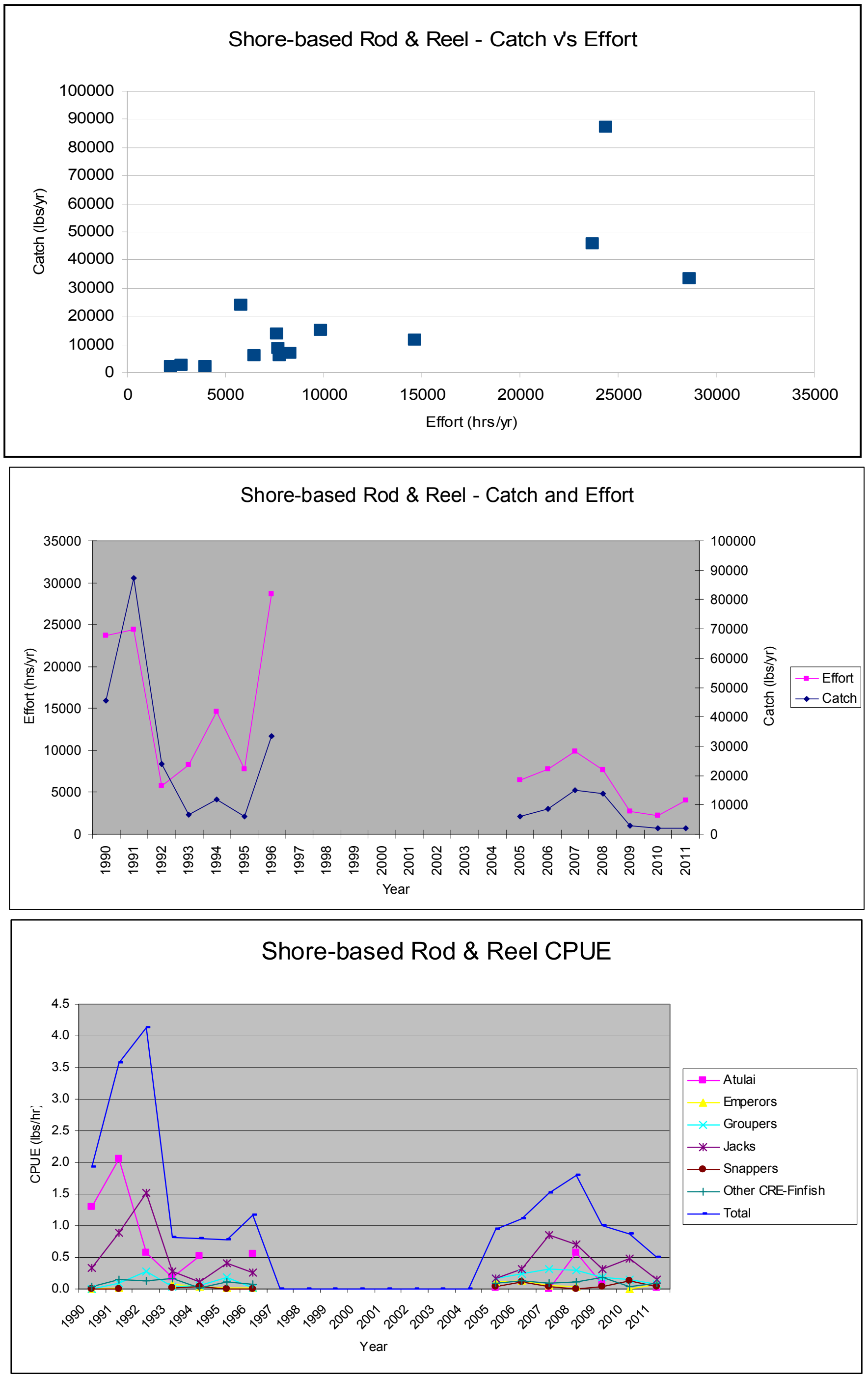


Figure 17. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top groups (Bottom) in the shore-based rod and reel fishery in American Samoa from 1990-2011.

Coral Reef Spear Fishery

Catch Trends: Shore-based spearfishing catch remained relatively low in 2011 (9,580 lbs) even though catch increased 52% from 2010 (4,688 lbs). Shore-based spearfishing catch in 2011 was comprised of molluscs (44%, 4,218 lbs), surgeonfish (19%, 1,833 lbs), parrotfish (16%, 1,536 lbs), squirrelfish (4%, 404 lbs) and grouper (4%, 337 lbs) with the remaining 8% of the catch (827 lbs) coming from small amounts of all other species groups.

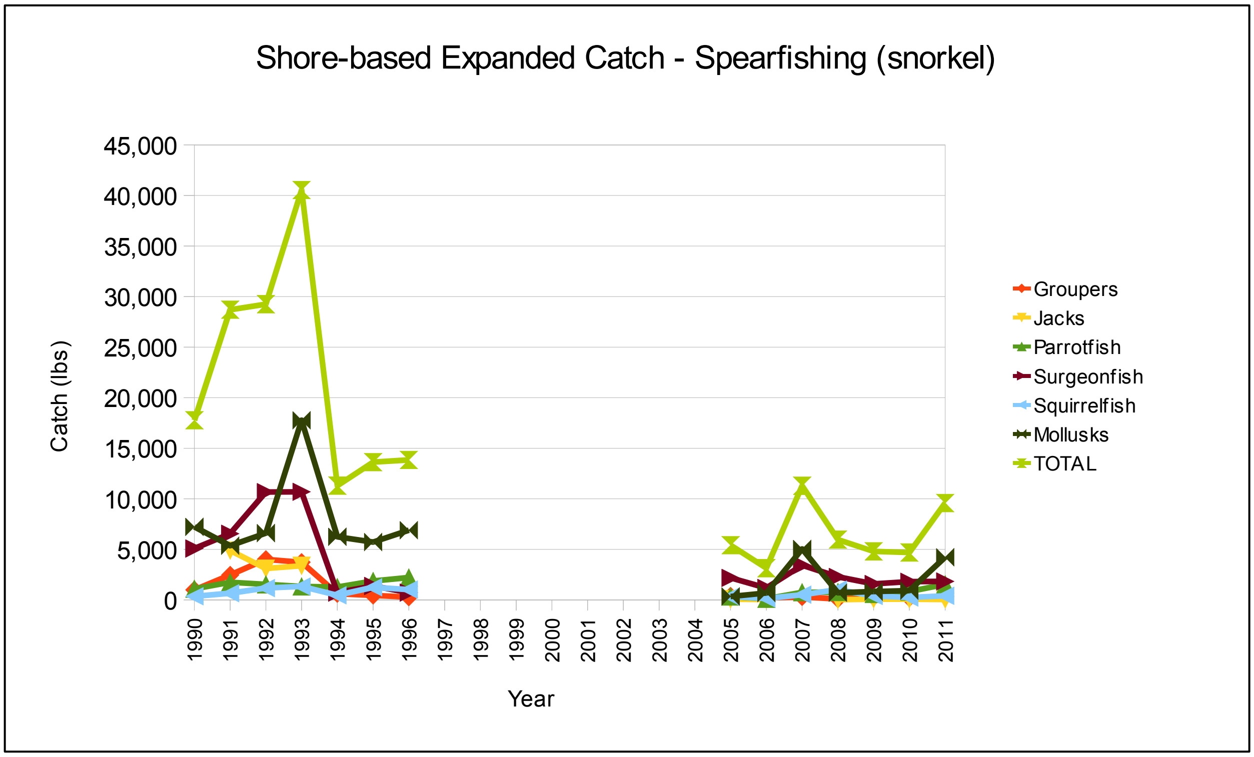


Figure 18. Expanded catch of families or species groups caught in the shore-based spear fishery in American Samoa from 1990 to 2011.

CPUE Trends: No clear trend exists when examining spearfishing CPUE throughout the years. When examining catch versus effort, however, there is a relatively clear linear relationship between the two for the shore-based spearfishing method. As more effort is expended, catches are also greater. When examining the effort and catch together it is again clear that effort seems to be dictating the level of catch as although there are slight variations during the years, there is no consistent pattern in variation, and the lines both follow a very similar trend.

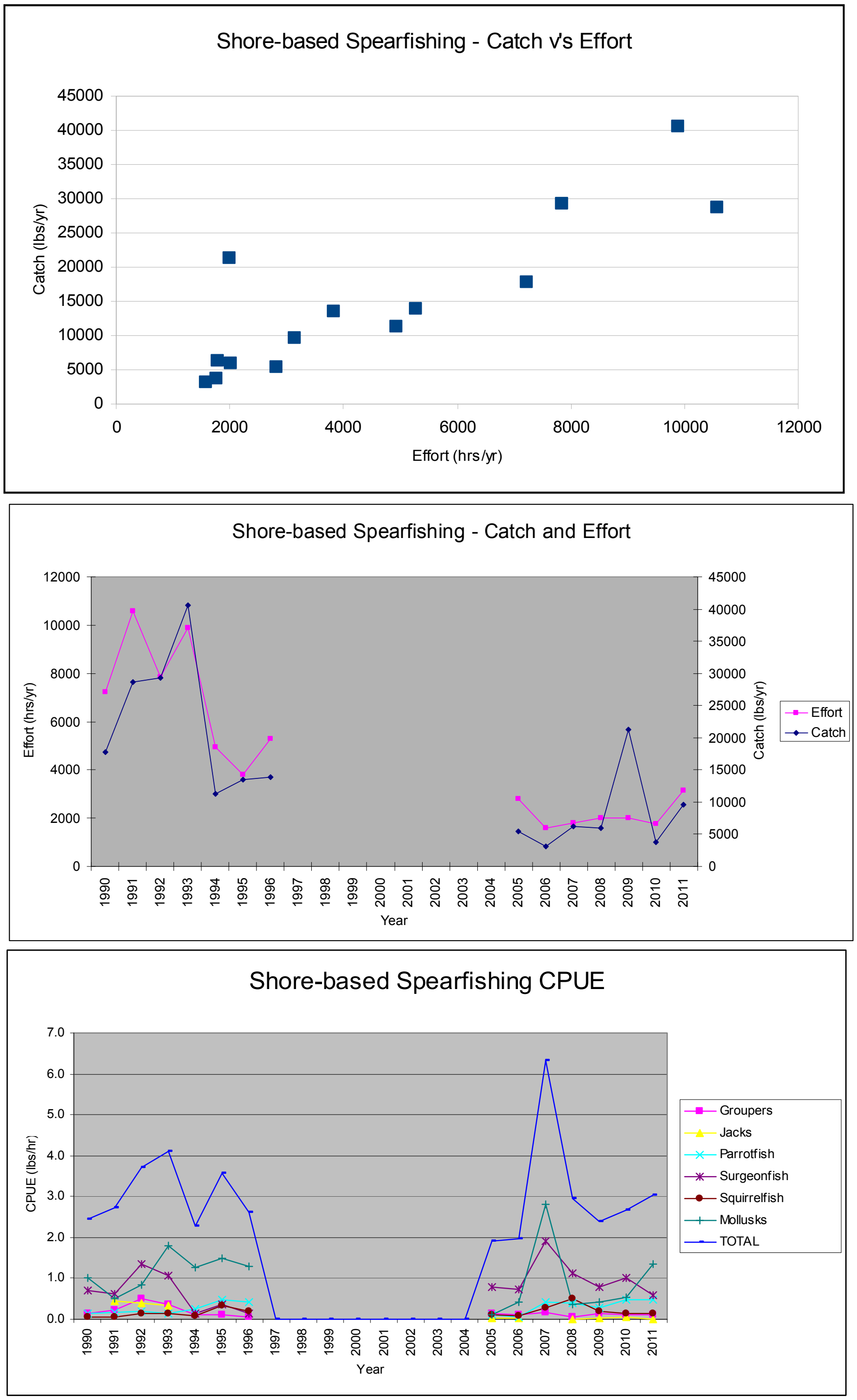


Figure 19. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top groups (Bottom) in the shore-based spear fishery in American Samoa from 1990-2011.

Throw Net Fishery

Catch Trends: Shore-based expanded catch using throw nets remained low in 2011 with a catch of 2,254 pounds. The catch was comprised of 49% mullet (1103 lbs), 23% surgeonfish (508 lbs), 15% other CRE finfish (338 lbs), 9% jacks (196 lbs), and the remaining 4% of the catch (109 lbs) from all other species groups.

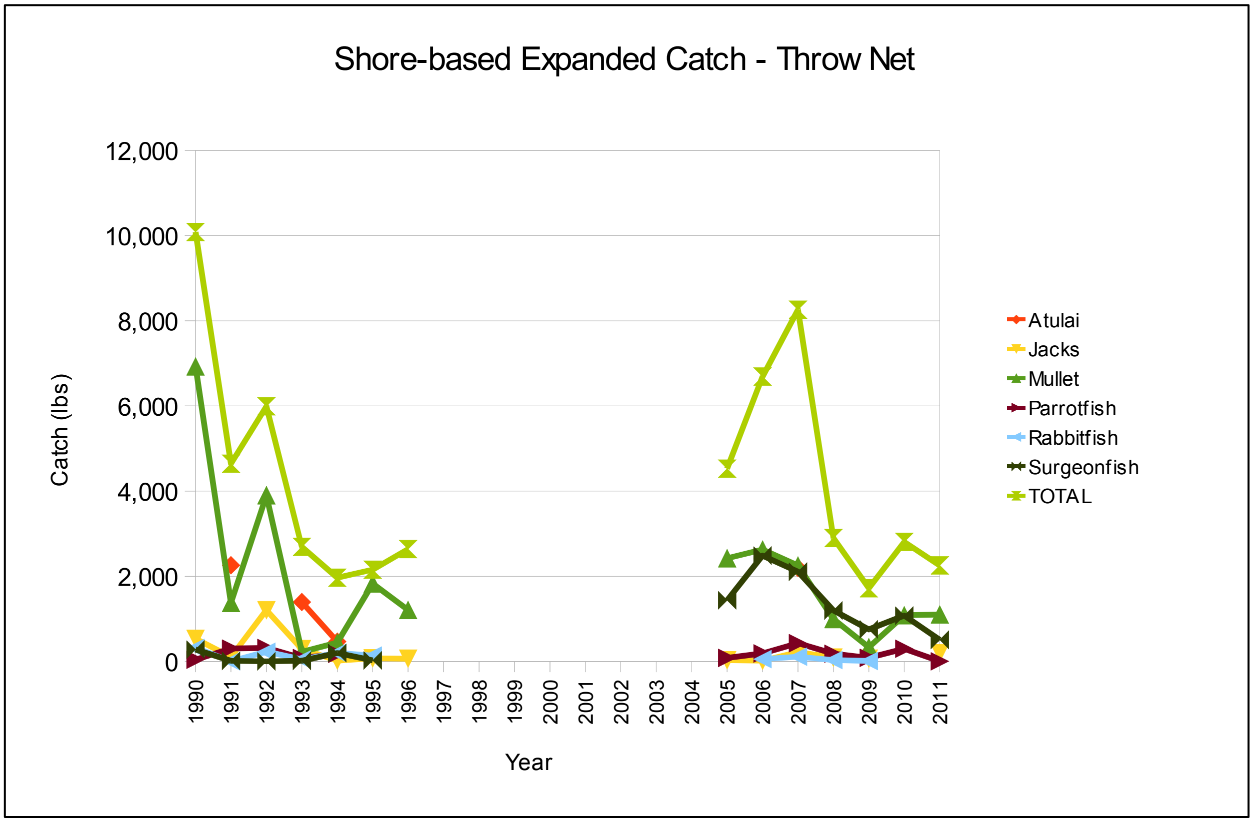


Figure 20. Expanded catch of families or species groups caught in the shore-based throw-net fishery in American Samoa from 1990 to 2011.

CPUE Trends: CPUE seems to have declined between 1990 and 1993, however, no clear pattern throughout the years appears to be evident. A relatively clear linear relationship between catch versus effort again exists for the shore-based throw net method. As more effort is expended, catches are also greater. When examining the effort and catch together it is again clear that effort seems to be dictating the level of catch. It is interesting that catch relative to effort seemed to be declining from 1990-1993, but no clear pattern seems evident from 2005-2011.

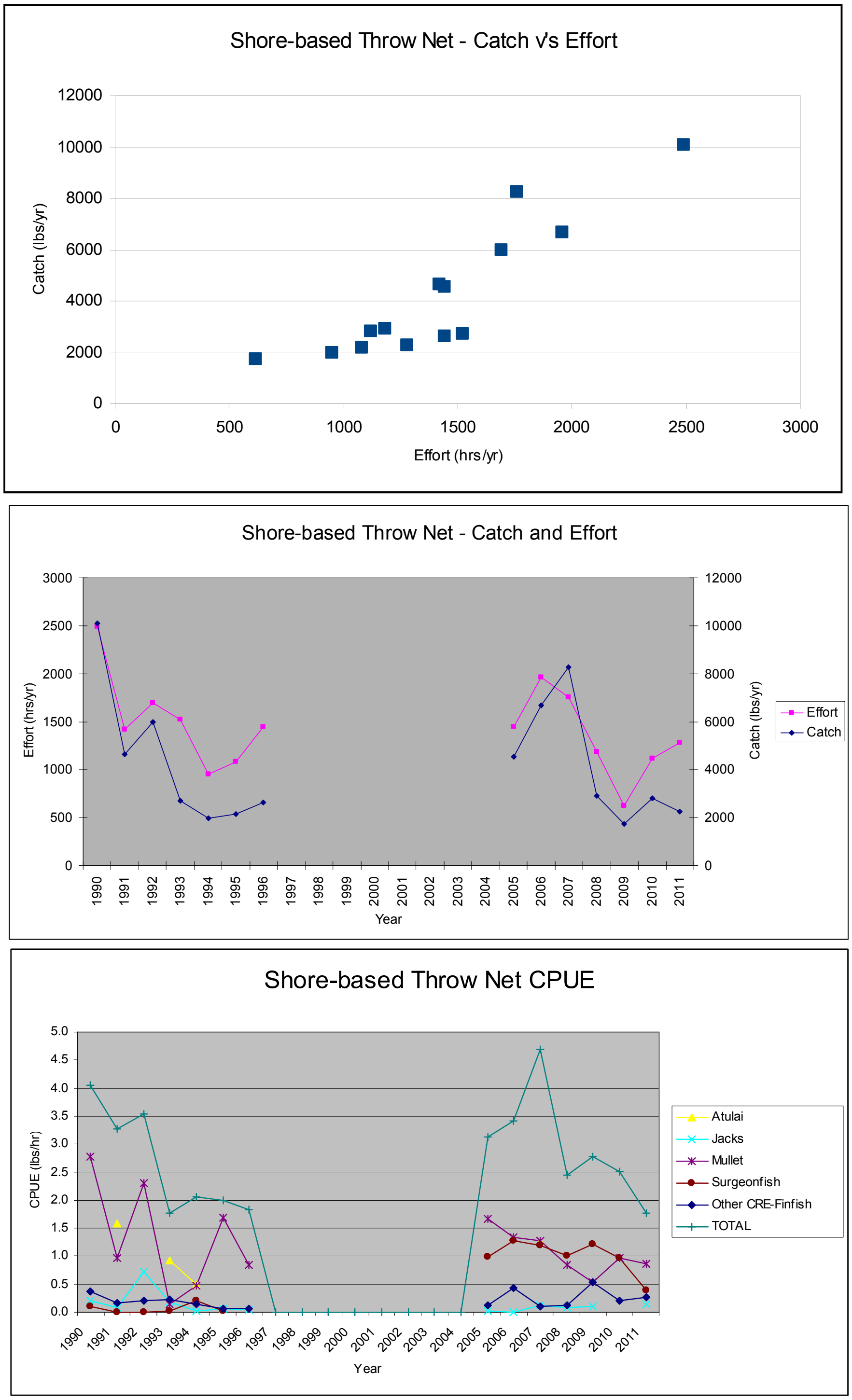


Figure 21. Catch to effort plot (Top), temporal plot of catch and effort (Middle), and CPUE time series of the top groups (Bottom) in the shore-based throw-net fishery in American Samoa from 1990-2011.

Gleaning Fishery

Catch Trends: The 2011 shore-based expanded gleaning catch was 2,977 pounds, remaining at very low levels especially compared with catch recorded in the early to mid 1990's. The 2011 catch was comprised of 91% mollusks (2,710 lbs), 4% surgeonfish (108 lbs), 3% parrotfish (78 lbs), 1% groupers (50 lbs) and 1% wrasse (20 lbs)..

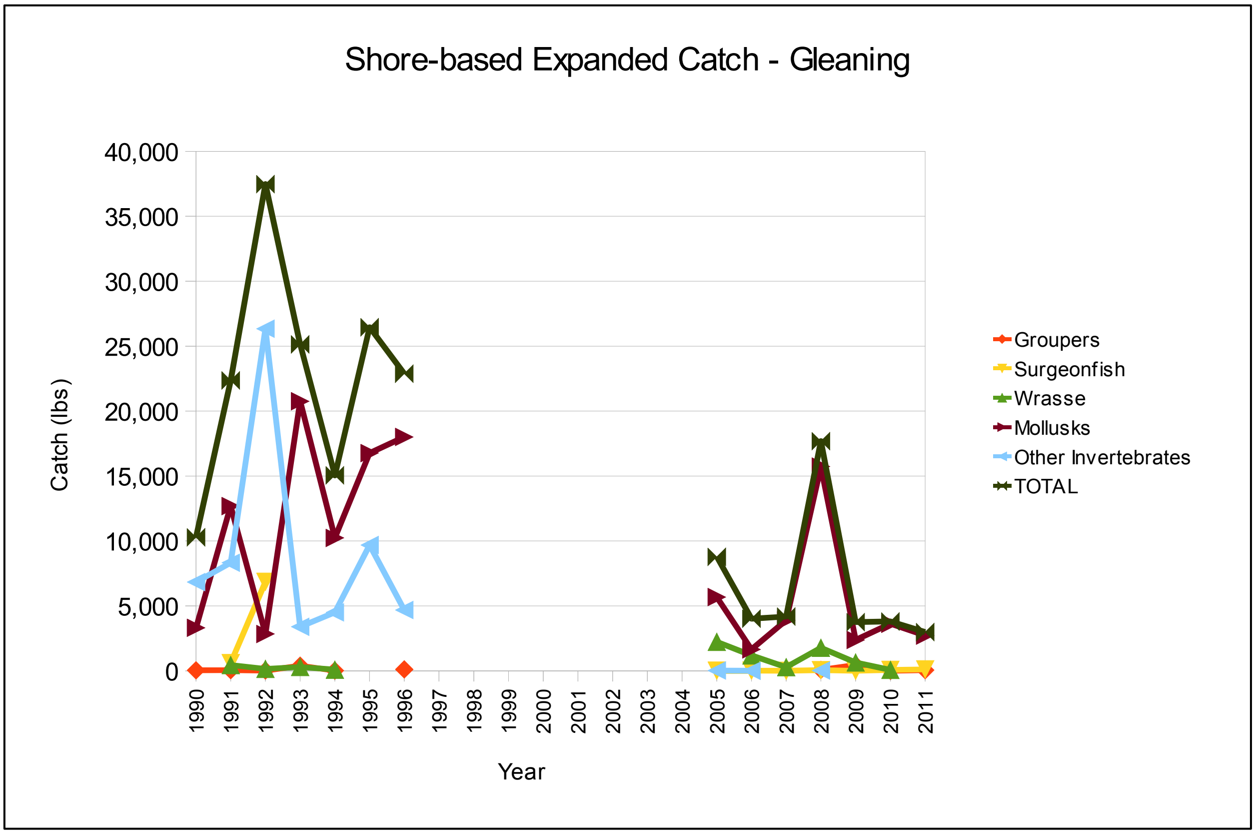
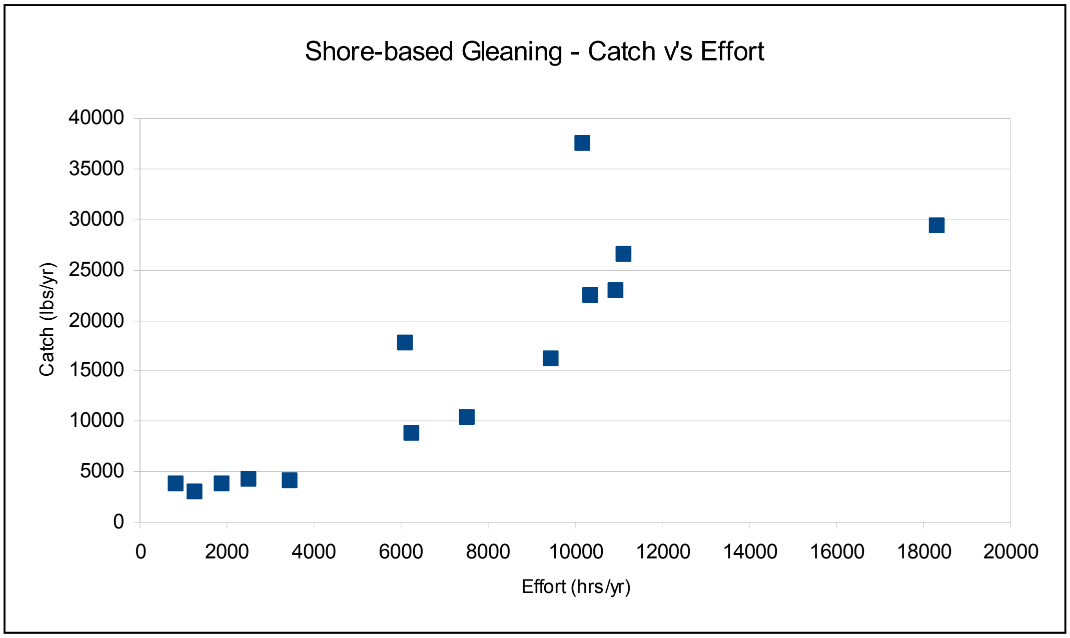


Figure 22. Expanded catch of families or species groups caught in the shore-based gleaning fishery in American Samoa from 1990 to 2011.

CPUE Trends: Shore-based gleaning CPUE has varied over the years and no clear trend exists. A roughly linear relationship between catch and effort may exist for the shore-based gleaning method. When examining the effort and catch together it is again clear that effort seems to be dictating the level of catch as both catch and effort follow the same general trend throughout the years.



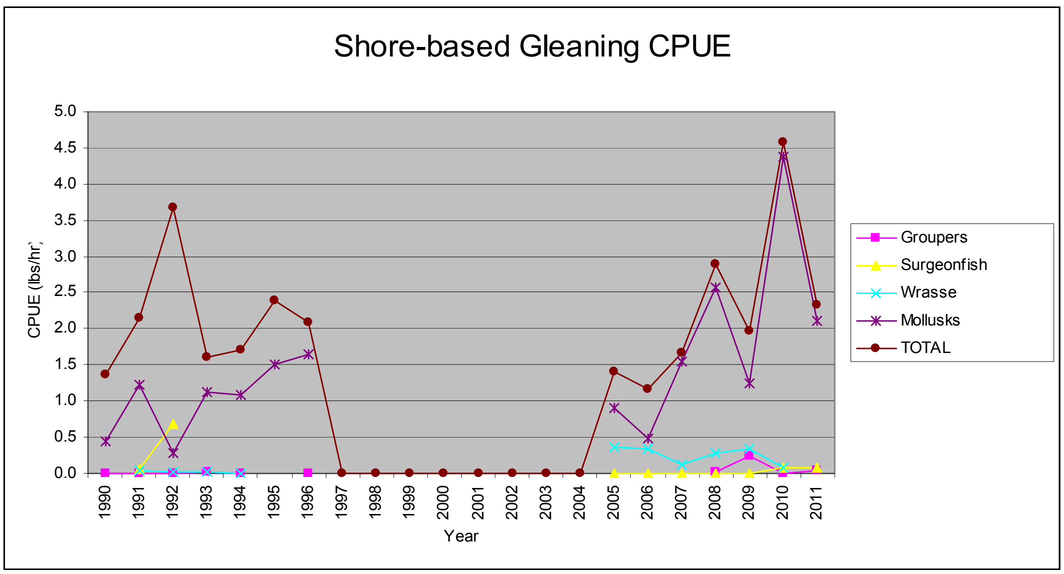


Figure 23. Catch to effort plot (Top) and CPUE time series of the top groups (Bottom) in the shore-based gleaning fishery in American Samoa from 1990-2011.

Coral Reef Fishery By-Catch

American Samoa coral reef fisheries are general non-selective and non-targeting where most of the catch are retained. These fishery characteristics render minimal by-catch. Interactions with protected species are believed to be minimal. To date, there have been no reported or observed interactions between protected species and coral reef fisheries in Federal waters around American Samoa and the potential for interactions is believed to be low due to the gear types and fishing methods used.

Status of the Coral Reef Fishery

There are no existing stock assessments on CREMUS stocks. There are biomass estimates for reef fish populations provided by CRED described in this report which may be used, among other data, in determining CREMUS annual catch limits.

Overfished and Overfishing Determinations
To date coral reef fisheries around Guam and CNMI have not been determined to be overfished or subject to overfishing.

MSY
No estimates of MSY are currently available for coral reef ecosystem associated species in the Mariana Archipelago.

OY
Optimum yield for coral reef ecosystem associated species is defined as 75% of their MSY.

Fishery Independent Data Collection

There are actually four on-going fishery independent data collection in the American Samoa territory: (1) the Key Reef Species monitoring program in DMWR funded by the Sportfish Restoration Grant (SFR) and conducted yearly; (2) the American Samoa Coral Reef Monitoring Program (ASCRMP) conducted yearly and funded by the NOAA Coral Reef Conservation Program; (3) the Pacific Islands Fishery Science Center's Coral Reef Ecosystem Division (CRED) monitoring program conducted every three years; and to some extent (4) the monitoring program conducted by the Community-Based Fishery Management Program (DMWR) on village-managed marine protected areas also funded by SFR. The first three monitoring programs are conducted in the same islands but in various sites using various methods and surveying different species groups. Of the first three programs, only the ASCRMP surveys the non-fishing target species groups such as damselfishes and butterflyfishes. This report will only discuss results from the Key Reef Species program as the other monitoring programs have either published their results as peer-reviewed manuscripts (CRED) or internally-submitted through their annual reports (ASCRMP). The analyses of the Key Reef Species data also included the previous monitoring program conducted for DMWR by Alison Green of the Great Barrier Marine Park Authority. The latter program also included various species groups such as damselfishes and butterflyfishes. The Key Reef Species program only focuses on 150+ species targeted by fishing in the American Samoa territory.

Underwater fish visual census has been an integral tool in studying coral reef fish and fisheries ecology. Most of our understanding of coral reef ecosystems has been derived from underwater surveys. However, this method has some inherent limitations and caveats should be borne in mind in the interpretation of derived results. Especially with regards to spearfishing which is most done at night, underwater visual censuses mostly cover diurnal species accounting for the differences in species. The method used in spearfishing, whether scuba or free-diving, also has some bearing on species targeted (depth related) while most of the underwater census is conducted under no-decompression conditions. Moreover, there are reports of quantified effects of diver presence and method impact on the data collected by the underwater fish visual census. The belt transect method, the most widely-used version and developed in relatively un-fished Great Barrier Reef, has been shown to detect fewer fishes due to diver disturbance and/or modified fish behavior especially in areas with intense spearfishing pressure. Dickens et al. (2011) estimated that the belt transect method under-estimated up to 52% of the mean number of fish recorded and up to 70% in individual families.

The analyses of key reef species fishery independent data showed that Green recorded around 35 and 59 species in 1992 and 2002 surveys, respectively. Sabater recorded 67 species in 2005, 44 species in 2006, and 40 species in 2007. Ochavillo recorded around 20 species. Around 103 fish species targeted by spearfishermen were recorded by the fishery independent survey. The differences in number of species recorded may due to the differences in coral reef area and habitats covered in the years covered and recorder bias. The recorder bias includes including more (or less) fish and species than covered by belt transect dimensions (search image is bigger or smaller than actual survey method dimensions). On the other hand, fluctuations in species presence and absence cannot also be ruled out. There are approximately 60 species targeted by spearfishermen based on four months data collection by the Biosampling project conducted by the American Samoa DMWR. The top 15 fish species recorded by various observers in various years are shown in Tables 1 to 6. The top 15 species (in numbers) caught by fishermen are shown in Table 7.

Table 6. Top 15 species recorded by Green in 1996. (average density = fish per 150 m2 of area surveyed, 50 m in length and 3 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	19.9
2	*Acanthurus nigrofuscus*	5.6
3	*Naso lituratus*	6.1
4	*Acanthurus nigricans*	4.8
5	*Unidentified scarid*	8.6
6	*Chlorurus sordidus*	5.2
7	*Chlorurus japanensis*	3.9
8	*Pterocaesio tile*	22.1

9	*Cephalopholis urodeta*	2.8
10	*Scarus psittacus*	4.4
11	*Lutjanus kasmira*	10.7
12	*Acanthurus triostegus*	9.5
13	*Ctenochaetus cyanocheilus*	3.9
14	*Mulloides flavolineatus*	10.0
15	*Cephalopholis argus*	1.9

Table 7. Top 15 species recorded by Green in 2002. (average density = fish per 150 m2 of area surveyed, 50 m in length and 3 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	278.8
2	*Acanthurus nigricans*	10.6
3	*Scarus psittacus*	10.2
4	*Mulloidicthys vanicolensis*	27.1
5	*Ctenochaetus cyanocheilus*	6.3
6	*Chlorurus sordidus*	5.9
7	*Acanthurus nigrofuscus*	4.2
8	*Chlorurus japanensis*	6.9
9	*Lutjanus kasmira*	11.2
10	*Gnathodentex aureolineatus*	13.8
11	*Acanthurus triostegus*	23.9
12	*Cephalopholis urodeta*	2.9
13	*Chlorurus frontalis*	9.0
14	*Scarus forsteni*	3.7
15	*Naso lituratus*	2.6

Table 8. Top 15 species recorded by Sabater in 2005. (average density = fish per 150 m2 of area surveyed, 30 m in length and 5 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	80.0
2	*Acanthurus nigricans*	24.2
3	*Pterocaesio tile*	94.1
4	*Chlorurus sordidus*	11.5
5	*Acanthurus nigrofuscus*	17.8
6	*Cephalopholis urodeta*	7.3
7	*Chlorurus japanensis*	5.4
8	*Acanthurus lineatus*	8.7
9	*Caesio teres*	58.2
10	*Naso lituratus*	5.6
11	*Melichthys vidua*	5.1

12	*Gnathodentex aureolineatus*	7.8
13	*Scarus psittacus*	15.5
14	*Chlorurus frontalis*	7.1
15	*Scarus oviceps*	11.8

Table 9. Top 15 species recorded by Sabater in 2006. (average density = fish per 150 m2 of area surveyed, 30 m in length and 5 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	121.9
2	*Acanthurus nigricans*	9.4
3	*Caesio teres*	36.3
4	*Chlorurus sordidus*	7.1
5	*Chlorurus japanensis*	4.4
6	*Acanthurus nigrofuscus*	8.6
7	*Scarus globiceps*	8.2
8	*Cephalopholis urodeta*	3.6
9	*Scarus psittacus*	7.4
10	*Acanthurus guttatus*	45.5
11	*Caranx melampygus*	7.0
12	*Naso lituratus*	3.7
13	*Acanthurus lineatus*	6.6
14	*Scarus oviceps*	4.4
15	*Aphareus furca*	2.6

Table 10. Top 15 species recorded by Sabater in 2007. (average density = fish per 150 m2 of area surveyed, 30 m in length and 5 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	51.1
2	*Acanthurus nigricans*	15.4
3	*Chlorurus sordidus*	17.2
4	*Chlorurus japanensis*	12.3
5	*Pterocaesio tile*	63.8
6	*Scarus psittacus*	15.5
7	*Acanthurus nigrofuscus*	12.3
8	*Mulloidicthys vanicolensis*	19.3
9	*Scarus spinus*	15.2
10	*Aphareus furca*	3.1
11	*Mulloidicthys vanicolensis*	35.5
12	*Cephalopholis urodeta*	2.2
13	*Naso lituratus*	4.0

14	*Scarus oviceps*	4.3
15	*Melichthys vidua*	2.8

Table 11. Top 15 species recorded by Ochavillo in 2008. (average density = fish per 150 m2 of area surveyed, 30 m in length and 5 m in width).

Rank	Species	Average density
1	*Ctenochaetus striatus*	24.4
2	*Acanthurus nigricans*	4.4
3	*Chlorurus sordidus*	4.5
4	*Acanthurus nigrofuscus*	4.3
5	*Cephalopholis urodeta*	1.7
6	*Oxycheilinus unifasciatus*	1.4
7	*Parupeneus multifasciatus*	1.5
8	*Caesio cunning*	4.7
9	*Parupeneus cyclostomus*	1.1
10	*Bodianus mesothorax*	1.1
11	*Scarus sp.*	2.3
12	*Acanthurus lineatus*	1.5
13	*Acanthurus pyroferus*	1.7
14	*Cephalopholis argus*	1.0
15	*Gnathodentex aureolineatus*	2.5

Table 12. Top 15 species (numbers) recorded from spearfishermen in 2010 to 2011.

Rank	Species
1	*Acanthurus lineatus*
2	*Acanthurus nigricans*
3	*Naso lituratus*
4	*Ctenochaetus striatus*
5	*Sargocentron tiere*
6	*Scarus oviceps*
7	*Myripristis berndti*
8	*Chlorurus japanensis*
9	*Scarus rubroviolaceus*
10	*Naso unicornis*
11	*Epinephelus melanostigma*
12	*Acanthurus guttatus*
13	*Myripristis murdjan*
14	*Calotomus carolinus*
15	*Scarus globiceps*

The fishery independent data showed that the coral reef fish target assemblage is dominated by surgeonfishes, parrotfishes and a few species of groupers, in this order. The dominant surgeonfishes were *Ctenochaetus striatus*, *Acanthurus nigricans*, *Acanthurus nigrofuscus* and *Naso lituratus* in this order. The most dominant parrotfishes were *Chlorurus sordidus*, *Chlorurus japanensis*, *Scarus psittacus*, and *Scarus oviceps*. The most dominant groupers were *Cephalopholis urodeta* and *Cephalopholis argus*. There were no or very few recorded soldierfishes and squirrelfishes.

The spearfishermen's data were also characterized by surgeonfishes, parrotfishes and groupers. In addition, soldierfishes and squirrelfishes were also important. In contrast to the fishery independent data, the most dominant surgeonfish was *Acanthurus lineatus* and *Ctenochaetus striatus* was a distant fourth. The surgeonfish *Acanthurus nigricans* was a distant second and the surgeonfish *Acanthurus nigrofuscus* was hardly in the catch. The dominant parrotfishes were *Chlorurus japanensis* (also dominant in the fishery independent data survey), *Scarus oviceps* and *Scarus rubroviolaceus*. The red-lip parrotfish *Scarus rubrioviolaceus* which is second in dominance in spearfish catch in terms of weight was recorded in the fishery independent data collection but was not dominant. The dominant grouper was the inshore grouper *Epinephelus cyanostigma*.

The most parsimonious explanation of the apparent differences in species composition is the depth distribution patterns of the fish targeted and the depth of spearfishing. Spearfishing in the territory is mainly by free-diving thus it is limited by the depth. Most fishermen spear in the shallows (< 10 m ~ reef flat to reef crest and upper reef slope). This is reflected by the shallow coral reef species: *Acanthurus lineatus*, *Acanthurus guttatus*, *Naso lituratus*, *Chlorurus japanensis*, *Scarus oviceps, Scarus rubroviolaceus* and *Epinephelus cyanostigma*. Both *Acanthurus nigricans* and *Acanthurus nigrofuscus* are found in deeper waters. The market-size *Chlorurus sordidus* is mainly found in deep waters. The groupers *Cephalopholis urodeta* and *Cephalopholis argus* are found in mid- to lower-reef slope areas. These results imply that in order for the fishery independent data to track the impact of fishing, it has to modify its methods to include upper reef slope, reef crest and reef flat areas. On the other hand, these areas are the most turbulent areas in the territory's coral reefs so care must be taken in conducting surveys and methods should be modified (e.g. use timed-swim and other non-belt transect methods).

Survey data are only useful if they provide trends. We have provided time series data for the more abundant six species in the fishery independent surveys that are also dominant in the spearfishing catch (Figure 24). The data indicated no apparent increasing or decreasing trends in density from 1996 up to 2008. There were fluctuations in the data that can either be attributed to natural causes or observer bias. In either case, there was no apparent decline in the abundance of the surgeonfishes *Acanthurus lineatus*, *Ctenochaetus striatus*, and *Acanthurus nigricans*; the parrotfishes *Chlorurus japanensis* and *Chlorurus sordidus*; and the groupers *Cephalopholis urodeta* and *Cephalopholis cyanostigma*.

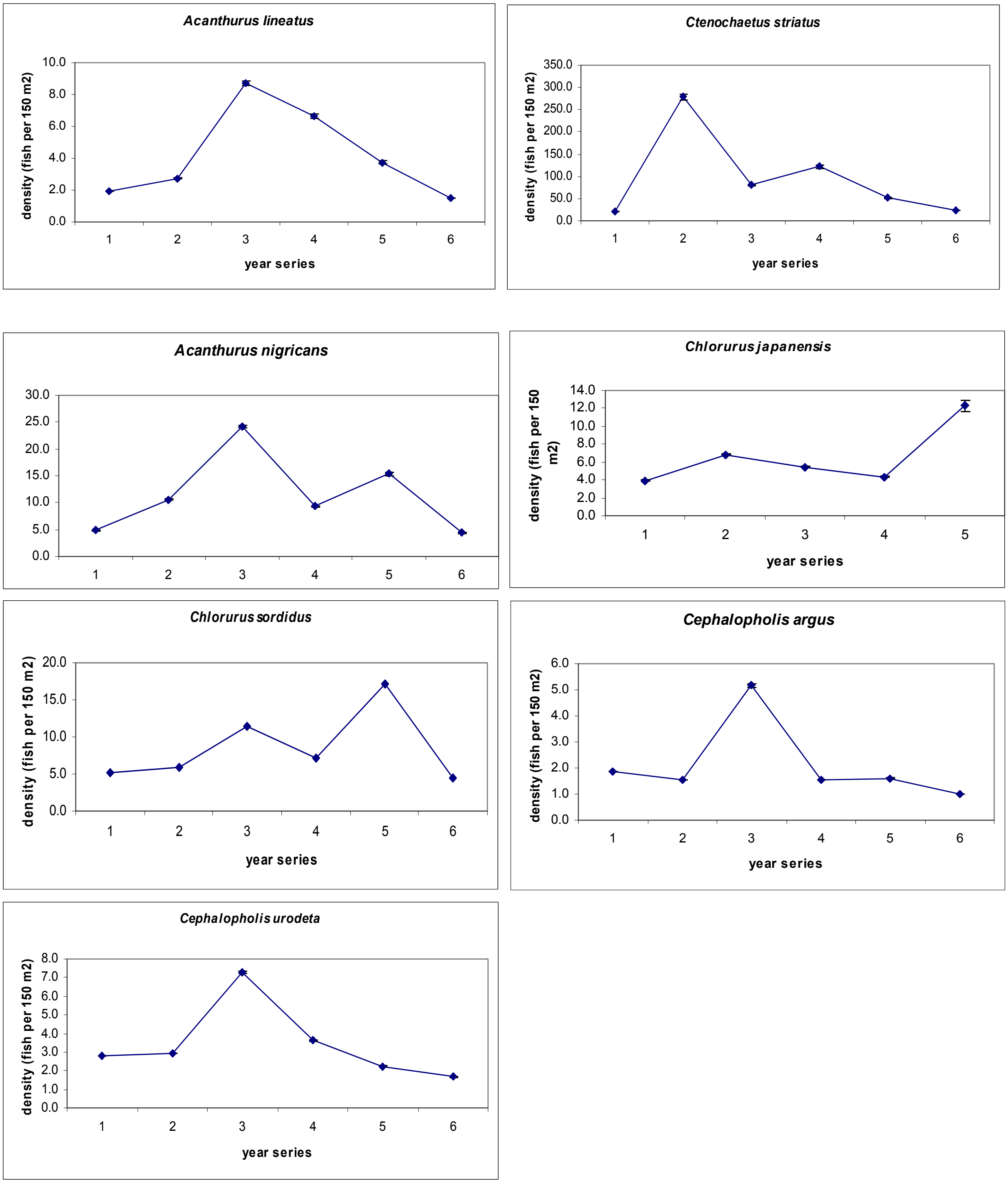


Figure 24. Density of selected Key Reef Species over time (1996 to 2008; other species had incomplete time data series).

Trend data patterns are limited by the period of observation. There is a need to forecast exploited populations in order to direct management policies. One way of forecasting population behavior is to use ecological models and predict scenarios in the future with degrees of probability using accumulated data. At present, the Key Reef Species Program of DMWR is using matrix population models to predict fish population growth using size-at-age, recruitment, mortality and survivorship data and growth-transition data using semi-empirical approaches. Preliminary results indicated similarities and differences among selected fast-growing surgeonfishes. Results indicated that recruitment is crucial to population dynamics as shown empirically by numerous coral reef fish studies. On the other hand, the survivorship of the recruits is important to population growth. This is contrary to the fisheries management policy of protecting only the reproductive adults. Interestingly, across the board protection of all stages (e.g. 20% coral reef area no-take) resulted to a significant population growth supporting current initiatives for the establishment of marine protected areas. The use of ecological models has been limited in coral reef fish ecology and we intend to use these models in forecasting the population growth of fish species from a variety of life history characteristics (e.g. fast versus slow-growing) for hypothesis-driven questions.

State of Coral Reef Habitat in American Samoa

Coral reef scientists have not reached an agreement on the definition of coral reef health, but they often mention the provision of ecosystem services, and comparisons with ecosystems that have not been impacted by humans. The benthic substrate and coral communities provide habitat for fish, and are essential fish habitat that is necessary for healthy fish populations and sustainable fish catches. Monitoring habitat is part of ecosystem-based management.

The coral reef slopes of Tutuila, American Samoa, have about 30% live coral cover in transects, in five different monitoring programs. That is slightly higher than for the Pacific as a whole and the South Pacific (Bruno and Selig, 2007) and for 17 countries in the Pacific (PROCfish). Coral cover in towboard surveys is as high as the US PRIAS (which are near-pristine) and higher than in the Hawaiian and Marianas archipelagos (Vroom, 2010) (though lower than in transects in American Samoa because transect locations are usually chosen to be better than random sites). Coral cover is not as high as in the Pacific in the past (Bruno and Selig, 2007), nor as high as two estimates of American Samoan coral cover in the past (Wass, Maragos, although the accuracy of estimates is questionable. No quantitative data exists from before the COTS outbreak.) Coral cover is increasing slightly over the 7 years of the Territorial Monitoring Program, and CRED and Key Reef Species have recorded increases of average coral cover as well. Average coral cover in the Pacific has been decreasing (Bruno and Selig, 2010; Côté et al. 2006), so the increase in coral here is better than the Pacific averages for change. There is only a small amount of dead coral, only about 5% cover, much less than in the average for 17 Pacific countries (PROCfish). Coral cover on reef flats (about 8-21%) is not as high as on slopes. Coralline algae cover is high (Vroom) and macroalgae is low and similar to that on near-pristine reefs (Vroom). Coralline algae is considered good since it requires the same conditions as coral and attracts coral larvae, and macroalgae cover is considered bad because they compete with corals and can take over in phase shifts after a disturbance kills lots of coral. The predominant cover on the reefs is encrusting, both encrusting coralline algae and encrusting corals. This may provide less hiding cover for fish than would branching coral, though the reef matrix provides many hiding holes most places.

The tsunami of Sept. 29, 2009, did significant damage to reef areas in Vatia Bay, Fagatele Bay, and Leone Bay, and lesser damage elsewhere. Heavily damaged areas were rare, moderately damaged areas more common, and lightly damaged or undamaged areas the most common. Within about 6 months, all the rubble moved in Fagatele Bay was completely covered with coralline algae, while none is at Vatia. Hurricane Wilma did additional damage in Vatia on Feb. 24, 2011, but little elsewhere.

Sedimentation rates near the mouths of streams are much higher than inside bays, which are in turn higher than outside bays. The water on outer reef slopes away from streams is relatively clear, with low nutrient levels. There is damage to small areas near stream mouths, and both Vatia Bay and the reef flat next to Coconut Point have had dense blooms of brown macroalgae. Those are no longer present in Vatia, but persist at Coconut Point. The reef slopes have more calcareous algae than non-calcareous, mostly coralline algae, but also by the green macroalga *Halimeda*. They contribute to building the reef, and are not known to bloom during phase shifts, unlike brown algae. The reefs have remarkably little brown macroalgae. Reefs in the harbor are in very poor condition.

There are only a few introduced marine species, none of which are invasive. There are very few bioeroders or filter feeders, and calcium accumulation on the reef appears to be very good. Disease incidence is low. Macroinvertebrates, including herbivorous urchins, are in general uncommon to rare, for unknown reasons, but very likely this is natural. Some may be hidden from sight. Macroinvertebrates are food for some types of fish. Hawaii and the Marianas also lack abundant large non-cryptic invertebrates. There have been no bleaching events in the last 7 years, but 3 events before that. Houk et al. (2010) reported a negative correlation of human population with coral diversity, but TMP has been unable to replicate that using slightly different variables and different sites.

The largest single disturbance on the territory's coral reefs was the crown-of-thorns starfish outbreak around 1978. Over 90% of all corals were eaten. Observers reported that they remember that table corals and staghorns were common, but areas dominated by other corals were not unusual. Most of our reefs are now dominated by encrusting corals and only a few patches have high densities of tables and staghorns, except perhaps the banks where tables are common. Thus the reefs may still be recovering from that event. One reef patch at the mouth of Vatia Bay has shown remarkably rapid recovery, but other areas have recovered slowly. The cause is not known, but does not seem to correlate with human populations.

Benthic reef communities are by no means pristine, but relatively healthy and far healthier than places like the Caribbean. Habitat quality outside the harbor provides little support for suggesting that the lower fish biomass or low large fish abundances we have are due to poor habitat quality.

Annual Catch Limits and Accountability Measures

The 2006 Reauthorization of the Magnuson-Stevens Act required that Regional Fishery Management Councils (RFMC) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee (SSC) or peer review process. Moreover, Councils were required to amend their fishery management plans to establish a mechanism for specifying annual catch limits at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

The MSA further directs that, unless otherwise provided for under an international agreement to which the U.S. participates, this mechanism must be established by 2010 for fisheries subject to overfishing, and by 2011 for all other fisheries. On January 16, 2009, the National Marine Fisheries Service (NMFS) published advisory guidelines under 50 CFR §600.310 (74 FR 3178) to assist RFMCs in implementing ACL and AM requirements.

To comply with the ACL and AM requirements, the Western Pacific Fishery Management Council (Council), in coordination with NMFS, prepared an omnibus amendment to the Fishery Ecosystem Plans (FEP) for American Samoa, Hawaii, the Mariana Archipelago (Guam and the Commonwealth of the Northern Mariana Islands (CNMI)), Pacific Remote Island Areas, and Pacific Pelagic fisheries. The amendment describes the mechanism the Council will use to specify ACLs and AMs for each FEP fishery. This includes:

> 1) Establishing a mechanism in each FEP that the Council will use to determine ACLs and AMs , including a process for setting acceptable biological catch limits (ABCs);
>
> 2) Adopt the ecosystem component (EC) species classification described in the NMFS advisory guidelines for National Standard 1 (NS1) so the Council can develop specific criteria for identifying EC species in subsequent amendments to the FEPs; and
>
> 3) Identify pelagic management unit species that have statutory exceptions to the ACL and AM requirements. The ACL and AM mechanism is designed to ensure long term sustainability of the fishery resources under the Council's jurisdiction.

Expanded catch landing time series from the combined boat and shore-based creel survey was used to determine ABCs. No stock assessment is available to base the overfishing limit from which the ABCs are typically referred from. The ABCs for most of the coral reef ecosystem management unit species are based on the modified Tier 5 control rule (catch only data) of ABC = 1*75th percentile of the entire catch time series. The ACLs were then set equal to ABC because catches were small relative to the biomass (estimated from CRED Rapid Ecological Assessment expanded to hard bottom habitats from 0-30m, see William 2010). Vulnerable species such as, humphead wrasse, bumphead parrotfish, and shark does not have a significant catch time series that this control rule can be applied. Biomass was used as a proxy data where 5% of the expanded biomass was used to generate the ABC. Guam bottomfish ABCs were based on the tier 4 control rule (ABC=091*MSY) where MSY was based on Moffitt et al 2007. The ACL was set equal to ABCs for the Guam bottomfish complex. Non-finfish ABCs were based on a range of methods described as follows:

Spiny lobster: ABC = 1*75th percentile of the entire catch time series; then ACL = ABC
Slipper lobster: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Deepwater shrimp: ABC = MSY – area proxy based on AS MSY estimate; then ACL = ABC
Kona crab: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Black corals: ABC = MSY – area proxy based on Hawaii MSY estimate; then ACL = ABC
Precious corals: maintained the quota of 1000 kg/yr and set that as the ABC; then ACL = ABC

Accountability measures are rules set to make sure that the ACLs are not exceeded and specifies steps to be taken once ACLs exceeded. In-season monitoring is currently beyond the capability of the local resource management agencies in all island commonwealth, territories and the State of Hawaii. None of the island commonwealth and territories has mandatory catch reporting. Total catches covering only areas within the survey boundaries are estimated using expansions of the creel survey catch estimates. The expansions are done on an annual basis in order to ensure that there is enough data to pool to come up with a reasonable catch estimate. Realistic monthly expansions are not possible without sacrificing the credibility of the results. Although the State of Hawaii are able to monitor and project catches for the deep 7 bottomfish fishery, attaining a complete catch report in a timely manner from a diverse and high number of participants in the coral reef fishery proved to be a big challenge. In addition, the only sector that is being monitored in Hawaii is the commercial sector. Majority of the coral reef fish catch are known to come from the recreational sector which is poorly monitored. The current personnel and logistics can only accommodate a limited number of species for near real-time monitoring. Expanding the number of species to be monitored is beyond the current capabilities and unless a significant funding resource is provided for the expansion, in-season accountability measures is not possible.

2012 Annual Catch Limit Specification and Monitoring

The following are the American Samoa ACLs specified for fishing year 2012:

Table 13. Current landing of different management unit species relative to the specified annual catch limits in the near-shore fisheries in American Samoa for fishing year 2012.

Fishery	Management Unit Species	ACLs	FY2012 Catches
Bottomfish	Bottomfish multi-species stock complex	99,200 lb (44,996 kg)	TBD
Crustacean	Deepwater Shrimp	80,000 lb (36,287 kg)	TBD
	Spiny Lobster	2,300 lb (1,043 kg)	TBD
	Slipper Lobster	30 lb (14 kg)	TBD
	Kona Crab	3,200 lb (1,451 kg)	TBD
Precious Coral	Black Coral	1,742 lb (790 kg)	TBD
	Precious Corals in the American Samoa Exploratory Area	2,205 lb (1,000 kg)	TBD
Coral Reef Ecosystem	Acanthuridae – surgeonfish	19,516 lb (8,852 kg)	TBD
	Lutjanidae – snappers	18,839 lb (8,545 kg)	TBD
	Selar crumenophthalmus – atule or bigeye scad	8,396 lb (3,808 kg)	TBD
	Mollusks – turbo snail; octopus; giant clams	16,694 lb (7,572 kg)	TBD
	Carangidae – jacks	9,490 lb (4,305 kg)	TBD
	Lethrinidae – emperors	7,350 lb (3,334 kg)	TBD
	Scaridae – parrotfish	8,145 lb (3,695 kg)	TBD
	Serranidae – groupers	5,600 lb (2,540 kg)	TBD
	Holocentridae – squirrelfish	2,585 lb(1,173 kg)	TBD
	Mugilidae – mullets	2,857 lb (1,296 kg)	TBD
	Crustaceans - crabs	2,248 lb (1,020 kg)	TBD
	Bolbometopon muricatum – bumphead parrotfish	235 lb (107 kg)	TBD
	Cheilinus undulatus – Humphead (Napoleon) wrasse	1,743 lb (791 kg)	TBD
	Carcharhinidae – Reef Sharks	1,309 lb (594 kg)	TBD
	All Other CREMUS combined	18,910 lb (8,577 kg)	TBD

Fishing year 2012 is the first year of ACL implementation. No catch data is available during the drafting of this report to determine if the limit had been exceeded. Monitoring still continues through the creel surveys.

Status Local Research Projects

American Samoa Community College

Innovative Fisheries and Aquaculture Distance Learning at the American Samoa Community College

Status: In collaboration with the UH Sea Grant College Program and the Aquaculture Program at UH and funded by NOAA PIRO, four computers were installed in the CNR computer lab to serve future students in the Aquaculture Training and Online Learning (ATOLL) certificate program soon to be offered by the UH Outreach College. Courses will serve ASCC students interested in fisheries and aquaculture careers. They will also serve local professionals requiring professional development opportunities. This certificate program is expected to rollout in October 2011.

Analyze and Compile the Nutritional Composition of Potential Feed Ingredient Resources in American Samoa into a Feed Manual for Use in Tilapia Feeds

Status: The lack of fish feeds in American Samoa limits the growth of the aquaculture industry here. By using locally available ingredients such as breadfruit, banana, cassava, and fish meal, feeds can be produced on-island. This project is in collaboration with the UH Sea Grant College Program Oceanic Institute and funded by the Center for Tropical and Subtropical Aquaculture. Ingredient samples are currently being analyzed and compiled into several recipe options for fish feeds. A workshop in September will train local fish farmers to make their own feeds with both low- and high-tech methods.

Quantitative Underwater Ecological Surveying Techniques

Status: The majority of coral reef monitoring and data collection in American Samoa is conducted by off-island contractors. Heavy rotation of contractors around every two years causes gaps in the databases that could be avoided by utilizing local personnel. However, training for local residents in underwater surveying has not been standardized. In partnership with UH Sea Grant College Program, National Park of American Samoa, AS Department of Marine and Wildlife Resources, and the UH Marine Option Program, the American Samoa Community College received NOAA PIRO funding to conduct a week-long course in January 2011 in underwater surveying techniques. A second course will be offered in December 2011.

American Samoa Water Quality Coordinator

Status: Stream water quality is impacted by human household, industrial and agriculture activities. The Community and Natural Resources Division at the American Samoa Community

College received USDA funding to monitor chemical, physical, and bacterial levels in local streams around the Territory. The collected data can be used to improve water resource management.

Coral Reef Advisory Group (CRAG) Agency Members and Partners

There are 43 projects being implemented by agency members of CRAG (DMWR, DOC, ASEPA, ASCC, NPAS), NGOs, and Federal Partners. The titles are as follows:

1. American Samoa Water Quality Coordination
2. Innovative Fisheries and Aquaculture Distance Learning at the American Samoa Community College
3. Analyze and Compile the Nutritional Composition of Potential Feed Ingredient Resources in American Samoa into a Feed Manual for Use in Tilapia Feeds
4. Quantitative Underwater Ecological Surveying Techniques
5. Analyze and Compile the Nutritional Composition of Potential Feed Ingredient Resources in American Samoa into a Feed Manual for Use in Tilapia Feeds
6. Quantitative Underwater Ecological Surveying Techniques
7. Erosion and Sediment Control Certification program
8. Beach Monitoring Program
9. Stream Monitoring Program
10. Environmental Monitoring and Assessment Program (EMAP)
11. Reversing coral bleaching using cooling
12. Amouli Coral Farms
13. Alofau Coral Farm
14. Nu'uuli coral Farm
15. Coral Climate Adaptation project
16. Marine Debris
17. Sediment Reduction
18. Nutrient Pollution Reduction
19. Enhancing Coral Reef Fishery and Bottomfish Data Collection in Ofu, Olosega, and Tau
20. Peer to Peer Learning Exchange for Community Leaders of Existing and Proposed Marine Protected Areas in the Samoan Archipelago
21. Effectively enforce regulations to sustainably manage marine resources.
22. Extension of the PLA Process to Ofu and Olosega to Assist with Marine Resource Management and MPA Establishment
23. Mapping coral reef fishing grounds to identify critical habitats for management
24. Surveying Reefs for Resilience
25. Assessing the impacts of Land-based Pollution on Am Sam's Coral Reefs
26. Continue Addressing Scientific Gaps Identified by ASEPA Coral Monitoring Efforts
27. Enhancing Sustainability of Socioeconomic Monitoring to Support Climate Change Adaptation and Socio-Ecological Resilience in American Samoa
28. MPA Program
29. Inshore Creel Survey
30. Sportfish monitoring and demographics
31. Large sportfish assessment on deep habitats

32. Sportfish enhancement through FADs
33. Village Based Fishery Management
34. Coral Reef Monitoring Program
35. Current Surveys between potential MPAs in American Samoa
36. Circulation model and larval dispersal simulation
37. Combating coral bleaching with shading
38. Fagatele Bay National Marine Sanctuary
39. Monitoring of reef fish in the National Park
40. Monitoring of benthic cover in the National Park
41. Movement patterns and habitat use of reef fish
42. Management Planning
43. Community resilience to climate change

Details of the projects, timelines, and status is found in Appendix 1

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Appendix 1

Responsible Agency	Title	Funding source	Funding 2011 (US$)	Duration	Goal/Nature of Project	Activity	Status (March 2012)	Contact person
ASCC/Community and Natural Resources Division	American Samoa Water Quality Coordination	USDA	39,264	2009-2012	Stream Water Quality	Monitoring chemical, physical, and bacterial levels	ongoing	Don Vargo donvargo@rocketmail.com
ASCC/Community and Natural Resources Division	American Samoa Water Quality Coordination	USDA	39,264	2009-2012	Stream Water Quality	Monitoring chemical, physical, and bacterial levels	ongoing	Don Vargo donvargo@rocketmail.com
ASCC/Seagrant	Innovative Fisheries and Aquaculture Distance Learning at the American Samoa Community College	NOAA PIRO	14,845	2010 - 2011	Capacity Building	Establish computer laboratory at ASCC for use in online aquaculture and fisheries program at UH Outreach College	completed	Ephraim Temple ephraim@hawaii.edu
ASCC/Seagrant	Analyze and Compile the Nutritional Composition of Potential Feed Ingredient Resources in American Samoa into a Feed Manual for Use in Tilapia Feeds	Center for Tropical and Subtropical Aquaculture	36,450	2008-2011	Research (aquaculture) and capacity building	Hire ASCC students to prepare food samples for analysis and inclusion in aquaculture feeds. Create feeds manual and conduct workshop. Increase production capability of ASCC feeds lab	completed	Ephraim Temple ephraim@hawaii.edu, Warren Dominy wdominy@oceanicinstitute.org
ASCC/Seagrant	Quantitative Underwater Ecological Surveying Techniques	NOAA PIRO	20,335	2010 - 2011	Capacity Building	Two week-long classes for ASCC students and agency employees to improve underwater surveying skills	first class conducted January 2011, second conducted March 2012. Third planned for March 2013	Ephraim Temple ephraim@hawaii.edu
AS-EPA and ASCMP (DOC)	Erosion and Sediment Control Certification program	NOAA CRCP and ASCMP	50,000	2011-ongoing	Training, regulatory	Work with contractors and regulators to reduce sediment load on AS coral reefs	Completed	Matt Vojik, vojik.matt@gmail.com / Christianera Tuitele christianeratuitele3@gmail.com
AS-EPA	Beach Monitoring Program	EPA	100,000	ongoing	monitoring	Take weekly measurements of bacteria levels on the territories beaches.	ongoing	Josephine Regis, j_regis96799@yahoo.com / Christianera Tuitele

								christianeratuitele3@gmail.com
AS-EPA	Stream Monitoring Program	EPA	50,000	ongoing	monitoring	Stream samples taken across the island, usually including at the stream mouth	ongoing	Dr Phil Wiles phil.wiles@asepa.gov Christianera Tuitele christianeratuitele3@gmail.com
AS-EPA	Environmental Monitoring and Assessment Program (EMAP)	EPA	100,000	2010-2011	Research	Snapshot of water quality over American Samoa's reef flats	Ongoing	Dr. Phil Wiles phil.wiles@asepa.gov Christianera Tuitele christianeratuitele3@gmail.com
Climate Foundation	Reversing coral bleaching using cooling	PICCC of NOAA (Pacific Islands Climate Change Cooperative		2010- ongoing	Research	Cooling corals to reverse bleaching, scaling up cooling systems, using solar cells to make it portable	Ongoing	Brian von Herzen brian@climatefoundation.org
CORL (NGO 501-(3)-c Conservation organization)	Amouli Coral Farms	NFWF / CORL	16,000	2009-ongoing	coral reef habitat restoration/rehabilitation	Coral farming, Coral reef restoration and rehabilitation. Growing corals for scientific studies.	Shut down due to funding constraints	Mike King
CORL (NGO 501-(3)-c Conservation organization)	Alofau Coral Farm	CTSA,NFWF, CORL	1000	2004-ongoing	coral reef habitat restoration/rehabilitation	Coral farming, Coral reef restoration and rehabilitation	On going	Mike King
CORL (NGO 501-(3)-c Conservation organization)	Nu'uuli coral Farm	NFWF / CORL	1000	2007-ongoing	coral reef habitat restoration/rehabilitation	Coral farming, Coral reef restoration and rehabilitation	On going	Mike King
CORL (NGO 501-(3)-c Conservation organization)	Coral Climate Adaptation project	CORL	2000	2004-ongoing	coral reef habitat restoration/rehabilitation	identify, propagate and plant corals that show resistance to temperature induced bleaching	On going, composing pre proposal	Mike King

CORL (NGO 501-(3)-c Conservation organization)	Sediment Reduction	NFWF / CORL	120,000 if awarded	Starts 8/1/2011 ends 7/30/2013	Sediment reduction in two priority watersheds	Install BMP's along streams and drainage areas to reduce sediments entering coral reef areas. Sedimentation Monitoring	Discontinued National wildlife took over…	Mike King
CORL (NGO 501-(3)-c Conservation organization)	Marine Debris	NFWF / CORL	45,000	Funding Ended 1/30/2011 Some objectives continued with funding by CORL	Marine Debris reduction.	Marine debris removal/reduction, Recycling, awareness, net trade in program. Tow net for floating debris created.	completed	Mike King
CORL (NGO 501-(c)-3 Conservation organization)	Nutrient Pollution Reduction	NFWF / CORL	49,000.00	extended up to Sept 2011	Nutrient Pollution Reduction	Test over 100 types of Detergents and soaps for phosphorus contents, create an ID book for Customs. Monitor 6 streams for surfactants	completed *nutrient pollution phosphate levels measured	Mike King
CRAG/DMWR	Enhancing Coral Reef Fishery and Bottomfish Data Collection in Ofu, Olosega, and Tau	CRI 2010 - through Fishery LAS	17,400	Funding source expires 3/31/2012	Fishery Monitoring	Two staff funded to carry out intercept interviews with fishermen in Manu'a (1.5 wks per month for 1 yr). CPUE and length family data collected. Includes shoreline and boat-based fishermen.	ongoing	Nonu Tuisamoa nonu.tui@gmail.com
CRAG/DMWR	Peer to Peer Learning Exchange for Community Leaders of Existing and Proposed Marine Protected Areas in the Samoan Archipelago	CRI 2010 - through Fishery LAS	15,050	Funding source expires 3/31/2012	Capacity building	Thirteen community members and 12 members of staff spent 4 days in Samoa visiting MPA villages to learn about MPAs in Samoa and instill stewardship community leaders.	Exchange visit completed March 2011; post exchange workshop planned for July 2011	Lucy Jacob lucyjacob.mpa@gmail.com / Selaina Tuimavave taahinemanua@yahoo.com
CRAG/DMWR	Effectively enforce regulations to sustainably manage marine resources.	CRI 2011 through Fishery LAS	29,871	Funding source expires 9/30/2013	Enforcement education	Two 3 days outreach in Manu'a on fishery regs; deputization workshop for CFMP Mayors; 3 outreaches to fishermen in Tutuila on regs; patroll and surveillance in Tutuila.	ongoing	Peter Eves peter_eves@yahoo.com

CRAG/DMWR	Extension of the PLA Process to Ofu and Olosega to Assist with Marine Resource Management and MPA Establishment	CRI 2011 through Fishery LAS	12,750	May - Dec 2011. Funding source expires 9/30/2013	Capacity Building	Participatory workshops with communities in Ofu, Olosega and Sili combined with education about MPAs.	ongoing (first workshop April/May 2011)	Lucy Jacob lucyjacob.mpa@gmail.com Tafito Aitaoto tafito@gmail.com
CRAG/DMWR	Mapping coral reef fishing grounds to identify critical habitats for management	CRI 2010 - through Fishery LAS	21,493	Funding source expires 3/31/2012	Mapping	Identify areas that are popular coral reef fishing areas and utilize the data to assist with MPA network design.	Planning process	Dr. Domingo Ochavillo ochavill@gmail.com
CRAG/DMWR (collaborating with the University of California, S. Barbara, Bren School).	Surveying Reefs for Resilience	CRI 2009 - through climate change LAS	8,265	Funding source expires 9/30/2011	Research (climate change)	Current meters surveys in near shore reef flats and pools to correlate with bleaching data from Dr. Fenner	planned for June 2011	Dr. Doug Fenner douglasfinner@yahoo.com
CRAG/EPA (collaborating with Dr. Peter Houk from PACMARES)	Assessing the impacts of Land-based Pollution on Am Sam's Coral Reefs	Re-administrated funds from CRI		Funding source expires 9/30/2011	Research / Monitoring	Compare Coral/fish transects with the AS-EPA stream monitoring program to compare coral health with land based pollution	Ongoing	Dr. Phi Wiles philip.wiles@gmail.com / Dr. Peter Houk peterhouk@pacmares.com Christianera Tuitele christianeratuitele3@hmail.com
CRAG/EPA (collaborating with Dr. Peter Houk from PACMARES)	Continue Addressing Scientific Gaps Identified by ASEPA Coral Monitoring Efforts	CRI 2010 - though Land Based Pollution LAS	31,450	Project ongoing for 5 years. Funding source expires 3/31/2012	Monitoring	Map watershed discharge patterns in 6 priority watersheds and compare with coral reef communities along transect from discharge point towards ocean.	Planning process	Dr. Phi Wiles philip.wiles@gmail.com / Dr. Peter Houk peterhouk@pacmares.com Christianera Tuitele christianeratuitele3@gmail.com
CRAG/NOAA PIRO	Enhancing Sustainability of Socioeconomic Monitoring to Support Climate Change Adaptation and Socio-Ecological Resilience in American Samoa	CRI 2010 - through Fishery LAS	32,625	Funding source expires 3/31/2012	Capacity building and research	Workshop to identify socioeconomic (SE) data needs and incorporation of SE monitoring into existing programs with adaptive management strategies.	Two workshops were conducted on January 9 and 11. Ongoing	Fatima Sauafea-Leau Fatima.Sauafea-Leau@noaa.gov / Dr. Arielle Levine Fatima.Sauafea-Leau@noaa.gov

DMWR	MPA Program	Sportfish Restoration Program	87,258.00	2006 - ongoing	Resource conservation	Establishment of no-fishing areas. Community outreach/monitoring	Ongoing	Lucy Jacob lucyjacob.mpa@gmail.com
DMWR	Inshore Creel Survey	Sportfish Restoration Program	130,042	1990 - ongoing	Fishery Monitoring	Shoreline monitoring; CPUE database	Ongoing	Yvonne Mika y_alisana@hotmail.com
DMWR	Sportfish monitoring and demographics	Sportfish Restoration Program	111,339	2005 - ongoing	Monitoring and research	UVC surveys of sportfish and habitat (24 sites); Age and growth studies	ongoing	Dr. Domingo Ochavillo ochavill@gmail.com
DMWR	Large sportfish assessment on deep habitats	Sportfish Restoration Program	70,610	2007-ongoing	Monitoring	UVC on reefs, flats and banks; drop camera surveys; GIS mapping	ongoing	Marlowe Sabater mgsabater@yahoo.com
DMWR	Sportfish enhancement through FADs	Sportfish Restoration Program	108,664	2001 - ongoing	Fishery enhancement	Deployment and maintenance of FADs	ongoing	Nonu Tuisamoa nonu.tui@gmail.com
DMWR	Village Based Fishery Management	Sportfish Restoration Program	125,566	2001 - ongoing	Community Based Resource Management	Establishment of co-managed fishery management areas in villages. Outreach, monitoring, enforcement training.	ongoing	Selaina Tuimavave taahinemanua@yahoo.com
DMWR	Coral Reef Monitoring Program	NOAA/NCCOS	129,985	2005 - ongoing	Monitoring	Annual monitoring of reef fish and reef benthos using UVC and line-intercept methodologies, as well as biodiversity surveys	ongoing	Ben Carroll benjaminapolis@hotmail.com; Douglas Fenner douglasfenner@yahoo.com
DMWR collaboration with Dr. Wiles, EPA	Current Surveys between potential MPAs in American Samoa	Western Pacific Regional Fisheries Management Council	46,000	2010 - 2011	Research (oceanography)	Purchase of an Acoustic Doppler Current Profiler; current surveys at various points around Tutuila (e.g. tips of the island and MPA sites)	Completed, in the process of finalizing oceanographic booklet and draft proposal to continue research	Lucy Jacob lucyjacob.mpa@gmail.com; Dr. P Wiles phil.wiles@asepa.gov Tafito Aitaoto tafito@gmail.com
DMWR in collaboration with Dr. Wiles, EPA and Dr. Treml, Uni of Queensland	Circulation model and larval dispersal simulation	NOAA PIRO	26,800	2010 - 2011	Research and modeling	Purchase of GPS trackable drifters and deployment at various locations. Purchase and validation of near-shore circulation model using ADCP data and drifter data.	ongoing	Lucy Jacob lucyjacob.mpa@gmail.com; Dr. P Wiles phil.wiles@asepa.gov Tafito Aitaoto tafito@gmail.com
Dominican University	Combating coral bleaching with shading	NOAA CRCP		2010-ongoing	Research	Shading corals to stop corals from bleaching, lab and field experiments	Ongoing	Vania Coelho vania.coelho@dominican.edu

National parks of American Samoa	Monitoring of reef fish in the Park	NPS		2007-ongoing	Monitoring	Monitor status of reef fish stocks in the National Park	Ongoing	Tim Clark Tim_Clark@nps.gov
Fagatele Bay National Marine Sanctuary	Fagatele Bay National Marine Sanctuary	NOAA		1986-ongoing	Resource Protection, Education & Outreach, Research and Monitoring, Community Engagement, among others	see draft management plan (expected release in late summer, 2011)	ongoing	Kevin Grant Veronika Mortenson veronika.mortenson@noaa.gov
National parks of American Samoa	Monitoring of benthic cover in the National Park	NPS		2007-ongoing	Monitoring	Monitor the status of benthic habitat in the National Park	Ongoing	Tim Clark Tim_Clark@nps.gov
National parks of American Samoa	Movement patterns and habitat use of reef fish	NPS		2011-2016	MPA research	Study the movement patterns and habitat use of reef fish species of interest	Ongoing	Tim Clark Tim_Clark@nps.gov
US Fish and Wildlife, National Marine Monument	Management Planning	USFWS		2011-2012	Planning	Prepare Comprehensive Conservation Plan	Preparing Draft Plan Final due 2012	Frank Pendleton
NOAA PIRO (collaboration with Dr. Chip Fletcher, Univ. of Hawaii & Dr. Arielle Levine, NOAA PIRO)	Community resilience to climate change	NOAA CRCP		2010 - 2011	Research and capacity building	Coastal elevation data collected in 2010 to develop sea level rise inundation model for Amouli village. Phase 2 will involve community workshop to develop a CC adaptation plan for village resiliency	Ongoing	Fatima Sauafea-Leau Fatima.Sauafea-Leau@noaa.gov / Dr. Arielle Levine Fatima.Sauafea-Leau@noaa.gov

CHAPTER 2: GUAM FISHERY ECOSYSTEM REPORT

CHAPTER 2: Guam Fishery Ecosystem Report

Chapter Authors: Brent Tibbats, Thomas Flores. Division of Aquatic and Wildlife Resources, 163 Dairy Road, Mangilao, GU 96913

SUMMARY: The Guam Department of Agriculture's Division of Aquatic and Wildlife Resources (DAWR) manage and monitor fisheries on Guam. This report covers the coral reef fisheries of Guam from 1985 to date. This report incorporates data from both shore based and boat based fisheries. The shore based fishery is primarily a subsistence or sport fishery, while the boat based fishery also includes cost recovery and commercial components. Total coral reef fisheries catch has fluctuated greatly over the time series. Several factors may cause this, including changes in fishing methods, typhoons and other natural disasters, regulatory changes, and governmental policy changes have all had effects on coral reef fishery take. Area closures due to the presence of PCBs in fish have lead to fish consumption advisories. In 2010, the military began closing an area (W-517) south-southwest of Guam to conduct live fire exercises. Closure of this area restricts access to many southern bank fishing areas. In 2011, W-517 was closed 101 days (27% of all days). Hook and line fishing is the most popular method of coral reef fishing activity. Six methods; hook and line, talaya (throw net), snorkel spear, gill net, and drag net fishing are the most common methods of shore based fishing. In 2011, these six methods accounted for 98% of shore based coral reef fish take. For the boat based fishery, Bottom fishing, SCUBA spear fishing, snorkel spearfishing, surround netting, gill netting, and trolling are popular methods of harvesting reef fish. In 2011, these methods accounted for 92 % of the boat based coral reef fishery. Six groups of reef fish; atulai, emperors, trevallys, rabbitfish, surgeon fish, and miscellaneous reef fish account for 82% of reef fish take. Seasonal runs of fish; juvenile trevally (I'e), rabbitfish(manahac or lesso), goatfish (ti'ao) and fusiliers (achemson) are an important component of the shore based coral reef fishery. Due to their seasonal nature, the catch of these species is calculated separately from other reef species to avoid overestimation of catch.

Background on Guam Coral Reef Fishery

Coral reef resource utilization by prehistoric Chamorro on Guam mirrors that of the CNMI. Archaeological evidence reviewed by Amesbury et al. (1989) suggested "an apparent tendency throughout prehistory and historic times for Mariana Island native groups to have relied more on inshore fish species than offshore ones." And, like the Chamorros in the northern islands, Spanish colonizers also systematically destroyed large oceangoing canoes in Guam in order to concentrate the indigenous population in a few settlements, thereby facilitating colonial rule as well as religious conversion (Amesbury and Hunter-Anderson 1989).

By the mid-nineteenth century, there were only 24 outrigger canoes on Guam, all of which were used only for fishing inside the reef (Myers 1993). Another far-reaching effect of European colonization of Guam and other areas of the Mariana archipelago was a disastrous decline in the number of Chamorros, from an estimated 40,000 persons in the late seventeenth century to approximately 1,500 persons a hundred years later (Amesbury and Hunter-Anderson 1989).

After the U.S. acquired Guam in 1898, following the Spanish–American War, the U.S. colonial government held training programs to encourage local residents to participate in offshore commercial fishing (Amesbury and Hunter-Anderson 1989). However, because they lacked the capital necessary to purchase and maintain large enough boats, most couldn't participate. Amesbury et al. (1989) concluded that "in the decades prior to the Second World War, inshore but not offshore fishing was part of the subsistence base of the native people." One document they reviewed was a list of the "principal fishes of Guam" written by a scientifically trained naval officer. Nearly all the fishes listed were reef associated. The first year that a pelagic fish species was included in the catch reports of the postwar Guam civilian government was 1956. Until then, all catch reports were of reef-associated species (Amesbury et al. 1989).

Shortly after the end of World War II, the U.S. military assisted several villages in developing an inshore commercial fishery using nets and traps. Post–World War II wage work enabled some fishermen to acquire small boats with outboard engines and other equipment for offshore fishing (Amesbury and Hunter-Anderson 1989). However, even as late as the 1970s, relatively few people in Guam fished offshore because boats and deep-sea fishing equipment were too expensive for most people (Jennison-Nolan 1979).

In the late 1970s, a group of Vietnamese refugees living on Guam fished commercially on a large scale, verifying the market potential for locally-caught reef fish, bottomfish, tuna, and mackerel (AECOS 1983). The Guam Fishermen's Cooperative Association began operations during that time. Until the co-op established a small marketing facility at the Public Market in Agana, fishermen were forced to make their own individual marketing arrangements after returning from fishing trips (AECOS 1983). In 1980, the co-op acquired a chill box and ice machine, and emphasized wholesaling. Today, the co-op's membership includes over 160 full-time and part-time fishermen, and it processes and markets (retail and wholesale) an estimated 80 percent of the local commercial catch (M. Duenas, GFCA, personal communication).

Since the late 1970s, the percentage of live coral cover on Guam's reefs and the recruitment of small corals have decreased. This trend has been attributed to poor recruitment by coral larvae, increased sedimentation of reef habitat, and domination of reef habitat by fleshy algae. Corals have also been affected by natural disturbances (Birkeland 1997a). Pervasive events include starfish predation between 1968 and 1970 and exposure of corals due to extreme tides during El Niño events. Heavy wave action, associated with typhoons, has had more localized effects.

Shore-based fishing accounts for most of the fish and invertebrate harvest from coral reefs around Guam. The coral reef fishery harvests more than 100 species of fish, including the families Acanthuridae, Carangidae, Gerreidae, Holocentridae, Kyphosidae, Labridae, Lethrinidae, Lutjanidae, Mugilidae, Mullidae, Scaridae, and Siganidae (Hensley and Sherwood 1993).

Myers (1997) noted that seven families (Acanthuridae, Mullidae, Siganidae, Carangidae, Mugilidae, Lethrinidae, and Scaridae) were consistently among the top ten species in any given year from fiscal year 1991 to fiscal year 1995 and accounted for 45 percent of the annual fish harvest. Approximately 40 taxa of invertebrates are harvested by the nearshore fishery, including 12 crustacean taxa, 24 mollusc taxa, and four echinoderm taxa (Hensley and Sherwood; Myers 1997). Species that became rare on shallow reefs due to heavy fishing include bumphead parrotfish (*Bolbometopon muricatum*), humphead wrasse (*Cheilinus undulatus*), stingrays, parrotfish, jacks, emperors, and groupers (Green 1997).

Many of the nearshore reefs around Guam appear to have been badly degraded by a combination of natural and human impacts, especially sedimentation, tourist overuse, and overharvesting. In the last few years, there has been an increase in commercial spearfishing using scuba at night. Catch rates have increased because of improved technology (high capacity tanks, high tech lights, and bang sticks) that allows spearing in deeper water (30–42 meters). As a result, many larger species that have already been heavily fished in shallow water—such as bumphead parrotfish, humphead wrasse, stingrays, and larger scarid species—are now reappearing in the fishery catch statistics (Green 1997).

Virtually no information exists on the condition of the reefs on offshore banks. On the basis of anecdotal information, most of the offshore banks are in good condition because of their isolation. According to Myers (1997), less than 20 percent of the total coral reef resources harvested in Guam are taken from the EEZ, primarily because they are associated with less accessible offshore banks. Finfish make up most of the catch in the EEZ. Most offshore banks are deep, remote and subject to strong currents. Generally, these banks are only accessible during calm weather in the summer months (May to August/September). Galvez Bank is the closest and most accessible and, consequently, fished most often. In contrast, the other banks (White Tuna, Santa Rose, Rota) are remote and can only be fished during exceptionally good weather conditions (Green 1997). Local fishermen report that up to ten commercial boats, with two to three people per boat, and some recreational boats, use the banks when the weather is good (Green 1997).

At present, the banks are fished using two methods: bottomfishing by hook and line and jigging at night for bigeye scad (*Selar crumenophthalmus*; Myers 1997). In recent years, the estimated annual catch in these fisheries has ranged from 14 to 22 metric tons of shallow bottomfish and 3 to 11 metric tons of bigeye scad (Green 1997). The shallow-water component accounted for almost 68 percent (35,002 to 65,162 lbs.) of the aggregate bottomfish landings in fiscal year 1992–94 (Myers 1997). Catch composition of the shallow-bottomfish complex (or coral reef species) is dominated by lethrinids, with a single species (*Lethrinus rubrioperculatus*) alone accounting for 36 percent of the total catch. Other important components of the bottomfish catch include lutjanids, carangids, serranids, and sharks. Holocentrids, mullids, labrids, scombrids, and balistids are minor components. It should be noted that at least two of these species (*Aprion virescens* and *Caranx lugubris*) also range into deeper water and some of the catch of these species occurs in the deepwater fishery.

The majority of bigeye scad fishing occurs in territorial waters, but also occasionally takes place in federal waters. Estimated annual offshore landings for this species since 1985 have ranged from 6,393 to 44,500 pounds, with no apparent trend (Myers 1997). It is unclear how much of the offshore bigeye scad fishery has occurred in the EEZ.

Boat-Based Coral Reef Fishery

The numbers and trends presented under this section are from Boat-Based Creel Survey Program. The catch and CPUE information are in the expanded form. The fishing methods considered in this report comprise methods that lands 90% of the total catch. The CREMUS family groups presented in the time series comprise the top groups that make up majority of the catch for each fishing methods.

The boat-based coral reef fisheries are comprised of the following fishing methods: trolling, bottomfishing, atulai night light, mix spearfishing, spear/snorkel, spear/scuba, jigging, gillnet, castnet, spincasting, and aquarium fish collecting. However, the most dominant ones are: trolling, bottomfishing, gillnet, spearfishing using snorkel and spearfishing using SCUBA. These five fishing method lands 89% of the total boat based landing.

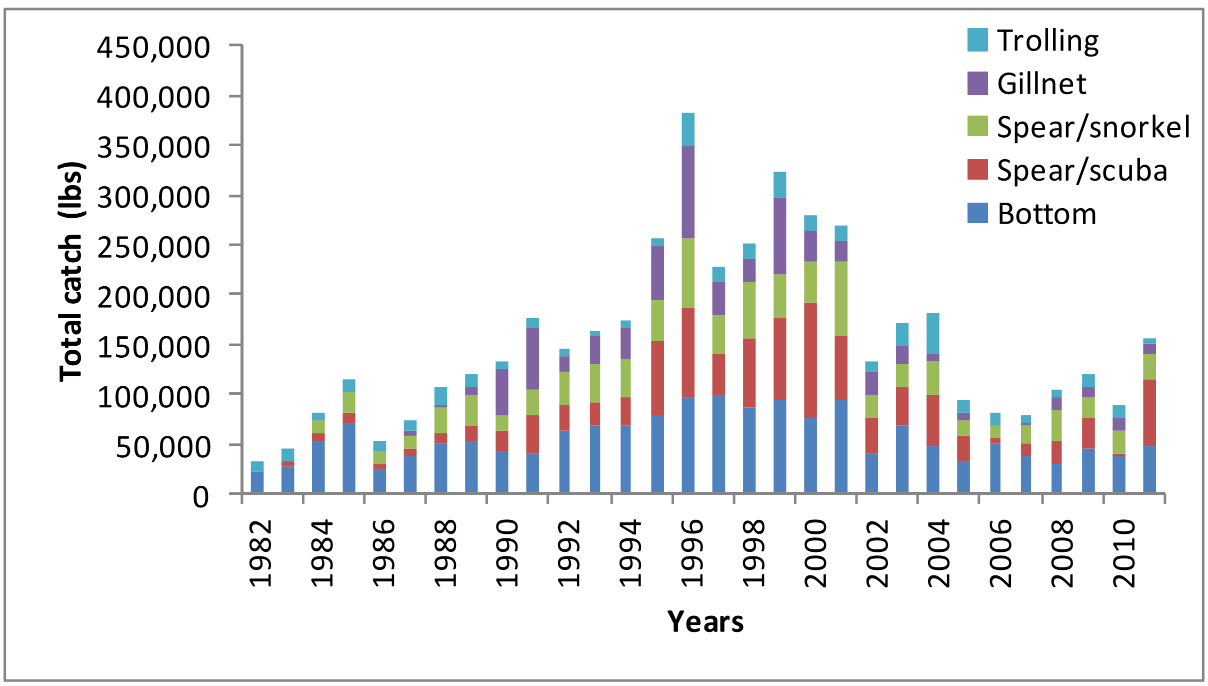

Figure 25. Total landings (lbs) from the dominant boat-based methods from 1982 to 2011.

Trends and Interpretation: Between 2001 and 2002, there as a 52% drop in coral reef species caught on Guam. Two events during 2002 contributed to this. Guam was struck by typhoons twice in 2002. The resulting loss of power and limited availability of ice and gasoline reduced the amount of fishing effort. Additionally, in 2002, as a cost cutting measure, the Government of

Guam passed a law allowing the sale of non- local fish to government agencies. Prior to this, all government agencies, such as the Department of Corrections, and the Department of Education, were required to provide locally caught fish to their clients. The government agencies accounted for up to 50% of the market for locally caught fish. A higher percentage of boat based coral reef fishing is done for commercial purposes than the shore based fishery, thus the greater impact a reduction in sales will have of the boat based reef fishery.

The methods by which reef fish are caught have changed. In the early 1990s, bottom fishing and gill net were the most popular methods of the boat based reef fish fishery. In 2011, SCUBA spear fishing and bottom fishing are the most popular methods. This change may reflect an increase in the availability of SCUBA equipment to fishermen, or may indicate a change in the distribution of the commonly caught reef fish. The change in gill net catch may be semantic issue, as the definition of the most commonly used method for catching atulai was changed from gill net to surround net. The most commonly caught fish may now be found in greater depths than gill nets are commonly used, resulting in the dominance of bottom fishing and SCUBA spear as the most popular methods

Selar crumenopthalmus (big eye scad locally known as atulai) is the most common coastal pelagic fish landed in Guam using various fishing method (Photo: Richard Wass – www.guamdawr.org)

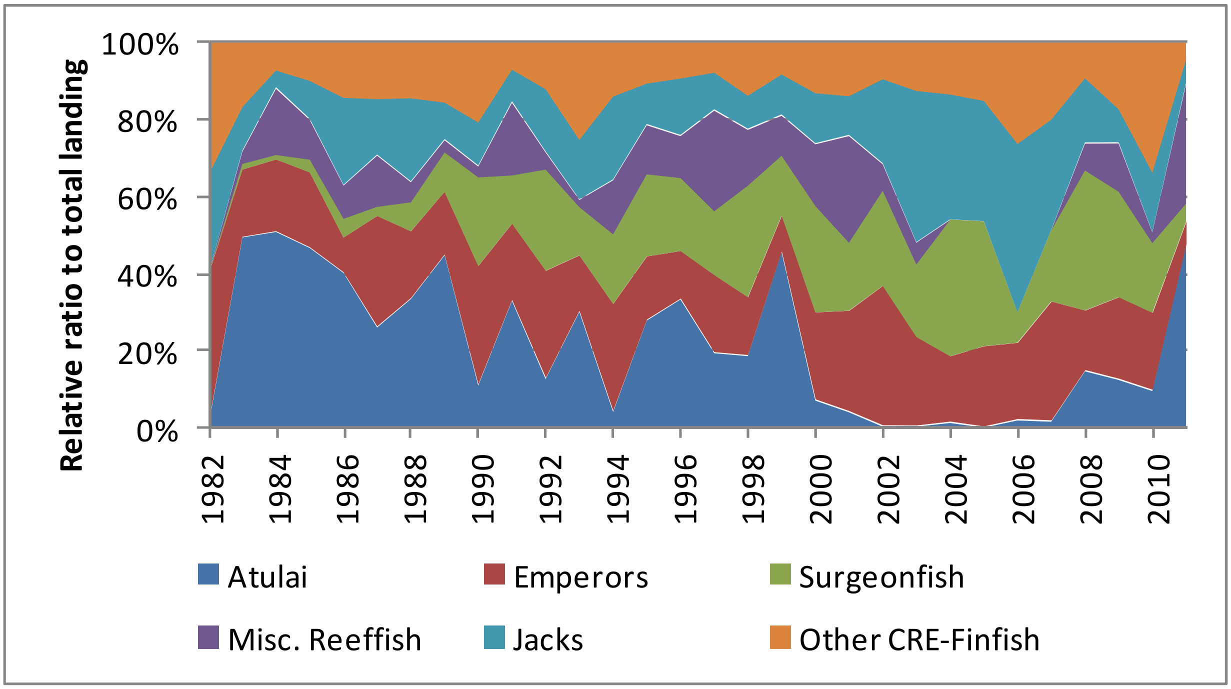

Figure 26. Relative ratio of the top six species/species groups to the total boat based catch landing from 1982 to 2011.

Changes in the species composition may reflect the seasonality of some species (atulai) or changes in the types of fishing used (surgeonfish, parrotfish, and jacks targeted by SCUBA spear fishing)

Bottomfish (Non-Bottomfish Management Unit Species) Fishery

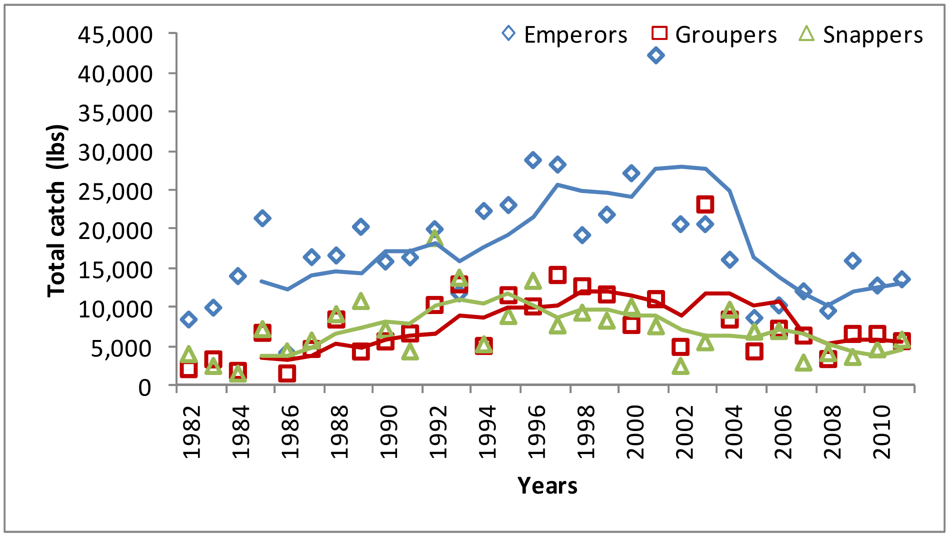

Figure 27. Total catch of the top three species/species groups caught in the bottomfish fishery (non-BMUS listed species) from 1982-2011.

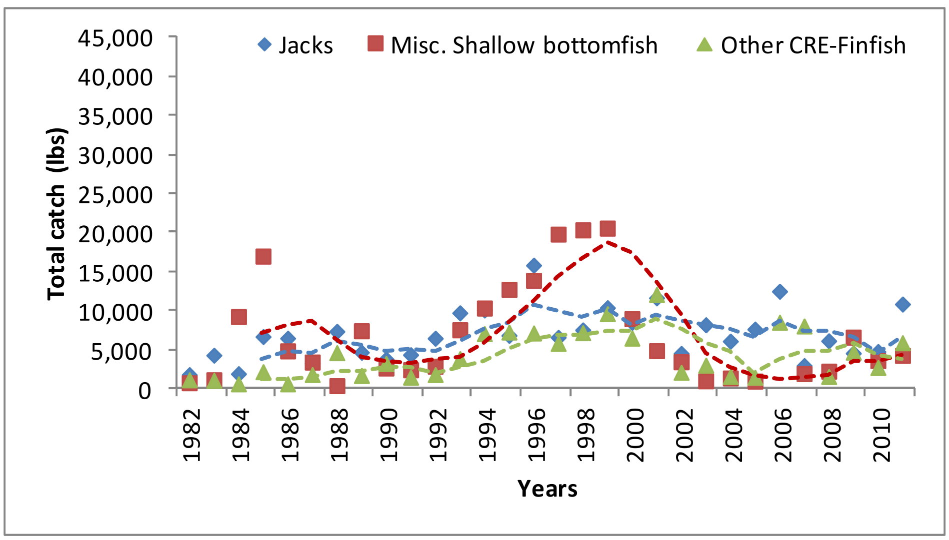

Figure 28. Total catch of the top 4 to 6 species/species groups caught in the bottomfish fishery (non-BMUS listed species) from 1982-2011.

Catch Trends and Interpretation: Emperors remain the largest component of the bottom fish fishery around Guam. The miscellaneous and other categories include groups such as goatfish, triggerfish, sharks, soldierfish, and squirrelfish. A miscellaneous reef fish interview is an interview in which the staff was not able to identify every species in a catch, usually due to time constraint or unwillingness of the fisher to give an interview. Other reef fish are fish belonging to families not in the top ten caught by weight.

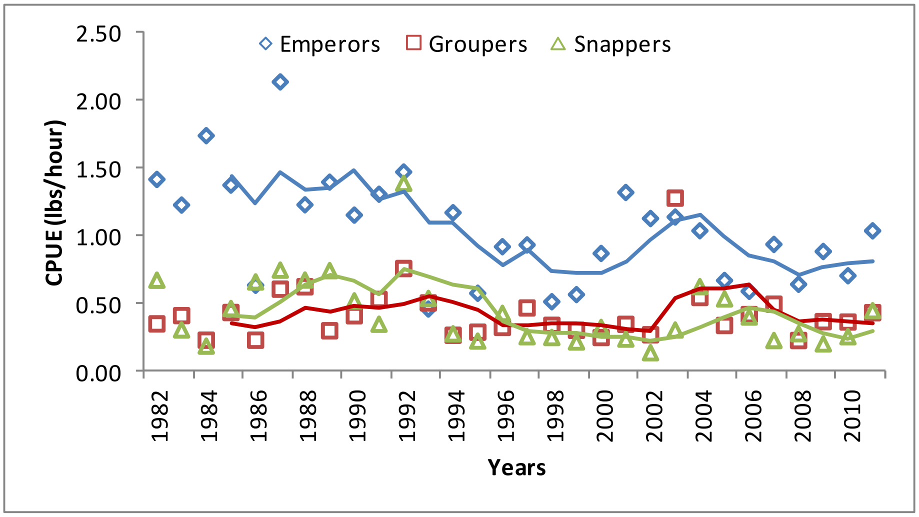

Figure 29. Catch per unit effort (lbs per hour) of the top three species/species groups in the bottomfish fishery (non-BMUS) from 1982-2011.

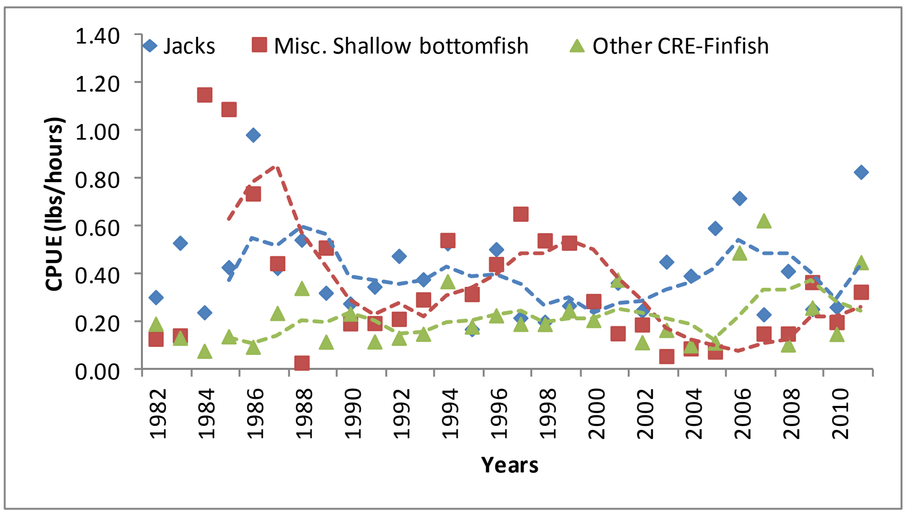

Figure 30. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the bottomfish fishery (non-BMUS) from 1982-2011.

CPUE Trends and Interpretation:

CPUE has remained relatively constant for bottom fish since the late 1980s. Higher rates prior to this time may be attributed to the relatively unfished bottom fished areas being more productive.

Emperor fish (mafuti) and groupers are typical shallow water bottomfish caught in the bottomfish fishery in Guam

SCUBA-assisted Spearfishing Fishery

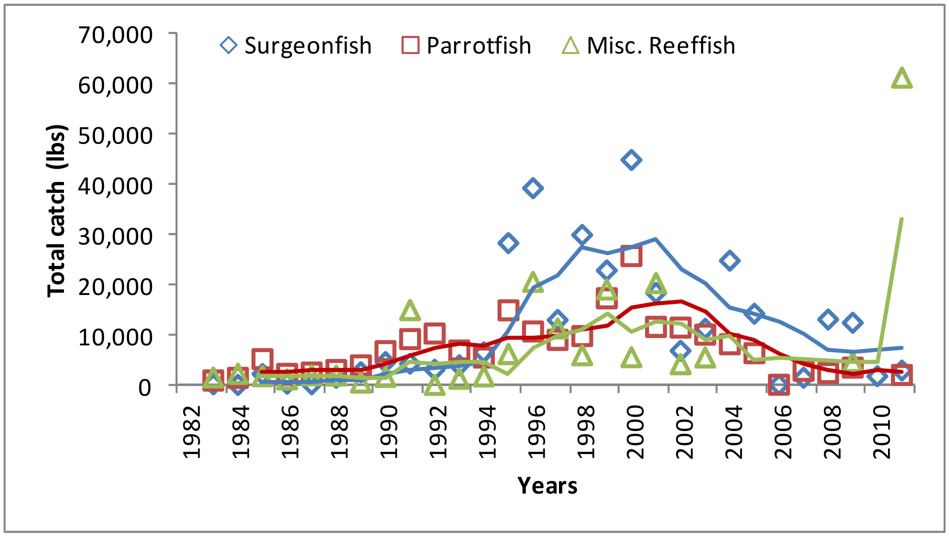

Figure 31. Total catch of the top three species/species groups caught in the SCUBA assisted spear fishery from 1982-2011.

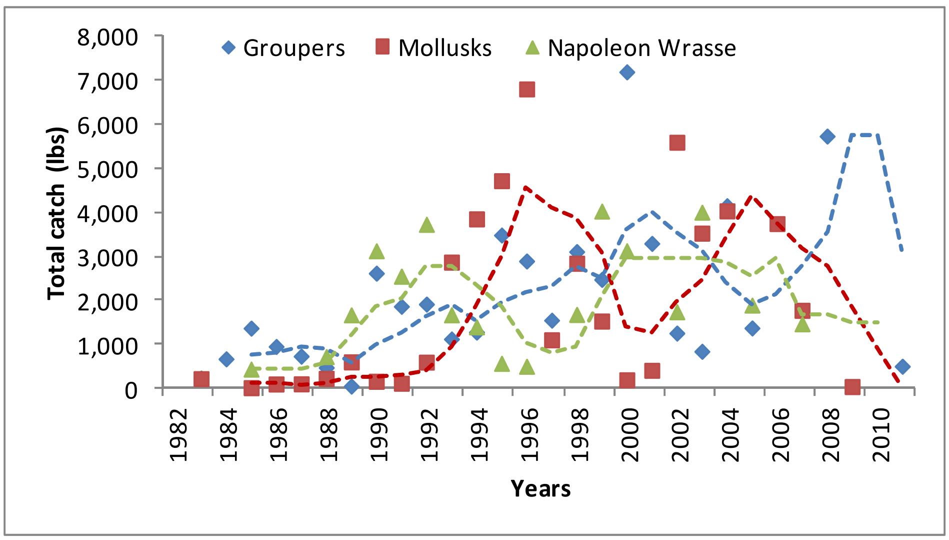

Figure 32. Total catch of the top 4-6 species/species groups caught in the SCUBA assisted spear fishery from 1982-2011.

Catch Trends and Interpretation: The high catch total of miscellaneous reef fish may be due to the lack of interviews of SCUBA spear fishermen by agency staff. Most SCUBA spear fishing data is from commercial sales. Frequently, when reef fish are sold, they are not broken down by species or family names, but simply recorded as assorted reef fish.

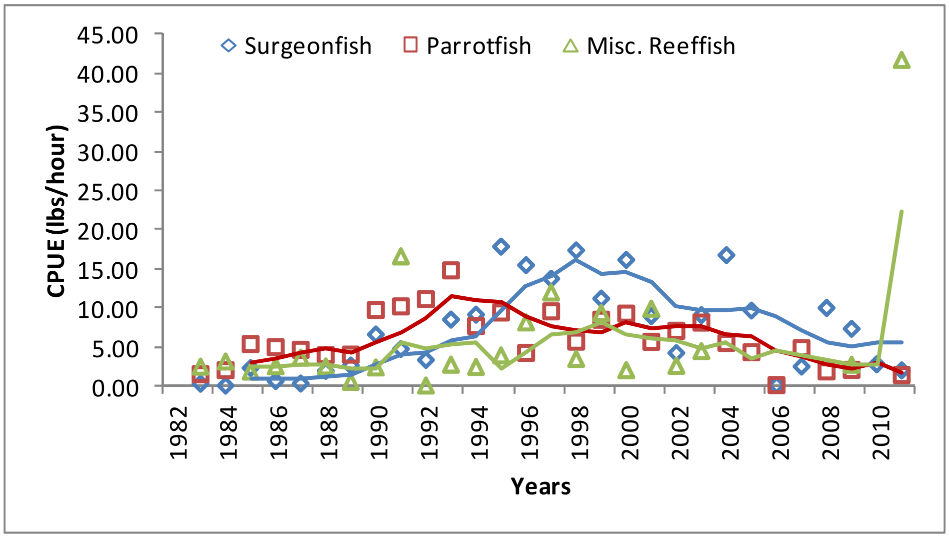

Figure 33. Catch per unit effort (lbs per hour) of the top three species/species groups in the SCUBA assisted spear fishery from 1982-2011.

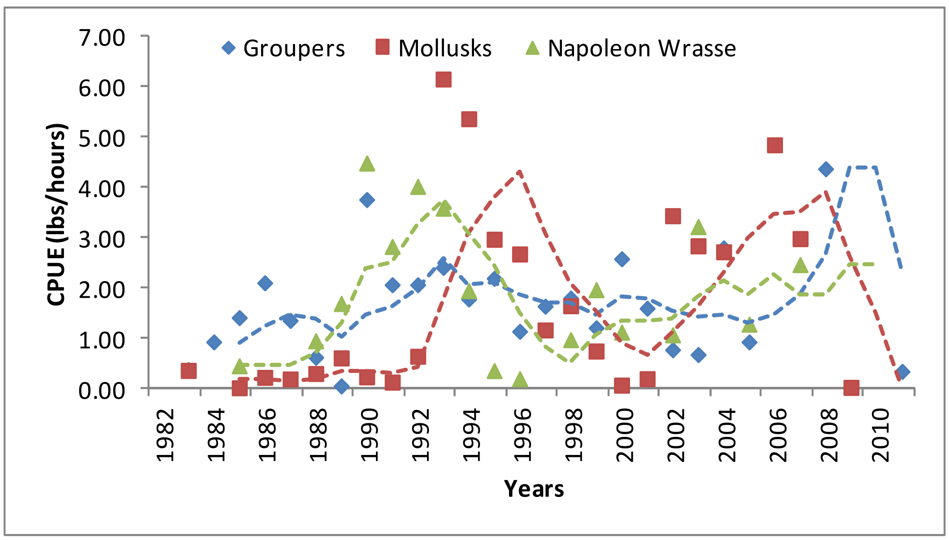

Figure 34. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the SCUBA assisted spear fishery from 1982-2011.

CPUE Trends and Interpretation: The high rate for miscellaneous reef fish may be due to the lack of interviews of SCUBA spear fishermen by agency staff. Most SCUBA spear fishing data is from commercial sales. Frequently, when reef fish are sold, they are not broken down by species or family names, but simply recorded as assorted reef fish.

Snorkel Spearfishing Fishery

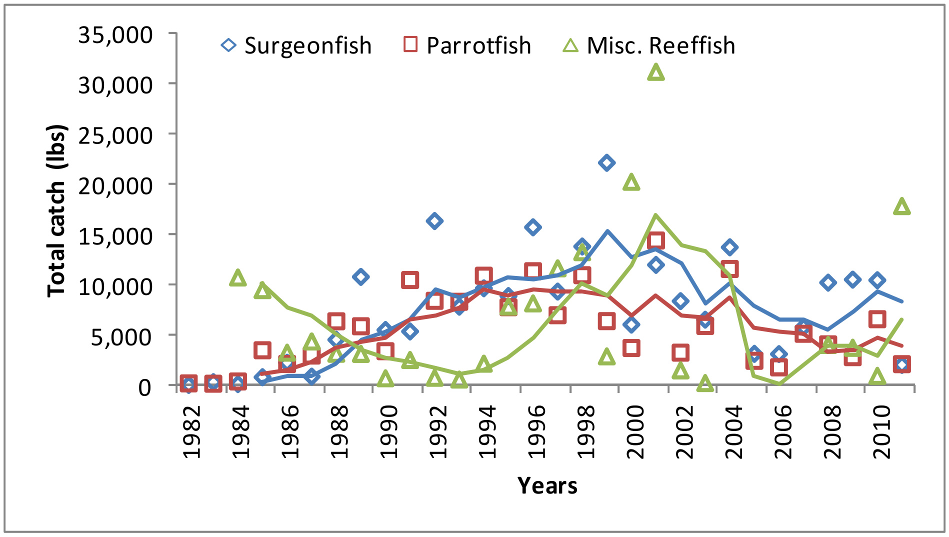

Figure 35. Total catch of the top three species/species groups caught in the snorkel spear fishery from 1982-2011.

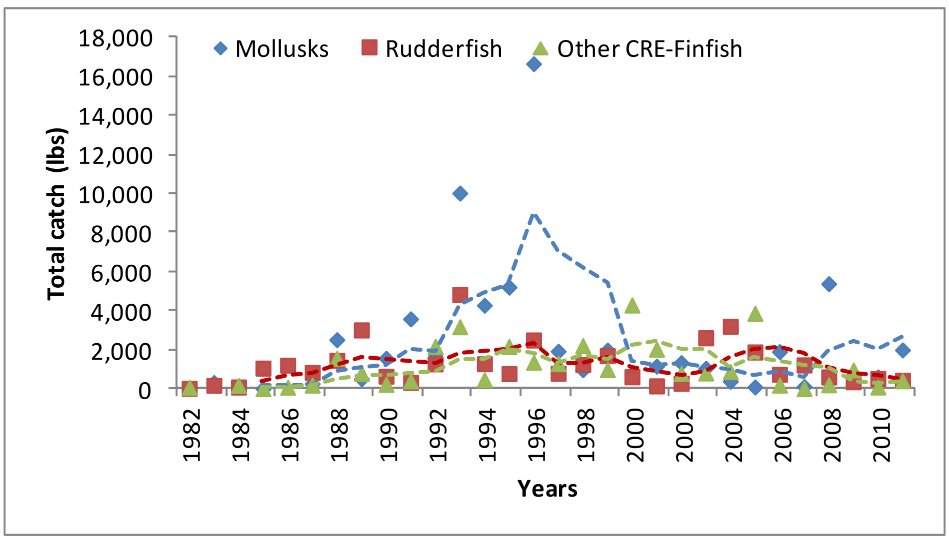

Figure 36. Total catch of the top 4-6 species/species groups caught in the snorkel spear fishery from 1982-2011.

Catch Trends and Interpretation: The high total for miscellaneous reef fish may be due to the lack of time to complete interviews of snorkel spear fishermen by agency staff. Many snorkel spear catches consist of many species (>15), and frequently fishermen are in a hurry to leave, and unwilling or unable to wait the required time for a complete species breakdown to be assessed by interviewers.

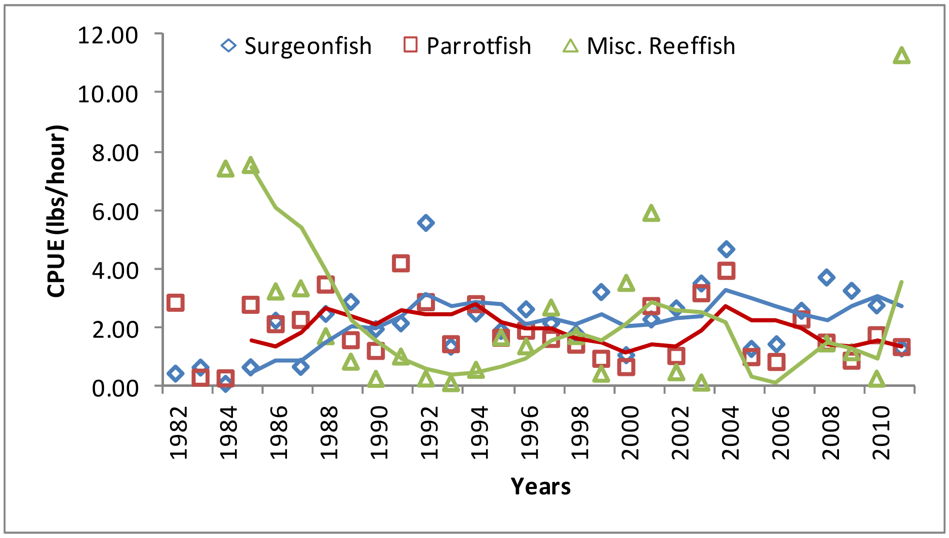

Figure 37. Catch per unit effort (lbs per hour) of the top three species/species groups in the snorkel spear fishery from 1982-2011.

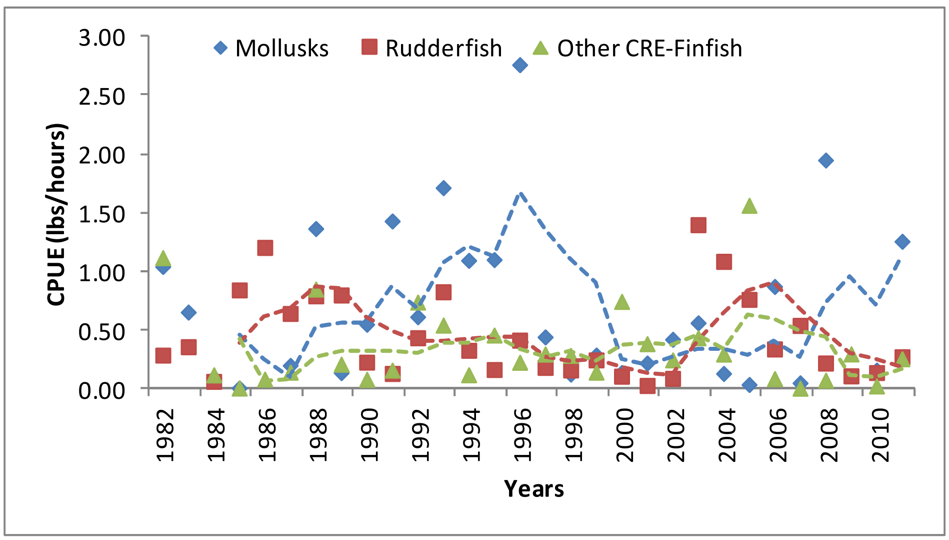

Figure 38. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the snorkel spear fishery from 1982-2011.

CPUE Trends and Interpretation: The high rate for miscellaneous reef fish may be due to the lack of time to complete interviews of snorkel spear fishermen by agency staff. Many snorkel spear catches consist of many species (>15), and frequently fishermen are in a hurry to leave, and unwilling or unable to wait the required time for a complete species breakdown to be assessed by interviewers.

Gillnetting Fishery

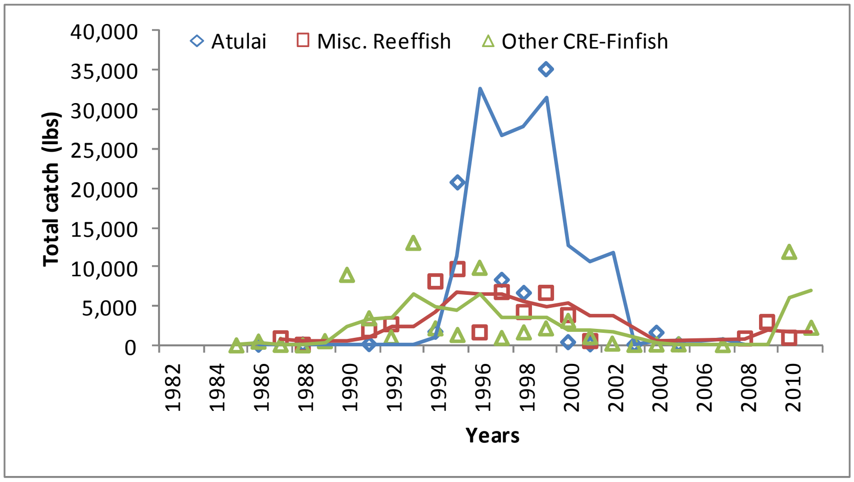

Figure 39. Total catch of the top three species/species groups caught in the gill net fishery from 1982-2011.

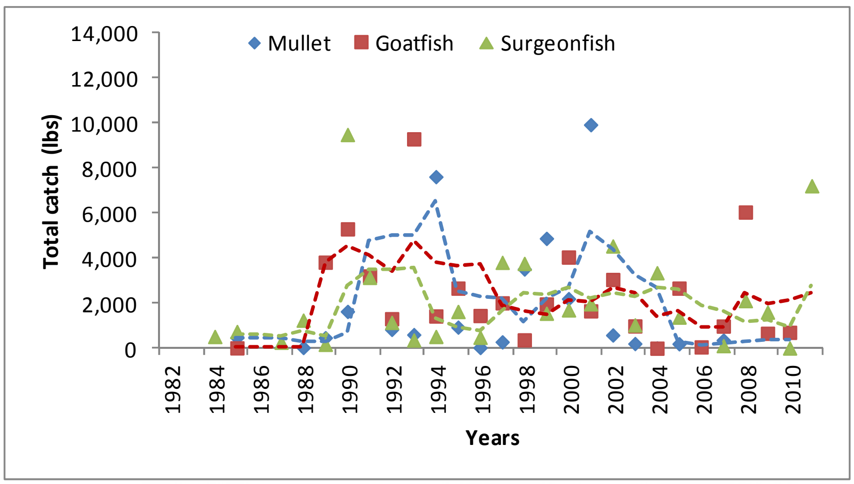

Figure 40. Total catch of the top 4-6 species/species groups caught in the gill net fishery from 1982-2011.

Catch Trends and Interpretation: The drop in atulai gill net catch is due a change in the classification of the nets used. Methods that were formally classified as gill nets are now classified as surround nets.

Surround netting in Umatic Bay in Guam

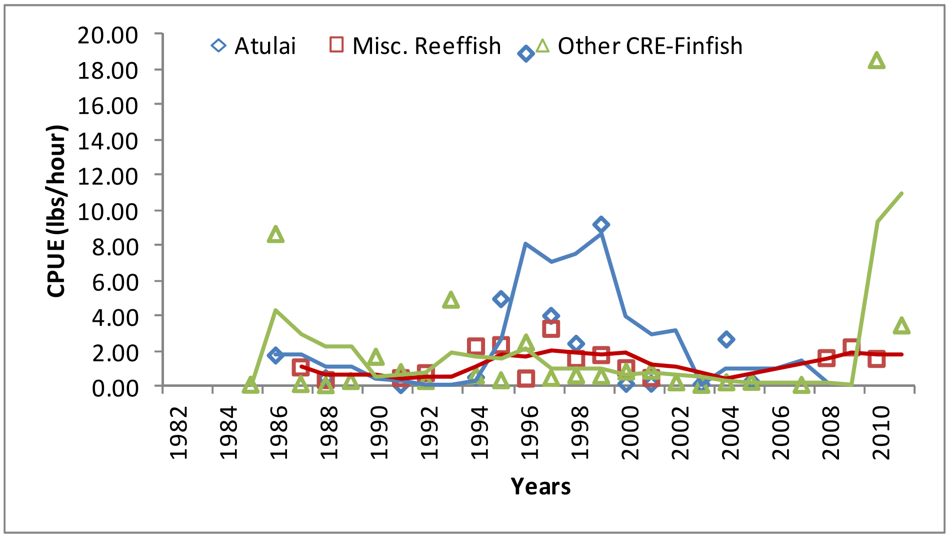

Figure 41. Catch per unit effort (lbs per hour) of the top three species/species groups in the gillnet fishery from 1982-2011.

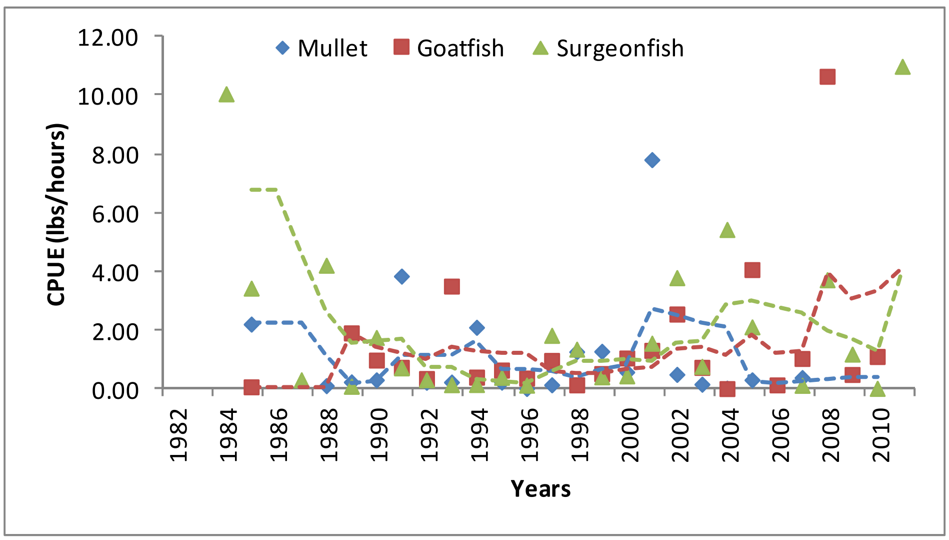

Figure 42. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the gillnet fishery from 1982-2011.

CPUE Trends and Interpretation: The high rate for miscellaneous reef fish may be due to the lack of time to complete interviews of gill net fishermen by agency staff. Gill net catches frequently consist of many species (>7), and occasionally fishermen are in a hurry to leave, and unwilling or unable to wait the required time for a complete species breakdown to be assessed by interviewers. A couple good catches of schooling surgeonfish may have been the cause of the high rate for surgeonfish catch in 2011.

Coral Reef Trolling Fishery

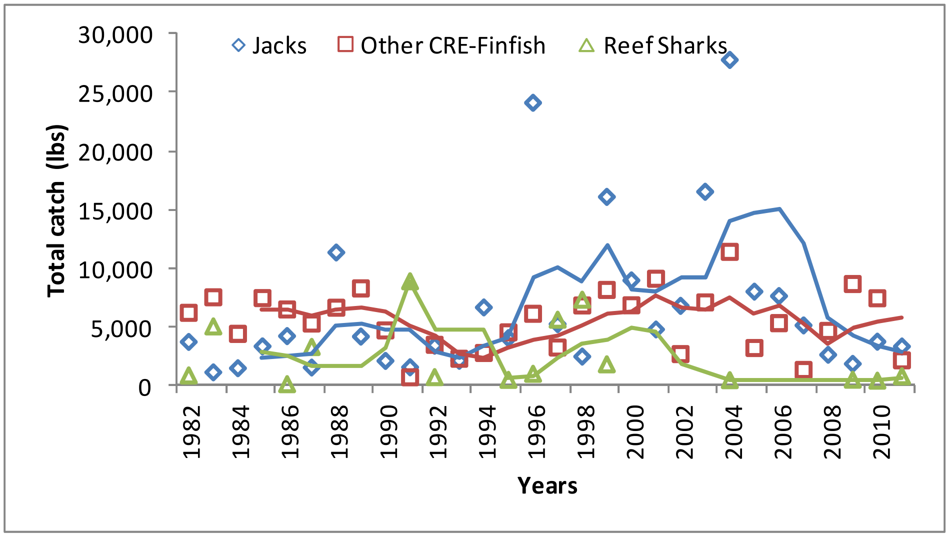

Figure 43. Total catch of the top three species/species groups caught in the trolling fishery from 1982-2011.

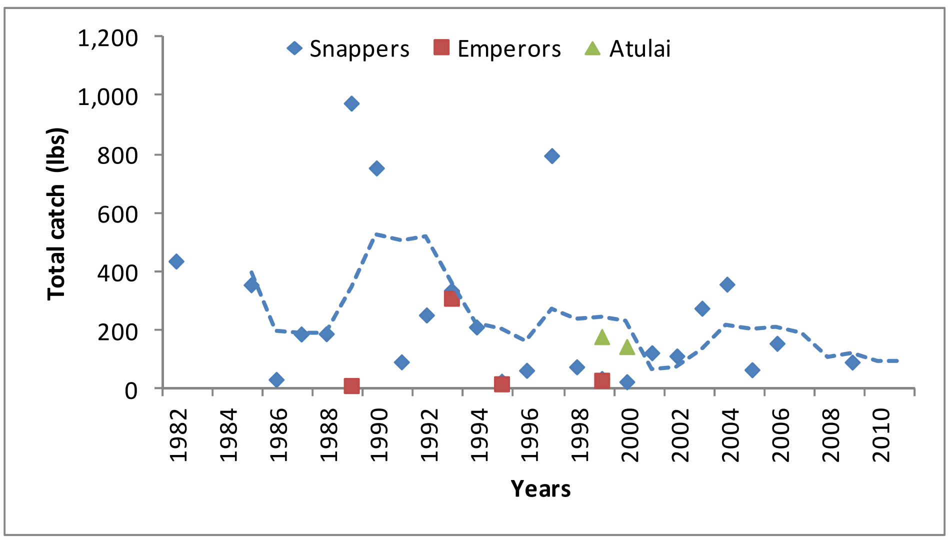

Figure 44. Total catch of the top 4-6 species/species groups caught in the trolling fishery from 1982-2011.

Catch Trends and Interpretation: Troll reef fish are frequently incidentally caught while fishermen are targeting more pelagic species.

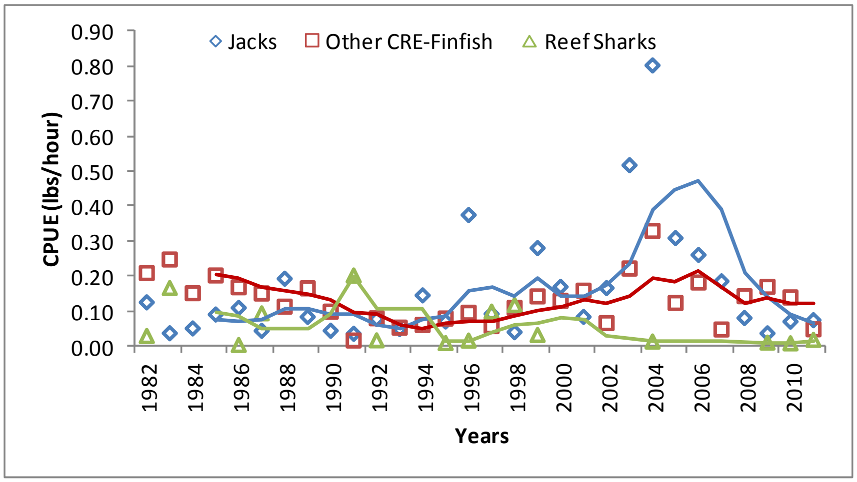

Figure 45. Catch per unit effort (lbs per hour) of the top three species/species groups in the trolling fishery from 1982-2011.

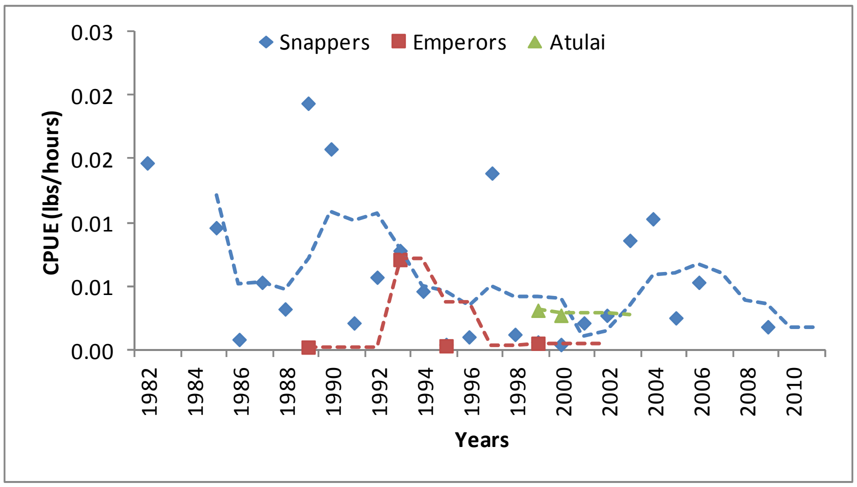

Figure 46. Catch per unit effort (lbs per hour) of the top 4-5 species/species groups in the trolling fishery from 1982-2011.

CPUE Trends and Interpretation: Troll reef fish are frequently incidentally caught while fishermen are targeting more pelagic species.

Trolling fleet joining the Fishing Derby in Guam

Shore-Based Coral Reef Fishery

The shore-based coral reef fisheries are comprised of the following fishing methods: hook and line, gill net, snorkel spear, cast net, surround net, hooks and gaffs, SCUBA spear, drag net, and other methods including gleaning. However, the most dominant ones include: hook and line, gill net, snorkel spear, cast net, and surround net. These fishing methods comprise 87% of the total shore-based fisheries landing.

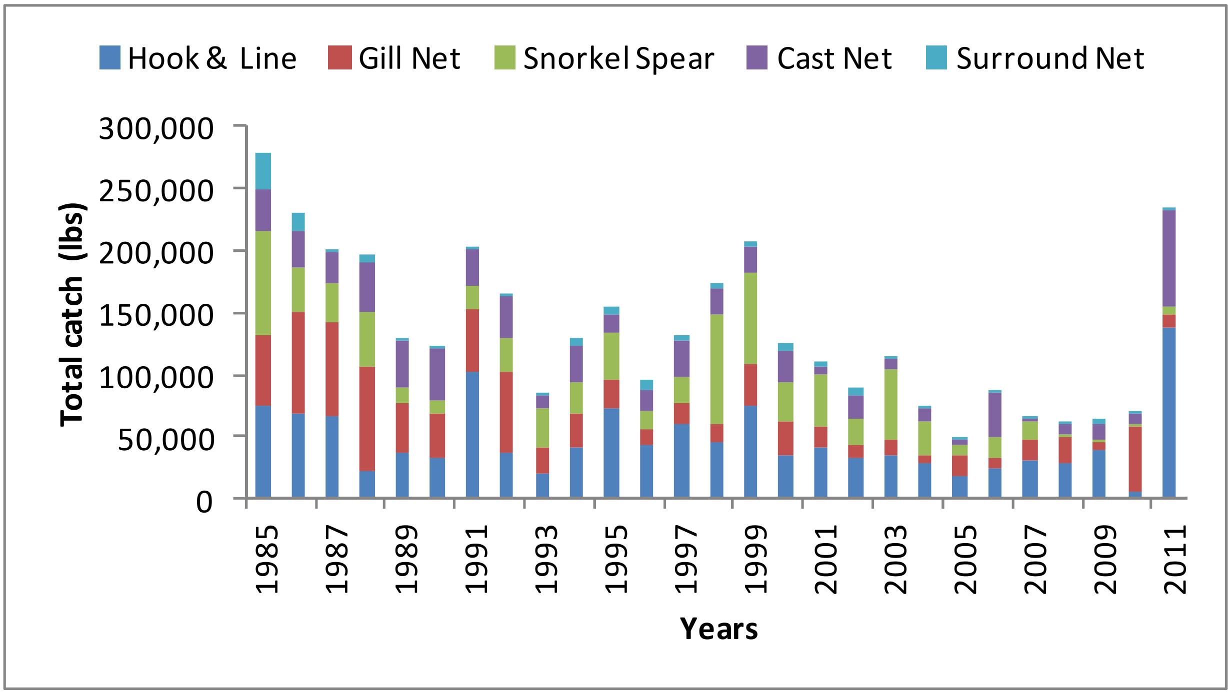

Figure 47. Total landings (lbs) from the dominant shore-based methods from 1985 to 2011.

Trends and Interpretation: Hook and line fishing is consistently the most common method in the shore based reef fishery on Guam. Commonly, catch totals for hook and line fishing will be the highest of any method in the shore based fishery. Talaya fishing catch totals may fluctuate a great deal, as this method is used most often when fishing for seasonally available fish (I'e, tiao, manahak) and catch totals will depend on the strength of the season of these seasonal species. Surround net fishing is seen most commonly on Guam during the Lenten season

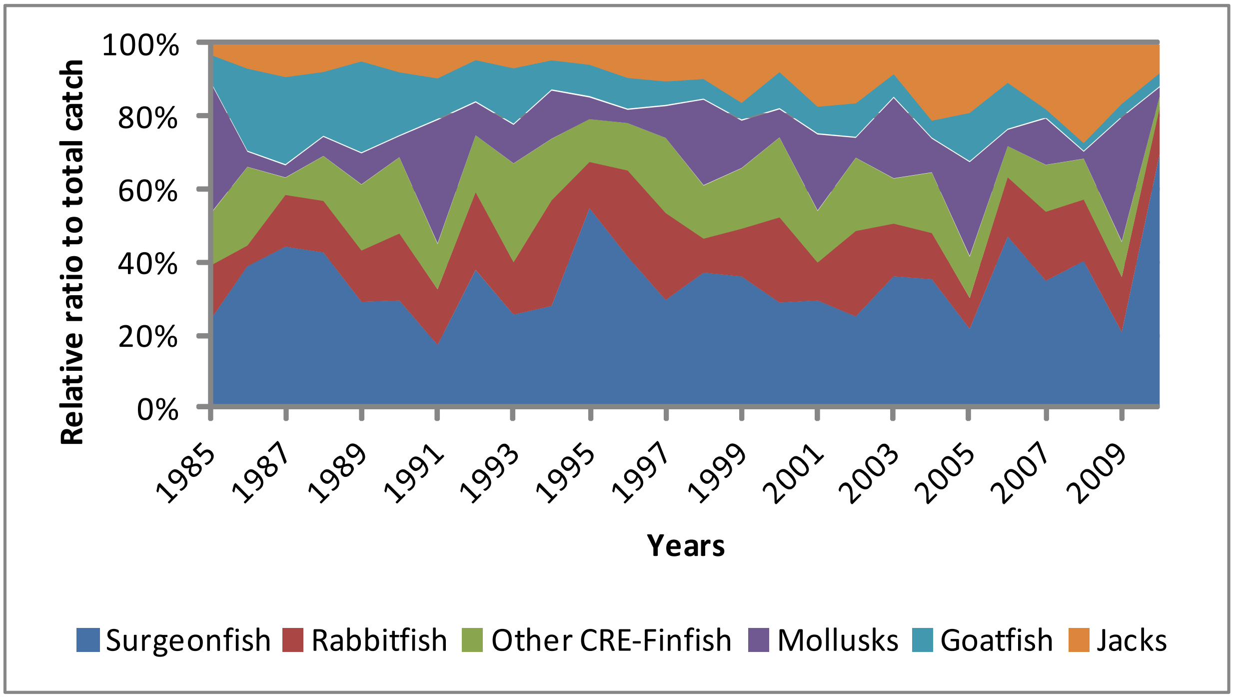

Figure 48. Relative ratio of the top six species/species groups to the total boat based catch landing from 1985 to 2011.

Trends and Interpretation: Surgeonfish and rabbitfish frequently compose the greatest percentage of the inshore reef fish fishery. This may be both due to preferred habitat (reef flat and fore reef areas), and susceptibility to commonly used methods, e.g hook and line, gill net, snorkel spear fishing.

Acanthurus lineatus and Naso lituratus are the dominant surgeon fish species that comprise the shore-based catches in Guam

Hook and Line Fishery

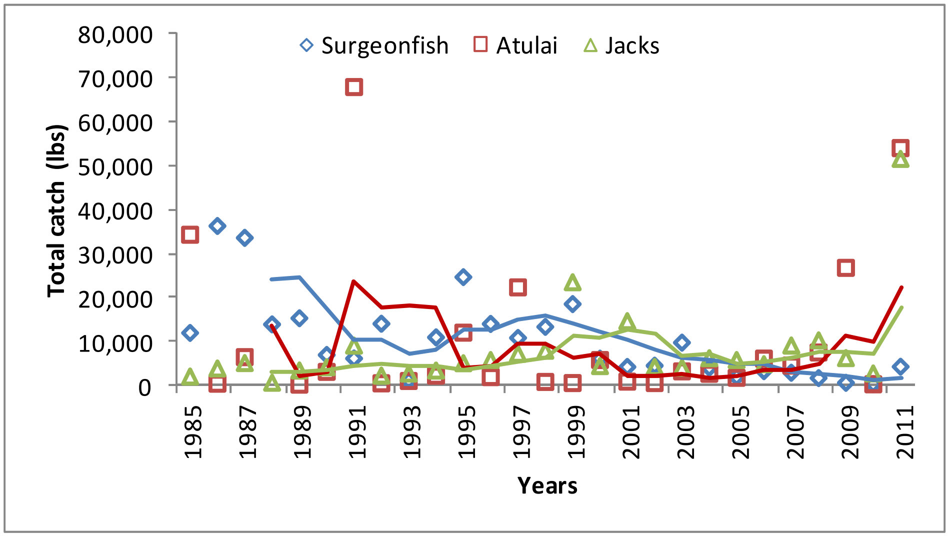

Figure 49. Total catch of the top three species/species groups caught in the hook and line fishery from 1985-2011.

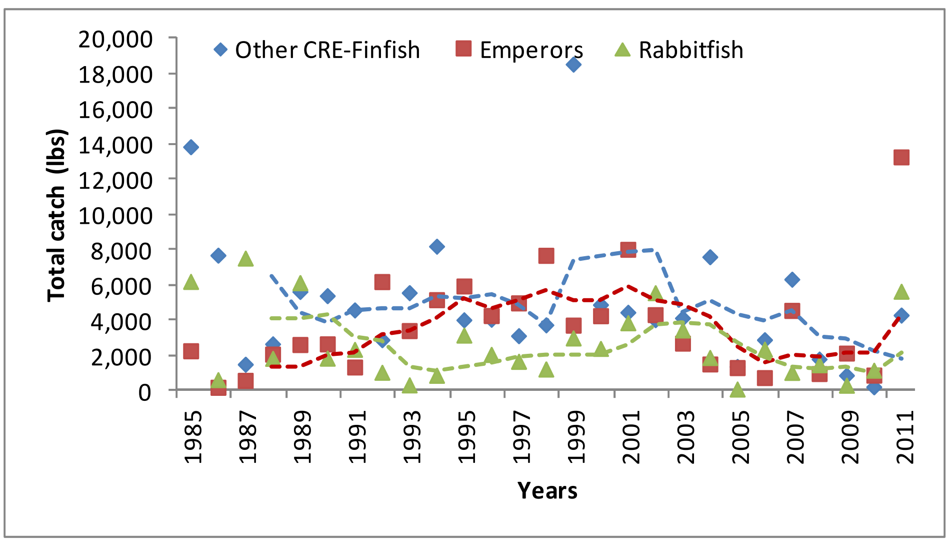

Figure 50. Total catch of the top 4-6 species/species groups caught in the hook and line fishery from 1985-2011.

Catch Trends and Interpretation: In 2011, enforcement of the ban on the use of nets in the channel at the Agana Boat Basin allowed the hook and line fishermen to exploit the atulai catch for a longer period of time than usual. This, in combination with a good atulai run, contributed to high catch totals for hook and line in 2011. Jacks and emperors are frequently incidental catch for the atulai fishery. Increased totals of these groups may also be attributed to the good atulai season.

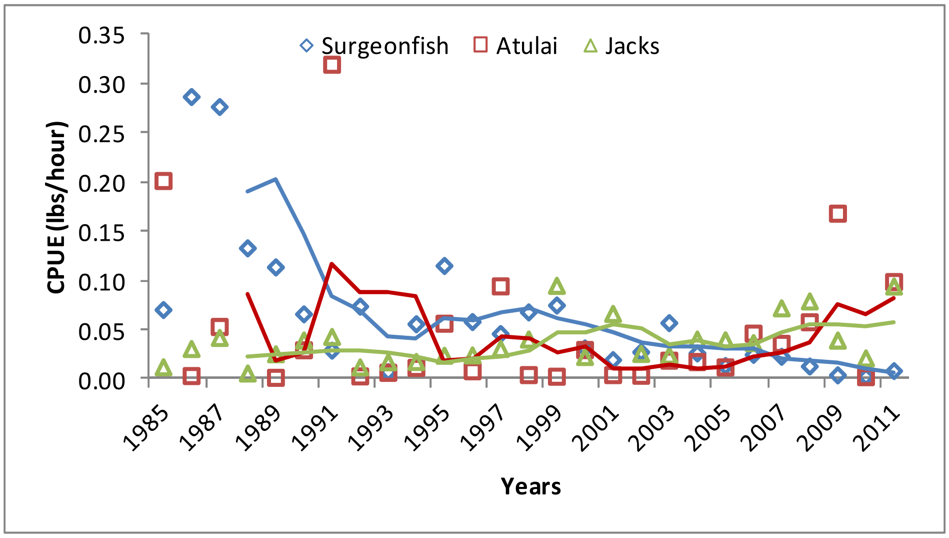

Figure 51. Catch per unit effort (lbs per hour) of the top three species/species groups in the hook and line fishery from 1985-2011.

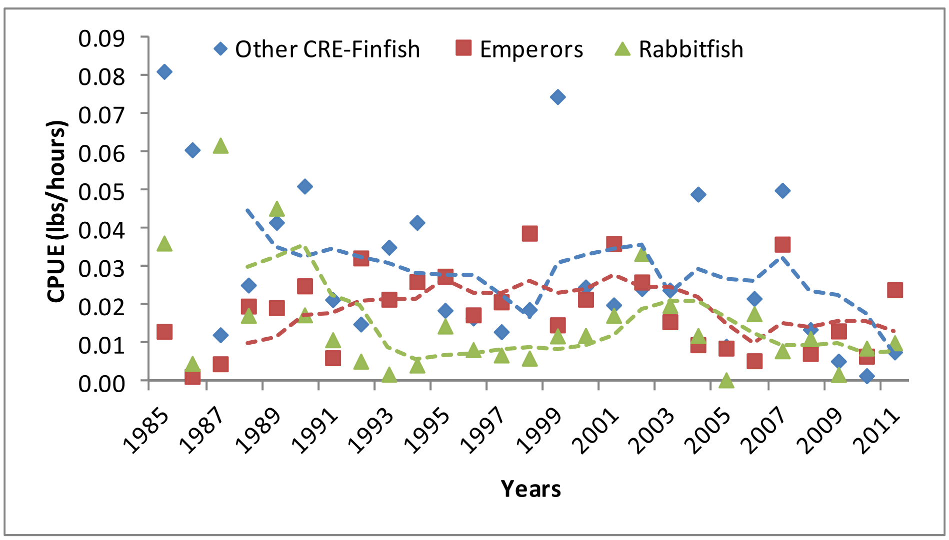

Figure 52. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the hook and line fishery from 1985-2011.

CPUE Trends and Interpretation: In 2011, a ban on the use of nets in the channel at the Agana Boat Basin allowed the hook and line fishermen to exploit the atulai catch for a longer period of time than usual. This, in combination with a good atulai run, contributed to high CPUE for hook and line in 2011. Jacks and emperors are frequently incidental catch for the atulai fishery. Increased CPUE for these groups may also be attributed to the good atulai season.

Gillnet Fishery

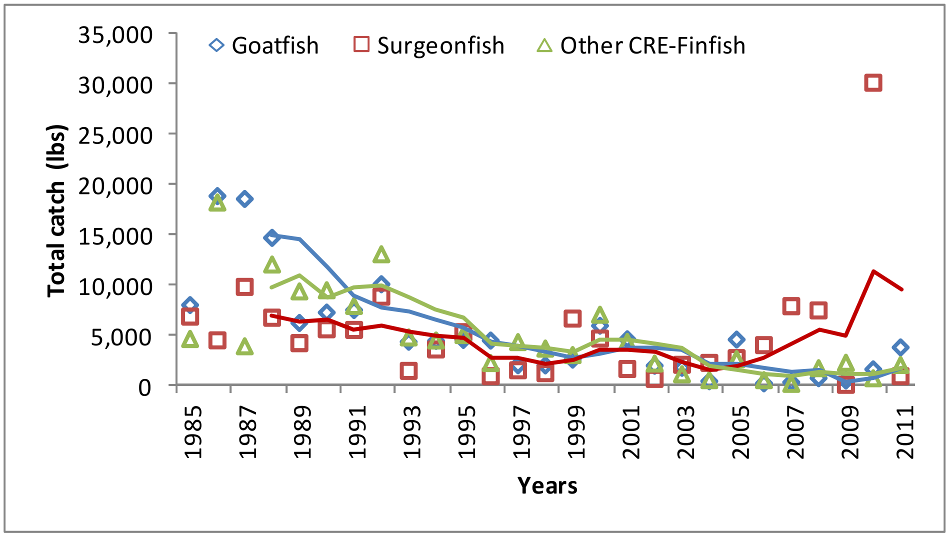

Figure 53. Total catch of the top three species/species groups caught in the gillnet fishery from 1985-2011.

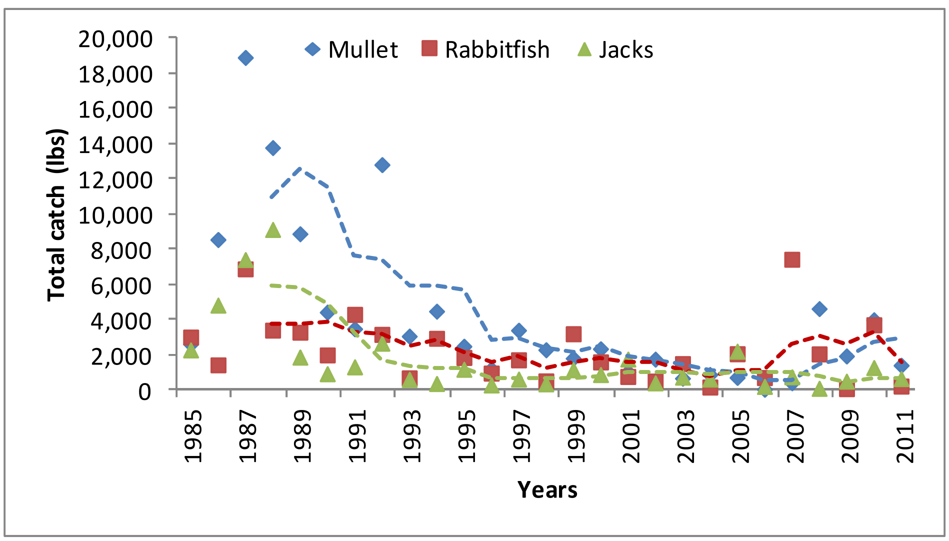

Figure 54. Total catch of the top 4-6 species/species groups caught in the gillnet fishery from 1985-2011.

Catch Trends and Interpretation: The species composition for the gill net fishery on Guam has remained relatively consistent over the time period. The exceptional catch total for surgeon fish in 2010 may be due to a few good catches of schooling surgeon fish by gill net, or an artifact of the expansion formula used to calculate the year catch from limited interviews.

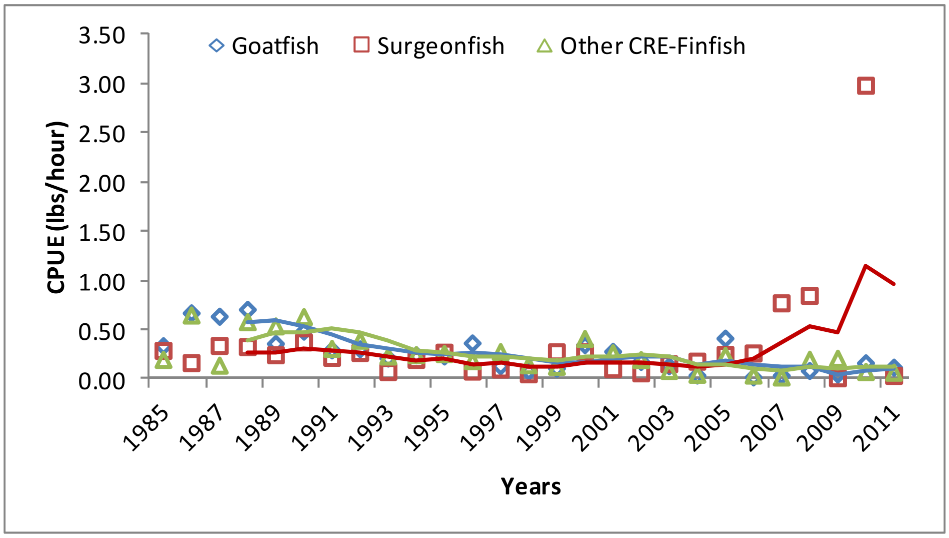

Figure 55. Catch per unit effort (lbs per hour) of the top three species/species groups in the gillnet fishery from 1985-2011.

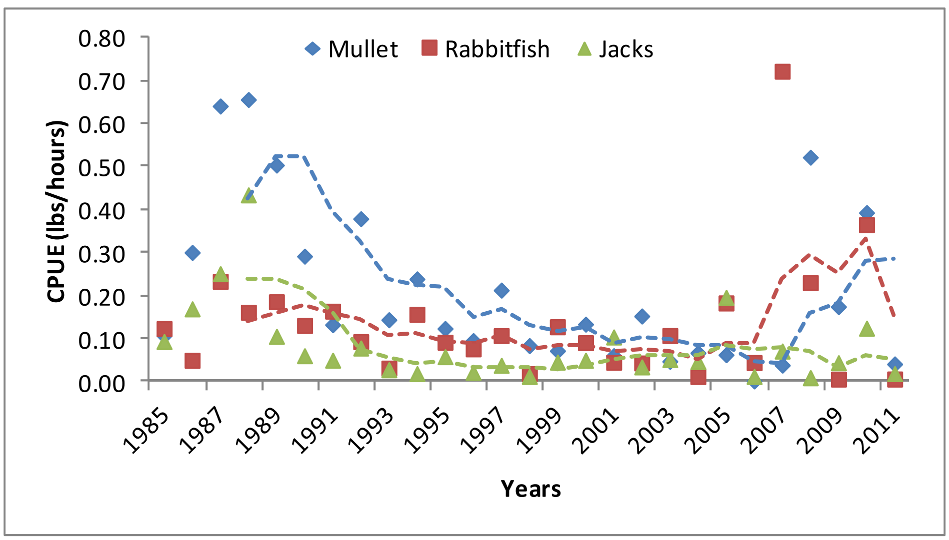

Figure 56. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the gillnet fishery from 1985-2011.

CPUE Trends and Interpretation: The species composition for the gill net fishery on Guam has remained relatively consistent over the time period. The exceptional CPUE for surgeon fish in 2010 may be due to a few good catches of schooling surgeon fish by gill net, or an artifact of the expansion formula used to calculate the year catch from limited interviews.

Snorkel Spearfishing Fishery

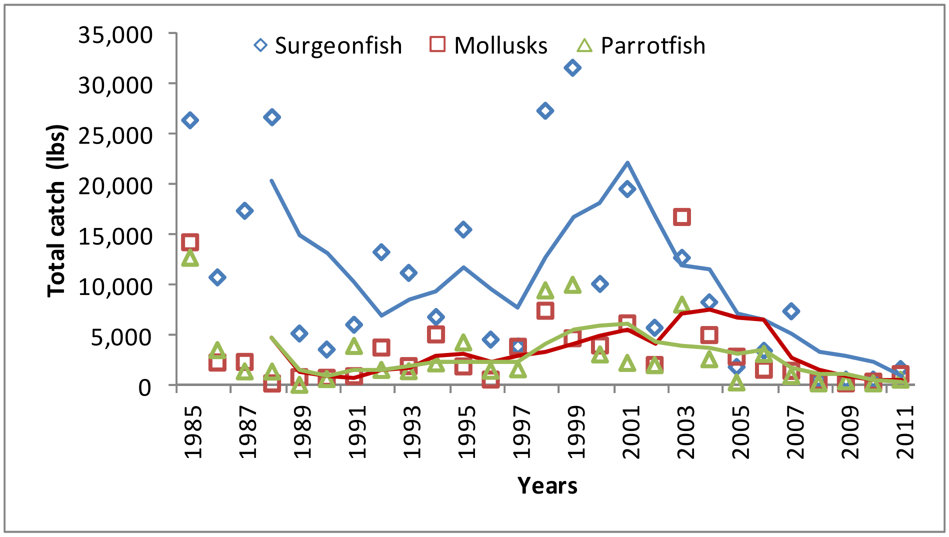

Figure 57. Total catch of the top three species/species groups caught in the snorkel spear fishery from 1985-2011.

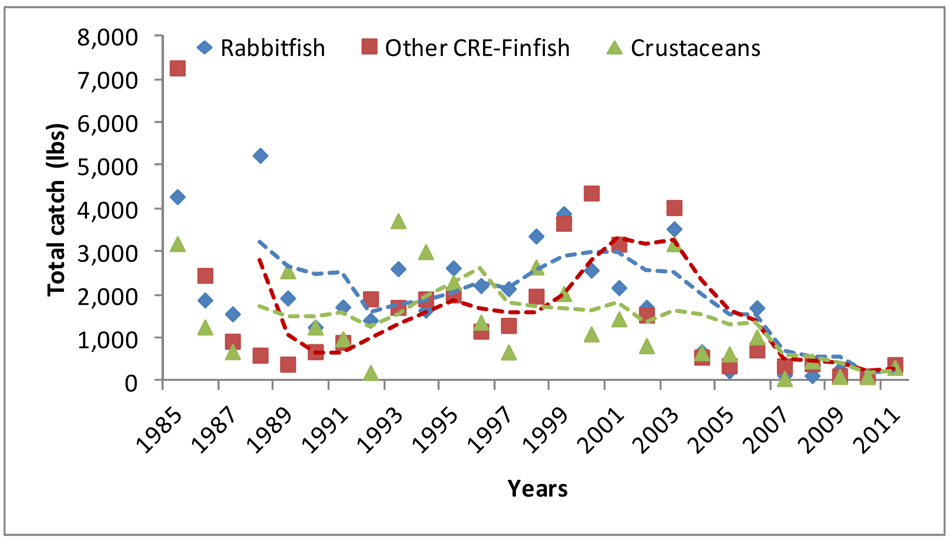

Figure 58. Total catch of the top 4-6 species/species groups caught in the snorkel spear fishery from 1985-2011.

Catch Trends and Interpretation: The number of shore based snorkel spear interviews has dropped considerably during recent years. This method is not seen as frequently as it was in the past. This has led to a drop in total catch reported for this method
NOTE: The crustacean catches described in the time series does not include lobsters, Kona crab, deepwater shrimp and slipper lobsters. Crustaceans caught via this method are primarily reef crabs and spiny lobsters, although spearing of crustaceans is currently illegal under Guam law.

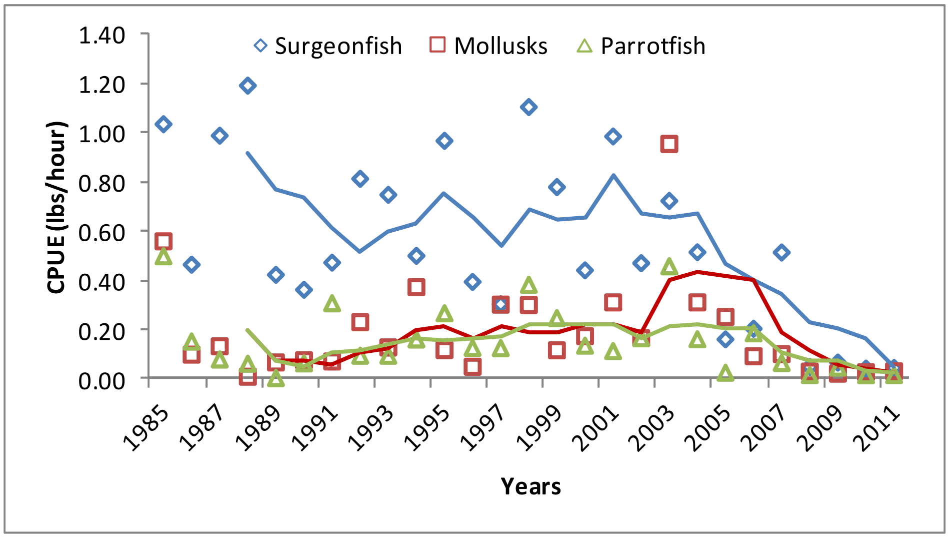

Figure 59. Catch per unit effort (lbs per hour) of the top three species/species groups in the snorkel spear fishery from 1985-2011.

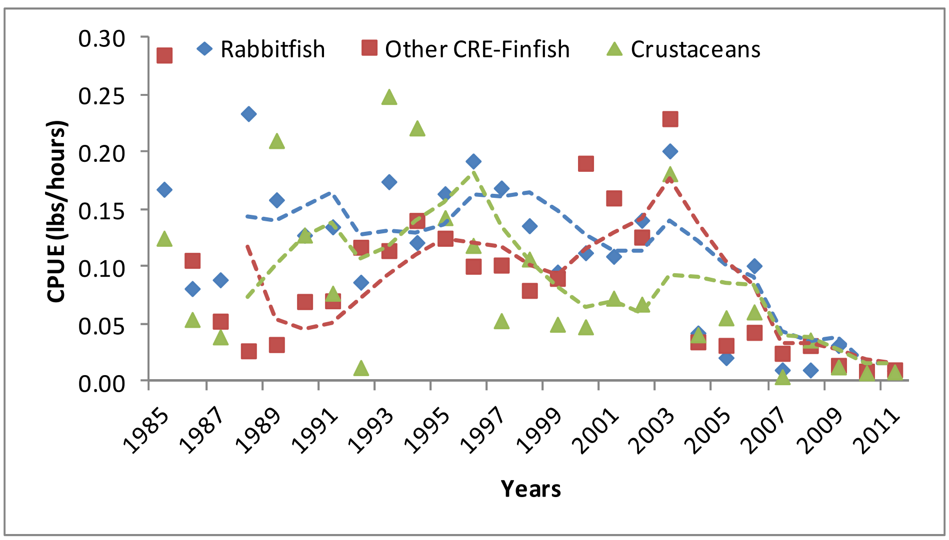

Figure 60. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the snorkel spear fishery from 1985-2011.

CPUE Trends and Interpretation: The number of shore based snorkel spear interviews has dropped considerably during recent years. This method is not seen as frequently as it was in the past. This has led to a drop in total catch reported for this method

NOTE: The crustacean catches described in the time series does not include lobsters, Kona crab, deepwater shrimp and slipper lobsters. Crustaceans caught via this method are primarily reef crabs and spiny lobsters, although spearing of crustaceans is currently illegal under Guam law.

Cast netting (talaya) Fishery

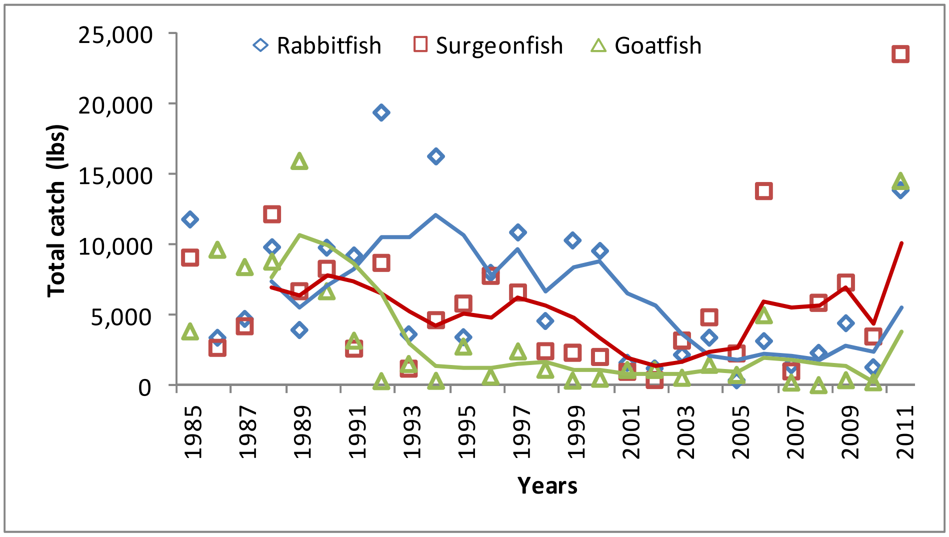

Figure 61. Total catch of the top three species/species groups caught in the cast net fishery from 1985-2011.

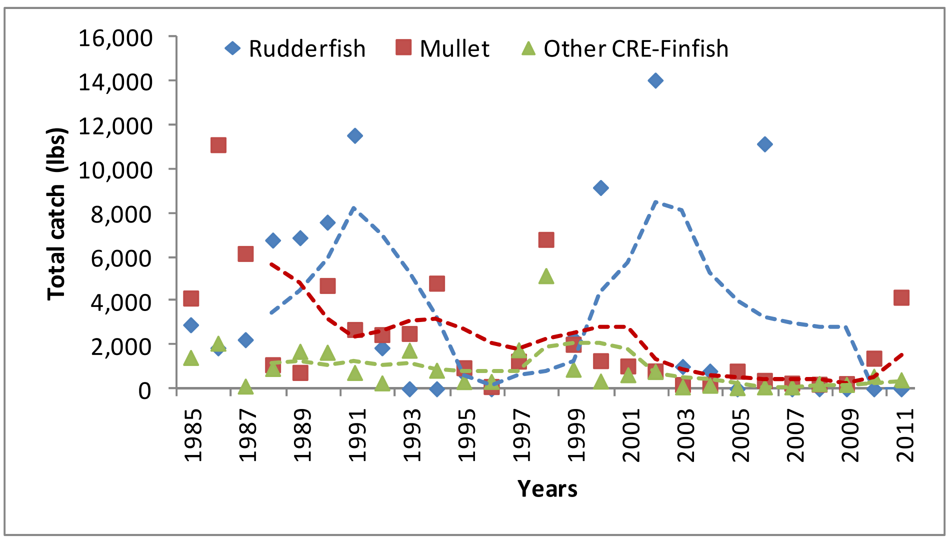

Figure 62. Total catch of the top 4-6 species/species groups caught in the cast net fishery from 1985-2011.

Catch Trends and Interpretation: Talaya (cast net) fishing is the method most commonly used for seasonal inshore fisheries (Tiao, manahak, i'e) on Guam. The high catch total for surgeonfish in 2011 is due to the expansion of a small number of good talaya catches of schooling surgeonfish species. Talaya is used primarily from shore for small fish, but may also be used at the reef crest for larger fish, primarily surgeonfish and rudderfish

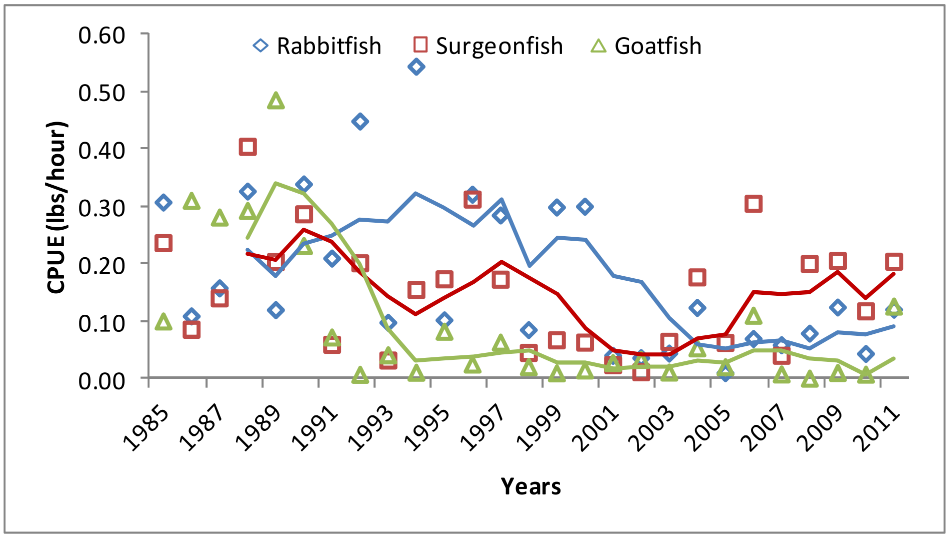

Figure 63. Catch per unit effort (lbs per hour) of the top three species/species groups in the cast net fishery from 1985-2011.

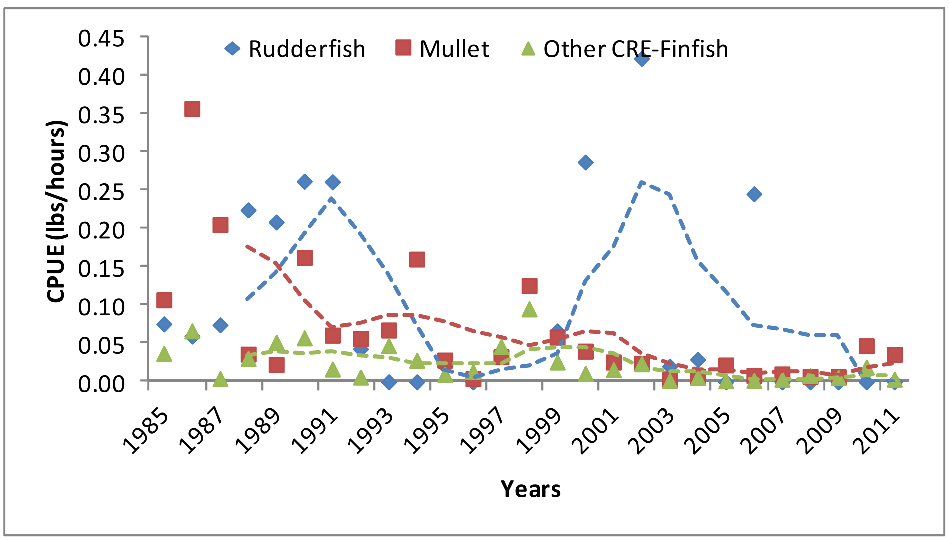

Figure 64. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the cast net fishery from 1985-2011.

CPUE Trends and Interpretation: Talaya (cast net) fishing is the method most commonly used for seasonal inshore fisheries (Tiao, manahak, i'e) on Guam. The high catch total for surgeonfish in 2011 is due to the expansion of a small number of good talaya catches of schooling surgeonfish species. Talaya is used primarily from shore for small fish, but may also be used at the reef crest for larger fish, primarily surgeonfish and rudderfish

Surround net Fishery

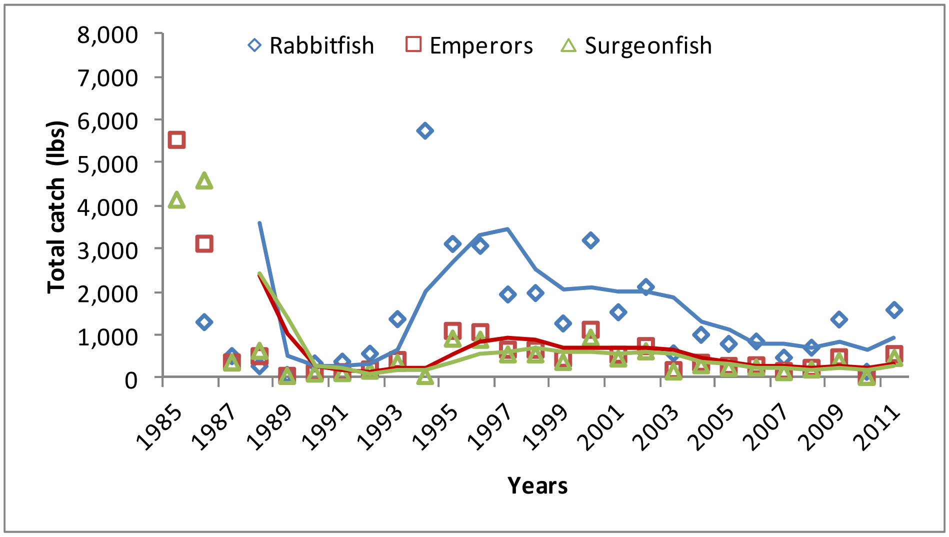

Figure 65. Total catch of the top three species/species groups caught in the surround net fishery from 1985-2011.

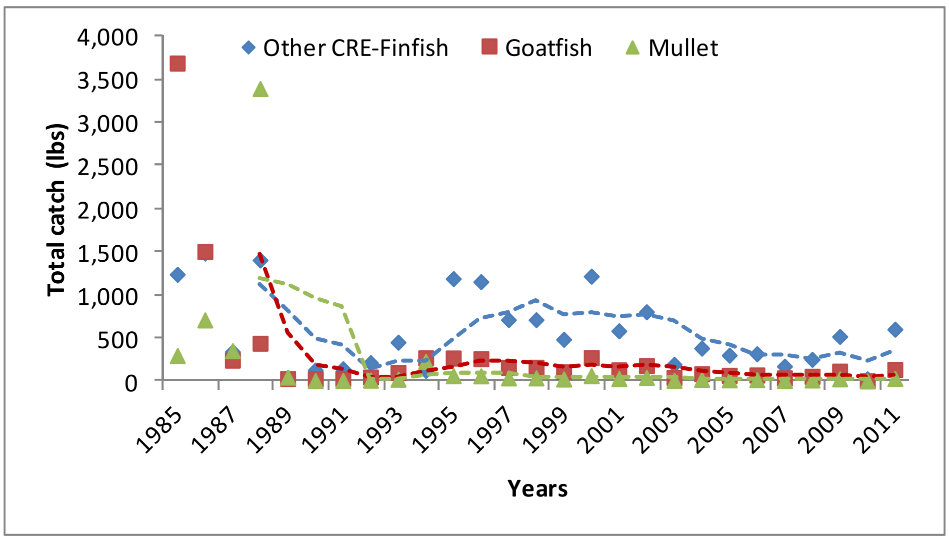

Figure 66. Total catch of the top 4-6 species/species groups caught in the surround net fishery from 1985-2011.

Catch Trends and Interpretation: Surround net fishing is seen most commonly on Guam during the Lenten season. As this fishery takes place in the same habitat (reef flats, and frequently in the same locations year after year, variation in species composition and CPUE is generally minimal.

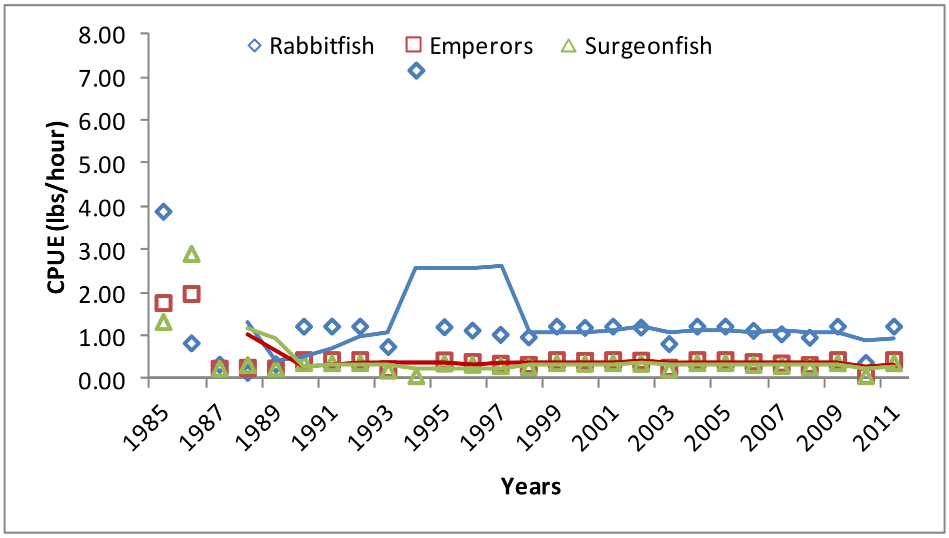

Figure 67. Catch per unit effort (lbs per hour) of the top three species/species groups in the surround net fishery from 1985-2011.

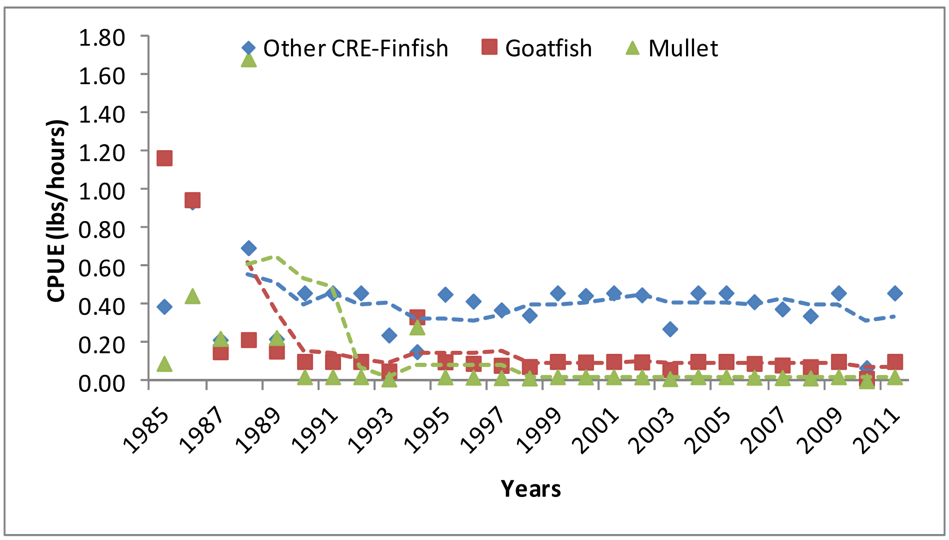

Figure 68. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the surround net fishery from 1985-2011.

CPUE Trends and Interpretation: Surround net fishing is seen most commonly on Guam during the Lenten season. As this fishery takes place in the same habitat (reef flats, and frequently in the same locations year after year, variation in species composition and CPUE is generally minimal.

Commercial Prices of Selected Species Groups

Mean Inflation Adjusted Prices of the Top Commercial Coral Reef Species in Guam

Calculation: The average prices for the miscellaneous bottomfish, miscellaneous reef fish, surgeonfish, parrotfish, atulai and jacks were calculated by dividing total revenue for each group by total weight sold. The inflation-adjusted prices were calculated by multiplying the unadjusted annual average price by the annual calculated consumer price index (CPI) for Guam Bureau of Statistics and Plans using 2011 as the base.

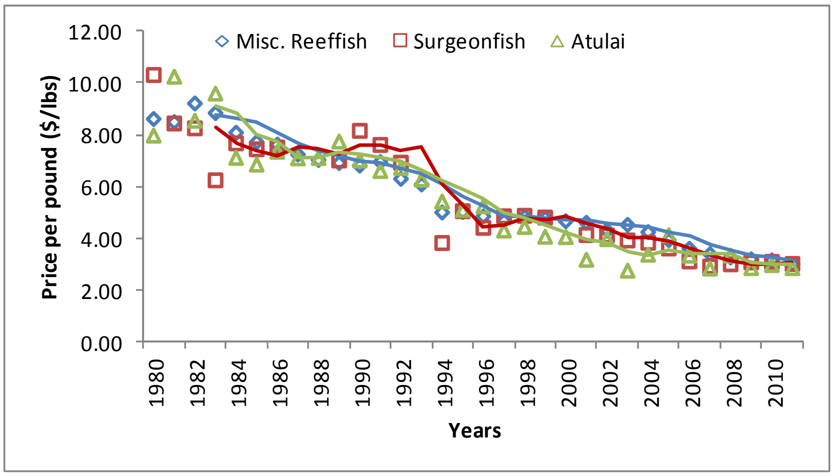

Figure 69. Trends in the mean inflation adjusted prices of miscellaneous reef fish, surgeonfish and atulai from 1980 to 2011.

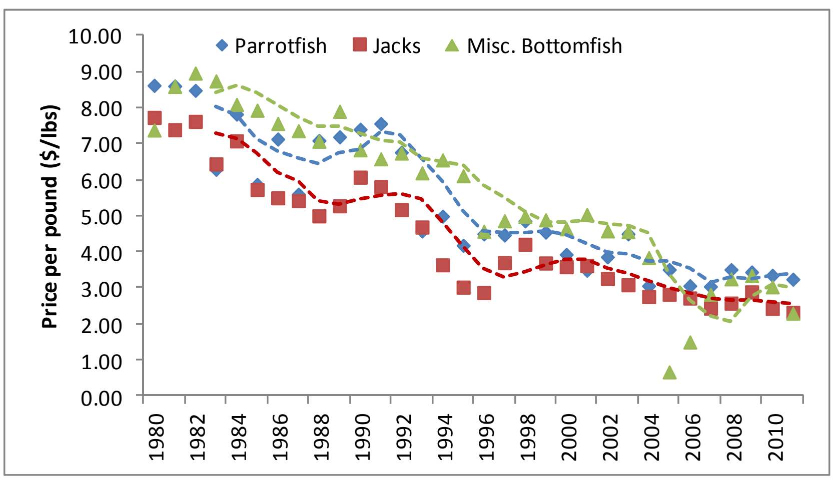

Figure 70. Trends in the mean inflation adjusted prices of miscellaneous bottomfish, jacks and parrotfish from 1980 to 2011.

Trends and Interpretation: Inflation adjusted prices for reef fish have shown a consistent decline over the time period. This may be due to an oversupply in some years, reduced demand, and competition with cheaper imported reef fish, primarily from the FSM and the Philippines.

Average Commercial Landing Prices of the Top Commercial Coral Reef Species in Guam

Calculation: The commercial landing average prices for miscellaneous bottomfish, miscellaneous reef fish, surgeonfish, parrotfish, atulai and jacks were calculated by dividing total revenue for each group by total weight sold. These prices were not adjusted for inflation.

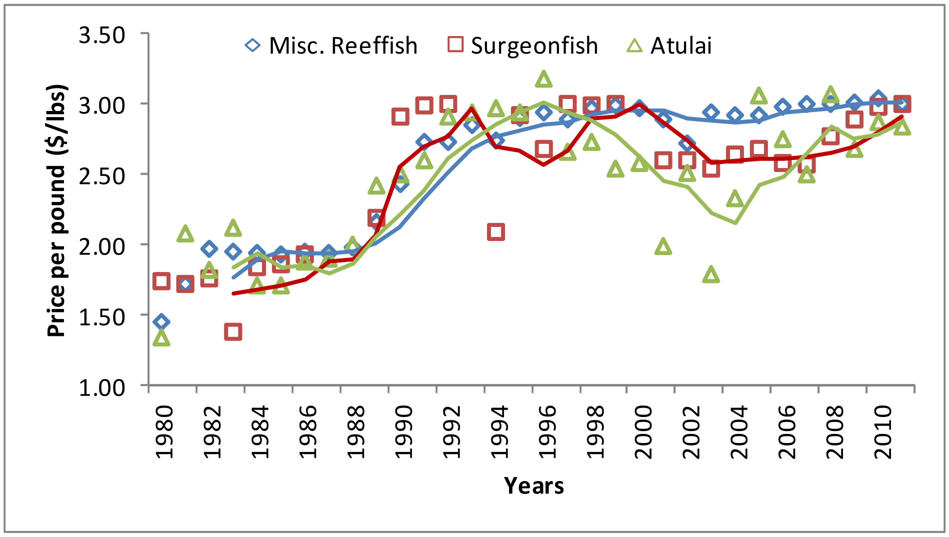

Figure 71. Trends in the average commercial landing prices of miscellaneous reef fish, surgeonfish and atulai from 1980 to 2011.

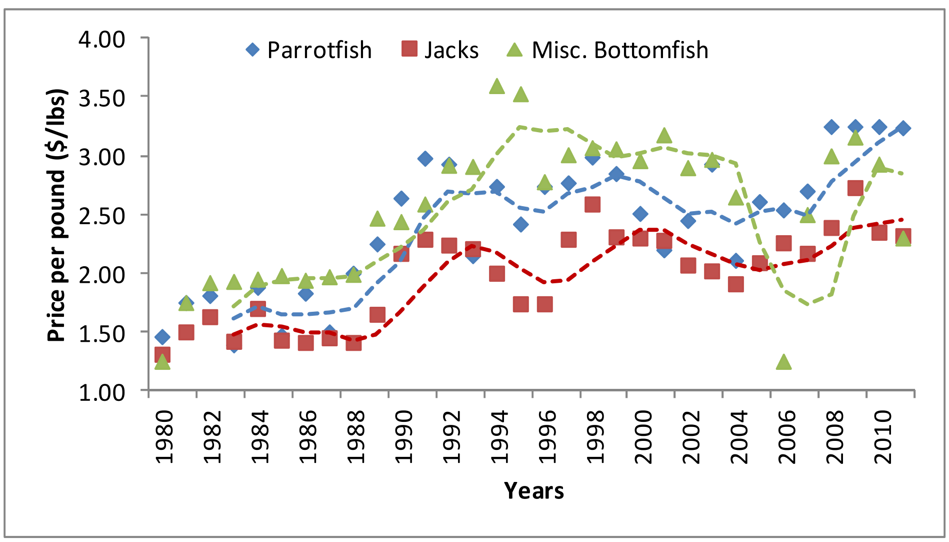

Figure 72. Trends in the average commercial landing prices of miscellaneous bottomfish, jacks and parrotfish from 1980 to 2011.

Trends and Interpretation: Price per pound has remained relatively consistent over the past 15-20 years on Guam. The price has not risen with inflation. This may be due to an oversupply of reef fish on the market, or an increase in cheap imported reef fish from countries such as the FSM and the Philippines.

Total Commercial Landing Sold of the Top Commercial Coral Reef Species in Guam

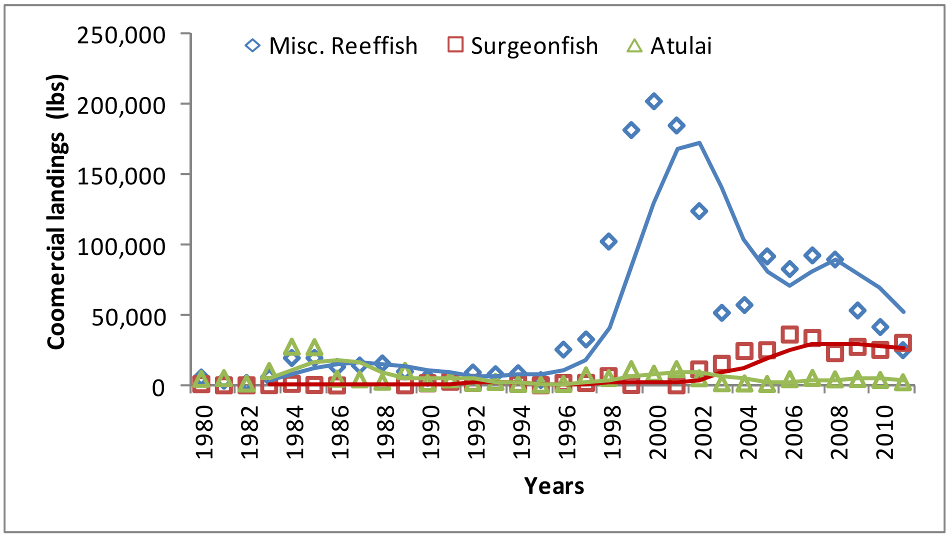

Figure 73. Total commercial landing of miscellaneous reef fish, surgeonfish and atulai sold from 1980 to 2011.

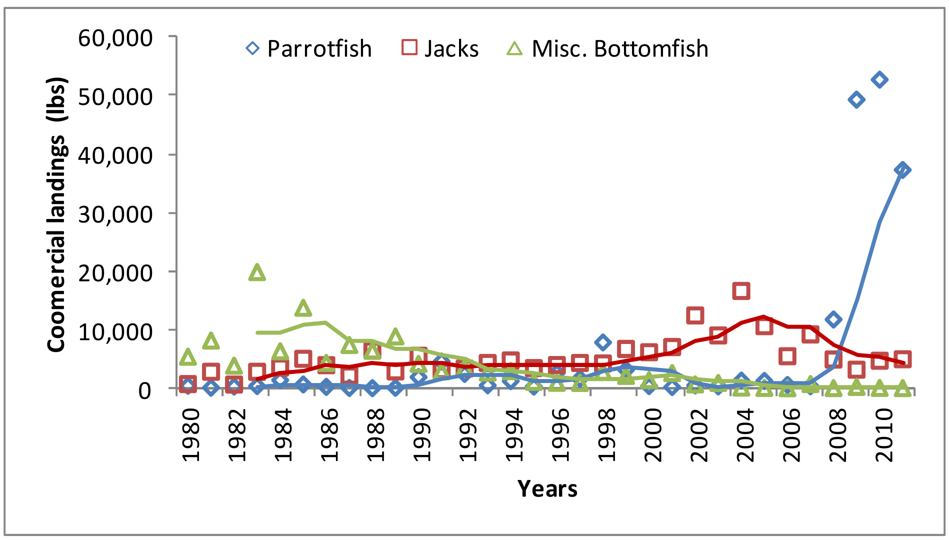

Figure 74. Total commercial landing of miscellaneous bottomfish, parrotfish and jack sold from 1980 to 2011.

Trends and Interpretation: The high totals of miscellaneous reef fish and parrotfish may be an artifact of the labeling on the commercial vendor receipts. Frequently, vendors do not break down reef fish by species or family group, but simply classify them as assorted reef fish. As parrotfish sell for a slightly different amount than other reef fish, they are separated on vendor receipts

Coral Reef Fishery By-Catch

Guam coral reef fisheries are general non-selective and non-targeting where most of the catch are retained. These fishery characteristics render minimal by-catch. Interactions with protected species are believed to be minimal. To date, there have been no reported or observed interactions between protected species and coral reef fisheries in Federal waters around Guam and CNMI and the potential for interactions is believed to be low due to the gear types and fishing methods used.

Status of the Coral Reef Fishery

There are no existing stock assessments on CREMUS stocks. There are biomass estimates for reef fish populations provided by CRED described in this report which may be used, among other data, in determining CREMUS annual catch limits.

Overfished and Overfishing Determinations
To date coral reef fisheries around Guam and CNMI have not been determined to be overfished or subject to overfishing.

MSY
No estimates of MSY are currently available for coral reef ecosystem associated species in the Mariana Archipelago.

OY
Optimum yield for coral reef ecosystem associated species is defined as 75% of their MSY.

Background on Guam Bottomfish Fishery

There are two distinct bottomfish fisheries on Guam that can be separated by depth and species composition. The shallow water complex (< 500 feet) makes up a larger portion of the total bottomfish effort and usually the harvest, comprising primarily reef-dwelling snappers, groupers, and jacks of the genera *Lutjanus*, *Lethrinus*, *Aprion*, *Epinephelus*, *Variola*, *Cephalopholis,* and *Caranx*. The deepwater complex (> 500 feet) consists primarily of groupers and snappers of the genera *Pristipomoides*, *Etelis*, *Aphareus*, *Epinephelus*, and *Cephalopholis*.

Bottomfishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. The majority of the participants in the bottomfish fishery operate vessels less than 25 feet long and primarily target the shallow-water bottomfish complex (WPRFMC 2003). The shallow-water component is the larger of the two in terms of participation because of the lower expenditure and relative ease of fishing close to shore (Myers 1997). Participants in the shallow-water component seldom sell their catch because they fish mainly for recreational or subsistence purposes (WPRFMC 2003). The commercially oriented highliner vessels tend to be longer than 25 feet, and their effort is usually concentrated on the deep-water bottomfish complex. Most fishermen troll for pelagic fish to supplement their bottomfishing effort and most of those who sell their catch also hold jobs outside the fishery (WPRFMC 2003).

Smaller vessels (< 25 ft) target mostly the shallow-water bottomfish complex and fish for a mix of recreational, subsistence, and small-scale commercial purposes. Some vessels fishing the offshore banks—particularly the few relatively large vessels (> 25 feet) that fish primarily for commercial purposes—target the deep-water bottomfish complex. At least one such vessel has been engaged in a venture that exports deep-slope species – particularly *onaga* – to Japan. It is possible that some vessels fishing on the banks around Guam land their catches in the CNMI (WPRFMC 2002a). In 1997, a highliner vessel made several bottomfishing trips to a seamount located 117 miles west of Guam (WPRFMC 2003).

The Agana Boat Basin is centrally located on the western leeward coast and serves as the island's primary launch site for boats fishing areas off the central and northern leeward coasts and the northern banks. The Merizo boat ramp, Seaplane Ramp in Apra Harbor, Umatac boat ramp, and Agat Marina are boat launch sites that provide access to the southern coast, Apra Harbor, Cocos Lagoon, and the southern banks. The Agat Marina, in particular, located between the Agana Boat Basin and the Merizo boat ramp, provides trailered boats from the northern and central areas of the island a closer and more convenient launch site to the southern fishing grounds. At Ylig Bay, a paved parking area and maintenance of the brush along the highway has helped increased the number of boats accessing the east side of the island.

Guam's bottomfish fishery can be highly seasonal, with effort significantly increasing when sea conditions are calm, generally during the summer months. During these periods, bottomfishing activity increases substantially on the offshore banks (in Federal waters), as well as on the east side of the island (in territorial waters), a more productive fishing area that is inaccessible to small boats during most of the year due to rough seas. Historical data on Guam bottomfish landings is provided in Figure 12.

According to Myers (1997), less than 20 percent of the total shallow-water marine resources harvested in Guam are taken outside 3 miles, primarily because the offshore banks are less accessible. Most offshore banks are deep, remote, have high shark densities, and subject to strong currents. Generally, these banks are only accessible during calm weather in the summer months (May to August/September). Galvez Bank is the closest and most accessible and, consequently, fished most often. In contrast, the other banks (White Tuna, Santa Rosa, Rota) are remote and can only be fished during exceptionally good weather conditions (Green 1997). Local fishermen report that up to ten commercial boats, with two to three people per boat, and some recreational boats, use the banks when the weather is good (Green 1997). The banks are fished using two methods: bottomfishing by hook-and-line and jigging at night for bigeye scad (*Selar crumenophthalmus*; Myers 1997). Catch composition of the shallow-bottomfish complex (or coral reef species) is dominated by lethrinids. Other important components of the bottomfish catch include lutjanids, carangids, serranids, and sharks. Holocentrids, mullids, labrids, scombrids, and balistids are minor components. It should be noted that at least two of these species (*Aprion virescens* and *Caranx lugubris*) also range into deeper water and some of the catch of these species occurs in the deepwater fishery.

Participants in small-scale offshore fisheries live throughout the island of Guam and are not concentrated in specific locales. Recent surveys of fishery participants found that these individuals reside throughout the island (Rubinstein 2001). With the small size of Guam, the dispersal of fishery participants and extensive community networks for sharing locally caught fish, it is likely that the social benefits of fishing are widely shared by most of the island's long-term residents (WPRFMC 2003).

Charter fishing has been a substantial component of the fishery since 1995, accounting for about 15–20 percent of all bottomfishing trips from 1995 through 2004 (WPRFMC 2006b). Charter vessels typically make multiple two-to-four hour trips on a daily basis. The charter fleet includes both vessels that engage in both trolling and bottomfishing trips and larger bottomfishing-only vessels that can accommodate as many as 35 patrons per trip. These larger vessels consistently fish in the same general area and release most of their catch, primarily small triggerfish, small groupers, and small goatfish. They occasionally keep larger fish and use a portion of the catch to serve as sashimi for their guests.

Guam's bottomfish datasets are from two voluntary creel surveys conducted year-round by DAWR personnel. The offshore creel survey obtains fishery information from boat-based participants, who are primarily trolling for pelagic species, bottomfishing, or jigging. However, methods not considered boat-based are often employed by fishermen who use boats to access remote shorelines, lagoons and reef margins to do spearing, gillnetting, and shoreline castnetting. The inshore creel survey obtains fishery information from shore-based participating, primarily employing hook-and-line, nets (gillnets, castnets, surround nets, etc.) and shore-based spearing. Both boat-based and shore-based methods harvest BMUS species.

Bottomfish Fishery Statistics

Total and Commercial Landings of BMUS and non-BMUS

Calculation: The estimated total landings of the bottomfish species are selected from both shore-based and boat-based expanded creel survey species composition files. However, the expanded estimates of catch by species may include a portion of the catch identified only by generic species codes categories. These generic categories (e.g. assorted/shallow/deep bottomfish) also include some non-BMUS bottomfish according to the FMP definition (e.g. triggerfish, wrasses, goatfish).

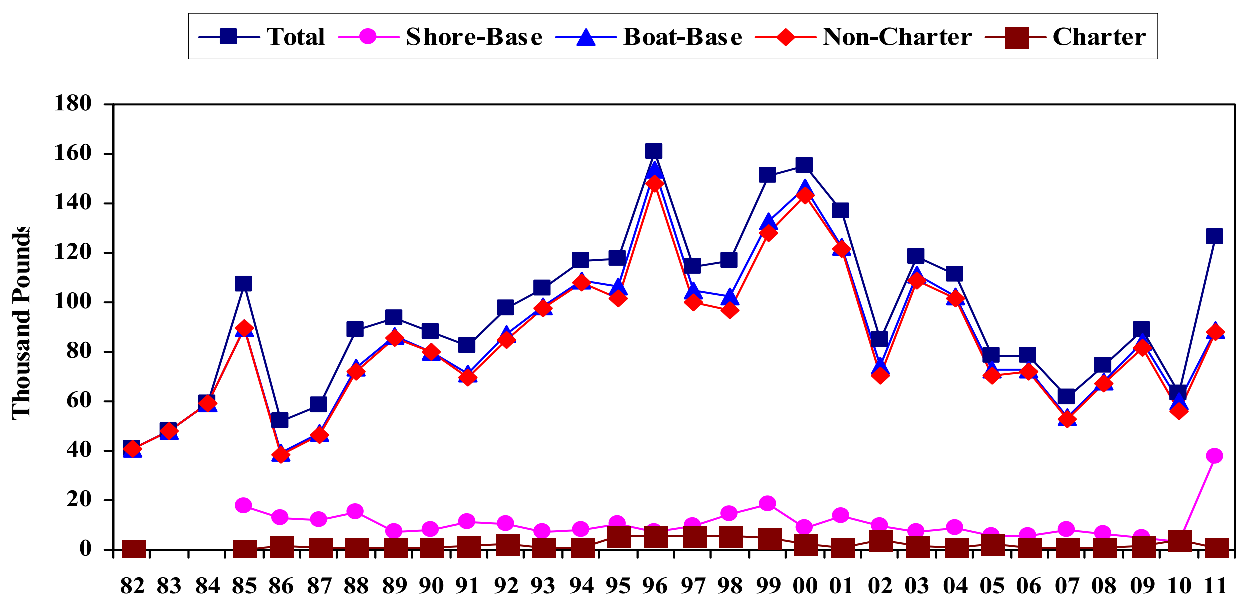

Figure 75. Temporal trends in the total landing of bottomfish, between sectors as well as landing origin (boat or shore) from 1982 to 2011 in Guam.

Trends and Interpretation: The 2011 total bottomfish and BMUS harvest, from both shore-based and boat-based fishing methods that caught bottomfish and BMUS species, increased 100% (126,717 pounds from 63,297 pounds) and 114% (59,172 pounds from 27,628 pounds) respectively. Both Bottomfish and BMUS harvests levels for 2011 were above the 30-year harvest average.

The shore-based bottomfish harvest increased over ten-fold (37,758 pounds from 3,337 pounds), while the boat-based bottomfish harvest increased 48% (88,959 pounds from 59,960 pounds). The boat-based non-charter bottomfish harvest increased 59% (88,396 pounds from 55,623 pounds) while the boat-based charter harvest decreased 87% (564 pounds from 4,337 pounds). The boat-based harvest comprised 70% of the bottomfish harvest.

The shore-based BMUS harvest increased 900% (1,090 pounds from 109 pounds), while the boat-based BMUS harvest increased 111% (58,082 pounds from 27,519 pounds). The boat-based non-charter BMUS harvest increased 126% (57,865 pounds from 25,602 pounds) while the boat-based charter harvest decreased 89% (216 pounds from 1,917 pounds). The boat-based non-charter fishers landed 98% of BMUS.

The increase in shoreline harvest was due to large harvests of juvenile jack pulse fisheries and other larger jack species by both shoreline hook and line and castnet fishers. The havest of juvenile jacks, *Caranx melampygus*, and *Caranx sexfasciatus* exceeded 120,000 pounds in 2011 compared with less than 5,000 pounds in 2010. Pulse fisheries in 2011 were more frequent and of longer duration compared with 2010. The boat-based increases were due to larger catches of onaga, ehu, overall jacks, and overall snapper landings.

Source: The DAWR boat-based and shore-based creel survey data as expanded by computer-based algorithms by method of fishing. All unidentified catch was allocated to species categories based on the species percentage of the total catch. The reported bottomfish and BMUS landings values were caught across all methods.

Estimated Fishing Effort and Participants

Calculation: The estimated number of boat trips and boat hours for bottomfishing methods are derived directly from the boat-based creel survey expansion algorithms. The annual value of bottomfish fishery participants was obtained by first running the WPacFIN-generated boat estimator model 1,000 times using a randomly selected order of the days sampled at all three sampling ports combined. Outliers were removed by eliminating the upper and lower 25 estimates. The mean and standard deviation were calculated for the remaining 950 estimates.

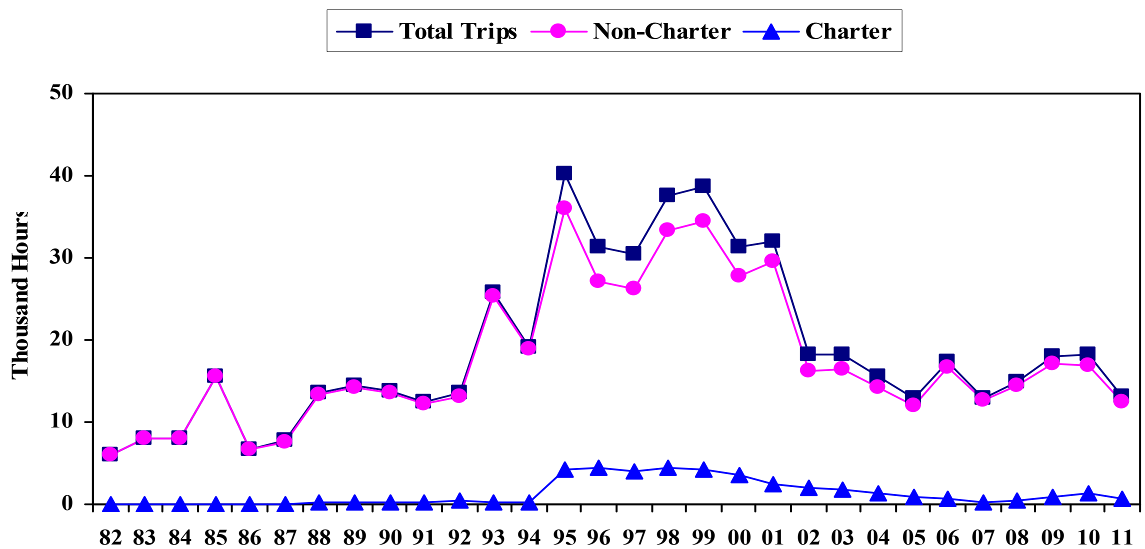

Figure 76. Annual estimates of number of hours boats are out bottomfishing (total and by sector) from 1982 to 2011 in Guam.

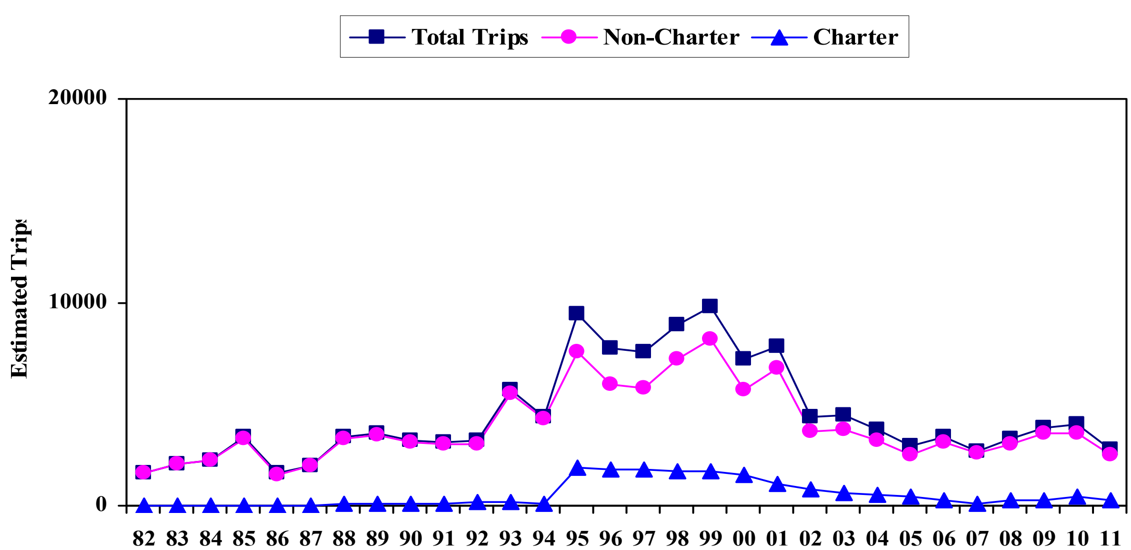

Figure 77. Annual estimates of number of trip made by boats harvesting bottomfish (total and by sector) from 1982 to 2011 in Guam.

Trends and Interpretation: Bottomfish effort, bottom fishing hours fished and the number of bottom fishing trips, shows effort increasing throughout the late 1990s until 2000. The period of economic growth on Guam during the early 1900s may have enabled more people to purchasing and utilize fishing boats. During this period, bottomfish harvest and the number of unique boats in the fishery also show a similar increasing trend. A decrease in overall effort after 2000 may have been due to several factors such as an increase in fuel costs, the cost of boating maintenance, the cost for fishing gear, a decrease in the bottom fish resource, and also from fishermen changing from bottom fishing to other more profitable fishing activities.

The passage of Public Law 24-21 in 1997 established five permanent marine preserves. This law closed off bottomfishing off Tumon Bay shoreward to 100 feet and closed off bottomfishing at the other four (4) preserves shoreward to 600 feet. Almost most of the coast is still available for fishing, a closure of these areas may have initially resulted in a decrease in fishing effort as fishermen fishing those grounds needed to find similar fishing grounds. However effort remained virtually the same from 1997 to 1999. Fishing effort began around 2000, with effort leveling off for approximately the last five years.

The closure of the makeshift ramp at Ylig bay occurred early 2011 in order for the construction of the new bridge over the Ylig river. This makeshift ramp has been an important boat launching site, with boaters engaged in trolling, bottom fishing, and spearing seen in significant numbers during periods of calm weather. In addition, the makeshift ramp is used by search and rescue for access to the eastern coast of Guam. Unfortunately, continued access at Ylig bay was not done as part of the construction plan for the new bridge. February 2011 was the last month trailered vehicles were reported by Agriculture. In anticipation of this, two formal requests were made to the Archdiocese of Agana for their consideration in obtaining property for boating access. Unfortunately, both requests were denied, citing excessive noise and trash from boaters. In addition, the Archdiocese has the Redemptoris Mater Seminary located above the makeshift ramp, and excessive noise has been an issue for the Seminary. Agriculture is considering requesting landowners on the other side of the river for land access, although this may be contested by the Archiocese of Agana. Currently, Agriculture is exploring other options to provide access to boating and fishing grounds on the east side of the island.

Total bottomfishing trips and hours decreased 31% and 29% respectively in 2011. Non-charter hours decreased 26% while charter hours decreased 57%. Non-charter trips decreased 29% while charter trips decreased 46%. Non-charter boats made up 96% of total bottomfishing hours and 92% of bottomfishing trips.

Source: The DAWR boat-based creel survey data, bottomfishing method only.

Calculations: The estimated number of boat-based bottomfishing trips and boat-based bottomfishing hours (bottomfishing method only) are derived directly from the creel survey expansion algorithms.

Estimated Catch per Unit Effort

Calculation: The yearly catch-per-unit-effort (CPUE) for "All Bottomfishing" is an expanded value of the Bottomfishing method only. It is calculated by taking the total expanded weight divided by the total expanded hours. The CPUE for "Deep Bottomfish" and "Shallow Bottomfish" are derived directly from actual interview data (unexpanded raw data).

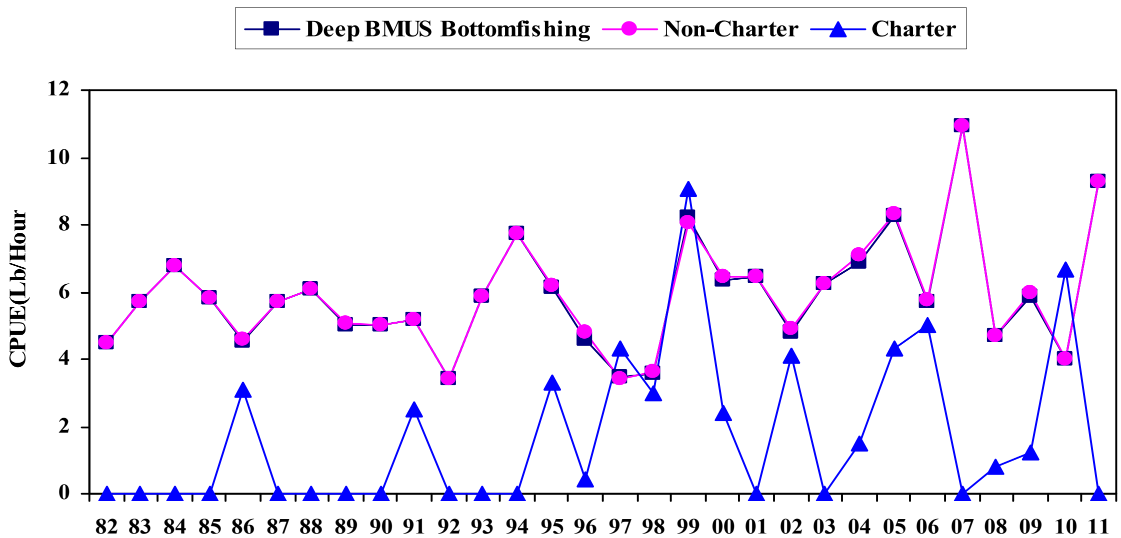

Figure 78. Overall CPUE trends for the deep BMUS by sector from 1982-2011 in Guam.

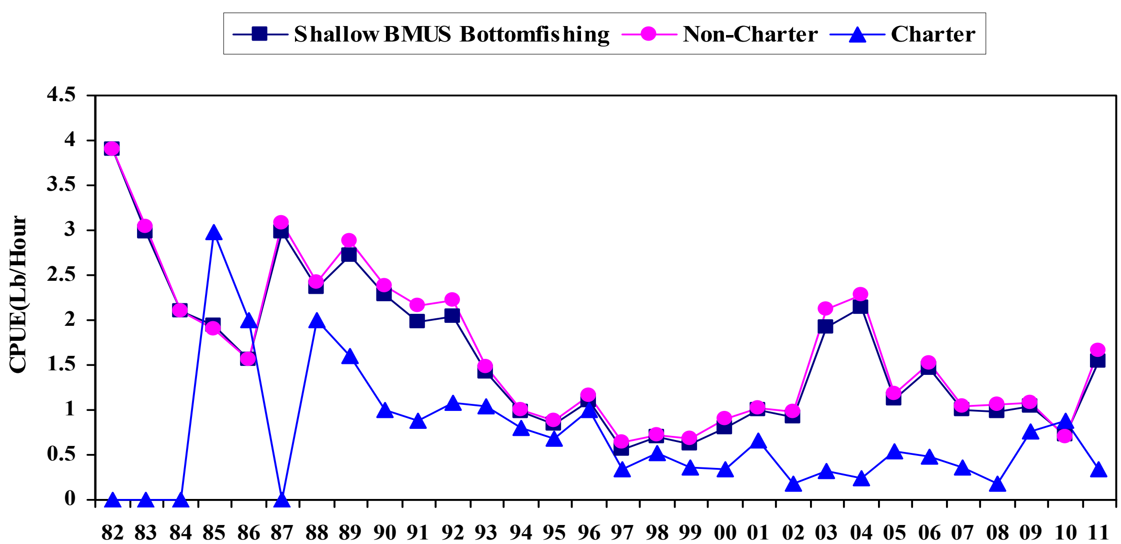

Figure 79. Overall CPUE trends for the shallow BMUS by sector from 1982-2011 in Guam.

Trends and Interpretation: The 2011 CPUE values, except for the charter trips, more than doubled. The CPUE for All Bottomfishing Trips, All Deep Trips, and All Shallow trips increased 117% (7.6 lbs/hr from 3.5 lbs/hr), 124% (10.3 lbs/hr from 4.6 lbs/hr), and 107% (6.4

lbs/hr from 3.1 lbs/hr) respectively. The CPUE for All BMUS Trips, Deep BMUS Trips, and Shallow BMUS trips increased 140% (4.1 lbs/hr from 1.71 lbs/hr), 132% (9.29 lbs/hr from 4.00 lbs/hr), and 115% (1.55 lbs/hr from 0.72 lbs/hr) respectively.

The CPUE for All Non-Charter Bottomfishing Trips, All Deep Trips, and All Shallow trips increased 129% (8.0 lbs/hr from 3.5 lbs/hr), 124% (10.3 lbs/hr from 4.6 lbs/hr), and 123% (6.9 lbs/hr from 3.1 lbs/hr) respectively. The CPUE for All Non-Charter BMUS Trips, Deep BMUS Trips, and Shallow BMUS trips increased 147% (4.32 lbs/hr from 1.75 lbs/hr), 132% (9.29 lbs/hr from 4.00 lbs/hr), and 137% (1.66 lbs/hr from 0.70 lbs/hr) respectively.

Charter CPUE for All Bottomfishing Trips and Shallow trips decreased 74% (0.9 lbs/hr from 3.5 lbs/hr) and 72% (0.9 lbs/hr from 3.2 lbs/hr) respectively. The charter strata for All BMUS Trips and Shallow BMUS trips decreased 74% (0.34 lbs/hr from 1.29 lbs/hr) and 61% (0.34 lbs/hr from 0.88 lbs/hr) respectively. Deep bottomfishing was not encountered by charter boats in 2011.

Source: The 2011 DAWR boat-based creel survey data for the bottomfishing method only.

Calculations: The yearly catch-per-unit-effort (CPUE) for "All Bottomfishing" in this section is a value taken only from the Bottomfishing method from the boat-based creel survey data. It is calculated by taking the total weight divided by the total hours (unexpanded raw interview data). The CPUE for "Deep Bottomfish" and "Shallow Bottomfish" are derived directly from actual interview data (unexpanded raw interview data). Years with no reported CPUE value for a particular strata indicates no interviews encountered during that year in order to calculate a CPUE value. This has occurred only in the charter strata.

Average Bottomfish Prices

Calculations: The average price of all bottomfish species combined is calculated by dividing the total bottomfish revenue by the sold weight. The inflation adjustment is made by using the Consumer Price Index (CPI) for Guam and establishing the 1998 figure as the base from which to calculate expansion factors for all previous years (e.g. divide the 1998 CPI by the CPI for any given year), and then multiplying the unadjusted average price by this factor to obtain the adjusted average price for the given year. A new "market basket" was created by the Department of Commerce in 1998, which resulted in the CPI figure being reset in 1999. The 2010 CPI value is 793.5.

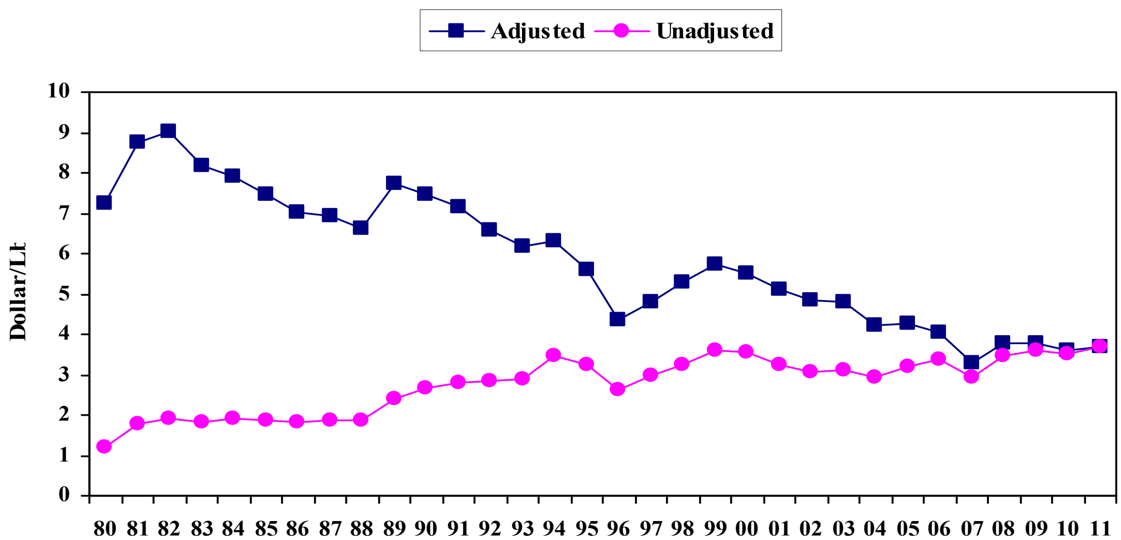

Figure 80. Consumer price index adjusted and unadjusted price of bottomfish in Guam from 1980 to 2011.

Trends and Interpretation: The decreases in adjusted fish prices observed prior to 1996 may have been the result of a consistent supply of reasonably priced fish and from numerous roadside vendors during those years. There were a significant number of roadside vendors, primarily from FSM, that imported species of fish of comparable size, including bottomfish and BMUS that competed with and may have discouraged local vendors from increasing the price of locally caught bottomfish. However, the Department of Public Health currently has been regulating these types of fish vendors. Not as prevalent as in the 1990s, but individuals selling iced fish in coolers can still be found alongside major highways and at public flea markets.

The adjusted price of bottomfish shows a general decreasing trend, although not as drastic as observed between 1980 and 1996. Roadside vendors and markets selling fish predominantly from the Federal States of Micronesia (FSM) and fish imports from Asia still compete with locally caught bottomfish fish. However, imported fish fills an important niche since the demand for bottomfish and BMUS still exceeds the quantity of bottomfish caught locally.

The adjusted average price for bottomfish has been showing a general decrease, with unadjusted prices showing a general increase. However, both unadjusted and adjusted prices show slight increases in 2011. The adjusted average 2011 price for bottomfish, $3.67, is a slight increase of 2% compared with 2010. The unadjusted price of bottomfish is above the 32-year average while the adjusted price of bottomfish still falls below the 32-year average.

Source: A summary of the commercial landings data from the major wholesalers is received by DAWR by the Pacific Islands Fishery Science Center in Honolulu.

Average Revenue per Trip

Calculation: The average revenue per trip for all species is calculated by summing the revenue of all species sold for any trip that landed bottomfish species, and dividing by the number of trips. The average bottomfish revenue per trips is calculated from those same trips by summing the sales of only bottomfish species and dividing by the number of trips.

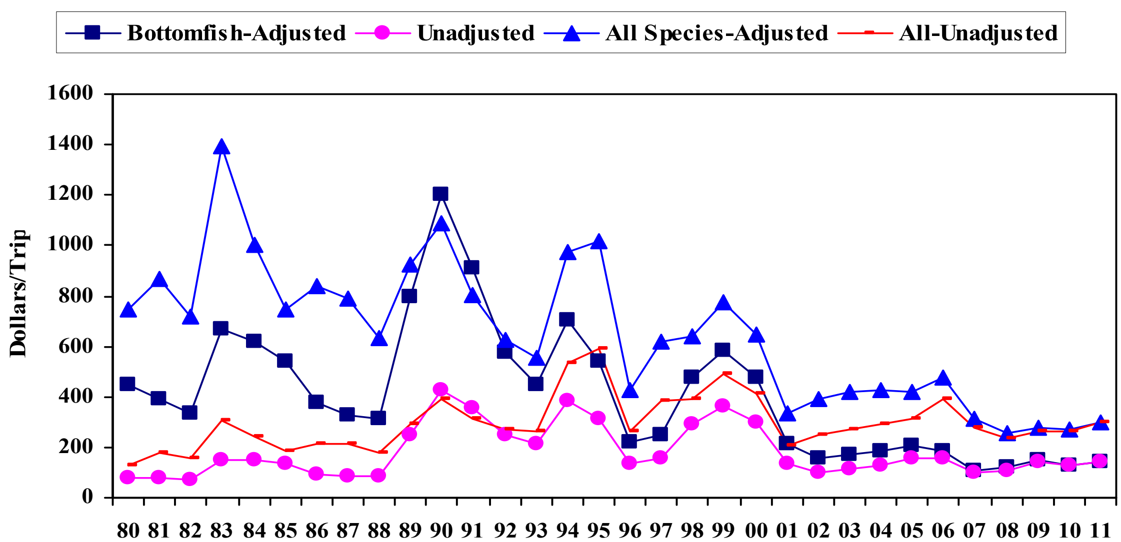

Figure 81. Average inflation adjusted revenue per trip landing bottomfish in Guam from 1980 to 2011.

Trends and Interpretation:

The inflation-adjusted average revenue for trips landing bottomfish had an increase of 8% in 2011 ($140/trip compared with $130/trip in 2010) and a 9% increase ($298/trip compared with $273/trip in 2010) when combining all species sold for that trip. Both values, however, are below the average adjusted revenue per trip in the 33-year time series.

Commercial fishery sectors, other than trips that did only bottomfishing, may include spearing from free divers and SCUB A spear divers and from the sale of fish from pulse fisheries such as mackerel scad. However, commercial fishers selling to a vendor participating in the commercial receipt book program may not always divide large catches into the various fish categories on the receipt book. Some trips, including commercial spearfishers, may have their entire catch lumped together as "reef fish." This may occur if all fish brought for sale are purchased by the vendor at the same price, with one weighing saving a significant amount of time compared with separating weighings dividing the catch to the family level.

Source: The commercial landings data from vendors participating in Fisheries' commercial receipt book program. The commercial summary is provided by the Pacific Islands Fishery Science Center in Honolulu for this section.

Bottomfish By-Catch

Bycatch is obtained directly from bottomfishing interviews where bycatch was voluntarily reported. It is an unexpanded number

Table 14. Estimated 2011 boat-based bottomfishing bycatch by sector.

Species Name	Number Released			Total	Bycatch (%)
	Alive	Dead / injured	Both		
Non-Charter					
Charter					
Serranidae	1		1	1	100
Mullidae	15		15	15	100
Parupeneus multifasciatus	8		8	12	66.67
Balistidae	16		16	16	100
Odonus niger	5		5	5	100
Charter Bycatch Total	45		45	49	91.84
Comparison with All Species Caught				127	35.43
All Bycatch Total	45		45	49	91.84
Comparison with All Species				2,081	2.16

Table 15. Summary of annual by-catch from the bottomfish fishery in Guam.

Year	**Released alive**	**Released dead/injured**	**Total Number Released**	**Total Number Landed**	**Percent Bycatch***	**Interviews with Bycatch**	**Total Number of Interviews**	**Percent of Interviews with Bycatch**
2001	620	3	623	3,896	16.0	58	183	31.7
2002	356	0	356	2,504	14.2	33	137	24.1
2003	191	0	191	1,888	10.1	14	101	13.9
2004	122	0	122	1,795	6.8	11	100	11
2005	66	0	66	1,669	3.95	6	103	5.82
2006	142	3	145	5,666	2.55	6	91	6.59
2007	139	0	139	5,361	2.59	5	12	41.66

2008	121	0	121	5,618	2.15	11	91	12.08
2009	75	2	77	2,702	2.84	8	134	5.97
2010	74	0	74	4,982	1.84	5	32	15.6
2011	45	0	45	2,081	2.16	3	10	30

*"percent bycatch" is the number of fish that was released or discarded compared to the total number of bottomfish that was landed. The bycatch information is obtained from unexpanded raw data, taken only from actual interviews that reported bycatch.

Trends and Interpretation: In 2011, the number of fish discarded as bycatch encountered decreased 39% from 74 pieces to 49 pieces. Bycatch was reported only by charter fishing boats and is composed primarily of juvenile groupers, triggerfish, and goatfish.

Source: The DAWR boat-based creel survey data for the bottomfishing method only. Bycatch is obtained directly from bottomfishing interviews where bycatch was voluntarily reported. It is an unexpanded number.

Calculations: Bycatch reflects the boat-based bottomfishing method, and is calculated by dividing the number of pieces of fish reported as bycatch by the number of fish caught by boat-based bottomfishing activity.

Status of the Guam Bottomfish Fishery

Moffitt et al. (2007) assessed the status of the bottomfish complexes in Guam, Commonwealth of Northern Mariana Island, and American Samoa using a surplus production model. The maximum sustainable yield for the Guam BMUS was estimated to be at 53,000 lbs per year. The BMUS biomass was above BMSY during 1982-2005 indicating that the stock is not overfished. Similarly, the estimates of relative exploitation rate indicate that the annual harvest rate has been below HMSY since 1982 except in 2000 indicating that the bottomfish complex has not experienced overfishing except perhaps in 2000. An updated stock assessment is scheduled to be released in June 2012.

Annual Catch Limits and Accountability Measures

The 2006 Reauthorization of the Magnuson-Stevens Act required that Regional Fishery Management Councils (RFMC) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee (SSC) or peer review process. Moreover, Councils were required to amend their fishery management plans to establish a mechanism for specifying annual catch limits at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

The MSA further directs that, unless otherwise provided for under an international agreement to which the U.S. participates, this mechanism must be established by 2010 for fisheries subject to overfishing, and by 2011 for all other fisheries. On January 16, 2009, the National Marine Fisheries Service (NMFS) published advisory guidelines under 50 CFR §600.310 (74 FR 3178) to assist RFMCs in implementing ACL and AM requirements.

To comply with the ACL and AM requirements, the Western Pacific Fishery Management Council (Council), in coordination with NMFS, prepared an omnibus amendment to the Fishery Ecosystem Plans (FEP) for American Samoa, Hawaii, the Mariana Archipelago (Guam and the Commonwealth of the Northern Mariana Islands (CNMI)), Pacific Remote Island Areas, and Pacific Pelagic fisheries. The amendment describes the mechanism the Council will use to specify ACLs and AMs for each FEP fishery. This includes:

> 1) Establishing a mechanism in each FEP that the Council will use to determine ACLs and AMs , including a process for setting acceptable biological catch limits (ABCs);
>
> 2) Adopt the ecosystem component (EC) species classification described in the NMFS advisory guidelines for National Standard 1 (NS1) so the Council can develop specific criteria for identifying EC species in subsequent amendments to the FEPs; and
>
> 3) Identify pelagic management unit species that have statutory exceptions to the ACL and AM requirements. The ACL and AM mechanism is designed to ensure long term sustainability of the fishery resources under the Council's jurisdiction.

Expanded catch landing time series from the combined boat and shore-based creel survey was used to determine ABCs. No stock assessment is available to base the overfishing limit from which the ABCs are typically referred from. The ABCs for most of the coral reef ecosystem management unit species are based on the modified Tier 5 control rule (catch only data) of ABC = 1*75th percentile of the entire catch time series. The ACLs were then set equal to ABC because catches were small relative to the biomass (estimated from CRED Rapid Ecological Assessment expanded to hard bottom habitats from 0-30m, see William 2010). Vulnerable species such as, humphead wrasse, bumphead parrotfish, and shark does not have a significant catch time series that this control rule can be applied. Biomass was used as a proxy data where 5% of the expanded biomass was used to generate the ABC. Guam bottomfish ABCs were based on the tier 4 control rule (ABC=091*MSY) where MSY was based on Moffitt et al 2007. The ACL was set equal to ABCs for the Guam bottomfish complex. Non-finfish ABCs were based on a range of methods described as follows:

Spiny lobster: ABC = 1*75th percentile of the entire catch time series; then ACL = ABC
Slipper lobster: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Deepwater shrimp: ABC = MSY – area proxy based on AS MSY estimate; then ACL = ABC
Kona crab: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Black corals: ABC = MSY – area proxy based on Hawaii MSY estimate; then ACL = ABC
Precious corals: maintained the quota of 1000 kg/yr and set that as the ABC; then ACL = ABC

Accountability measures are rules set to make sure that the ACLs are not exceeded and specifies steps to be taken once ACLs exceeded. In-season monitoring is currently beyond the capability of the local resource management agencies in all island commonwealth, territories and the State of Hawaii. None of the island commonwealth and territories has mandatory catch reporting. Total catches covering only areas within the survey boundaries are estimated using expansions of the creel survey catch estimates. The expansions are done on an annual basis in order to ensure that there is enough data to pool to come up with a reasonable catch estimate. Realistic monthly expansions are not possible without sacrificing the credibility of the results. Although the State of Hawaii are able to monitor and project catches for the deep 7 bottomfish fishery, attaining a complete catch report in a timely manner from a diverse and high number of participants in the coral reef fishery proved to be a big challenge. In addition, the only sector that is being monitored in Hawaii is the commercial sector. Majority of the coral reef fish catch are known to come from the recreational sector which is poorly monitored. The current personnel and logistics can only accommodate a limited number of species for near real-time monitoring. Expanding the number of species to be monitored is beyond the current capabilities and unless a significant funding resource is provided for the expansion, in-season accountability measures is not possible.

2012 Annual Catch Limit Specification and Monitoring

The following are the ACLs specified for fishing year 2012:

Table 16. Current landing of different management unit species relative to the specified annual catch limits in the near-shore fisheries in Guam for fishing year 2012.

Fishery	Management Unit Species	ACLs	FY 2012 Catch Landing
Bottomfish	Bottomfish multi-species stock complex	48,200 lb (21,863 kg)	TBD
Crustaceans	Deepwater Shrimp	48,488 lb (21,994 kg)	TBD
	Spiny Lobster	2,700 lb (1,225 kg)	TBD
	Slipper Lobster	20 lb (9 kg)	TBD
	Kona Crab	1,900 lb (862 kg)	TBD
Precious Coral	Black Coral	700 kg (1,543 lb)	TBD
	Precious Corals in the Guam Exploratory Area	1,000 kg (2,205 lb)	TBD
Cora Reef Ecosystem	Acanthuridae – surgeonfish	70,702 lb (32,070 kg)	TBD
	Carangidae – jacks	45,377 lb (20,583 kg)	TBD
	<u>Selar crumenophthalmus</u> – atulai or bigeye scad	56,514 lb (25,634 kg)	TBD
	Lethrinidae – emperors	38,720 lb (17,563 kg)	TBD
	Scaridae – parrotfish	28,649 lb (12,995 kg)	TBD
	Mullidae – goatfish	25,367 lb (11,506 kg)	TBD
	Mollusks – turbo snail; octopus; giant clams	21,941 lb (9,952 kg)	TBD
	Siganidae – rabbitfish	26,120 lb (11,848 kg)	TBD
	Lutjanidae – snappers	17,726 lb (8,040 kg)	TBD
	Serranidae – groupers	17,958 lb (8,146 kg)	TBD
	Mugilidae – mullets	15,032 lb (6,818 kg)	TBD
	Kyphosidae – chubs/rudderfish	13,247 lb (6,009 kg)	TBD
	Crustaceans - crabs	5,523 lb (2,505 kg)	TBD
	Holocentridae – squirrelfish	8,300 lb (3,765 kg)	TBD
	Algae	5,329 lb (2,417 kg)	TBD
	Labridae – wrasses	5,195 lb (2,356 kg)	TBD
	<u>Bolbometopon muricatum</u> – bumphead parrotfish	797 lb (362 kg) (CNMI and Guam combined)	TBD
	<u>Cheilinus undulatus</u> – Humphead (Napoleon) wrasse	1,960 lb (889 kg)	TBD

	Carcharhinidae – Reef Sharks	6,942 lb (3,149 kg)	TBD
	All Other CREMUS combined	83,214 lb (37,745 kg)	TBD

Fishing year 2012 is the first year of ACL implementation. No catch data is available during the drafting of this report to determine if the limit had been exceeded. Monitoring still continues through the creel surveys.

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CHAPTER 3: COMMONWEALTH OF NORTHERN MARIANA ISLANDS FISHERY ECOSYSTEM REPORT

CHAPTER 3: Commonwealth of Northern Mariana Islands Fishery Ecosystem Report

Chapter authors: Sean MacDuff and Ray Roberto, Division of Fish and Wildlife, PO Box 10007 Saipan, MP 96950

SUMMARY: The CNMI Archipelagic Fishery Annual Report is a compilation and assessment of the islands coral reef and bottomfish fisheries resources. This report also discusses Annual Catch Limits (ACL) and provides the 2012 ACLs for the CNMI. Finally, this report discusses the current projects, workshops, and other activities sponsored by the Western Pacific Fishery Management Council (Council) in the CNMI.

The assessment of the boat- and shore- based coral reef fisheries is based on fisheries dependent creel survey data. Fisheries independent survey data are being collected, but are not used to generate the graphs used in this report. The main boat-based fishing methods are Bottomfishing (non BMUS), Trolling, Snorkel Spearfishing, Atulai, and Cast Net. The Bottomfish method (non BMUS) landed the most fish from 2000 to 2011 averaging about 32,000 lbs each year. Emperor fish are the main catch, sometimes doubling or tripling the next most landed species. In 2007, Boat-based Bottomfishing landed just under 60,000 lbs, two thirds of that were Emperors. The main shore-based methods are Hook and Line, Snorkel Spearfishing, and Cast Net. The shore-based creel survey was designed to capture fishing from shore. Hook and line was the most frequent fishing method encountered, consequently it also landed the most fish averaging about 18,000 lbs from 2005 to 2011. Jacks, followed closely by Emperors were the most landed fish by this method.

2011 reporting for the Bottomfish fishery (BMUS) is currently incomplete. The data reported in this report covers data up to 2010. There was a 46% decrease in bottomfish landings from 2009 to 2010 figures. The number of trips during which bottomfishes were caught also decreased 46% from 2009 to 2010. The average bottomfish catch per trip remained the same. This fishery continues to show a high turnover with changes in the high liners participating in the fishery. Fishermen sometimes conduct multi-purpose trips that focus primarily on shallow-water bottomfishes and catch pelagic species while in transit. In doing so, the shallow-water bottomfish complex continues to be exploited, but as part of the exploitation of reefs near the populated islands. Redgill emperor (mafute') is the most frequently harvested and easily identified species in this complex, although a variety of snappers and groupers are also harvested. Revenues and prices for bottomfishes were decreased by 44% in 2010 than in 2009, with the inflation-adjusted revenue increasing by 1% and the inflation-adjusted average price per pound increasing 3%.

The Council sponsored several workshops in the CNMI. The Council co-hosted the Open Ocean Cage Culture Symposium with the Northern Marianas College Cooperative Research, Extension and Education Service on January 26-27, 2011 at the Saipan World Resort in CNMI.

The goal of the workshop was to provide a forum to discuss the development and advancement of an aquaculture industry in CNMI. On January 25-27 the Council also convened a workshop to address the status and recovery of green turtles in the Mariana Archipelago. This workshop aimed to strengthen international collaborations with areas with known common green turtle stocks and to identify the cultural needs and traditions associated with green turtles and develop methods to integrate such needs into green turtle conservation activities in the Commonwealth of the Northern Mariana Islands (CNMI) and Guam.

CNMI Coral Reef Fishery

Small-scale nearshore fisheries in the CNMI are of fundamental importance for subsistence, social and cultural purposes, in addition to providing food, trade, and recreational resources. In CNMI, most coral reef fishing occurs in near-shore areas. Finfish and invertebrates are the primary targets and small quantities of seaweed are also harvested. Cast-netting, spear-fishing, hook and line, gleaning, trolling, and bottom fishing are just some of the common fishing techniques practiced in CNMI. The coral reef fishery is an important resource for families in the CNMI. Not only is it a source of food but also an alternate source of income and majority of fishermen sell part of their catch and keep the rest for consumption.

Some of the common families targeted by CNMI's reef fish fishery are:
Acanthuridae (surgeonfish), Scaridae (parrotfish), Mullidae (goatfish), Serranidae, (grouper), Labridae (wrasse), Holocentridae (soldier/squirrelfish), Carangidae (Jacks), Balistidae (triggerfish), Scombridae (scad), Haemulidae (sweetlips), Gerridae (mojarra), Kuhliidae (flagtail), Kyphosidae (rudderfish) and Mugilidae (mullet), as well as other and non-finfish.

Currently, there are five Marine Protected Areas (MPAs) in the waters around Saipan, three of which are no take marine conservation areas and two species based reserves. Additional management measures such as gillnet ban and scuba spear fishing ban, trochus moratorium, sea cucumber moratorium, cast net restrictions, lobster size limits, and others have been implemented in recent years.

CNMI Bottomfish Fishery

The Commonwealth of the Northern Mariana Islands' (CNMI) bottomfish fishery occurs primarily around the islands and banks from Rota Island to Zealandia Bank north of Sarigan. However, the data are limited to the catches landed on Saipan, which is by far the largest market. Landings (in pounds) and revenues are inflated by 30% to represent the CNMI as a whole (assuming a 60% coverage of the commercial sales on Saipan and that Saipan is 90% of the market). The fishery is characterized in this report by data collected through the Commercial Purchase Database, which indirectly records actual landings by recording all local fish sales to commercial establishments. This data collection system is dependent upon voluntary participation by first-level purchasers of local fresh fish to accurately record all fish purchases by species categories on specially designed invoices. Division of Fish and Wildlife (DFW) staff routinely collected and distributed invoice books to around 30 participating local fish purchasers in 2009; which include the majority of the fish markets, stores, restaurants, hotels, government agencies, and roadside vendors (fish-mobiles). This reduction from participants last year is due to the economic down turn in CNMI which has forced a number of vendors and businesses to close.

Although this data collection system has been in operation since the mid-1970s, only data collected since 1983 are considered accurate enough to be comparable for most aspects of the fishery. The identification and categorization of fishes on the sales invoices has improved markedly in the last 10 years. Unfortunately, two inherent problems remain in the database. First, a number of the bottomfish MUS are not listed on the sales receipts. This was partially corrected by the addition of new taxa (but not all BMUS species) to the receipts (black jack, giant trevally, amberjack, ehu, blueline snapper, and kalikali were added to sales invoices in 2001). Moreover, for those BMUS species not specifically listed on the receipts there remains some confusion regarding where they should be added to the receipts. Second, the commercial sales invoice is a voluntary program which not all vendors participate in.

The CNMI's bottomfishery still consists primarily of small-scale local boats engaged in local commercial and subsistence fishing, although a few (generally <5) larger vessels (30–60 ft) usually participate in the fishery. The bottomfishery can be broken down into two sectors: deep-water (>500 ft) and shallow-water (100–500 ft) fisheries. The deep-water fishery is primarily commercial, targeting snappers and groupers. The snappers targeted include members of *Etelis* and *Pristipomoides,* whereas the eight-band grouper (*Epinephelus octofasciatus*) is the only targeted grouper. The shallow-water fishery, which targets the redgill emperor (*Lethrinus rubrioperculatus*), is mostly commercial but also includes subsistence fishermen. These fishermen are taking not only bottomfishes, but many reef fishes (especially snappers and groupers) as well. Hand lines, home-fabricated hand reels and electric reels are the commonly used gear for small-scale fishing operations, whereas electric reels and hydraulics are the commonly used gear for the larger operations in this fishery. Historically, some trips have lasted for more than a day, but currently, effort is defined and calculated on a daily trip basis. Fishing trips are often restricted to daylight hours, with vessels presumed to return before or soon after sunset, unless fishing in the northern islands. In terms of participation, the bottomfish fleet consists primarily of vessels less than 30 ft long that are usually limited to a 50-mi radius from Saipan. The larger commercial vessels that are able to fish extended trips and which focus their effort from Esmeralda Bank to Zealandia Bank are presumed to have landed the majority of the deep-water bottomfish reported through the purchase receipt forms.

Bottomfishing requires more technical skill than pelagic trolling, including knowledge of the location of specific bathymetric features. Presently, bottomfishing can still be described as "hit or miss" for most of the smaller (12–29 ft) vessels. Without fathometers or nautical charts, the majority of fishermen utilizing smaller vessels often rely on land features for guidance to a fishing area. This type of fishing is inefficient and usually results in a lower catch-per-unit-effort (CPUE) in comparison with pelagic trolling. These fishermen tend to make multi-purpose trips—trolling on their way to reefs where they fish for shallow-water bottomfish and reef fish. Larger sized (30-ft and larger) vessels typically utilize Global Positioning System (GPS), fathometers, and electric reels, resulting in a more efficient operation. In addition, reef fishes are now commanding a consistently higher price than in previous years. This appears to be reflected in an increased number of fishermen using small vessels focusing on reef and/or pelagic species over bottomfishes.

Fishermen targeting the deep-water bottomfish, if successful, tend to fish for 1–4 years before leaving the fishery, whereas the majority of fishermen targeting shallow-water bottomfish tend to leave the fishery after the first year. The overall participation of fishermen in the bottomfishery tends to be very short term (less than 4 years). The slight difference between the shallow-water fishermen and the deep-water fishermen likely reflects the greater skill and investment required to participate in the deep-water bottomfishery. In addition, these tend to be larger ventures that are more buffered from the vagaries of an individual's choices and are usually dependent on a skilled captain/fisherman. Overall, the long-term commitment to hard work, maintenance and repairs, and staff retention appear to be difficult, if not impossible for CNMI bottomfishermen to sustain more than a few years.

Boat-Based Fishery

The boat-based coral reef fisheries are comprised of the following fishing methods: trolling, bottomfishing, atulai fishing, spearfishing (non SCUBA), octopus hooking, and cast netting. However, the most dominant ones are: trolling, bottomfishing, spearfishing (non SCUBA), atulai, and cast net. These five fishing method lands 95% of the total boat based landing. Gillnets were banned in 2003 with exemptions granted for cultural reasons (fiestas, etc.). Rota and Tinian amended this ban to allow gillnet use with permit on each respective island in 2010 and 2011. Scuba spear fishing was banned in Tinian in 2002 and in Saipan and the Northern Islands in 2003. The total catch and the CPUE for many species decreased drastically in the first several years of the survey. It is possible that these fisheries decreased, but because several fisheries that are not closely related followed similar trends, it could be attributed to an initial learning curve for collecting survey data and identifying fish species.

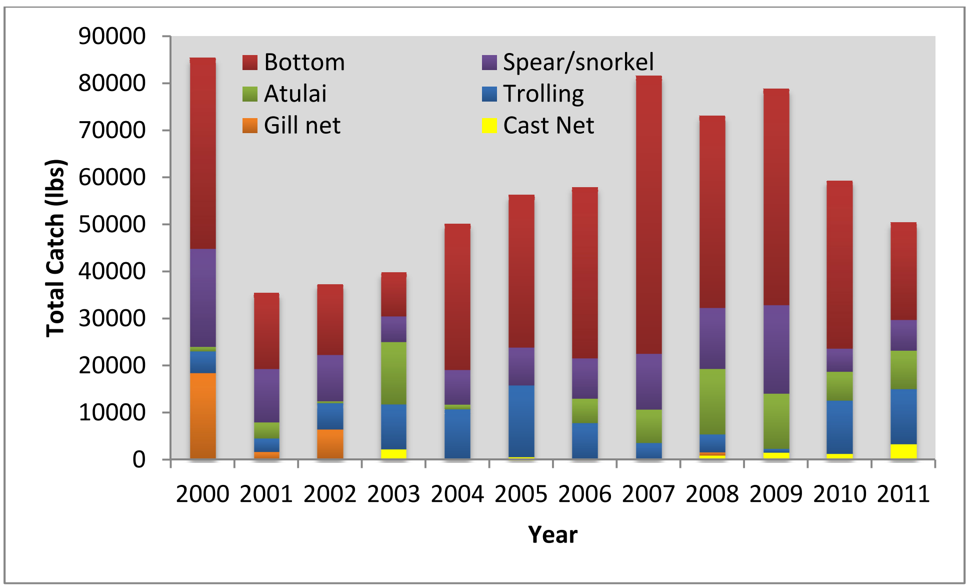


Figure 82. Total landings (lbs) from the dominant boat-based methods from 2000 to 2011.

Trends and Interpretation: Total pounds caught over the past ten years for the boat-based survey have not indicated drastic changes, except for 2000, where landings seem to be excessively high with respect to the other years. This is because the use of gill nets was still legal in the CNMI. A regulation prohibiting the use of gill nets was implemented in 2003 (some exemptions). Gill netting accounted for about 22% of the landings for the year 2000. The 2008 record of gill net fishing was a chance encounter with the permitted net fishing activity. These fishing activities are usually monitored on an opportunistic basis. Although 5-10 cultural gillnet exemptions are granted each year, DFW closely monitors total pounds taken. This has effectively removed the effects of fishing with gillnets on the overall fisheries of Saipan.

Total landings by gear type are highly variable by year. Bottomfishing makes up a large portion of the total landings each year and is less variable by year during the last seven years than other gear types. There seems to be a slight decrease in bottomfishing landings between 2010 and 2011. In 2011, bottomfishing accounted for 41% of the total landings. The cast net, trolling, spear/snorkel, and atulai methods have remained fairly constant between 2010 and 2011.

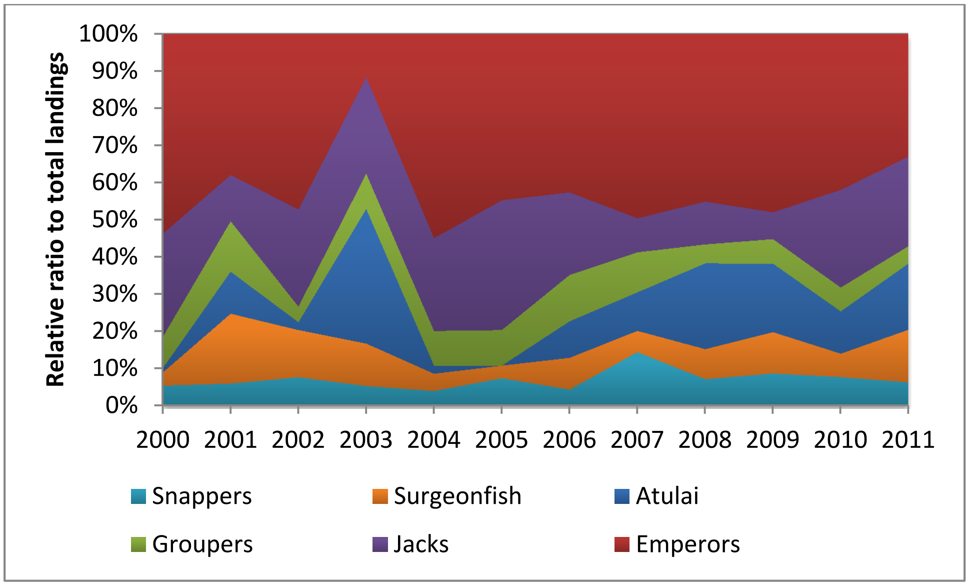


Figure 83. Relative ratio of the top six species/species groups to the total boat based catch landing from 2000 to 2011.

Trends and Interpretation: The relative ratio of landings seems to be dominated by emperor fish, with the exception of 2003, where Atulai dominated the catch for that year. Emperor fish are caught by various fishing methods, which may explain its' dominance in percent landed over the years. However, Emperor fish landings have slightly decreased from the previous years, which, may be relative to the decrease in number of fishers between the years (?). If the information on figure 1 is correct, then most of these Emperors and Jacks were caught by trolling or hook and line within the lagoon or along the reef line (we need to look at raw data).

Atulai percentages are highly variable with large percentages in a few years. Jacks and Surgeonfish show some yearly variability. Groupers, snappers and emperors are landed in consistent percentages with the exception of 2003. This exception likely had to do with the increased availability of atulai that year.

Bottomfish (BMUS) Fishery

Total and Commercial Landings of BMUS and non-BMUS

The estimated total landings of the bottomfish species are selected from both shore-based and boat-based expanded creel survey species composition files. However, the expanded estimates of catch by species may include a portion of the catch identified only by generic species codes categories. These generic categories (e.g. assorted/shallow/deep bottomfish) also include some non-BMUS bottomfish according to the FMP definition (e.g. triggerfish, wrasses, goatfish). 2011, data values, for all graphs below, are still being compiled and are incomplete. Trends discussed will not include 2011 data in this report.

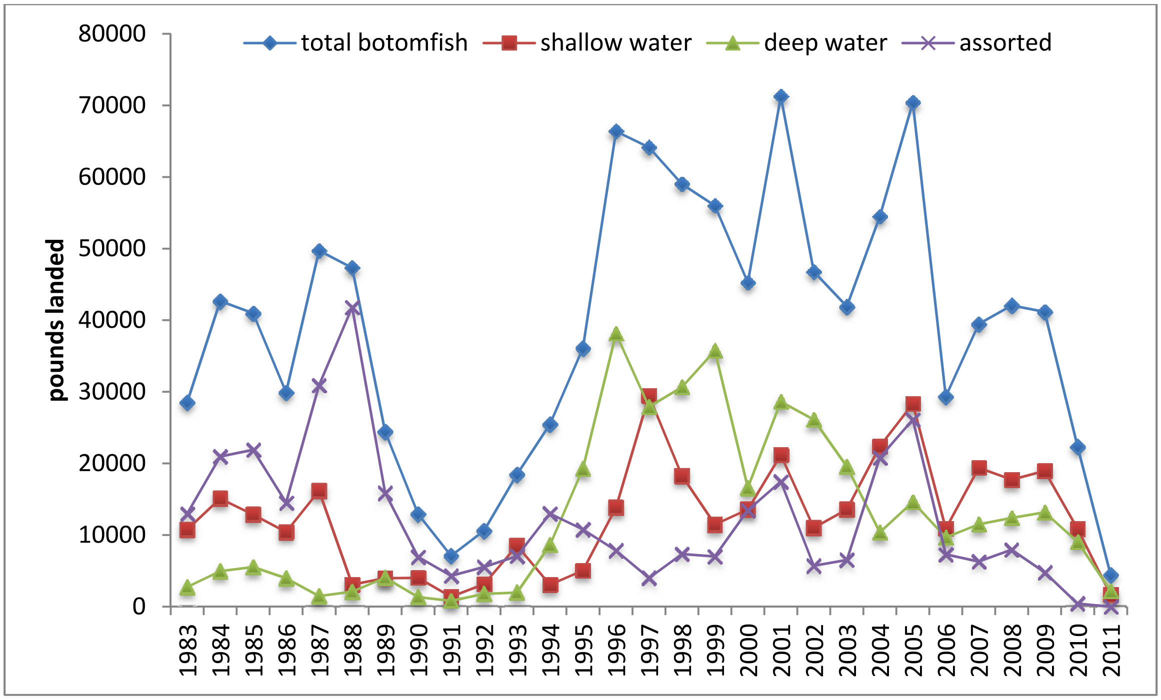


Figure 84. Commercial bottomfish landings allocated to sector of the fishery from 1983 to 2011.

Typical bottomfish catch in CNMI comprised of deep and shallow bottomfish management unit species (BMUS). Pristipomoides zonatus (gindai or yellow barred snapper) is part of the deep water complex.

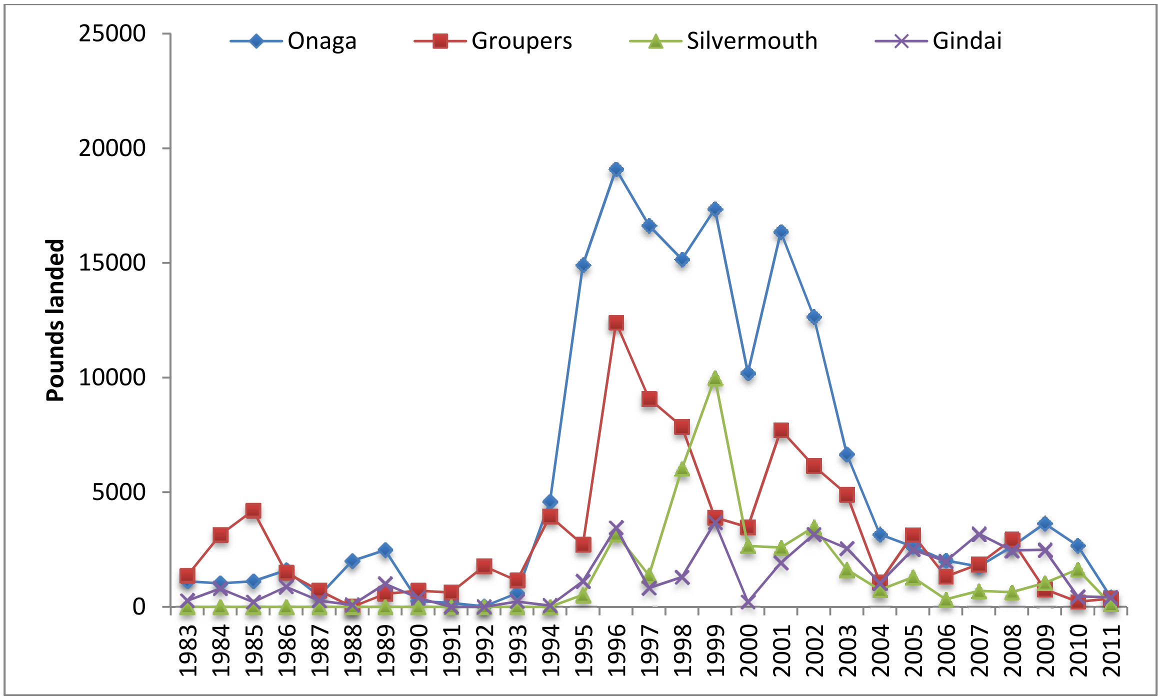


Figure 85. Commercial bottomfish landings (lbs) of deep-water species from 1983 to 2011.

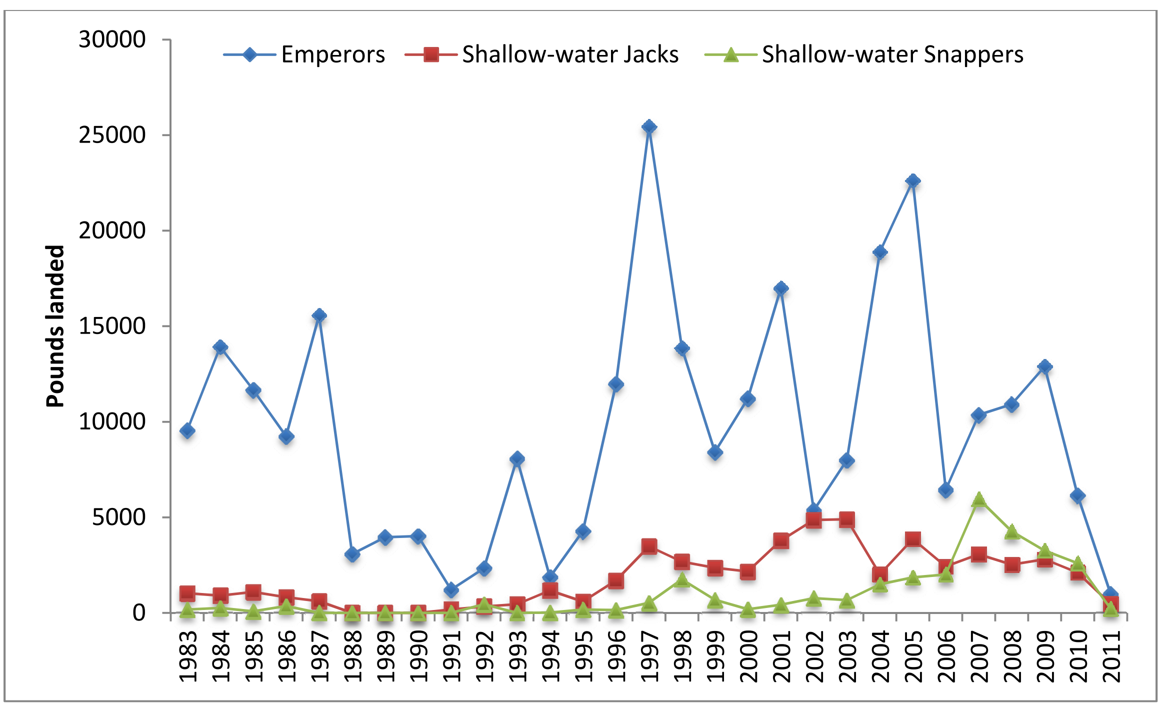


Figure 86. Commercial bottomfish landings (lbs) of shallow-water species from 1983 to 2011.

Trends and Interpretation: The number of pounds of bottomfishes sold (landings) decreased in 2010 by 54% from that of 2009. Majority of the larger vessels conducting deep-water bottom fishing did not fish in the northern islands from 2004 till present.

Bottomfishes that were categorized simply as "assorted bottomfish" were the largest portion of the landings until 1995. Since 1995, deep-water bottomfishes have been the largest portion of the catch, with shallow-water bottomfishes becoming the second largest portion of the catch in 1996, and remaining there through 2003. In 2003, "assorted bottomfishes" accounted for 15.6% of the landings. This reflects the use of the new sales invoice forms, with more species specifically listed. The use of the category "assorted bottomfish" will likely continue, because the diversity of the catch is great and many buyers sell these species as "assorted bottomfish," so there is little perceived need to identify them more completely. However in 2004 and 2005, shallow water bottomfish comprised the majority of the landings. This is probably due to restrictions on sea conditions, allowing the small fishing vessels to fish close to the islands for shallow-water bottom fish and the lack of fishing effort by the larger northern islands fishing vessels.
Deep-water bottomfish landings increased significantly in 1995 and have remained fairly high until 2001. This is likely the result of an increase in the number of large vessels participating in the deep-water bottomfishery that are capable of fishing the islands and banks north of Farallon de Medinilla. Note however, that deep-water bottomfishes are still caught near Saipan. Since 2001 rough sea conditions and vessels participating in the northern islands deep bottom fishery has declined fishing effort. 2004 landings of deep-water bottom fish decline drastically because of the lack of fishing effort in the northern islands. However in 2005 deep-water bottom fish increased 40% possibly due to the increased trips made. The variation in participation of these larger vessels greatly affects this part of the fishery.

The landings of onaga (*Etelis coruscans* and some *Etelis radiosus*) fell steeply in from 2003 to 2008 however 2009 landings increased 35% in 2009 but still below their 27-year mean. Note that this sector of the industry also has a high turnover, but differs from the mafute' in that successful onaga fishermen often participate for more (1–4) years. Landing of grouper primarily (*Epinephelus octofasciatus*, but almost certainly including shallow-water BMUS species such as *Variola louti* and *E. fasciatus*) have varied widely over the last 10 years with a 20.3% decrease in landings in 2002 from 2001, 21.6% decrease in landings in 2003 and decrease another 78% in 2004. In 2005 landings significantly increased 193% however the following two years landings decreased until increasing 53% in 2008. Grouper landings in 2009 and 2010 decreased 73% and 71% respectively. Most of these landings were from the smaller vessels fishing near the main island of Saipan. Silvermouth (*Aphareus rutilans*) and Gindai landings have fluctuated considerably.

The number of pounds of shallow-water bottomfishes commercially sold (landings) appeared to peak between 1996 and 2001. It is likely that there was a comparable peak in landings between 1984 and 1987, but this result is difficult to discern because of the large number of bottomfishes that were categorized as "assorted bottomfish" during the earlier period. The landings of emperor (mafute' of the family Lethrinidae) have experienced large fluctuations over the last 25 years, and particularly over the last 8 years. In 2002, the number of pounds of mafute' commercially sold fell, below the 20-year mean, to the lowest level since 1995. In 2003, the number of pounds of mafute' landed increased slightly, but is still below the 21-year mean. 2004 mafute' landings increased by 136% from 2003 and increased 18% in 2005. In 2006 mafute' landings dropped signicantly by 249% then increased 82% in 2007 and then dropped 31% in 2008 but increased 5% in 2009. The landings of jacks fished in shallow areas (itemized as "jacks," amberjack [*Seriola dumerili*], giant trevally [*Caranx ignobilis*], brassy trevally [*C. papuenis*], and black jack [*C. lugubris*] on the sales invoices) appears to have slowly increased over the last 10 years, with the highest landings reported in 2003. Landings of jacks were only 0.57% higher (28 pounds greater) in 2003, than in 2002 but decreased tremendously in 2004 by 87%. 2005 landings increased tremendously by 313% and landing remained relatively stable until 2008 when it decreased by 50% however landings in 2009 increased 17% and above the 27 year mean. The category "jacks" may include any carangids sold, including BMUS species, as well as *Carangoides orthogrammus, Caranx melampygus, C. papuensis,* and *C. sexfasciatus*. Landings of amberjack were higer by 128% higher in 2007 than the previous year and again increased 9% in 2008. 2009 landings decreased 40%. Giant trevally and black jack were reported in 2002 for the first time and brassy trevally was reported in 2003 for the first time, both likely as a result of being added to the new sales invoice. However Giant trevally is usually not purchased by vendors participating in the commercial invoice program therefore would be rarely recorded in this report. Jobfish (*Aprion virescens*) have been reported in consistently in the last 15 years, and in 2007 landings were the highest ever reported surpassing the 2004 record . 2005 for uku was just below 2004 but dropped in 2006 and then increasing over 3,000 lbs in 2007. 2008 landings decreased 49% and decreased another 37% in 2009. 2007 Landings of blueline snapper (*Lutjanus kasmira*) and Humpback snapper (*Lutjanus gibbus*) were much higher than last year, but this species is often lumped within assorted reef fishes. Landings of snapper in 2007 where the highest in the time series however landings decreased 53% in 2008 and decreased another 35% in 2009.

Estimated Fishing Effort and Participants

The estimated number of boat trips and boat hours for bottomfishing methods are derived directly from the boat-based creel survey expansion algorithms. The annual value of bottomfish fishery participants was obtained by first running the WPacFIN-generated boat estimator model 1,000 times using a randomly selected order of the days sampled at all three sampling ports combined. Outliers were removed by eliminating the upper and lower 25 estimates. The mean and standard deviation were calculated for the remaining 950 estimates.

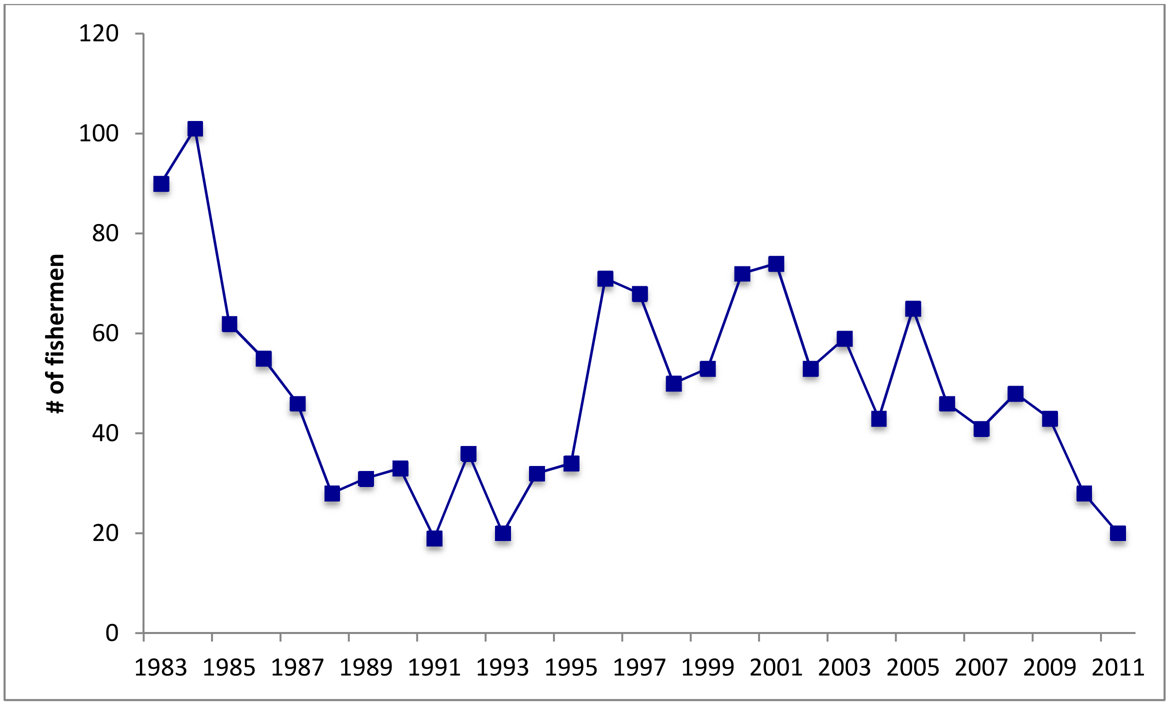


Figure 87. Number of fishermen (boats) making bottomfish landings from 1983 to 2011.

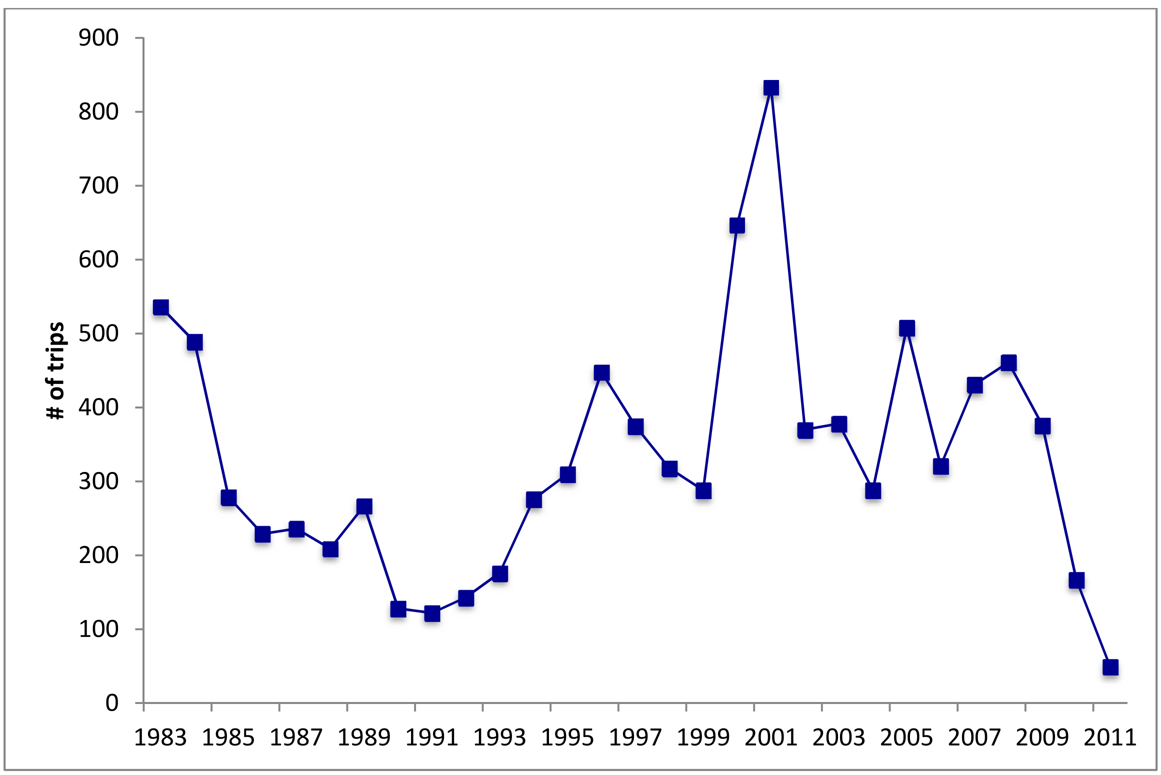


Figure 88. Number of bottomfish trips from 1983 to 2011.

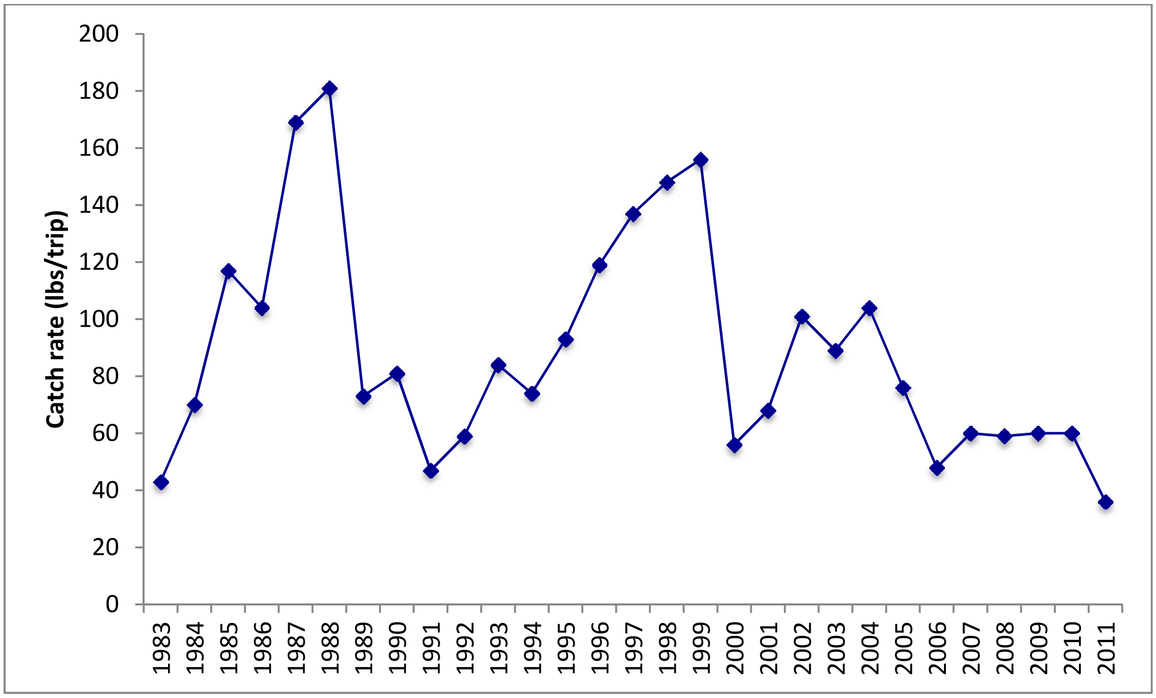


Figure 89. CNMI bottomfish average catch rate (lbs/trip) from 1983 to 2011.

Trends and Interpretation: The number of fishermen (used as a proxy for the number of boats) making commercial sales of any bottomfish species has varied widely over the last 26 years. In 2008 there were more fishermen selling bottomfish than last year, and the 2008 number is still slightly lower than 26-year mean. In 2010 there were 28 fishermen which was about a 35% decrease from 2009. Most of these fishermen are using small vessels and when catching bottomfish and are more likely to target the shallow-water species.

The number of bottomfish trips was high from 1983 through 1989 as a result of consistent fishing activity centered on the island of Farallon de Medinilla. This fishery subsequently largely ceased in 1990, resulting in a drop in bottomfish trips in the early 1990s. In 1994, consistent fishing activity in the northern islands began once more and has continued to the present (although participation seems to be dropping this year). The number of bottomfish trips more than doubled in 2000 and 2001 to reach the highest levels in 18 years. During this time, more of the smaller vessels increased their focus on reef fishes, and although bottomfishes were still being caught and sold, they were no longer the largest (or most valuable) part of the catch. This resulted in fishermen catching bottomfishes as co-lateral catch on more trips. The number of trips decreased in 2002 and remained at this lower level in 2003 (near the 20-year mean), probably as a result of fewer fishermen focusing on catching bottomfishes at all. The number of bottom fishing trips for 2004 decreased below the 22 year mean partly due to rough sea conditions through out the year and the decrease in participation or closure of vendors in the commercial sales invoice program. However, the 2005 trips increased by 75% possibly due to the troll fishermen conducting more bottomfishing. In 2006 the number of trips decreased 35% but increased in 2007 by 31%. 2008 number of trips declined slightly by 8% and further declining 17% in 2009 and 55% in 2010. The increasing fuel cost has caused many fishermen to conduct a multiple method trip (trolling and bottomfishing) in order to lower their fuel consumption and cost.

Although the average catch per trip is not a very good measure of CPUE, because it is subject to significant biases (e.g., changes in trip length and relative amounts of bottom fishing compared to trolling or reef fishing); it is the only measure readily obtained from the commercial purchase system. However, the smaller vessels commonly make mixed trips and the relative proportions of bottom fishes to pelagic and reef fishes are changing.

This report only represents the commercial fishery as reported on sales invoices in the CNMI. Charter vessels that do not sell their catch and recreational/subsistence catches are not included here.

Calculation: The purchasers identify the fisherman or boats selling the catch on the sales invoices used when they purchase fishes from the fishermen. The "number of fishermen" is the number of unique fishermen selling their catch of bottomfish within a given year.
Adding each recorded fisherman's sales for each day tallies the number of trips that resulted in landing any bottomfish. This assumes that each fisherman lands only once in a given day, and that all of the catch is sold on that day. Most trips last a single day, but it is also known that the occurrence of longer fishing trips happens. These actions will cause this measure of trips to underestimate the fishing effort tallied here as trips.

The catch rate is calculated by dividing the total weight of all bottomfish landings by the number of trips that landed bottomfish. Bottomfish revenue per trip is the total revenue of the bottomfish sold from a trip. The revenue per bottomfishing trip for all species is the total revenue for all trips that resulted in sales of any bottomfish. The inflation adjustment is made using the Consumer Price Index (CPI) and establishing the 2005 CPI figure as the basis by which calculations of previous years' prices are made.

Average Bottomfish Prices

The average price of all bottomfish species combined is calculated by dividing the total bottomfish revenue by the sold weight. The inflation adjustment is made by using the Consumer Price Index (CPI) for Guam and establishing the 1998 figure as the base from which to calculate expansion factors for all previous years (e.g. divide the 1998 CPI by the CPI for any given year), and then multiplying the unadjusted average price by this factor to obtain the adjusted average price for the given year. A new "market basket" was created by the Department of Commerce in 1998, which resulted in the CPI figure being reset in 1999.

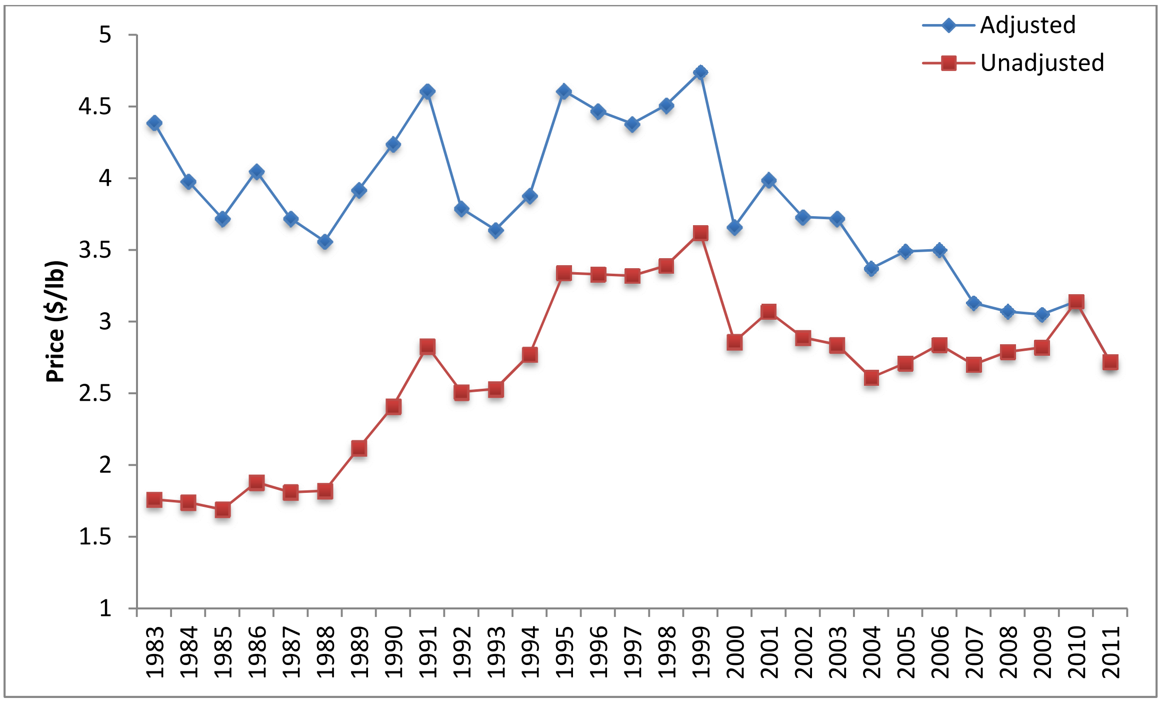


Figure 90. CNMI adjusted and unadjusted average prices ($/lb) of bottomfish from 1983 to 2011.

Trends and Interpretation: Landings, revenues, and adjusted revenues for 2009 are all below the 27-year mean. 2009 total bottomfish landings fell 10% in comparison to 2008 total landings. Landings, revenues, and adjusted revenues for bottomfishes has been fluctuating yearly mainly due to high turn over rate among fishermen that either leave the fishery or switch to other fishing methods like trolling for pelagics species. The economy also plays a major role in the demand for bottomfish.

Inflation-adjusted bottomfish revenues recovered slightly from the marked decrease of 2000, but fell 12.3% from 2002. The inflation-adjusted revenue for 2003 is 4.2% below the 21-yr mean. The 2004 inflation-adjusted revenue increased 18% from 2003. The inflation adjusted revenue for 2005 increased by 33 but declined in 2006 by 58%. In 2007 the inflation adjusted revenue recovered slightly by 19% and another 4% in 2008 however 2009 and 2010 inflation adjusted revenues decreased by 10% from 2008 levels. The bottomfish fishery has always been a small proportion of the total fisheries, and it appears that bottomfish are now a relatively lower percentage of the trip revenue on trips where bottomfish were caught. Moreover, many of the fishermen catching mafute' do so locally, but appear to be increasing their focus on reef fishes. Vessels capable of landing large amounts of onaga are usually larger vessels fishing the northern islands. The difficulty of maintaining the equipment, vessel, and crew to consistently and routinely make these trips successful appears to be difficult in the long term for fishermen in the CNMI, as seen by the loss of 4 of the 8 vessels from the fishery in 2003.

The adjusted average price per pound is still lower than the 27-yr mean. The unadjusted price is higher than the 27-yr mean. Bottomfishes are not commanding the high prices they once did however this may change due to increasing fuel costs. Local buyers seem to increasingly prefer reef fishes.

Calculation: The CNMI's consumer price index is computed by the CNMI Department of Commerce using the Laspeyres' formula. The CPIs for 1983–1987 were not available from the CNMI Department of Commerce and were, therefore, estimated by using Guam's annual inflation rate to proportionally adjust the 1988 CNMI CPI. The CNMI Department of Commerce "reset" the CPI to 1.00 for the 1st quarter of 2003, with the 3 subsequent quarters showing devaluation.

Revenue in dollars is from a simple summation of the value field. The average price for bottomfish is calculated by dividing the total revenue by the total landings. The inflation adjustment is made using the Consumer Price Index (CPI) and establishing the 2004 CPI figure as the basis by which calculations of previous years' prices are made.

Average Revenue per Trip

The average revenue per trip for all species is calculated by summing the revenue of all species sold for any trip that landed bottomfish species, and dividing by the number of trips. The average bottomfish revenue per trips is calculated from those same trips by summing the sales of only bottomfish species and dividing by the number of trips.

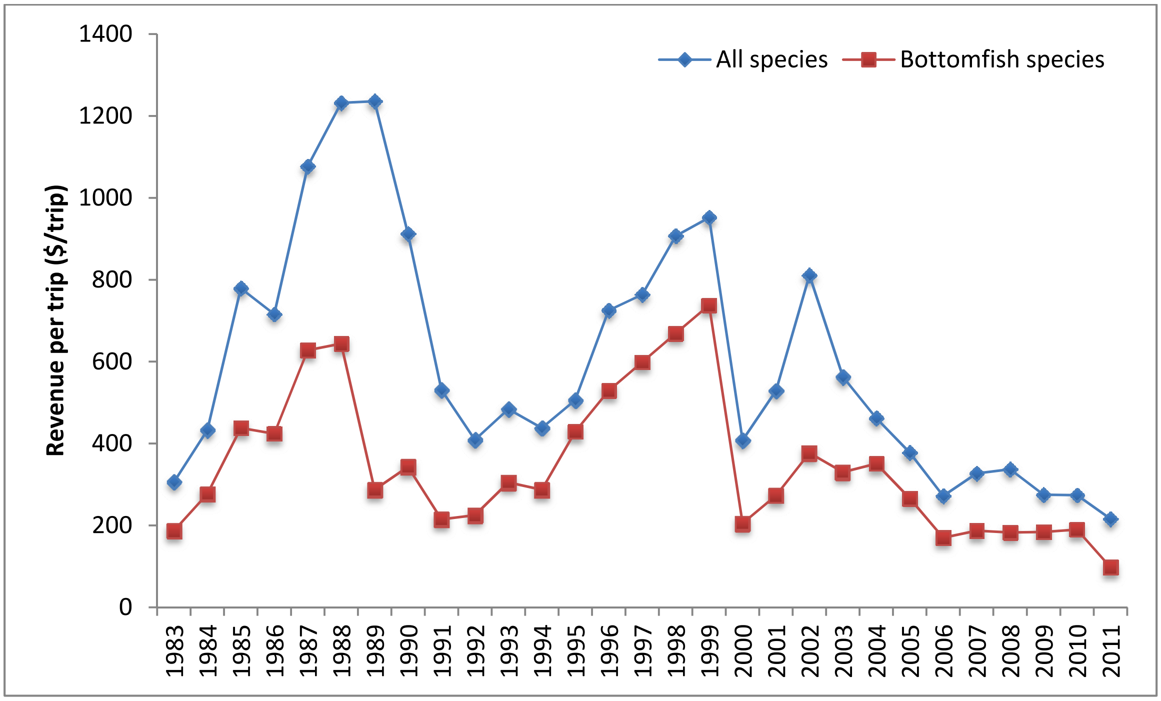


Figure 91. CNMI average inflation-adjusted revenue per trip landing bottomfish from 1983 to 2011.

Trends and Interpretation: The substantial increase in pounds of bottomfish sold per trip since the low in 1991 can be primarily attributed to the northern islands fishery, coincident with the increase in vessels making bottomfish trips, increased revenues, and annual landings during the next 8 years. The average pounds of bottomfish landed per trip in 2000 decreased 63.1% from 1999, and recovered slightly in 2001 and 2002. In 2005 bottomfish landed per trip decreased and continued in 2006 but in 2007 bottomfish landed per trip increased slightly over 2006 by 20%. 2008 lbs/trip declined 3% however 2009 lbs/trip increased slightly by 2%.

This report only represents the commercial fishery as reported on sales invoices in the CNMI. Charter vessels that do not sell their catch and recreational/subsistence catches are not included here.

Calculation: The purchasers identify the fisherman or boats selling the catch on the sales invoices used when they purchase fishes from the fishermen. The "number of fishermen" is the number of unique fishermen selling their catch of bottomfish within a given year.
Adding each recorded fisherman's sales for each day tallies the number of trips that resulted in landing any bottomfish. This assumes that each fisherman lands only once in a given day, and

that all of the catch is sold on that day. Most trips last a single day, but it is also known that the occurrence of longer fishing trips happens. These actions will cause this measure of trips to underestimate the fishing effort tallied here as trips.

Bottomfish By-Catch

Bycatch is obtained directly from bottomfishing interviews where bycatch was voluntarily reported. It is an unexpanded number.

The CNMI Bottom fishery characteristics render minimal by-catch. Interactions with protected species are believed to be minimal. To date, there have been no reported or observed interactions between protected species and coral reef fisheries in Federal waters around the CNMI and the potential for interactions is believed to be low due to the gear types and fishing methods used.

Status of the Guam Bottomfish Fishery

Moffitt et al. (2007) assessed the status of the bottomfish complexes in Guam, Commonwealth of Northern Mariana Island, and American Samoa using a surplus production model. The maximum sustainable yield for the CNMI BMUS was estimated to be at 200,500 lbs per year. The BMUS biomass was above BMSY during 1982-2005 indicating that the stock is not overfished. Similarly, the estimates of relative exploitation rate indicate that the annual harvest rate has been below HMSY from 1985 - 2005 indicating that the bottomfish complex has not experienced overfishing. An updated stock assessment is scheduled to be released in June 2012.

Bottomfish (Non-Bottomfish Management Unit Species) Fishery

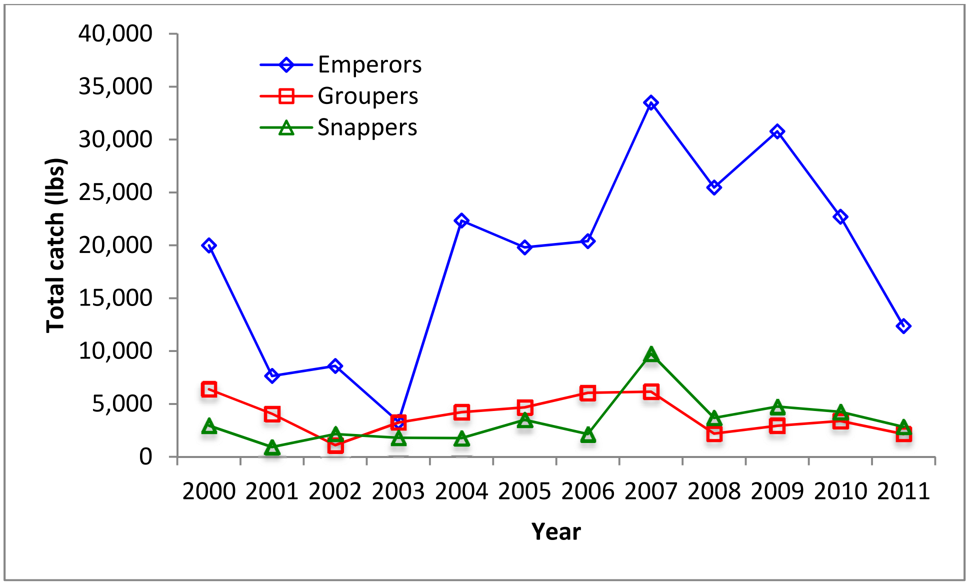


Figure 92. Total catch of the top three species/species groups caught in the bottomfish fishery (non-BMUS listed species) from 2000-2011.

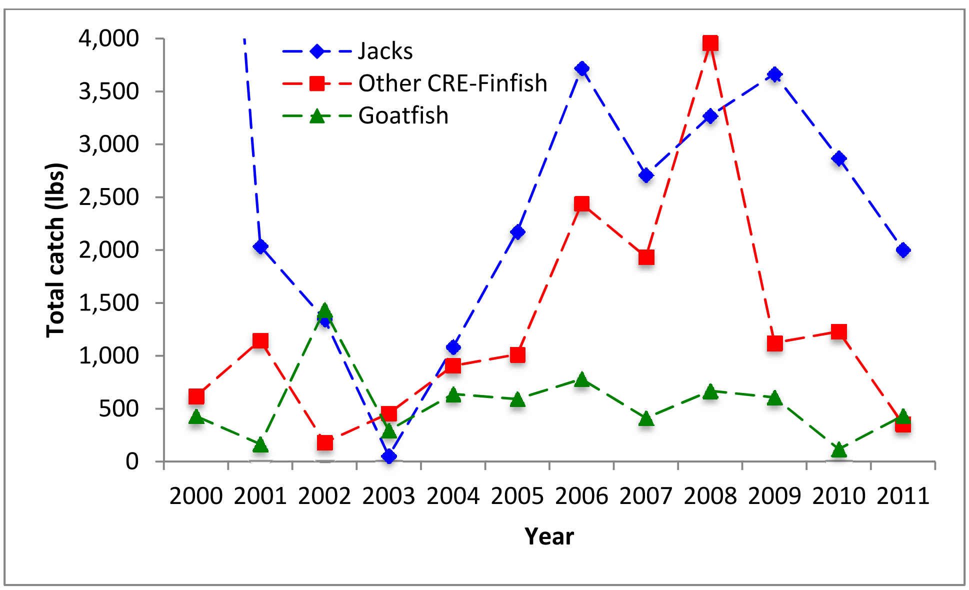


Figure 93. Total catch of the top 4 to 6 species/species groups caught in the bottomfish fishery (non-BMUS listed species) from 2000-2011. Data value of 9,962 lbs of Jacks landed in 2000 is not shown.

Catch Trends and Interpretation: In 2003, a net restriction law was implemented by the CNMI-DFW. The restriction of the net fishing method, may have contributed to the increase in landings of Emperor fish for the bottomfish fishery. The boat-based surveys for Emperors suggest an increase in catch for the Bottom fishing method between 2008 and 2009. On the other hand, Emperor fish landings have indicated a10 thousand pound decrease in total catch for the boat based survey between 2010 and 2011. The trend for Snappers and Groupers appear to be fairly stable over the years. Changes between 2009 and 2010 for Groupers and Snappers are insignificant.

In 2000, a significant amount of Jacks were landed in the bottomfish fishery for the boat based survey (data point not shown). More data mining needs to be done to substantiate this spike. This could have been a good recruitment year for Jacks. Between 2001 and 2007, little change has been recorded in the boat-based survey. Most Jacks caught in the boat-based surveys are in the sub-adult to adult stage of life. Common species of jacks caught under the boat-based survey were identified as *C. melampygus, C. lugubris, S. dumerili, T. steindachneri.* In 2010, there appears to be a decrease in the pounds of Jacks and Goatfish landed in the boat-based survey for bottomfish fishery.

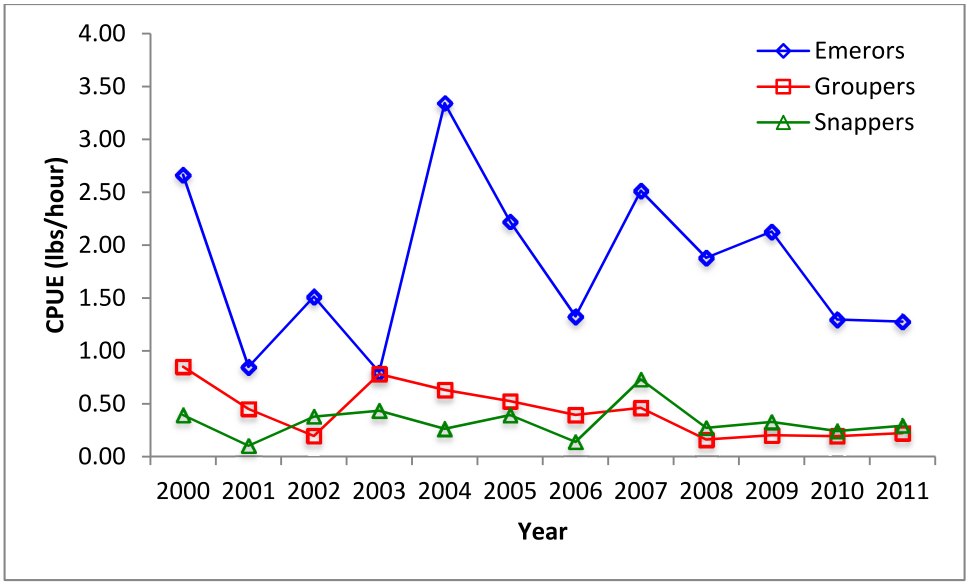


Figure 94. Catch per unit effort (lbs per hour) of the top 3 species/species groups in the bottomfish fishery (non-BMUS) from 2000-2011.

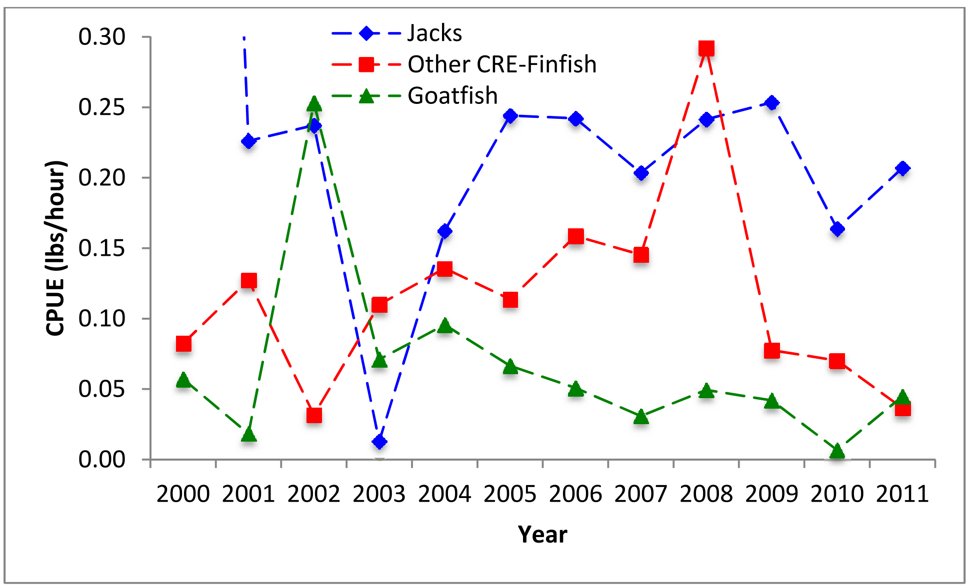


Figure 95. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the bottomfish fishery (non-BMUS) from 2000-2011. CPUE value of 1.3286 for Jacks in 2000 is not shown.

CPUE Trends and Interpretation: CPUE for Emperors in the Boat-based survey decreased between the 2009 and 2010. 2011 CPUE for Emperors remained at 2010 levels. Since 2003, Groupers caught in the Boat-based surveys have indicated a decline in CPUE. However, there is a slight increase in CPUE between 2009 and 2010. This is also a similar result with the Snappers. The trend in Snapper CPUE has been stable.

A slight decrease in CPUE is indicated for Bottom method in 2010. After further inquiries with the data, we found that a majority of the Jacks caught in the Boat-based surveys are in the adult stage. Goatfish has also seen a slight decrease in Bottom fishing CPUE for 2010. The general trend for Goatfish CPUE seems stable since 2003.

Atulai Fishery

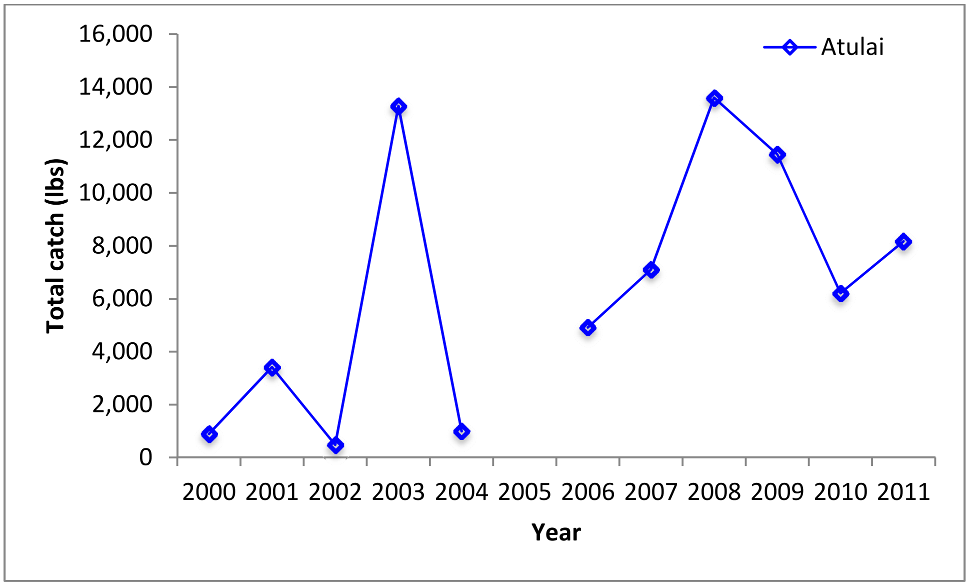


Figure 96. Total catch of the top species caught in the Atulai fishery from 2000-2011. Landings of other fish groups were miniscule and not shown.

Catch Trends and Interpretation: The total catch from the atulai fishery is highly variable, which is expected of this type of pulse fishery. Since 2008, the average landings of atulai seem to revolve around 8,500 pounds. The atulai landings increased from 6,209 pounds in 2010 to 8,169 pounds in 2011. During years with low catches of atulai fisherman may subsidize trips by focusing effort on other species. These catches are normally minimal.

Selar crumenopthalmus (big eye scad locally known as atulai) is the most common coastal pelagic fish landed in CNMI using various fishing method

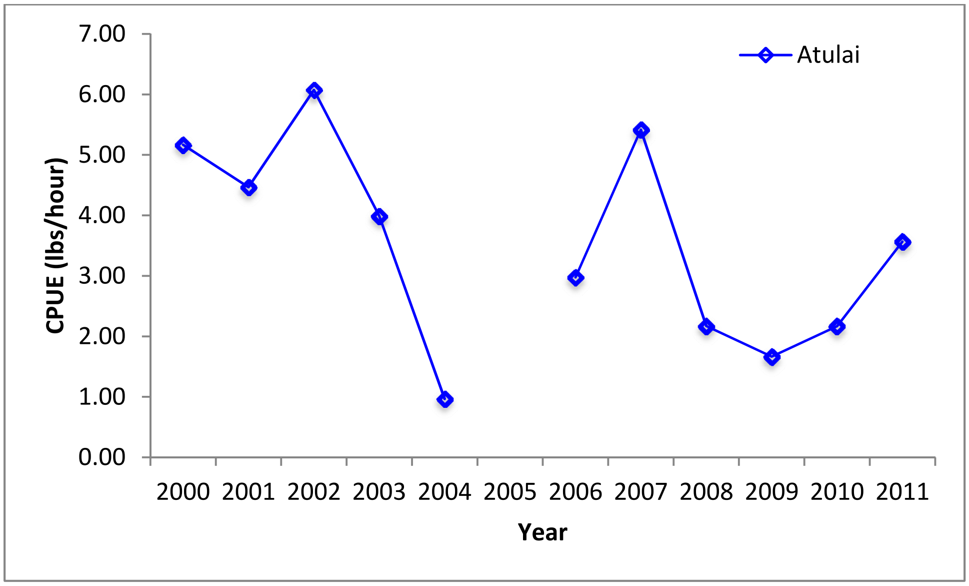


Figure 97. Catch per unit effort (lbs per hour) of the top species caught in the Atulai fishery from 2000-2011. CPUE values of other fish groups were miniscule and not shown.

CPUE Trends and Interpretation: The Atulai fishing method consists of hook and line fishing on a vessel with the use of artificial lighting at or above the surface to attract fish. Atulai CPUE is higher from 2000 to 2003 than from 2004 to 2008. CPUE for the Atulai method has increased and has more than doubled from 1.6 lbs/hr in 2009 to 3.6 lbs/hr in 2011.

Surround netting for atulai in CNMI

Cast net (talaya) Fishery

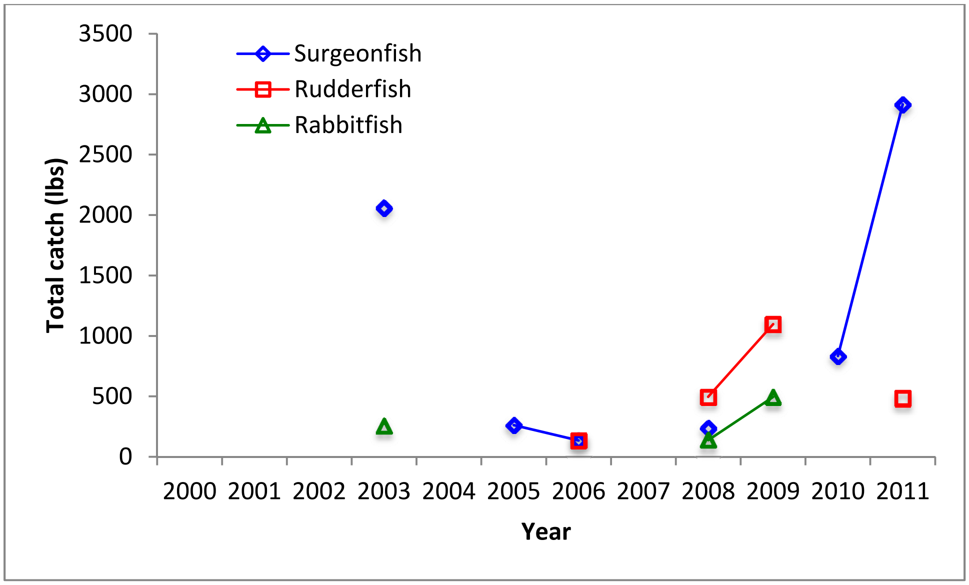


Figure 98. Total catch of the top three species/species groups caught in the cast netting fishery from 2000-2011.

Catch Trends and Interpretation: Landings of surgeonfish had not been recorded in the boat-based survey for the cast net method. Cast net method for harvest surgeonfish usually requires fishermen to fish along reef flats accessible by boat. This is a specialized method with a limited number of fishers participating Surgeon fish landings with the cast net method may be reflected more in the shore-based survey. Not all cast net fishers require a boat to harvest Surgeonfish or Rudder fish. Rudderfish and Rabbitfish suggest an increase in landings since 2006 and 2008 respectively. No records of landings for all three families using cast nets were registered in the boat based survey in 2007. 2010 has seen a significant increase in landings of surgeons in the Boat-based survey.

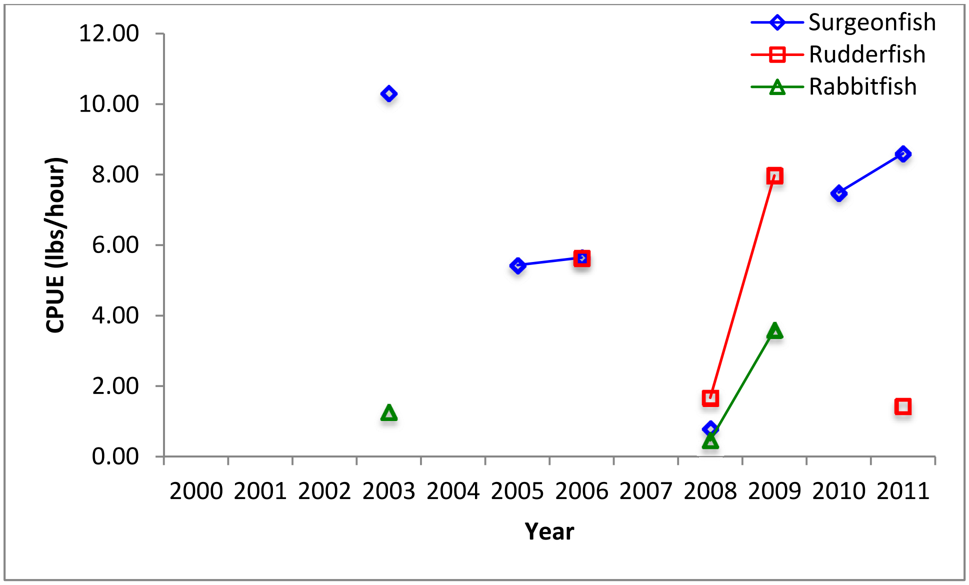


Figure 99. Catch per unit effort (lbs per hour) of the top three species/species groups in the cast netting fishery from 2000-2011.

CPUE Trends and Interpretation: Atulai CPUE indicates an increase in 2009 for the cast net fishery in the boat based survey. CPUE for the other families have been sporadic over the 10 year period. Figure 10 suggests that no landings of any of these families of fish were recorded for the cast net fishery in the boat based survey. Cast Net results have been sporadic, but CPUE is interestingly higher than the other two methods.

Snorkel Spear Fishery

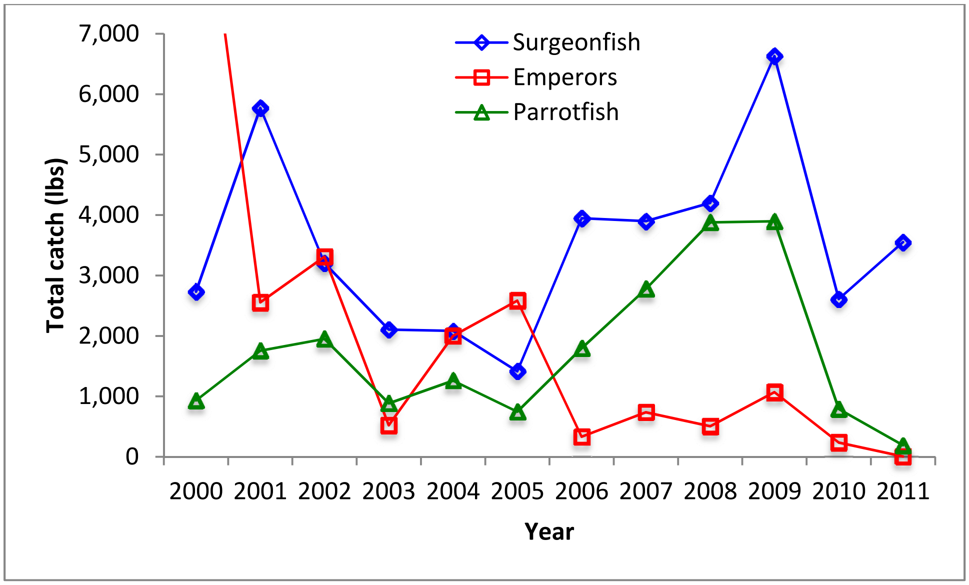


Figure 100. Total catch of the top three species/species groups caught in the snorkel spear fishery from 2000-2011. Data value of 10,660 lbs of Emperors landed in 2000 is not shown.

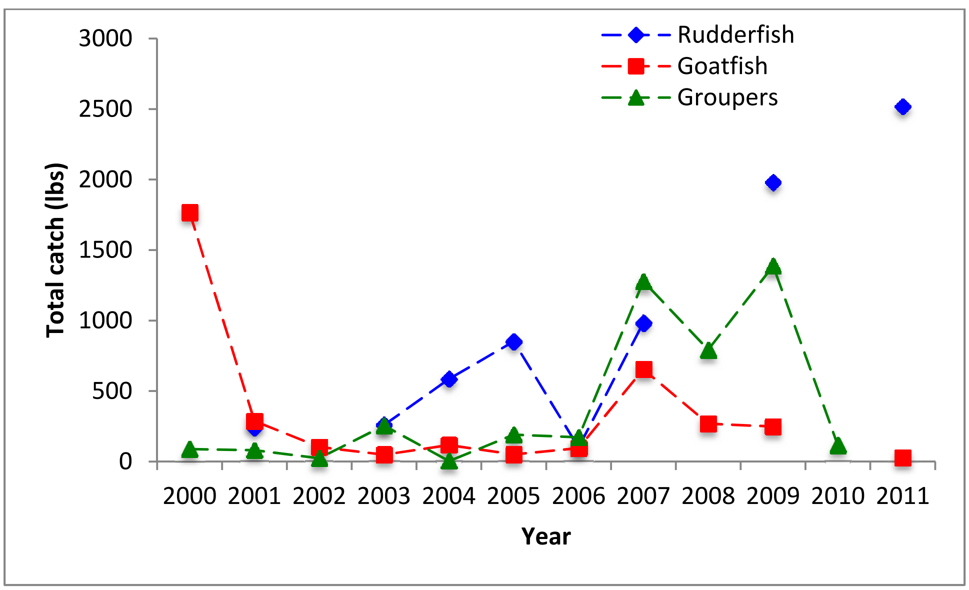


Figure 101. Total catch of the top 4-6 species/species groups caught in the snorkel spear fishery from 2000-2011.

Catch Trends and Interpretation: Emperors total catch decreased by a large amount from 10,660 pounds in 2000 to 2,555 pounds in 2001. It had several decreases in 2003 and 2006 and then averaged about 550 pounds from 2007 – 2011. Total catch for surgeons was high in 2001 and 2009, but remained near a consistent level with some variation during other years. Total catch for parrotfish decreased from 2002 to 2005 and from 2009 to 2010. It doubled from 2000 to 2002 and more than tripled from 2005 to 2009. Rudderfish total catch increased throughout the survey period, but there are some missing years that could affect the time series. 2011 has seen an increase in landings of Rudderfish in the Boat-based survey. Goatfish total catch was high in 2000, but after was low and mildly variable. Goatfish landings have decreased to 29lbs of fish in 2011 for the Boat-based surveys. Grouper total catch was low with only slight variability until 2006 when it became more variable by year.

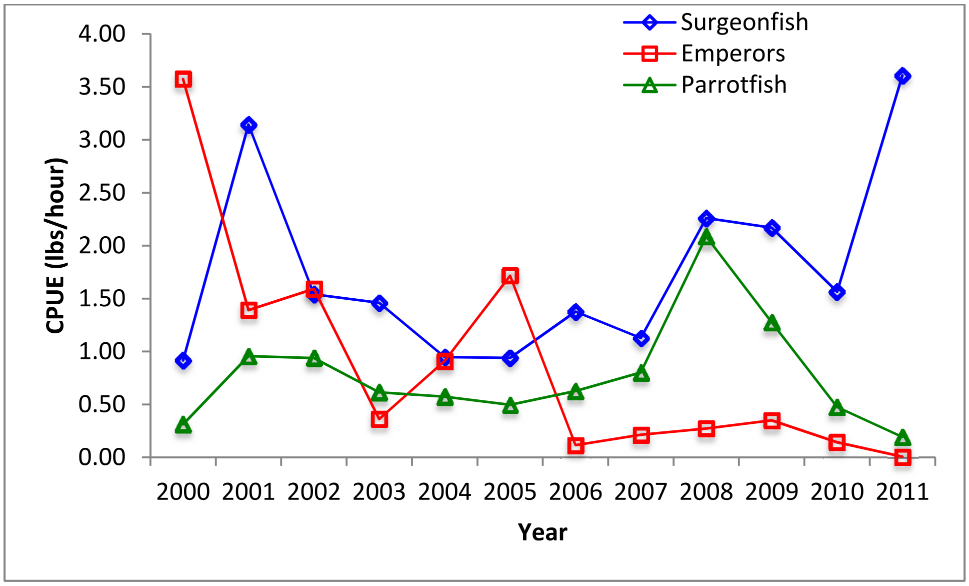


Figure 102. Catch per unit effort (lbs per hour) of the top three species/species groups in the snorkel spear fishery from 2000-2011.

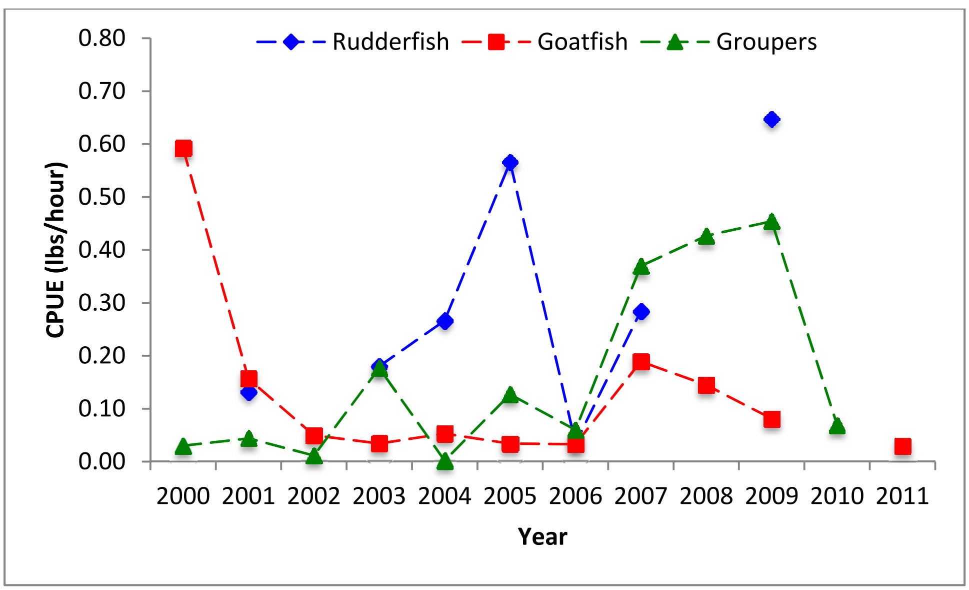


Figure 103. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the snorkel spear fishery from 2000-2011. CPUE value of 2.56 lbs/hr of Rudderfish in 2011 is not shown.

CPUE Trends and Interpretation: Surgeonfish CPUE was highly variable from 2000-2002. From 2003 to 2007, it was less variable around 1 lb/hr. In 2008 surgeon CPUE increased to 2.26 lbs/hr, remained near that level through 2010 and peaked at 3.60 lbs/hr in 2011. From 2000 to

2005 emperor CPUE was highly variable but high. In 2006 in decreased to a low level of 0.12 lb/hr and had low variability through 2011. Parrotfish CPUE tripled from 2000 to 2001, then showed a continual decrease from 2001 to 2005. In 2008 parrotfish CPUE increased to 2.01 lbs/hr, but decreased steadily to 0.2 lb/hr in 2011. After 2003 rudderfish CPUE became highly variable. From 2007 to 2009, grouper CPUE was higher than all other years. The other years of grouper CPUE were variable but did not reach the levels of those years. Goatfish CPUE decreased from 2000 to 2002 and then remained constant until 2006. In 2007 in increased slightly but decreased after that.

Coral Reef Troll Fishery

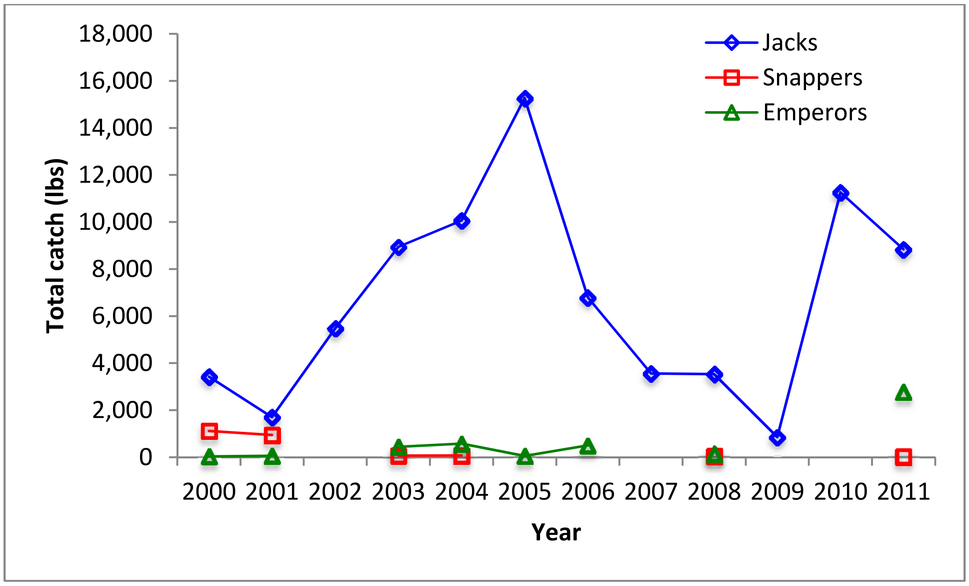


Figure 104. Total catch of the top three species/species groups caught in the trolling fishery from 2000-2011.

Total catch for jacks increased consistently from 1,705 pounds in 2001 to 15,273 pounds in 2005. It then decreased by to 858 pounds in 2009 and increased to 8,837 pounds in 2011. Snapper and emperor total catches in the trolling fishery were low comparatively and remained roughly the same over time.

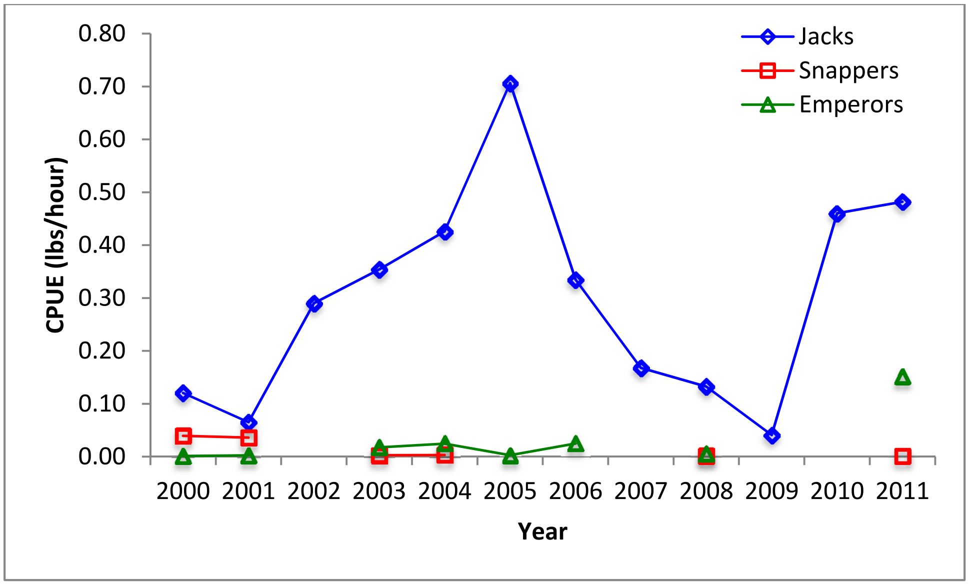


Figure 105. Catch per unit effort (lbs per hour) of the top three species/species groups in the trolling fishery from 2000-2011.

CPUE Trends and Interpretation: CPUE trends for Jacks have been sporadic, with a high CPUE of .70 in 2005 and a downward slope since then. Although a downward trend is indicated for Jacks, a measurable increase in indicated from 2009 to 2010. CPUE snapper and emperor trends remain relatively flat over the ten year period. (These are probably landings of Jobfish (*Aprion virenscens*), longnose emperor (*Lethrinus olivaceus*), and yellowlip emperor (*Lethrinus xanthocheilus*)). CPUE follows the total catch trend exactly which implies that the hours trolling remained consistent over years.

Shore-Based Coral Reef Fishery

The shore-based coral reef fisheries are comprised of the following fishing methods: hook and line, spearfishing (non SCUBA), cast netting, and octopus hooking. However, the most dominant ones include: hook and line, spearfishing (non SCUBA), and cast netting. These fishing methods comprise 99% of the total shore-based fisheries landing. Gillnets, surround nets, and drag nets were banned in 2003 with exemptions granted for cultural purposes. Scuba spear fishing was banned in Saipan in 2003. Current creel survey sites encompass Saipan's Western Lagoon only. Data are expanded and extrapolated to cover the entire CNMI. Saipan may account for a majority of the fish landings, but keep in mind, that all the other islands (Southern and Northern) are not represented. This under-representation might result in an under-estimation of the fish landings for the entire CNMI. Efforts have been taken to expand creel surveys to Tinian and Rota.

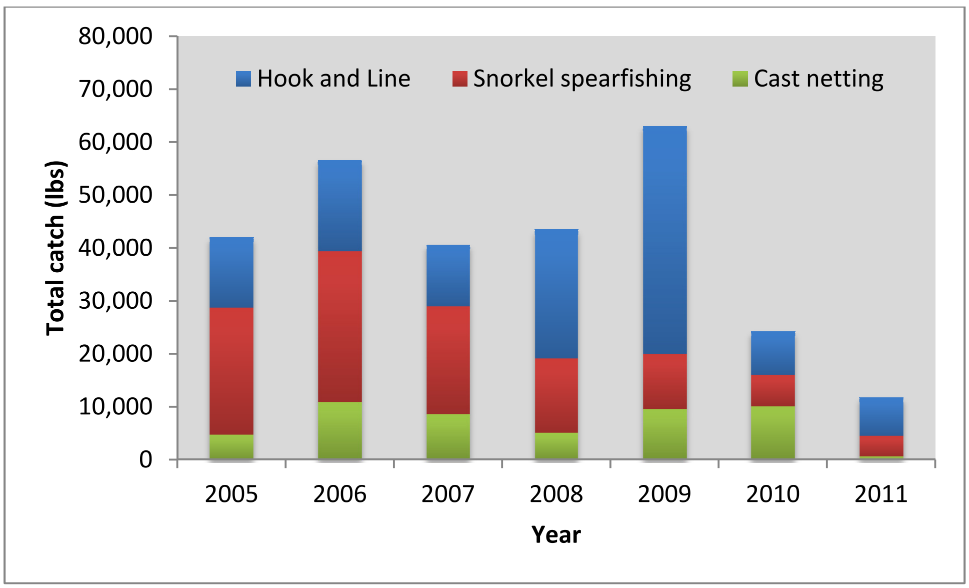


Figure 106. Total landings (lbs) from the dominant shore-based methods from 2005-2011.

Trends and Interpretation: Spearfishing total landing are consistent from 2005 to 2007 and then decrease from 2007 to 2011. The shore based creel program is not set up to intercept spearfisherman. Spearfisherman are only interviewed after trips. There are no partial interviews like in the hook and line category. Spearfishers also have a better ability to avoiding creel staff by waiting in the water until creel staff moves on. Hook and line landings from 2005 to 2007 are consistent. In 2008 and 2009 total landing had considerable increases, but in 2010 and 2011 landings decreased significantly from previous years. Again, this may be due to the decrease in the CNMI population by almost a third of what it was in the 2000 census. Cast net landings are variable among years.

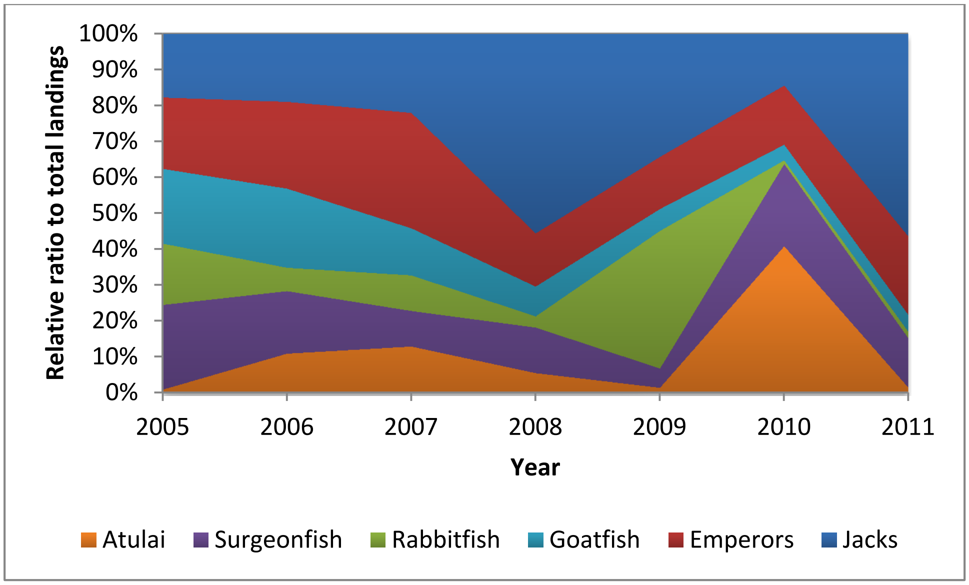


Figure 107. Relative ratio of the top six species/species groups to the total shore-based catch landing from 2005-2011.

Trends and Interpretation: The ratio of Atulai in the total catch is highly variable. Over this five year period ratio of goatfish in total catch has decreased. Surgeonfish ratio has been variable but not shown an overall trend. The ratio of emperors decreased after 2007. Jack ratio made up a high percentage in 2008. In 2010 Jacks and Atulai have represented a larger percentage of catches. However, Jack have become the dominant Family in percent landed for the Shore-based survey. When these species groups are available the fisheries shift to target them.

Cast net (talaya) Fishery

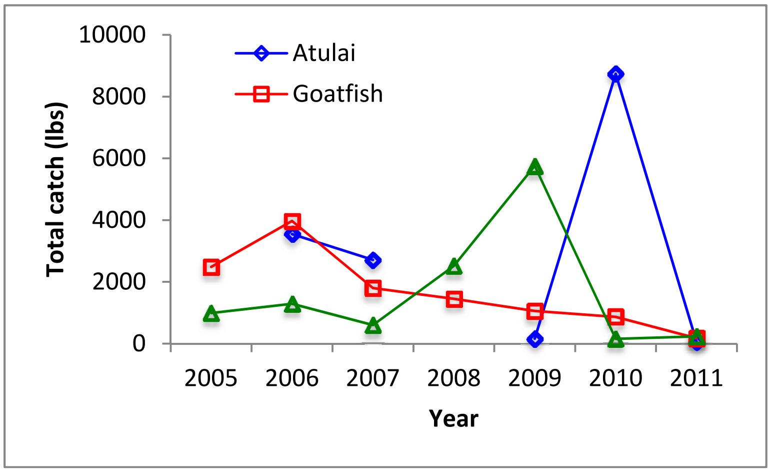


Figure 108. Total catch of the top three species/species groups caught in the cast net fishery from 2005-2011.

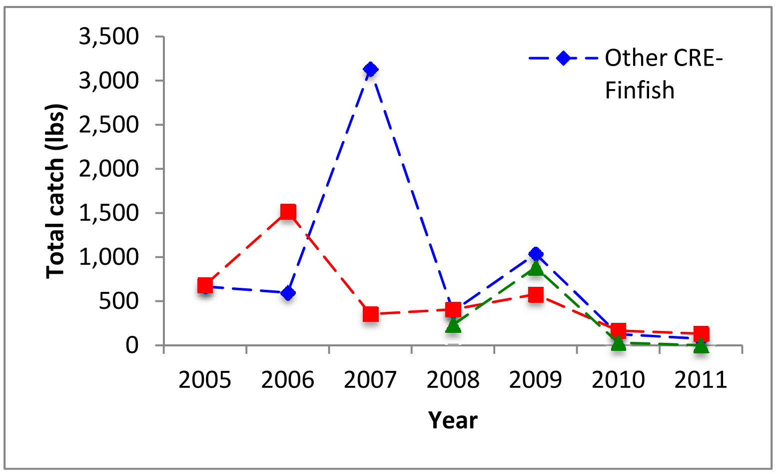


Figure 109. Total catch of the top 4-6 species/species groups caught in the cast net fishery from 2005-2011.

Catch Trends and Interpretation: 2009 and 2010 had high cast net catches of jacks and atulai respectively. Goatfish total catch from cast nets steadily declined after an initial increase in 2006. Mullet consistently have a low total catch. Rabbitfish and other fish have periodic low landings, but do not show any noticeable trends. In 2011, cast net landings of the top six families, except for Jacks have decreased in the Shore-based survey.

Typical talaya catch comprised of atulai and goat fish

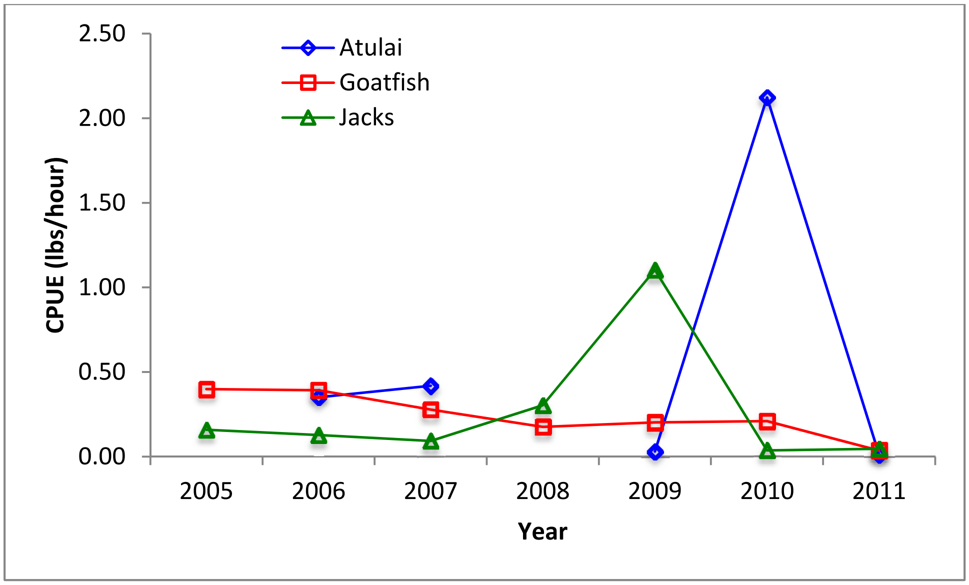


Figure 110. Catch per unit effort (lbs per hour) of the top three species/species groups in the cast net fishery from 2005-2011.

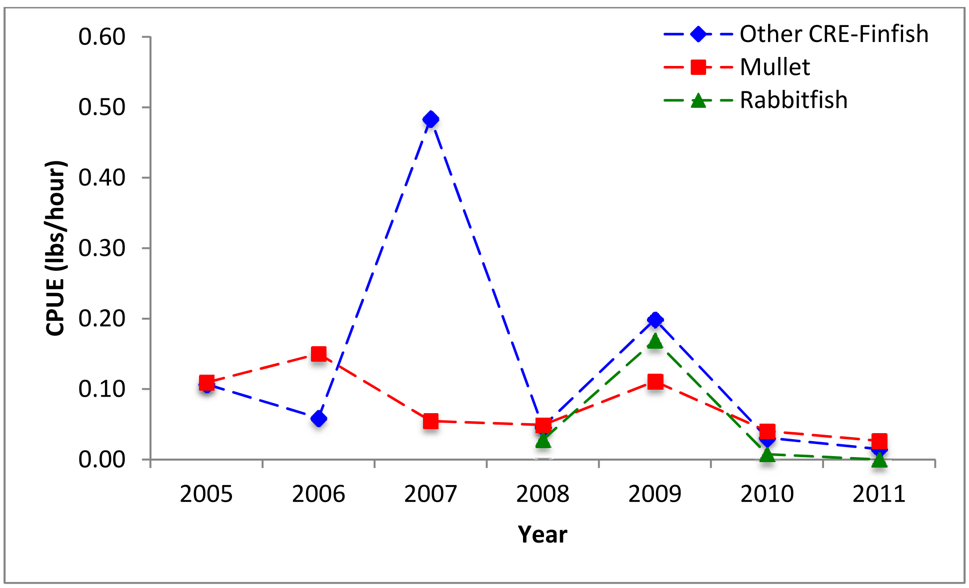


Figure 111. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the cast net fishery from 2005-2011.

CPUE Trends and Interpretation: Jacks, atulai and goatfish had consistent castnet CPUE except for high jack and atulai CPUE in 2009. 2009 was possibly a good year for Jacks, Goatfish and Mullet recruitment, which are highly targeted fisheries in the juvenile life stage. Mullet had consistently low CPUE during the 5-year period. Rabbitfish and other fish inconsistently were reported in the cast net fishery.

Hook and Line Fishery

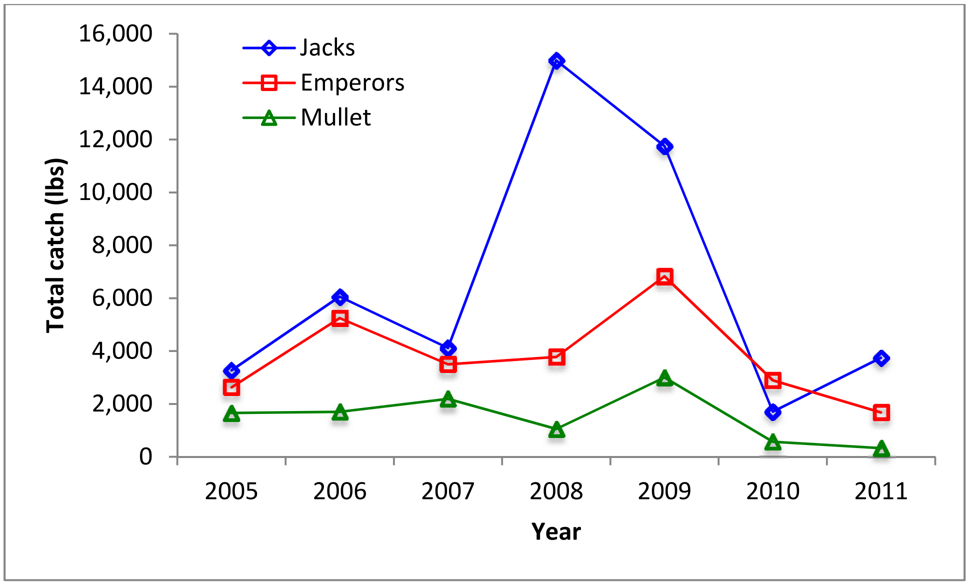


Figure 112. Total catch of the top three species/species groups caught in the hook and line fishery from 2005-2011.

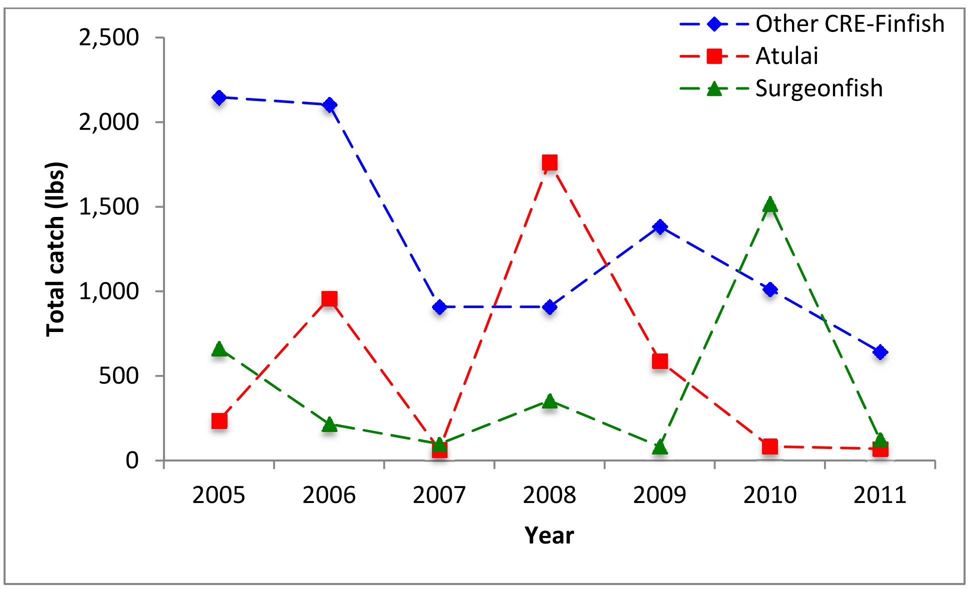


Figure 113. Total catch of the top 4-6 species/species groups caught in the hook and line fishery from 2005-2011.

Catch Trends and Interpretation: Jacks had high total catches in 2008 and 2009 with 14,989 and 11,755 pounds respectively. Emperor and mullet catches showed some variability but remain relatively constant. In 2011, emperor and mullet landings of 1,674 and 327 pounds were recorded. Total catch of Other-CRE finfish decreased from 2006 to 2007, but remained near the new level in the following years. This decrease in Other-CRE finfish may be due to better fish identification by survey staff. Atulai catches for hook and line seem highly variable like other atulai fisheries. Surgeonfish total catches remained consistently low, but had a spike in 2010.

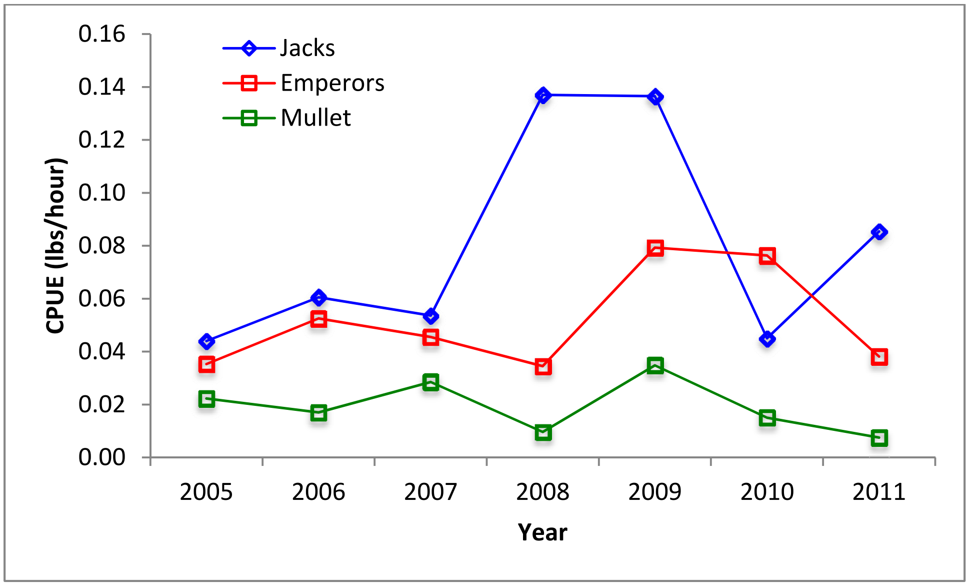


Figure 114. Catch per unit effort (lbs per hour) of the top three species/species groups in the hook and line fishery from 2005-2011.

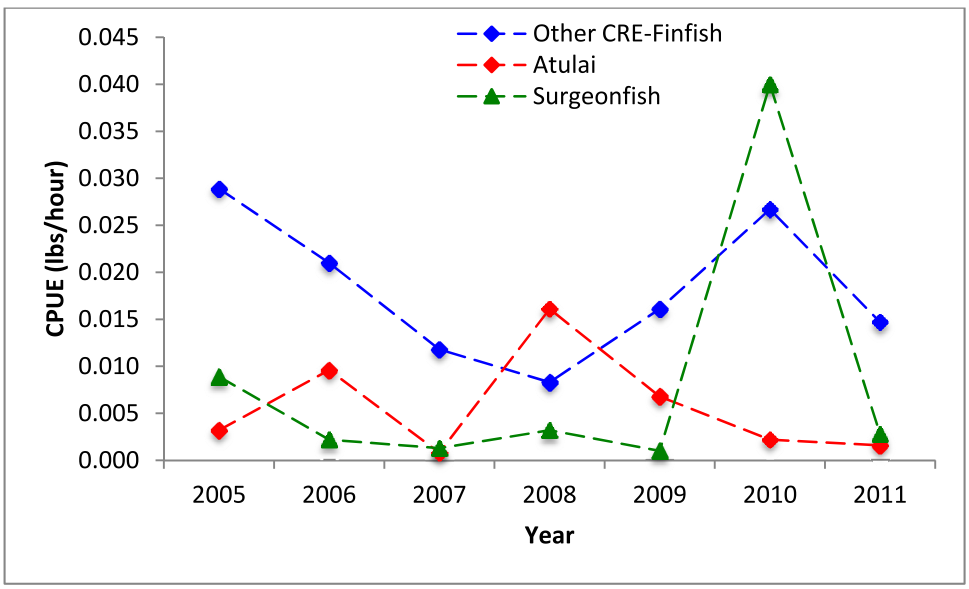


Figure 115. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the hook and line fishery from 2005-2011.

CPUE Trends and Interpretation: CPUE for Jacks was high in 2008 and 2009 with a value of 0.14 lb/hr. Emperor CPUE was consistent from 2005 to 2008, then in 2009 it increased and stayed near that new value in 2010. In 2011, Emperor CPUE dropped to 2005 – 2008 levels ranging from 0.03 – 0.05 lb/hr. Mullet CPUE was variable but remained low, all below 0.035 lb/hr. Aside from 2007 atuali CPUE and other CPUE had an inverse relationship. Surgeonfish CPUE was high in 2010, after being low all the other years.

Snorkel Spear Fishery

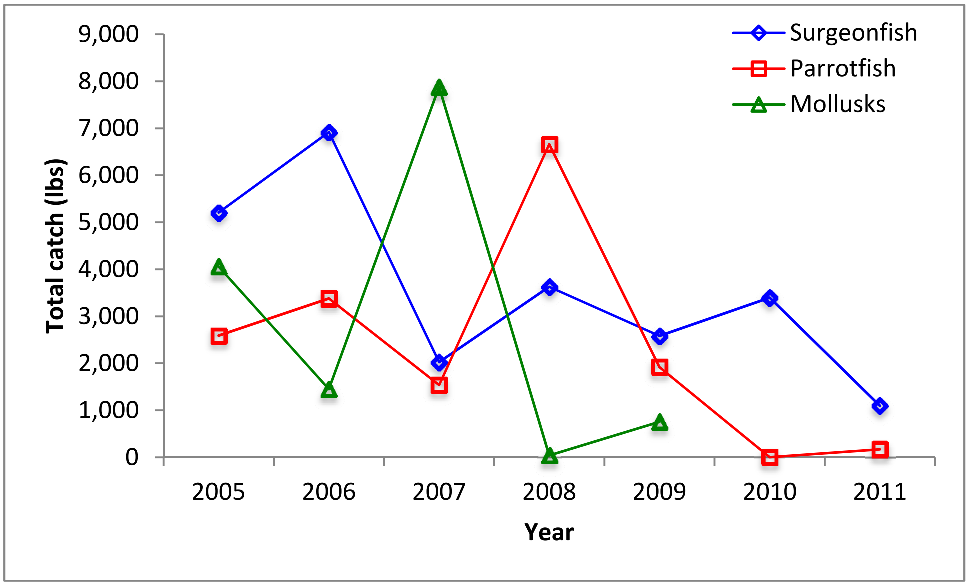


Figure 116. Total catch of the top three species/species groups caught in the snorkel spear fishery from 2005-2011.

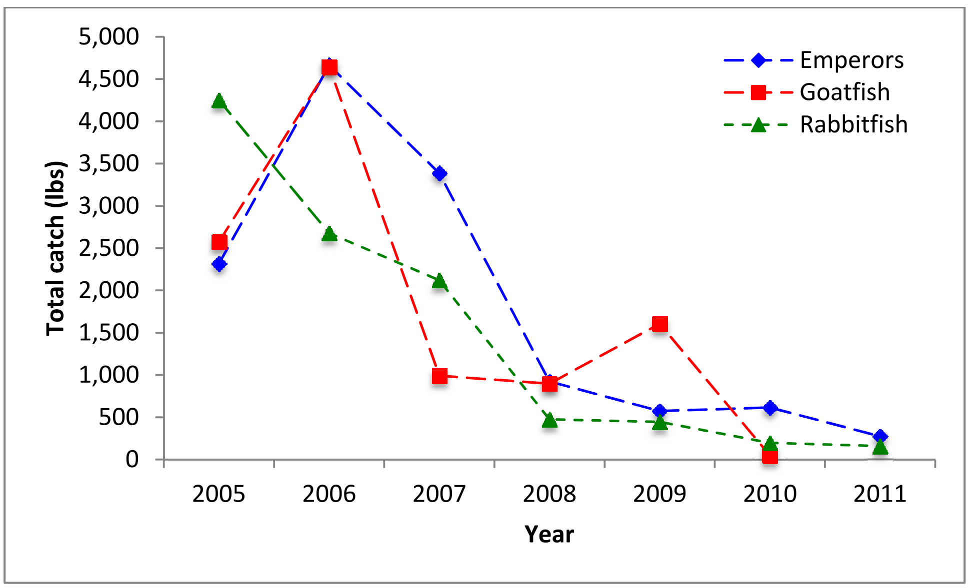


Figure 117. Total catch of the top 4-6 species/species groups caught in the snorkel spear fishery from 2005-2011.

Catch Trends and Interpretation: These numbers are likely influenced by number of interviews and should be interpreted conservatively. In addition, the current creel survey methodology was not specifically designed to intercept spearfishermen. Other surveys like the market surveys capture the spear fishery more adequately. These surveys are cot currently taken into account and are not represented in these graphs.

Spearfisherman have shown a propensity to avoid interviewers. Surgeonfish total catches were higher in 2005 and 2006 before decreasing to a lower level in 2007 and remaining near there through 2011. Parrotfish total landings had an unusually high value in 2008 and an unusually low value in 2011. Mollusk landings were highly variable. From 2006 to 2009 emperor total catch decreased a large amount. Goatfish total catches decreased from 2006 to 2007 and remained low after that. From 2005 to 2008 rabbitfish total catches decreased also and remained low afterwards.

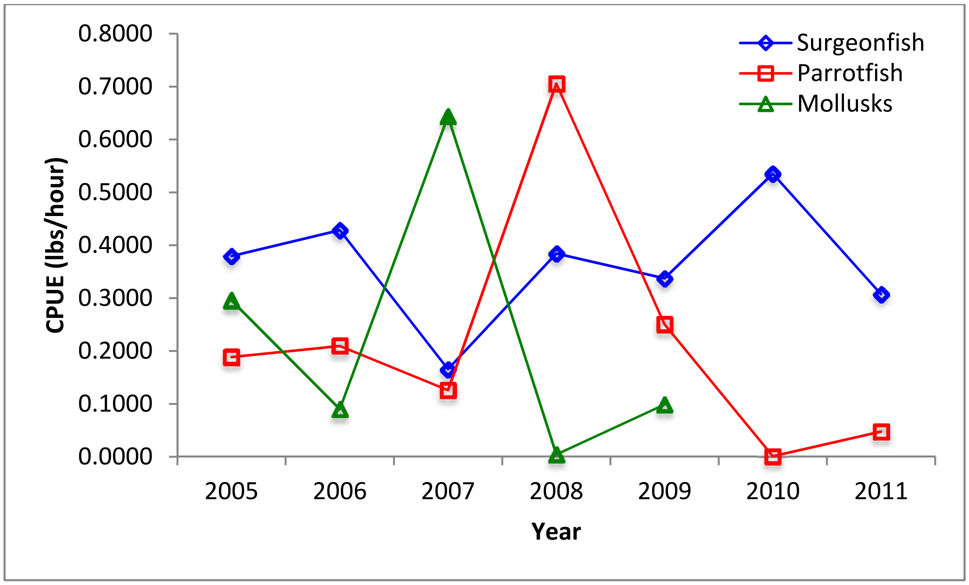


Figure 118. Catch per unit effort (lbs per hour) of the top three species/species groups in the snorkel spear fishery from 2005-2011.

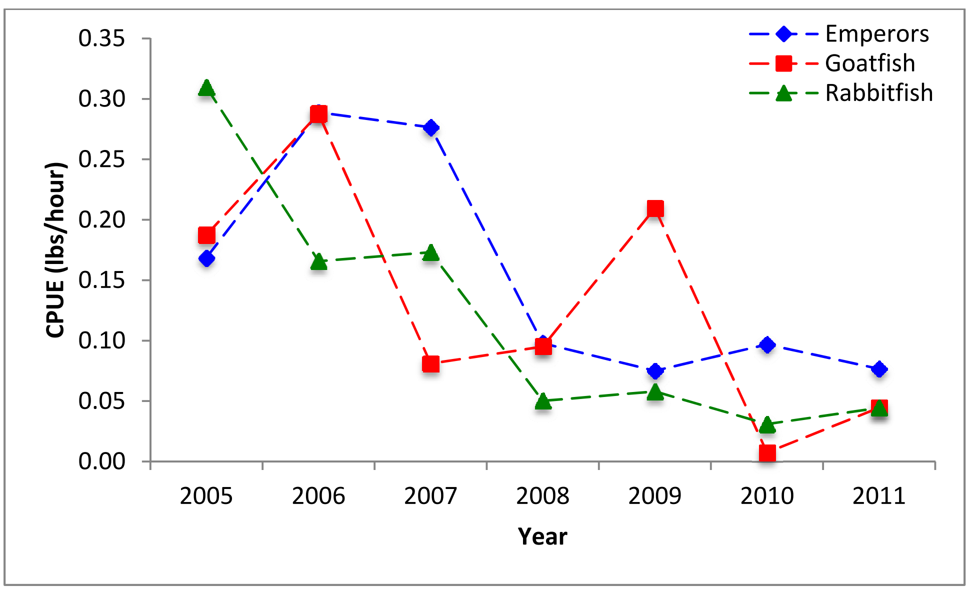


Figure 119. Catch per unit effort (lbs per hour) of the top 4-6 species/species groups in the snorkel spear fishery from 2005-2011.

CPUE Trends and Interpretation: Surgeonfish CPUE remained relatively constant ranging between 0.3 – 0.5 lb/hr. 2007 was an exception for surgeonfish CPUE as it decreased to 0.17 lb/hr. Parrotfish total landings had an unusually high value of 0.71 lb/hr in 2008 and an unusually low values of 0.0008 and 0.05 lb/hr in 2010 and 2011. Mollusk landings were highly variable. From 2006 to 2009 emperor CPUE decreased a large amount. Goatfish total catches were variable, with highs in 2006 and 2009. From 2005 to 2008 rabbitfish total catch decreased also and remained low afterwards.

Commercial Prices of Selected Species Groups

Mean Inflation Adjusted Prices of the Top Commercial Coral Reef Species in the CNMI

The average prices for the miscellaneous bottomfish, miscellaneous reef fish, surgeonfish, parrotfish, atulai and jacks were calculated by dividing total revenue for each group by total weight sold. The inflation-adjusted prices were calculated by multiplying the unadjusted annual average price by the annual calculated consumer price index (CPI) for Guam Bureau of Statistics and Plans using 2011 as the base.

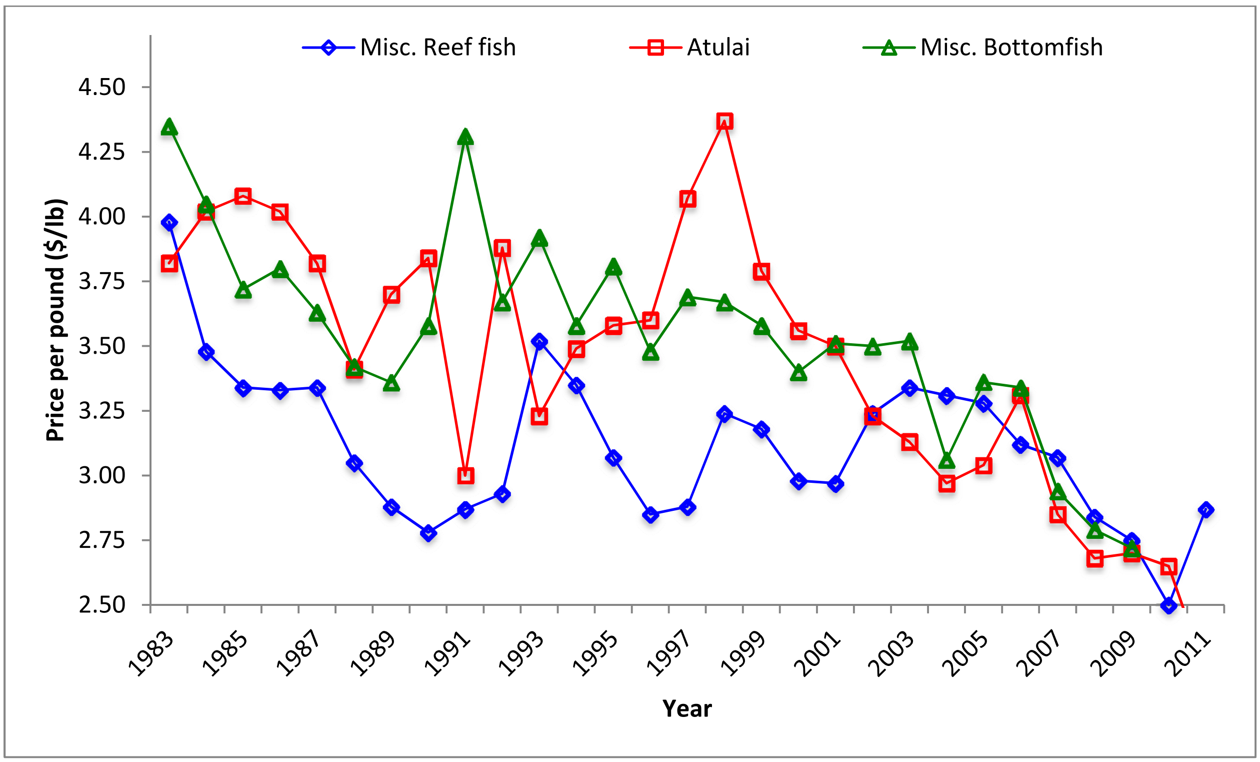


Figure 120. Trends in the mean inflation adjusted prices of miscellaneous reef fsih, atulai and miscellaneous bottomfish from 1983 to 2011.

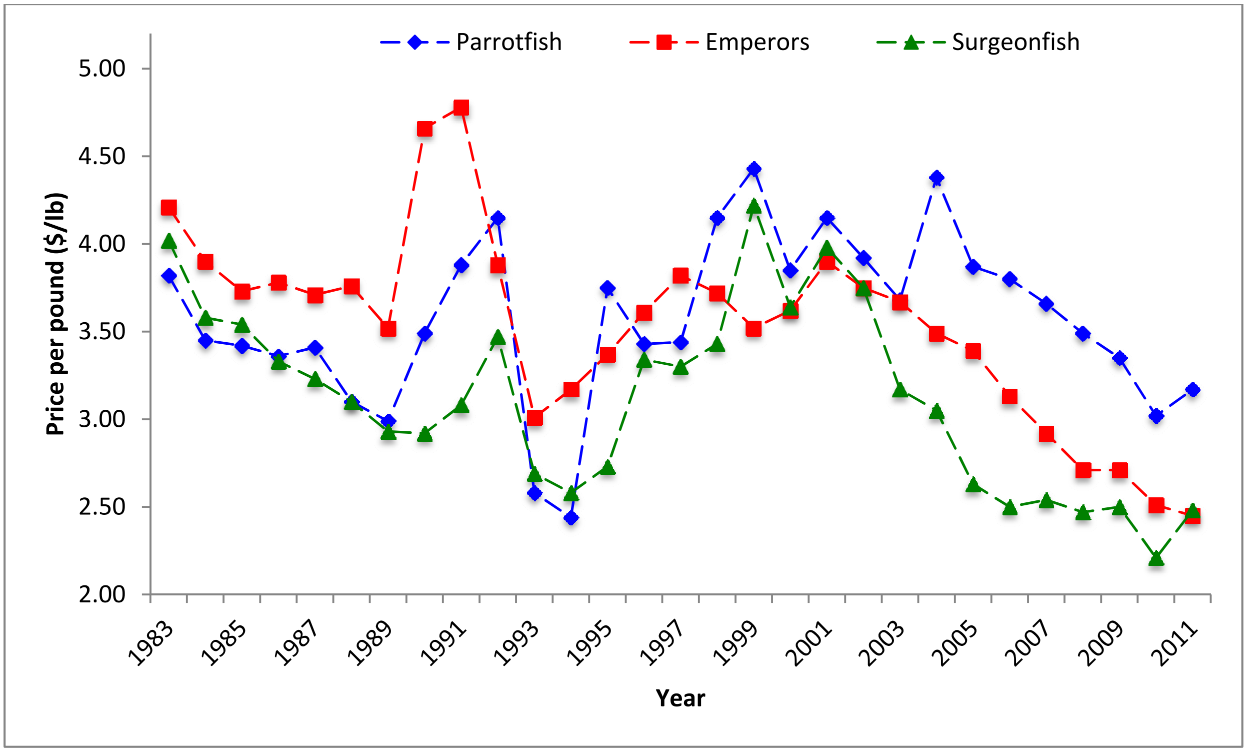


Figure 121. Trends in the mean inflation adjusted prices of parrotfish, emperors and surgeonfish from 1983 to 2011.

Trends and Interpretation: Prices have been decreasing since 2001 suggesting there is a large supply of fish. For all fish groups above prices have been variable up to 2001. From 2001 to 2011 prices have dropped about $1.00. This could be due to the struggling CNMI economy and/or the overall health of the fishery (the supply exceeds the demand).

Average Commercial Landing Prices of the Top Commercial Coral Reef Species in the CNMI

The commercial landing average prices for miscellaneous bottomfish, miscellaneous reef fish, surgeonfish, parrotfish, atulai and jacks were calculated by dividing total revenue for each group by total weight sold. These prices were not adjusted for inflation.

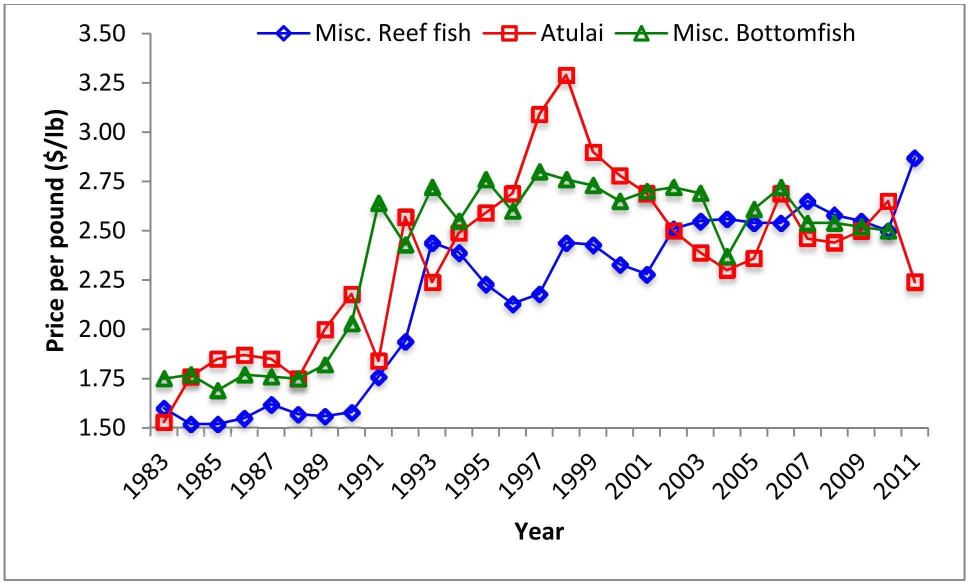


Figure 122. Trends in the average commercial landing prices of miscellaneous reef fish, atulai and miscellaneous bottomfish from 1983 to 2011.

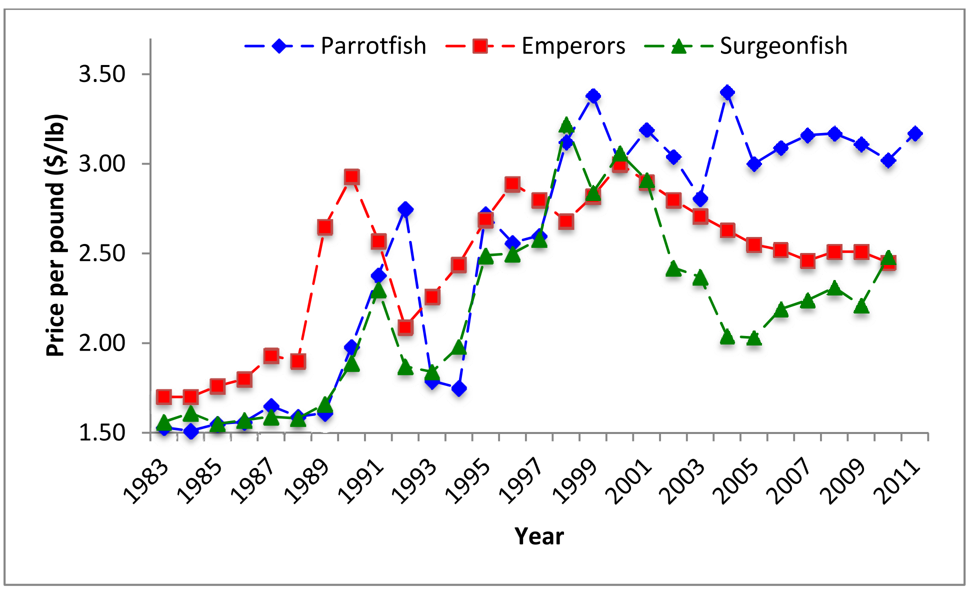


Figure 123. Trends in the average commercial landing prices of parrotfish, emperors and surgeonfish from 1983 to 2011.

Trends and Interpretation: Unadjusted values show that recent prices are holding constant and adjusted values are decreasing. Inflation is increasing, but prices are staying constant causing adjusted prices to decrease

Total Commercial Landing Sold of the Top Commercial Coral Reef Species in the CNMI

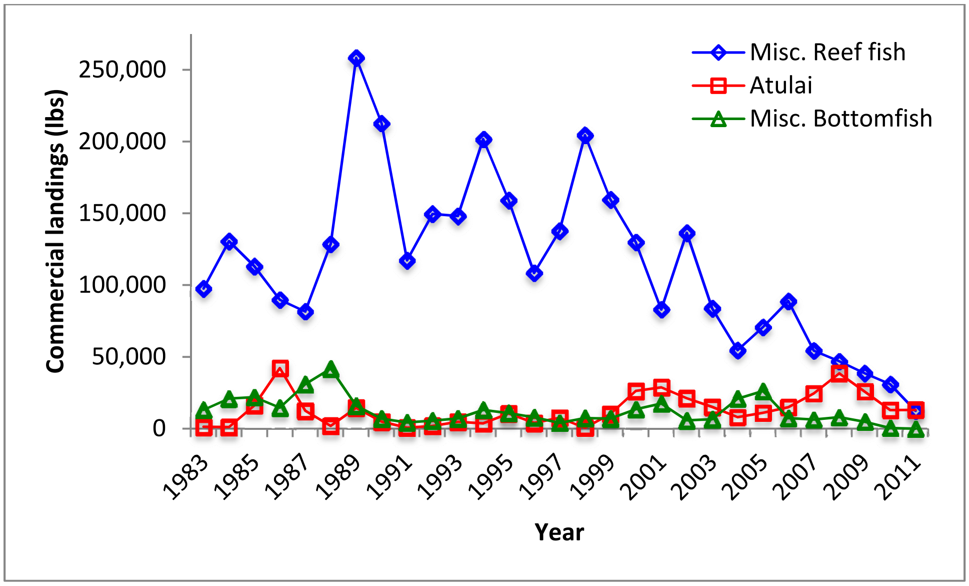


Figure 124. Total commercial landing of miscellaneous reef fish, atulai and miscellaneous bottomfish from 1983 to 2011.

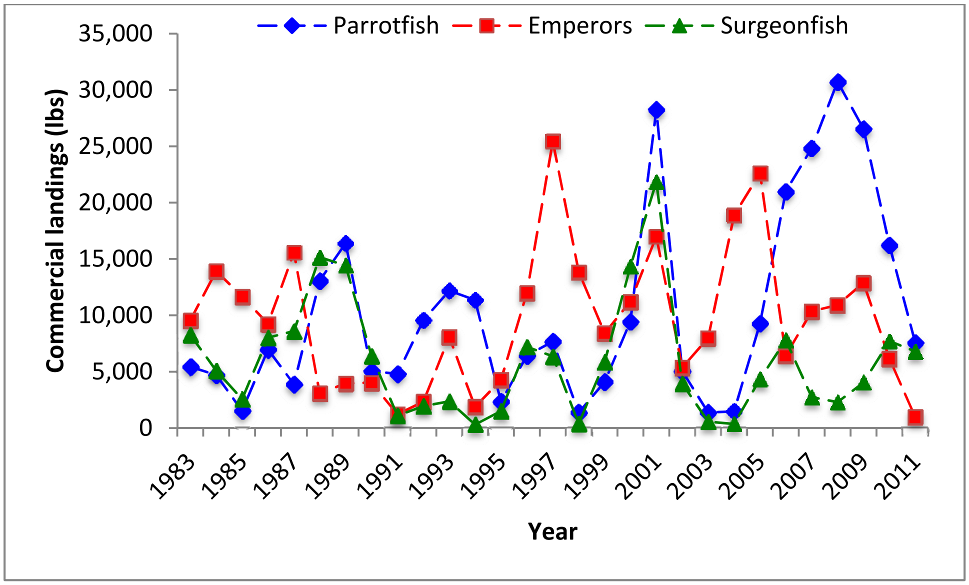


Figure 125. Total commericial landing of parrotfish, emperors and surgeonfish from 1983 to 2011.

Trends and Interpretation:
Overall reef fish landings have been decreasing for the last 10 years, but three important reef fish (parrotfish, emperors, and surgeonfish) have remained on a cyclical pattern with higher peaks during the past 10 years.

Coral Reef Fishery By-Catch

CNMI coral reef fisheries are general non-selective and non-targeting where most of the catch are retained. These fishery characteristics render minimal by-catch. Interactions with protected species are believed to be minimal. To date, there have been no reported or observed interactions between protected species and coral reef fisheries in Federal waters around the CNMI and the potential for interactions is believed to be low due to the gear types and fishing methods used.

Status of the Coral Reef Fishery

There are no existing stock assessments on CREMUS stocks. There are biomass estimates for reef fish populations provided by CRED described in this report, which may be used, among other data, in determining CREMUS annual catch limits.

Overfished and Overfishing Determinations
To date coral reef fisheries around the CNMI have not been determined to be overfished or subject to overfishing.

MSY
No estimates of MSY are currently available for coral reef ecosystem associated species in the Mariana Archipelago.

OY
Optimum yield for coral reef ecosystem associated species is defined as 75% of their MSY.

Annual Catch Limits and Accountability Measures

The 2006 Reauthorization of the Magnuson-Stevens Act required that Regional Fishery Management Councils (RFMC) develop annual catch limits for each of its managed fisheries that may not exceed the fishing level recommendations of its scientific and statistical committee (SSC) or peer review process. Moreover, Councils were required to amend their fishery management plans to establish a mechanism for specifying annual catch limits at a level such that overfishing does not occur in the fishery, including measures to ensure accountability.

The MSA further directs that, unless otherwise provided for under an international agreement to which the U.S. participates, this mechanism must be established by 2010 for fisheries subject to overfishing, and by 2011 for all other fisheries. On January 16, 2009, the National Marine

Fisheries Service (NMFS) published advisory guidelines under 50 CFR §600.310 (74 FR 3178) to assist RFMCs in implementing ACL and AM requirements.

To comply with the ACL and AM requirements, the Western Pacific Fishery Management Council (Council), in coordination with NMFS, prepared an omnibus amendment to the Fishery Ecosystem Plans (FEP) for American Samoa, Hawaii, the Mariana Archipelago (Guam and the Commonwealth of the Northern Mariana Islands (CNMI)), Pacific Remote Island Areas, and Pacific Pelagic fisheries. The amendment describes the mechanism the Council will use to specify ACLs and AMs for each FEP fishery. This includes:

> 1) Establishing a mechanism in each FEP that the Council will use to determine ACLs and AMs , including a process for setting acceptable biological catch limits (ABCs);
>
> 2) Adopt the ecosystem component (EC) species classification described in the NMFS advisory guidelines for National Standard 1 (NS1) so the Council can develop specific criteria for identifying EC species in subsequent amendments to the FEPs; and
>
> 3) Identify pelagic management unit species that have statutory exceptions to the ACL and AM requirements. The ACL and AM mechanism is designed to ensure long term sustainability of the fishery resources under the Council's jurisdiction.

Expanded catch landing time series from the combined boat and shore-based creel survey was used to determine ABCs. No stock assessment is available to base the overfishing limit from which the ABCs are typically referred from. The ABCs for most of the coral reef ecosystem management unit species are based on the modified Tier 5 control rule (catch only data) of ABC = 1*75th percentile of the entire catch time series. The ACLs were then set equal to ABC because catches were small relative to the biomass (estimated from CRED Rapid Ecological Assessment expanded to hard bottom habitats from 0-30m, see William 2010). Vulnerable species such as, humphead wrasse, bumphead parrotfish, and shark does not have a significant catch time series that this control rule can be applied. Biomass was used as a proxy data where 5% of the expanded biomass was used to generate the ABC. Guam bottomfish ABCs were based on the tier 4 control rule (ABC=091*MSY) where MSY was based on Moffitt et al 2007. The ACL was set equal to ABCs for the Guam bottomfish complex. Non-finfish ABCs were based on a range of methods described as follows:

Spiny lobster: ABC = 1*75th percentile of the entire catch time series; then ACL = ABC
Slipper lobster: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Deepwater shrimp: ABC = MSY – area proxy based on AS MSY estimate; then ACL = ABC
Kona crab: ABC = catch – area proxy based on Hawaii catch landing; then ACL = ABC
Black corals: ABC = MSY – area proxy based on Hawaii MSY estimate; then ACL = ABC
Precious corals: maintained the quota of 1000 kg/yr and set that as the ABC; then ACL = ABC

Accountability measures are rules set to make sure that the ACLs are not exceeded and specifies steps to be taken once ACLs exceeded. In-season monitoring is currently beyond the capability of the local resource management agencies in all island commonwealth, territories and the State of Hawaii. None of the island commonwealth and territories has mandatory catch reporting.

Total catches covering only areas within the survey boundaries are estimated using expansions of the creel survey catch estimates. The expansions are done on an annual basis in order to ensure that there is enough data to pool to come up with a reasonable catch estimate. Realistic monthly expansions are not possible without sacrificing the credibility of the results. Although the State of Hawaii are able to monitor and project catches for the deep 7 bottomfish fishery, attaining a complete catch report in a timely manner from a diverse and high number of participants in the coral reef fishery proved to be a big challenge. In addition, the only sector that is being monitored in Hawaii is the commercial sector. Majority of the coral reef fish catch are known to come from the recreational sector which is poorly monitored. The current personnel and logistics can only accommodate a limited number of species for near real-time monitoring. Expanding the number of species to be monitored is beyond the current capabilities and unless a significant funding resource is provided for the expansion, in-season accountability measures is not possible.

2012 Annual Catch Limit Specification and Monitoring

The following are the CNMI ACLs specified for fishing year 2012:

Table 17. Current landing of different management unit species relative to the specified annual catch limits in the near-shore fisheries in CNMI for fishing year 2012

Fishery	Management Unit Species	ACLs	FY 2012 Catch Landing
Bottomfish	Bottomfish multi-species stock complex	182,500 lb (82,781 kg)	TBD
Crustacean	Deepwater Shrimp	275,570 lb (124,996 kg)	TBD
	Spiny Lobster	5,500 lb (2,495 kg)	TBD
	Slipper Lobster	60 lb (27 kg)	TBD
	Kona Crab	6,300 lb (2,858 kg)	TBD
Precious Coral	Black Coral	2,100 kg (4,630 lb)	TBD
	Precious Corals in the CNMI Exploratory Area	1,000 kg (2,205 lb)	TBD
Coral Reef Ecosystem	Lethrinidae – emperors	27,466 lb (12,458 kg)	TBD
	Carangidae – jacks	21,512 lb (9,758 kg)	TBD
	Acanthuridae – surgeonfish	6,884 lb (3,123 kg)	TBD
	Selar crumenophthalmus – atulai or bigeye scad	7,459 lb(3,383 kg)	TBD
	Serranidae – groupers	5,519 lb (2,503 kg)	TBD
	Lutjanidae – snappers	3,905 lb (1,771 kg)	TBD
	Mullidae – goatfish	3,670 lb (1,665 kg)	TBD
	Scaridae – parrotfish	3,784 lb (1,716 kg)	TBD
	Mollusks – turbo snail; octopus; giant clams	4,446 lb (2,017 kg)	TBD
	Mugilidae – mullets	3,308 lb (1,500 kg)	TBD
	Siganidae – rabbitfish	2,537 lb (1,151 kg)	TBD
	Bolbometopon muricatum – bumphead parrotfish	797 lb (362 kg) (CNMI and Guam combined)	TBD
	Cheilinus undulatus – Humphead (Napoleon) wrasse	2,009 lb (911 kg)	TBD
	Carcharhinidae – Reef Sharks	5,600 lb (2,540 kg)	TBD
	All Other CREMUS combined	9,820 lb (4,454 kg)	TBD

Fishing year 2012 is the first year of ACL implementation. No catch data is available during the drafting of this report to determine if the limit had been exceeded. Monitoring still continues through the creel surveys.

References

Moffitt, R.B., Brodziak, J., and Flores, T. 2007. Status of the Bottomfish resources of American Samoa Guam, and the Commonwealth of the Northern Mariana Islands, 2005. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-07-04, 47 p.

CHAPTER 4: Federal Regulatory Activities and Projects

CHAPTER 4: Federal Regulatory Activities and Projects

Chapter Authors: Staff of Western Pacific Regional Fishery Management Council, NMFS-Pacific Island Fisheries Science Center, and NMFS-Pacific Island Regional Office

Western Pacific Regional Fishery Management Council

The Council collaborates with the local fishery management agencies and the local communities to implement projects to support fishery development, fishery research, as well as fishery management. Funding support for such activities is sourced from various Council grants such as the Coral Reef Conservation Program, Sustainable Fisheries Fund, Marine Education and Training, Community Demonstration Program Projects etc.

Program Planning

Evaluation of Data Collection Programs in the Western Pacific Region: The fishery data collection programs in the Western Pacific region including Guam, Saipan and American Samoa were evaluated. The objective of the study was to identify issues of the existing data collection programs and how they relate to producing statistically valid estimates of total catch and effort for the implementation of Annual Catch Limit (ACL) requirements.

Three fishery data collection programs were evaluated as requested by the Western Pacific Regional Fishery Management Council, and they are the Commercial Purchase System, Tournament data collection program, and the Creel Survey Programs (boat-based, and shore-based). Due to its complexity and reliance from management the Creel Survey Program was the primary focus of this evaluation.

The creel survey was designed to collect fishery information by intercepting fishers or fishing trips from public access sites on survey days using available resources. The collected data are used to understand the trend of fisheries for monitoring purposes. In this report, evaluated areas of the Creel Survey Programs include sampling design, survey implementation and the estimation methods.

In short, the evaluation concludes that the currently implemented fishery data collection programs may not be adequate to provide statistically valid estimates for the ACL implementation

1) The survey design and strategy of the creel survey programs do not extend to all fishery sectors

2) The operational procedure and protocols of the creel survey programs are unclear, in practice, thus producing unknown errors in the data and estimates
3) The Expansion Algorithm uses unverified assumptions and imputation methods that introduce unknown level of uncertainty in the estimates.

Other survey methods and strategies are needed for the fishery sectors that the creel survey design does not adequately cover. While there are other existing data collection systems such as the Commercial Purchase System and Tournament data collection, they need significant improvement in their survey design, strategy, and implementation efforts. Data collected from the Commercial Purchase System may be biased and inaccurate for its low response rates due, in part, to the sensitivity of the requested data, and unreliable quality from its self-reported nature. The Tournament data collection program is not currently well developed and not implemented in Guam and Saipan.

American Samoa

Fishery Development

Tutuila Boat Ramps: Currently, there are two public boat ramps on Tutuila (Pago Pago and Fagasa). Both of these ramps suffered damage from the September 29,2009 tsunami and remain inaccessible. The Federal Emergency Management Agency is providing funding to DMWR to restore these boat ramps. The Pago Pago boat ramp is located within Pago Pago Harbor, but trailoring a boat to the ramp does involve driving through Tutuila's most traffic congested areas. The Fagasa boat ramp is on the north side of Tutuila, which involves driving over steep hills from central Tutuila. The existing boat ramp locations are not well suited for fishermen that trailer their boats and wish to fish on the western end of Tutuila. SFF funds have been used to construct two boat ramps: one in Faga'alu Park, and one Lyon's Park in Tafuna. Both ramps are located on government owned lands administered by the Department of Parks and Recreation (DPR). The boat ramps had been completed in February 2012 but still required changes in the structural modification to lengthen the ramp seaward to allow boat deployment even on low tide.

The boat ramp in Faga'alu. (Photo:U.Faasili)

Manua Islands Vessel Fuel Storage: The Manua Islands (Ofu, Olosega, Ta'u) currently lack fuel storage to support local boat-based fisheries, restricting the range of the small-vessel fleet and participation in bottomfish and pelagic fisheries. To support fisheries development in Manua Islands, the Council, in coordination with DMWR, is funding the establishment fuel storage facilities on Ofu and Ta'u. Four 500 gallon tanks will be located near the boat harbors of Ofu and Ta'u. The tanks will be secured to trailers and transported to Tutuila on the weekly inter-island ferry for refueling. A custom fuel tank manufacturing company based in Connecticut had built and shipped the fuel tanks to Tutuila, where they are being stored outside the DMWR office. The tanks are built in accordance with US Environmental Protection Agency requirements and National Fire Protection Association and American Petroleum Institute standards for fuel storage. Authorizations have been provided by the local American Samoa government Project Notification Review System board including approval of a Spill Prevention, Control, and Countermeasure Plan required by the Environmental Protection Agency. The tanks will be delivered to the Manua Islands upon completion of storage shelters, which is expected to be in April 2012.

Transportable fuel tanks (500 gallons) to be shipped to Manua Islands (Photo:U.Faasili)

Manua Islands Icemakers: An important aspect of fisheries development is providing infrastructure that will facilitate the delivery of quality and safe seafood products. The lack of ice has been consistent limiting factor in providing fish products from the Manua Islands to markets in Tutuila. This project will establish ice making machines that will be located in Ofu and Ta'u and support the several alia vessels fishing the Manua Islands. The Council, in coordination with DMWR, selected a local American Samoa company to provide the delivery, installation, and maintenance of 5,000 lb icemakers on Ofu and Ta'u as well as 7ft x 8 ft x 10 ft refrigerated storage containers. The ice makers and storage containers have arrived in Tutuila and will be shipped to Ofu and Ta’u upon completion of the storage fale(s).

Ofu and Tau Storage Fale: To properly house and secure the fuel tanks and ice machines, storage shelters are being constructed on existing concrete foundations on American Samoa government owned land. These shelters are located in a short distance (200 yds) from the Ofu and Tau harbors. See pictures below of Tau shelter under construction.

Construction of the storage fale (fuel and ice making) in the island of Ta'u (Photo:U.Faasili)

Manua Islands Fisheremen's CoOps: On November 17, 2011, Articles of Incorporation (AOI) for the Tai Samosama (Tau) and Faleluaanuu (Ofu) Fishermen's Cooperatives were signed at the DMWR office in Tutuila. In January 2012, the American Samoa Attorney General's office approved both AOIs. The CoOps are now in the process of developing their bylaws. Initial membership interest for the Tai Samosama CoOp and Faleluaanuu CoOp is expected to be 25 and 20, respectively. Members of either CoOp have to be fishermen.

Samoa Tuna Processors and Fresh Fish Export: In the fall of 2010, Tri Marine Group, Ltd., one of the world's largest tuna supply companies, announced that it had secured the lease of the cannery facility that was previously occupied by Chicken of the Sea. Tri Marine will be conducting tuna canning and fresh tuna fish export under its subsidiary named Samoa Tuna Processors, Inc (STP). Tri Marine also announced it formed a partnership with Luen Thai Fishing Ventures (Hong Kong-based) and Yuh Yow Fishery Co. (Taiwan-based) on the fresh fish export side of the business. Luen Thai is one of the largest longline companies in the Pacific and is reported to own 70 longline vessels, services 150 longline vessels, as well as operating an integrated fishing business including base operations, logistics, and processing and marketing of tuna and seafood products primarily to Asian, European, and US markets. Luen Thai also owns 747 cargo jets that it will use to transport fresh fish out of American Samoa. Yuh Yow Fishing Co. is reported to own 45 longline fishing vessels, with access agreements for 16 longline vessels in the Cook Islands as well as operations in the Solomon Islands. In May 2011, the Council sponsored a fresh fish handling workshop at STP for American Samoa fishermen that are interested in selling fish to STP. The workshop was well attended with approximately 40 fishermen participating. A fresh fish market in American Samoa is a new opportunity that may stimulate revitalization the small vessel longline fishery in American Samoa.

In October 2011, STP communicated to the Council that 4 foreign vessels licensed in the Cook Island are providing fresh bigeye and yellowfin tuna to STP and frozen albacore to the Starkist cannery. It is believed that these vessels are targeting albacore early in the trip to be delivered frozen, and then on the last 10 sets or so, fishing for bigeye and yellowfin to be delivered on ice. One local American Samoa alia vessel have been provided ice on several occasions for fresh fish trials, but fishing skill/equipment/funding are identified as ongoing issues. Up to October 2011, 3 shipments totaling approximately 10 tons of fresh fish have been shipped by STP to markets in USA (Los Angeles) and Japan (Tokyo). The Council has requested from STP the number of fresh fish shipments, tonnage, and species since October 2011, but at the time of drafting this report, requested information has yet to be obtained.

In 2012, the Council may continue to work with STP to identify and provide training opportunities and workshops for local alia vessel operators. In addition, the Council will be contributing to the construction of a new small vessel dock fronting STP to support the offloading of fresh fish by local alia vessels. The new small vessel dock is part of a larger redesign and rehabilitation of the facility being operated by STP.

Fagatogo Fish Market: In 2007, the American Samoa Departments of Commerce, Agriculture, and Marine and Wildlife Resources secured federal Economic Development Administration funding to build a produce and fish market in Fagatogo. The marketplace was completed in 2009 and soon opened for venders to sell agricultural products and crafts. However, the fish market did not open due to because the stated plan for the market by the American Samoa government was to have a fishermen's cooperative lease and operate the fish market. In 2009, a group attempted to form a cooperative with the goal of running the fish market, but was unsuccessful due to lack of membership. Furthermore, the fish market is designed as such that it will not support value added processing, nor is it equipped with an ice machine. The retail benches are also simply designed and without modification only whole fish could be displayed. In August 2011, the fish market was opened for business with individual fishermen selling their catch on ice within the bench-style display tables. The market is still without an ice machine and the Council may wish to coordinate with DMWR on the need to provide a small ice machine.

Council-Funded Coral Reef Projects

Current Surveys Between Potential Marine Managed Areas in American Samoa: The nature of these surveys makes it difficult to create an instantaneous (synoptic) picture of the currents around Tutuila. Due to boat scheduling and personnel resources, the surveys are scheduled once per week (with a backup day later in the week). Factoring in weather issues makes it difficult to perform several surveys in a short period of time. This inherently means that oceanographic conditions have enough time to change between the surveys such that the ensemble of surveys cannot be considered as synoptic. For this reason the ADCP surveys are planned over several seasons. An example of the implications of this is the observed residual eastward current at Taema bank and no observed residual current in the Aunu'u Tutuila channel. If these results were found simultaneously, then it would imply that the residual flow is either being pushed south of Aunu'u or further south into deeper water, or reversing to go west in a counter clockwise eddy. An important mechanism that these studies are starting to quantify is the potential for local scale topography (bays and headlands) to create recirculating back current eddies. There are likely to be finer scale eddies even closer to the reef and on the reef flat that future efforts using this equipment may be able to capture. Many eddies are caused by the tide and disappear when the direction of flow reverses. However the eddy in Amanave bay is caused by a residual flow and is likely to remain for long periods of time. Continued surveys are needed at this (and at the other sites) to find out if the flow past the western tip of Amanave is always to the south, i.e. does the residual flow dominate over the tide? If this is the case, then one would not expect to see larvae from Amanave seeding any reefs north of the western tip. This growing dataset indicates that enhancing spawning stocks in a location such as Fagamalo would be very beneficial to Maloata, Poloa and Amanave, and of some benefit to the Aoloau coastline east of Fagamalo. However, enhanced spawning stocks in Amanave may have little benefit to Poloa, Maloata and Fagamalo

Mariana Islands (Guam and CNMI)

Marianas Annual Catch Limits Workshop: On 2011, a series of public meetings and workshops were held in Saipan, Rota, and Tinian to provide ACL information and to receive comments, suggestions, and other feedback from participants from both the general and the fishing community.

Open-ocean Cage Culture Symposium: The Council co-hosted the Open Ocean Cage Culture Symposium with the Northern Marianas College Cooperative Research, Extension and Education Service on January 26-27, 2011 at the Saipan World Resort in CNMI. The symposium was broadcast live via VTC to Tinian and Rota, and to the world through the internet. The agenda was set up to include speakers on offshore aquaculture over two days, ending with a panel discussion on each day. NMC CREES counted over 200 participants on the first day of the symposium with approximately 100 participants on the second day. The goal of the workshop was to provide a forum to discuss the development and advancement of an aquaculture industry in CNMI. The symposium featured speakers from CNMI, Guam, the Secretariat of the Pacific Community (SPC), Hawaii and Korea that presented on information on current aquaculture in the Pacific, regulations, and business considerations. The results of this workshop produced many ideas on how to further the development of an aquaculture industry in CNMI.

Green Turtle Workshop: The status of green turtles in the Mariana Archipelago is not well known due to the lack of long-term data on nesting and foraging populations. Without consistent monitoring to document the long-term population trend data both at nesting and foraging habitats, these island areas will not have sufficient green turtle data to be evaluated against current or any future revised recovery criteria set forth under the Endangered Species Act (ESA) recovery plans. In addition, international collaboration must be strengthened with areas with shared green turtle stocks to ensure the sustainability of populations throughout their range. Further, a balance between recovery goals and cultural needs must be achieved to gain public support needed for a successful sea turtle conservation and management program.

Given this status, the Western Pacific Regional Fishery Management Council convened a workshop to address the status and recovery of green turtles in the Mariana Archipelago. This workshop aimed to strengthen international collaborations with areas with known common green turtle stocks and to identify the cultural needs and traditions associated with green turtles and develop methods to integrate such needs into green turtle conservation activities in the Commonwealth of the Northern Mariana Islands (CNMI) and Guam. Approximately 50 participants including cultural practitioners, fishermen, researchers, biologists, environmentalists and government representatives gathered from CNMI, Guam, American Samoa, Hawaii, Japan and the Philippines for the three-day workshop in Saipan on Jan. 25-27, 2011.

Researchers presented ongoing studies and current knowledge of green turtles in their respective areas. Participants made commitments to one another to share data and information to further the understanding of green turtles in the region and also suggested that a regional ecosystem management plan be developed to include the Mariana Archipelago, Japan, Philippines and the broader Micronesian region.

The workshop also provided a unique opportunity to learn from the practitioners about the importance and significance of sea turtles in their culture and to begin a dialogue to balance cultural needs and modern-day conservation. Because some cultural knowledge is passed down according to protocol and shared only among the keepers of knowledge, the practitioners would speak among themselves to decide what pieces of knowledge to share with others. Among the knowledge they shared were three ways in which sea turtles hold significance in their culture: 1) turtles as a symbol of peace; 2) important use in the women's menstruation house; and 3) use in navigation. One practitioner shared that traditional navigators know of 184 migratory paths of turtles, with each route having its own name. Practitioners are able to tell where turtles will go, based on the sex of the turtle, season and other known factors. Modern science of satellite tracking and flipper tag recoveries, they said, are confirming what they have known all along. The process of finding a balance between such rich cultural knowledge and modern-day conservation will take patience and understanding among all of those involved. This workshop started that process.

Traditional Lunar Calendar Workshop: The Traditional Lunar Calendar Workshop held January 27 and 28, 2011, on Saipan, Commonwealth of the Northern Mariana Islands (CNMI), was designed to help the Council evaluate and improve the effectiveness of the traditional lunar calendars that it has produced for the four island areas of the Western Pacific Region since 2007. The calendars were initially produced as an outreach and education tool to publicize and garner support for the Council's fishery ecosystem plans. Fishing, indigenous and educational communities embraced the calendars not only for this purpose but also to promote best practices in fisheries conservation and natural resource management as well as traditional knowledge and indigenous languages and cultures.

Although community and fishermen support for the calendars has been strong, their effectiveness as an outreach and education tool for conservation and management has been questioned. The workshop served to address this point by having experts in the field evaluate the use of these and other lunar calendars in the US flagged and associated Pacific islands and suggest areas for improvement. Meanwhile, formal evaluation of the calendars' effectiveness is being conducted by a professional research company, which also participated in the workshop.

The participants in this first of its kind meeting came from American Samoa, Palau, Yap, Guam, Rota, Saipan, Oahu, Maui, Molokai and Moku o Keawe. They included approximately 30 indigenous practitioners, island fishermen, Western scientists, cultural educators, researchers, academics, designers and publishers who support the use of traditional lunar calendars to guide the ways we use, manage and educate others about our natural resources and our indigenous language and cultures. The full report is available at the Council Office.

Lunar Calendar Festival: The Guam Fishermen's Cooperative Association, with support from the Dept. of Chamorro Affairs, Farmers Cooperative Association of Guam, Guam Hotel & Restaurant Association, Guam Visitors Bureau, Mayor's Council of Guam, and the Western Pacific Regional Fishery Management Council, celebrated the ***4th Gupot Fanha'aniyan Pulan CHamoru*** (Chamorro Lunar Calendar Festival) last January 22, 2012, the day before the beginning of the New Moon and Lunar New Year on January 23. It was held on the grounds of the Guam Fishermen's Cooperative Association along the stretch of the Marina and Boat Basin next to the Chamorro Village in Hagåtña.

The Western Pacific Regional Fishery Management Council conducted a poster competition for Guam designed for students in grades K-12. The CHamoru theme of the competition was *"Fino' Gualåffon: Espiriton Lina'la' gi Tinilaikan Klema ginen i Kutturat Kustombre yan Maneran i ManChamorro Siha"* (Moonlight Talk: Surviving Climate Change through Chamorro Cultural Traditions &Values)." This theme encourages discussion on how traditional knowledge and practices can prepare the community to adapt/survive the impacts of climate change. The lunar movement directs the life cycles of the flora and fauna of the land. Climate Change can have catastrophic impacts to these resources and the people of the Marianas. The practice of culture and tradition has provided the people of the Marianas resiliency in the face of such challenges. Teachers were encouraged to include this contest in their lesson plans and hundreds of entries were received.

Traditional Fishing Documentation: The goal of the project is to document traditional fishing on Guam. The goal was not only to document the traditional fishing techniques, but also the traditional ecological knowledge behind the techniques. The help of the village mayors and the Guam Fishermen's Co-operative Association in were enlisted to identify traditional fishers. Eight traditional fishers or fishing families was interviewed, and four was selected to be filmed. The film was broadcasted through the local Public Broadcasting Service (PBS) station KGTF to produce a 30-minute television program aimed at adults. The information gained from the interviews was used to produce a 24-page booklet, which was distributed in the schools. It was also distributed at cultural events related to fishing, such as the annual *Gupot Y Peskadot* (Fishermen's Festival) and *Gupot Fanha'aniyan Pulan CHamoru* (Chamorro Lunar Calendar Festival). It is hoped to preserve the knowledge of traditional fishing and note ways in which the traditional ecological knowledge can be used in present-day science-based fishery management. The use of the booklet in the schools will also promote sustainable fishing practices and pride in traditional resource management.

Support Staff for the BioSampling Program in Guam and CNMI: The Council funded two part-time positions (one each for Guam and CNMI) to support the PIFSC BioSampling Program. This program aimed to gather more comprehensive length-weight estimates by conducting a census of the catch being landed in the commercial fishery. Inherently, the Program also collected a better resolution for catch composition and estimate of total catch since the sampling is being done in collaboration with the market. Additional manpower was needed to cope with the amount of catch that needs to be measured. Contracts were issued to the leads of each area in order to hire additional bodies to support their work.

National Marine Fisheries Service – Pacific Islands Fisheries Science Center

2011 Mariana Archipelago Cost-Earnings Study

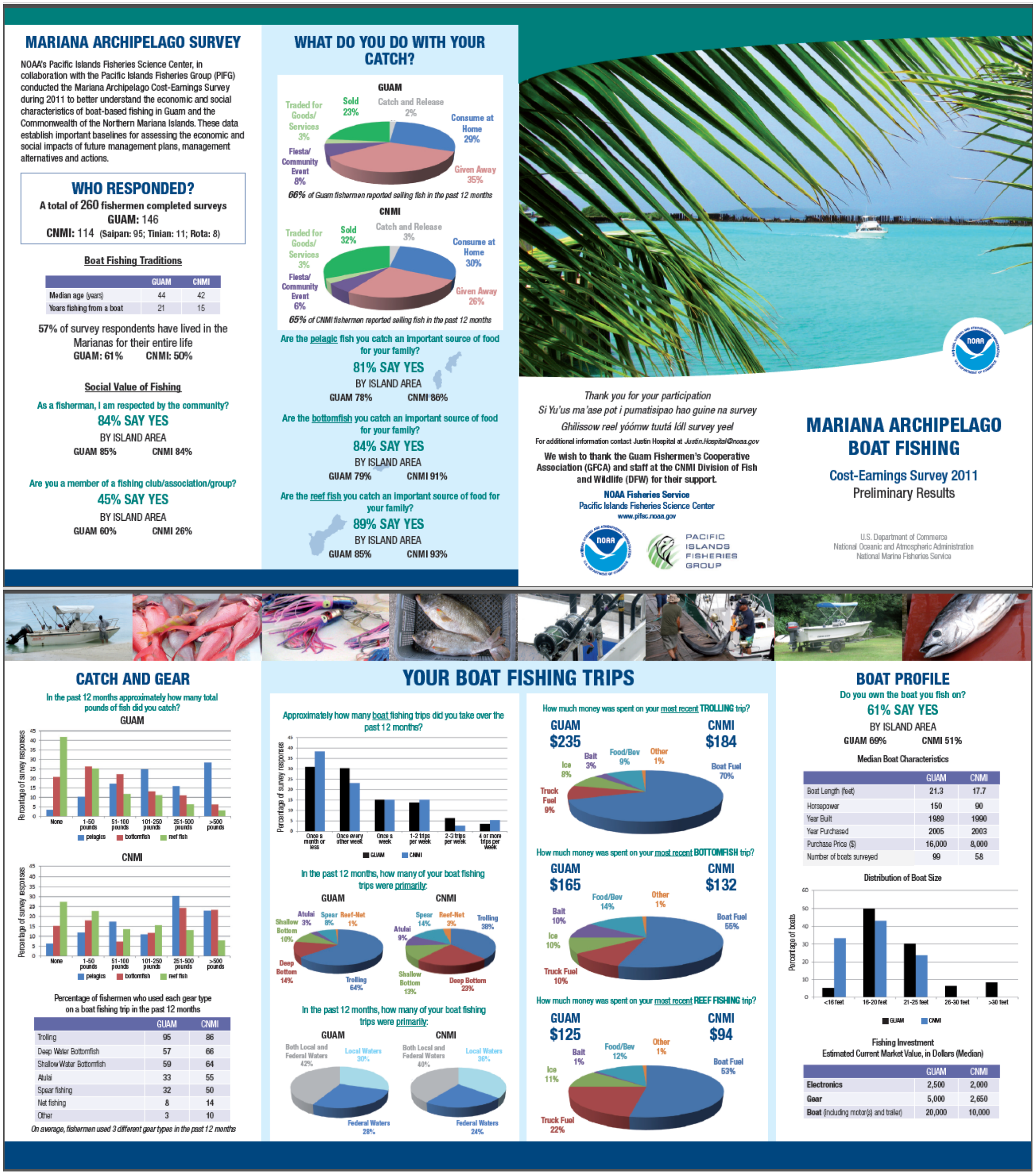
In 2011, PIFSC Economist Justin Hospital, in collaboration with the Pacific Islands Fisheries Group (PIFG), completed a cost-earnings survey to better understand the economic, social, and cultural importance of boat-based fishing across the Mariana archipelago (Guam and Commonwealth of the Northern Mariana Islands). Data were collected from surveys of 260 fishermen, including some of the first boat-based fisheries data to come from the islands of Tinian and Rota.

A brochure with preliminary results was developed. It provides valuable insights to characterize boat-based fishing across the Mariana Archipelago. Researchers confirmed the strong sociocultural role of fishing in this region. Most pelagic fishermen (81% of them), bottomfish fishermen (84%) and reef fishermen (89%) consider the fish they catch to be an important source of food for their family. Consistent with this result, on average only a portion of catch (27%) was sold, whereas the majority of fish was either given away to family and friends (31%), consumed at home (30%), or caught for fiestas and other community events (7%).

Whereas 65% of responding fishermen reported selling fish in the past 12 months, only 24% considered themselves to be a commercial fisherman, while 40% (the largest group) described themselves as subsistence fishermen. Additionally, 38% described themselves as fitting into more than one fisherman classification category, emphasizing the diverse motivations for fishing in the region.

The rising costs of fishing, changing weather and climate were cited as primary reasons that have made fishing more difficult in the region in recent years. Despite such challenges, most fishermen believed that more people will be involved in fishing in the near future, due to the cultural importance of fishing and the poor economy.

A full report of survey findings in currently under development and should be published by the end of 2012.



Marianas Cooperative Research Projects

This section is an excerpt from the Pacific Island Fisheries Group website on Cooperative Research. (http://www.fishtoday.org/cooperative-research/bottomfish-cooperative-research). The Pacific Island Fisheries Group (PIFG) was contracted, through the National Marine Fisheries Service Cooperative Research Program (CRP) initiative, to assist in achieving four goals: 1) Implement a pilot fishery-independent survey of bottomfish in waters around Oahu, Maui and Guam; 2) Expand the Hawaii bottomfish tagging program; 3) Expand fishery-dependent sampling of bottomfish throughout the Main Hawaiian Islands (MHI); and 4) Educate the community and conduct outreach about these efforts.

PIFG contracted six vessels with highly experienced captains and four observers to conduct the fishery-independent survey around Oahu, Maui and Guam. As of publication of this report, three single-day observer trips from Oahu and Maui were conducted, one targeting onaga and two targeting opakapaka. There were also three multi-day observer trips conducted targeting both species. All targeted fishing trips yielded the respective targeted species, however landing success varied based on weather conditions. A total of 12 observer trips were conducted on Galvez Bank off Guam over a two-week period, during which time contracted vessels fished a total of 83 NOAA-selected waypoint sites. After fishing the required sampling sites, the Guam-contracted vessels still had enough time to conduct limited exploratory fishing at randomly sampled sites, and productivity and the type of species landed from both efforts can be compared. Data analysis will include a focus on correlation between landing levels and sea conditions. The full report is available at the PIFG website.

National Marine Fisheries Service – Pacific Island Regional Office

Sustainable Fisheries is the primary division at the NMFS-Pacific Islands Regional Office (PIRO) responsible for overseeing and implementing fishery management plans for commercial and non-commercial domestic fisheries in the Pacific Islands, as authorized under the Magnuson-Stevens Fishery Conservation and Management Act.

The Sustainable Fisheries Division strives to maintain healthy stocks, eliminate overfishing, and rebuild overfished stocks important to commercial, recreational, and subsistence fisheries. Under these objectives, the goal is to increase long-term economic and social benefits to the nation from living marine resources.

This summary contains excerpts of the PIRO reports to the 150th to 153rd Western Pacific Fishery Management Council meetings held from March 2011 to March 2012, and other relevant information. The activities and actions taken by the PIRO Sustainable Fisheries Division relate to American Samoa.

American Samoa

Rulemaking

Annual Catch Limits for Federal Fisheries: On March 16, 2011, the National Marine Fisheries Service (NMFS) announced the availability of the amendments to all five Fishery Ecosystem Plans (FEPs), and an associated environmental assessment, that would establish a way of setting annual catch limits (ACL) for western Pacific federal fisheries, that is, from 3-200 nautical miles from shore (76 FR 14367). On March 31, 2001, NMFS published a proposed rule that would implement the ACL amendment (76 FR 17808).

On June 14, 2011, the Secretary approved Amendment 1 to the Pacific Remote Island Areas (PRIA) FEP, Amendment 2 to the American Samoa FEP, Amendment 2 to the Marianas FEP, Amendment 3 to the Hawaii FEP, and Amendment 4 to the Pelagics FEP. These amendments established a way of setting annual catch limits (ACLs) and accountability measures in western Pacific federal fisheries. NMFS established regulations for the ACL process in a final rule published on June 27, 2011 (76 FR 37285). That rule was effective July 27, 2011.

On January 3, 2012, NMFS proposed annual catch limits for western Pacific bottomfish, crustacean, precious coral, and coral reef ecosystem fisheries in federal waters (77 FR 66). NMFS published the final ACL specifications on February 7, 2012 (77 FR 6019). If any of the 101 ACLs are exceeded, the Council may take action (as an accountability measure) to reduce that ACL for the next fishing year by the amount of the overage or could recommend other appropriate measures.

Purse Seine Fishing Closed Area around American Samoa: On April 6, 2011, NMFS announced the availability of Pelagic FEP Amendment 3 and environmental assessment (76 FR 19028). In Amendment 3, the Council recommended that NMFS increase the prohibited areas for purse seine fishing around American Samoa from 50 to 75 nautical miles from shore. On April 29, 2001, NMFS published a proposed rule that would implement Amendment 3 (76 FR 23964).

On July 5, 2011, the Secretary disapproved Amendment 3 to the Pelagics FEP. This amendment does not establish conservation and management objectives that are consistent with the National Standard guidelines. The existing 50 nautical mile prohibited purse seine fishing zone around American Samoa remains. On July 7, 2011, NMFS withdrew the proposed rule (76 FR 40674).

Gear Modifications for the American Samoa Longline Fishery: On August 8, 2011, the Secretary approved Amendment 5 to the Pelagics FEP. Amendment 5 requires specific gear configurations for pelagic longline fishing south of the Equator to reduce interactions with sea turtles, including around American Samoa. Longline fishermen are required to set their gear to fish at least 100 meters deep with specific minimum lengths for fishing gear. On August 24, 2011, NMFS published a final rule to implement Amendment 5 (76 FR 52888) and an additional requirement from a September 16, 2010, biological opinion resulting from Endangered Species Act (ESA) section 7 consultation. That final rule was effective on September 23, 2011.

Program Activities

Tsunami Disaster Relief for American Samoa: The Pacific Islands Regional Office, with the assistance of the American Samoa Department of Marine and Wildlife Resources, Council, and Pacific Islands Fisheries Science Center compiled information for evaluating whether a commercial fishery failure had occurred in American Samoa from the 2009 tsunami. In a letter sent to Governor Tulafono on January 26, 2012, the Secretary of Commerce, John Bryson, determined that a commercial fishery failure occurred for the commercial bottomfish fishery in American Samoa. The 2009 tsunami caused a fishery resource disaster from damage to fishing vessels that created a loss of access to the fishery and reduced revenue. If Congress provides disaster relief funding, PIRO will work with the Governor's administration to develop an economic spending plan to support and restore the bottomfish fishery, prevent a similar failure, and assist the affected fishing community.

Permits for the American Samoa Longline Fishery: On January 14, 2011, NMFS announced the availability of four Class A permits and three Class B permits in the American Samoa longline fishery (76 FR 2664). As of May 11, 2011, PIRO received five applications for Class B permits and none for Class A permits. The deadline for permit applications was May 16, 2011.

On September 1, 2011, PIRO mailed reminders to American Samoa longline permit holders whose permits will expire by the end of 2011. This was the second reminder of the permit expirations and minimum catch requirement. Several American Samoa longline permit holders transferred permits to Hawaii longline permit holders, increasing the total of dual-permitted vessels to 18 (at that time).

Mariana Archipelago (Guam and CNMI)

National Actions

Marine Recreational Fishing: On May 9, 2011, PIRO hosted an informal recreational fishing working group to begin the process of working with island fishermen to identify key recreational fishing issues. The purpose is to focus on actions that are realistic and achievable in addressing Pacific Island marine recreational fishing issues, consistent with the National Saltwater Action Plan. Nationwide, all regions are holding similar meetings to grapple with data collection issues, improved communications with fishermen and increased fishing opportunities, and involvement of stakeholders by July 15, 2011.

Rulemaking

On March 11, 2011, NMFS announced the availability of Pelagic FEP Amendment 2 and environmental assessment (76 FR 13330). In Amendment 2, the Council recommended that NMFS prohibit purse seine fishing in the EEZ around the CNMI and Guam, and establish a longline prohibited area around the CNMI. Comments on Amendment 2 were due on May 10, 2011. On March 31, 2001, NMFS published a proposed rule that would implement Amendment 2 (76 FR 17811). Comments on the proposed rule were due on May 16, 2011.

On March 16, 2011, NMFS announced the availability of the amendments to all five FEPs, and an associated Environmental Assessment, that would establish a mechanism for setting annual catch limits (ACL) in western Pacific fisheries (76 FR 14367). Comments on the ACL amendments were due on May 31, 2011. On March 31, 2011, NMFS published a proposed rule that would implement the ACL amendment (76 FR 17808). Comments on the proposed rule were due on May 16, 2011.
On June 8, 2011, the Secretary, through NMFS, partially approved Amendment 2 to the Pelagics Fishery Ecosystem Plan (FEP) concerning the Mariana Archipelago. The Secretary approved the prohibition on pelagic longline fishing around the Commonwealth of the Northern Mariana Islands (CNMI), and disapproved the prohibition on purse seine fishing in the U.S. EEZ around CNMI and Guam because it was inconsistent with the national Standard guidelines. On June 27, 2011, NMFS published a final rule to prohibit pelagic longline fishing within approximately 30 nm of shore around the CNMI (76 FR 37287). That rule took effect on July 27, 2011.

On June 27, 2011, NMFS published in the Federal Register the final rule that establishes the procedures and timing for specifying annual catch limits (ACLs) and accountability measures (AMs) for western Pacific fisheries. The final rule is intended to help NMFS end and prevent overfishing, rebuild overfished stocks, and achieve optimum yield. This rule became effective July 27, 2011.

On July 7, 2011, NMFS announced its approval of an MCP for Guam (76 FR 39858). The MCP is effective from June 28, 2011, through June 27, 2014.

On August 12, 2011, NMFS announced its approval of an MCP for the Northern Mariana Islands (76 FR 50183). The MCP is effective from August 4, 2011, through August 3, 2014.

On October 11, 2011, NMFS published in the Federal Register a temporary rule that would have closed the U.S. pelagic longline fishery for bigeye tuna in the WCPO as a result of the fishery reaching the 2011 bigeye tuna catch limit, effective November 27, 2011 (76 FR 71469). On December 1, 2011, NMFS withdrew the temporary rule because NMFS no longer expected that the fishery would reach the bigeye tuna limit in 2011 (76 FR 74747).

On December 30, 2011, NMFS issued an interim final rule (76 FR 82180, December 30, 2011) for U.S. purse seine vessels operating in the Western and Central Pacific Ocean (WCPO) extending the dates of applicability through December 31, 2012 for fishing effort limits, prohibition periods for using fish aggregating devices, high seas area closures, catch retention provisions, and observer coverage provisions. The regulations implement the Western and Central Pacific Fisheries Commission's (WCPFC) conservation and management measure (CMM) for bigeye and yellowfin tuna (CMM 2008-01). CMM 2008-01 was scheduled to expire on December 31, 2011, but on December 20, 2011, the WCPFC made an intersessional decision to extend the effectiveness of the measure until the next regular annual session of the WCPFC, now scheduled for March 2012.

On January 3, 2012, NMFS proposed annual catch limits for western Pacific bottomfish, crustacean, precious coral, and coral reef ecosystem fisheries (77 FR 66). The public comment period ended on January 18, 2012; NMFS did not receive any public comments. If any of the 101 ACLs are exceeded, the Council may (as an accountability measure) take action to reduce that ACL for the subsequent fishing year by the amount of the overage or could recommend other appropriate measures. NMFS published the final ACL specifications on February 7, 2012 (77 FR 6019).

NMFS provides proposed and final rules and other important notices at www.fpir.noaa.gov/SFD/SFD_regs_1.html. Anyone may view proposed and final rules, supporting documents, and public comments at www.regulations.gov.

Program Activities

In March 2011, PIRO staff visited Saipan to help commercial bottomfish fishermen apply for Federal fishing permits. Many vessel owners with boats in the commercial CNMI bottomfish fishery do not have a Federal Bottomfish Permit, two years after the permit became required. Many captains and boat owners are still unaware of the requirements, so PIRO is contacting these fishermen to assist with their permit applications.

In March 2011, staff also conducted a Protected Species Workshop for eight longline fishermen based in Saipan.

In August 2011, SF staff visited Saipan to help commercial bottomfish fishermen apply for Federal fishing permits. Many vessel owners with boats in the commercial CNMI bottomfish fishery do not have a required Federal Northern Mariana Islands Bottomfish Permit. SF staff worked with other PIRO staff in Saipan, NOAA Law Enforcement, Pacific Islands Fisheries Science Center, and the CNMI government.

In December 2011, SF staff traveled to Saipan to contact CNMI commercial bottomfish vessel owners regarding the required federal Northern Mariana Islands Bottomfish Permit. Of the estimated 50 commercial bottomfish vessel owners, only nine have the required permit. As part of the outreach effort, SF worked with NOAA Law Enforcement, PIFSC, and the CNMI government. Meetings were held with representatives from private tackle shops, roadside fish stands, and a boat repair shop to deliver information and application packets to vessel owners.

In February 2012, PIRO completed the booklet, Sharks of the Marianas Archipelago, which provides concise information on 18 species of sharks. The objective of the booklet is to encourage responsible harvest and conservation of sharks in the islands.

Western Pacific Regional
Fishery Management Council
1164 Bishop Street, Suite 1400
Honolulu, Hawaii 96813
Tel: 808-522-8220
Fax: 808-522-8226
www.wpcouncil.org