Mariana Archipelago Fishery Ecosystem Plan 2009 Annual Report

April 2011

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WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

DRAFT

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Annual Report

Information and data analysis for this document provided by scientists at NMFS Pacific Islands Fisheries Science Center, Guam Department of Agriculture, Division of Aquatic and Wildlife Resources; Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife; the FEP Plan Team, and NMFS Pacific Islands Regional Office

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1.0 Introduction

Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), fishery management councils create fishery management plans (FMP) to manage fisheries in their respective regions. The Western Pacific Regional Fishery Management Council (Council) developed the Hawaii Islands Archipelago Fishery Ecosystem Plan[1] (FEP) as an FMP, consistent with the MSA and the national standards for fishery conservation and management, in 2009. The Council's archipelagic FEPs represent the first step in a collaborative approach to implementing an ecosystem-based approach to fishery management in the Hawaiian Islands. In addition, the organizational structure for developing and implementing the Hawaii Islands Archipelago FEP incorporates community input and local knowledge into the management process. This report is the first annual FEP report on Council-managed insular fisheries and activities in Hawaii.

The Mariana Islands Archipelago FEP established the framework under which the Council manages the fishery resources of Guam and the islands of the Commonwealth of the Northern Mariana Islands (CNMI), and seeks to integrate and implement an ecosystem approaches to management. The FEP did not establish any new fisheries or fishery management regulations. The FEP identified as management unit species (MUS) those current management unit species known to be present in waters around the Mariana Archipelago 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.

1.1 Mariana Archipelago 2009

For 2009, the most significant action would be the ongoing and future military buildup on Guam and other areas of the CNMI. The buildup would include the relocation of up to 40,000 additional people to Guam, a significant impact to an island of merely 212 sq mi and currently populated with approximately 160,000 people. This is likely a major event significantly affecting the fishing community, habitat, and potentially fish stocks in Guam and parts of the CNMI in the near future.

In 2009, bottomfish landings in Guam, nearly 90,000 lbs, were the highest since 2003 and adjusted commercial revenue increased 41% to nearly $58,000. Effort and overall catch rate in Guam's bottomfish fishery increased over time.

In CNMI, during 2009 approximately 38,000 lbs of bottomfish were estimated as landed by approximately 40 fishers with a value just above $107,000. The majority was landed during the first half of the year (January-May). Total landings during 2009 were considerably less than CNMI's bottomfish catch in 2005 (nearly 70,000 lbs). This, in part, because most of the 8 larger vessels that previously fished the northern islands did

[1] Can be located at:
http://wpcouncil.org/fep/WPRFMC%20American%20Samoa%20FEP%20(2009-09-22).pdf

not fish in 2009.

2.0 Archipelagic Fisheries

The Mariana Archipelago is comprised of the US Territory of Guam and the US Commonwealth of the Northern Mariana Islands (CNMI). The archipelago's indigenous Chamorro and Refaluwasch communities have a long history of fishing which continues today primarily for subsistence, barter and cultural sharing purposes, such as for fiestas and food exchanges with family and friends as well as for commercial sale. Non-commercial fishing in the Mariana Islands cannot be easily distinguished from commercial fishing because many fishing trips result in catch which is sold and retained for personal consumption. In addition, there are strong social obligations to share fish on Guam and CNMI and these obligations extend to all fishery sectors. Though little is known about the economic contribution of recreational fisheries, it is likely that the social and cultural importance of fisheries outweighs any economic value in the Mariana Islands.

The major fisheries in the Mariana Archipelago FEP include bottomfish, coral reef, and crustaceans fisheries. The major commercial fishery is the pelagics fishery which includes a small amount of longlining, trolling, and pole-and-line fishing. Pelagic fisheries are not included in this report as they are managed under the Pacific Pelagics FEP and will be part of that annual report.

2.0.1 Guam Data Collection

Guam currently has four fishery-dependent collection programs which can be described as a long-term data collection programs comprised of different approaches for collecting important fishery information from fishermen. The four programs are: 1) offshore data collection program; 2) inshore data collection program; 3) commercial receipt books; and 4) volunteer information program. Sportfish Restoration provides a significant portion of the funding for these programs. Training of the fishery staff to collect information is rigorous. Identification of fish to species level is the goal of Guam's fishery staff. The annual catch totals are calculated by an expansion process done in collaboration with NOAA's Pacific Islands Fishery Science Center (PIFSC).

The offshore and inshore creel survey programs collects fishery participation, effort, and catch data from fishermen. DAWR collaborates with PIFSC that maintains the fishery database and provides summary of the data on an annual basis in the form 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. The chronic challenge is refusals from fishermen to consistently provide data and persuading fishermen that providing data is a way to ensure a sustainable harvest is still an ongoing effort. Nonetheless, Guam's long term offshore, inshore, and commercial data programs provide an adequate picture of the fishery.

Significant data gaps that is currently being addressed include: 1) obtaining useful data from highliners such as commercial fishermen (e.g. spear fishers, netters, non-GFCA members) and fishermen from non-surveyed ports; and 2) persuading commercial vendors to provide catch data with breakdown at least to the actual fish families rather than generic "reef fish" designations. Overcoming these challenges will provide better and more useful fishery data about fish species and families that may be at risk.

2.0.2 CNMI Data Collection

CNMI's data collection system is dependent upon voluntary participation of the first-level purchasers of local fresh fish to accurately record all fish purchased to 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). The reduction in participants last year is due to the economic downturn in CNMI that forced a number of vendors and businesses to close.

Although CNMI's 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 had improved markedly in the last 10 years. Unfortunately, two inherent problems remained 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 bottomfih MUS 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 and not all vendors participate.

2.1 Guam Bottomfish Fishery

2.1.1. Introduction to Guam's Bottomfish Fishery

Bottomfishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. It can be separated into two distinct fisheries targeting species complexes separated by depth and species composition: shallow-water and deep-water complexes. The shallow water complex (<500 feet) makes up a larger portion of the total bottomfish effort and harvest and is comprised primarily of reef-dwelling species under genus *Lutjanus*, *Lethrinus*, *Aprion*, *Epinephelus*, *Variola*, *Cephalopholis* and *Caranx* (part of the bottomfish MUS or BMUS). The deepwater complex (>500 feet) consists primarily of groupers and snappers of the genera *Pristipomoides*, *Etelis*, *Aphareus*, *Epinephelus*, and *Cephalopholis* (see Table 1 for all BMUS). In recent years, deepwater species have made up a significant portion of the expanded bottomfishing catch.

The majority of participants in Guam's bottomfish fishery are either subsistence or part-time commercial that operate boats less than 25 feet in length and primarily target the shallow water bottomfish complex. It is uncommon for fishermen to combine bottomfishing with other methods such as trolling, spearing, and jigging to maximize their catch. The high demand for reef fish and bottomfish had made it profitable to sell locally caught bottomfish. However, the rise in the cost of fuel and fishing gear, as well as, weather conditions affect bottomfishing activities.

Table 1: Mariana Archipelago Bottomfish MUS

Local Name Chamorro/Carolinian	English Common Name	Scientific Name
lehi/maroobw	red snapper/silvermouth	*Aphareus rutilans*
gogunafon/aiwe	gray snapper/jobfish	*Aprion virescens*
tarakitu/etam	giant trevally/jack	*Caranx ignobilis*
tarakiton attelong/orong	black trevally/jack	*C. lugubris*
gadao/meteyil	blacktip grouper	*Epinephelus fasciatus*
bueli/bwele	lunartail grouper	*Variola louti*
buninas agaga'/falaghal moroobw	red snapper	*Etelis carbunculus*
abuninas/taighulupegh	red snapper	*E. coruscans*
mafuti/atigh	redgill emperor	*Lethrinus rubrioperculatus*
funai/saas	blueline snapper	*Lutjanus kasmira*
buninas/falaghal-maroobw	yellowtail snapper	*Pristipomoides auricilla*
buninas or pakapaka/falaghal-maroobw	pink snapper	*P. filamentosus*
buninas/falaghal-maroobw	yelloweye snapper	*P. flavipinnis*
NA	pink snapper	*P. seiboldii*
buninas rayao amariyu/falaghal-maroobw	Snapper	*P. zonatus*
tarakiton tadong/meseyugh	Amberjack	*Seriola dumerili*

2.1.2 Guam Fishery Performance and Economic Data

2.1.2.1 Guam Landings

Nearly 90,000 lb of bottomfish were caught in Guam during 2009, which is below the 27-year average (Table 3). Overall landings of bottomfish increased, with only shore-based bottomfish harvest decreasing in 2009. The boat-based sector was responsible for the majority (about 90%) of the landings in 2009 and of the boat-based sector the majority of the catch came from non-charter vessels (Table 3, Figures 1&2).

The harvest of the four bottomfish families had increased by 119% for jacks, 45% for groupers, 52% for emperors and a 11% decrease for snappers. A 38% increase was observed when combining all four families. Boat-based methods harvested 66% of jacks, 99% of snappers, 98% of groupers, and 94% of emperors compared with shore-based methods.

Table 2: Expanded Boat-based Creel Survey Bottomfish Catch Data, 2009

BMUS	**Harvest* (Pounds)**
lehi/maroobw (*A. rutilans)*	743
gogunafon/aiwe (*A. virescens)*	1,123
buninas agaga'/falaghal moroobw (*E. carbunculus)*	7,012
abuninas/taighulupegh (*E. coruscans)*	11,302
buninas/falaghal-maroobw (*P. auricilla)*	2,630
buninas or pakapaka/falaghal-maroobw (*P. filamentosus)*	1,094
buninas/falaghal-maroobw (*P. flavipinnis)*	970
buninas rayao amariyu/falaghal-maroobw (*P. zonatus)*	2,206
funai/saas (*L. kasmira)*	304
tarakitu/etam (*C. ignobilis)*	193
tarakiton attelong/orong (*C. lugubris)*	631
tarakiton tadong/meseyugh (*S. dumerili)*	236
gadao/meteyil (*E. fasciatus)*	1,576
bueli/bwele (*V. louti)*	1,771
mafuti/atigh (*L. rubrioperculatus)*	6,834
BMUS Total	**38,623**

Non-BMUS Bottomfish	**Harvest* (Pounds)**
Other Snappers	3,926
Other Jacks	5,196
Other Groupers	10,453
Other Emperors	12,149
Non-BMUS Bottomfish Total	**31,724**

Non-Specific Bottomfish	**Harvest* (Pounds)**
Misc Bottomfish	237
Shallow Bottomfish	6,612

Deep Bottomfish	4,711
Non-Specific Bottomfish Total	**11,560**
BOTTOMFISH TOTAL	**81,908**

*The commercial harvest landing for a species replaces the creel harvest landing if the commercial landing is higher. Therefore, the BOTTOMFISH TOTAL value may differ from BOTTOMFISH TOTAL values reported later in this module. The landings are bottomfish landed across all methods, both boat-based and shore-based.

Table 3: Bottomfish Landings (lb) 1982-2009, by Sector

Year	Total	Shore-Based	Boat-Based	Non-Charter	Charter
1982	37,639		37,639	37,639	
1983	47,119		47,119	47,119	
1984	58,095		58,095	58,095	
1985	106,043	17,930	88,113	87,935	177
1986	49,632	12,858	36,774	35,362	1,412
1987	57,677	11,753	45,924	45,509	415
1988	77,621	15,348	62,273	61,506	768
1989	89,737	6,981	82,756	82,015	741
1990	86,602	8,253	78,349	77,942	407
1991	80,711	11,092	69,619	68,600	1,019
1992	93,392	10,710	82,682	81,224	1,459
1993	103,039	7,224	95,815	95,057	757
1994	110,801	7,755	103,046	102,480	566
1995	114,142	10,798	103,344	98,179	5,165
1996	146,035	7,414	138,621	133,508	5,113
1997	109,556	9,451	100,105	95,330	4,775
1998	114,964	14,228	100,736	95,131	5,605
1999	135,747	18,680	117,067	113,011	4,057
2000	147,500	9,102	138,398	136,068	2,330
2001	131,096	13,919	117,177	116,374	803
2002	78,132	9,843	68,289	64,780	3,509
2003	100,158	7,278	92,880	91,246	1,634
2004	81,490	8,646	72,844	72,101	743
2005	71,492	5,915	65,577	63,848	1,728
2006	69,039	5,328	63,711	63,254	458
2007	56,706	7,829	48,877	48,520	357
2008	72,176	6,489	65,687	65,231	455
2009	**88,570**	**4,859**	**83,711**	**81,843**	**1,868**
Average	89,818	9,987	80,901	79,247	1,853
SD	29,651	3,751	27,652	26,658	1,754

Figure 1: Guam Bottomfish Catch, Boat and Shore, 1982-2009

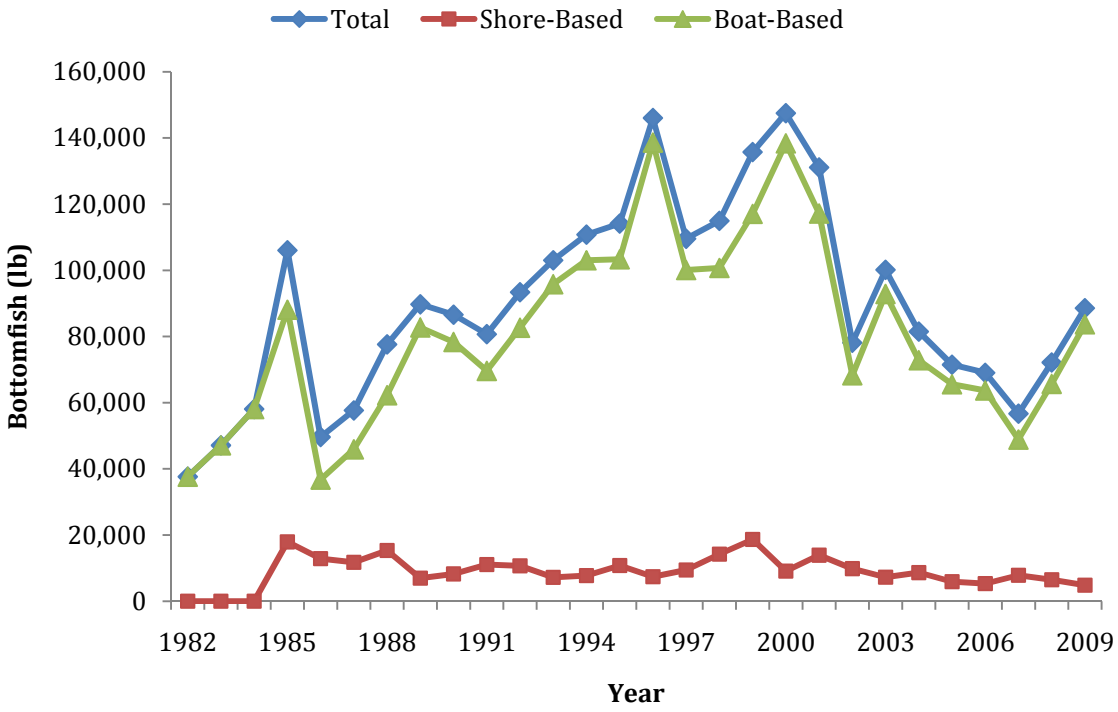


Figure 2: Guam Charter & Non-charter Vessel Bottomfish Landings, 1982-2009

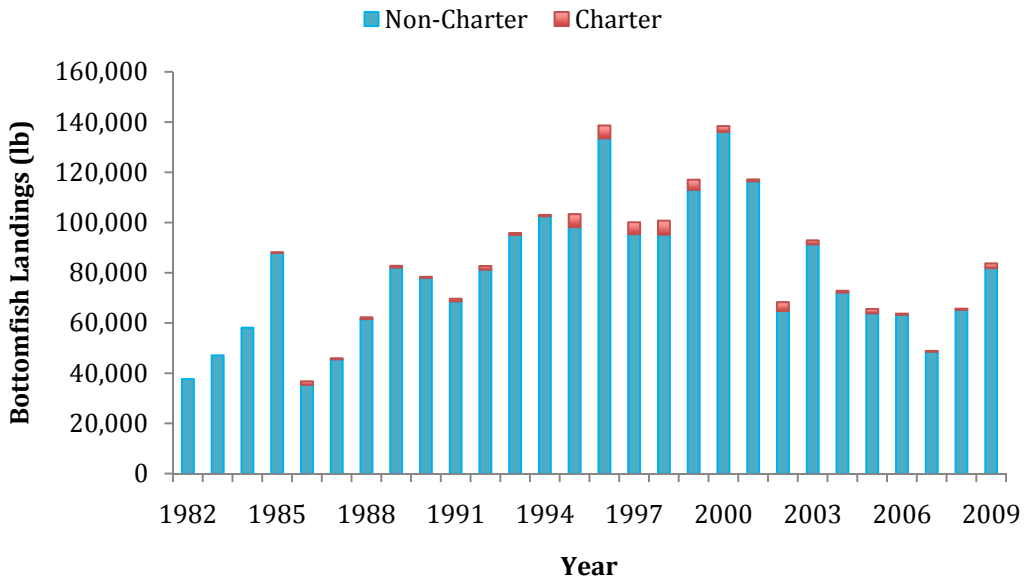
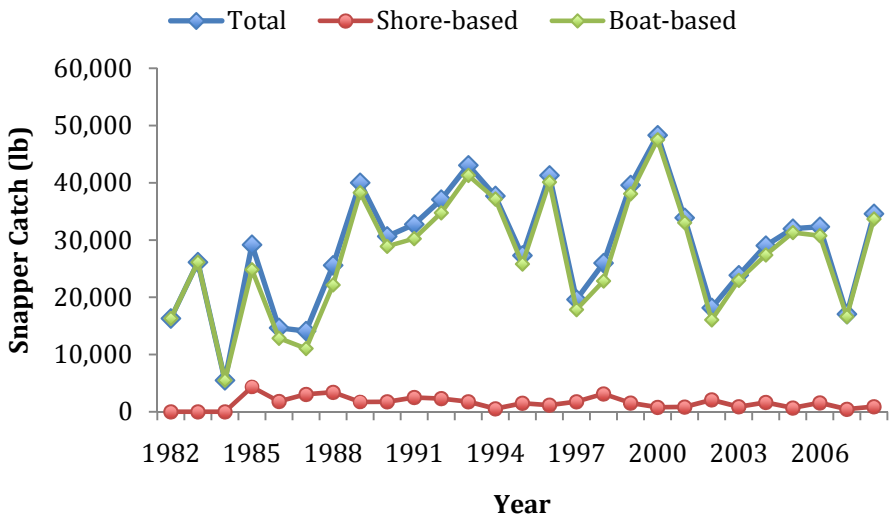


Figure 3: Guam Snapper Landings, Shore and Boat-based, 1982-2009



Note: Snappers includes only *Lutjanus*, *Pristipomoides*, *Aphareus*, *Etelis spp.*

James Borja of Guam with his 26 lb Onaga Catch

2.1.2.2 Guam Bottomfish CPUE

Boat-based catch per unit effort (CPUE in pounds/hour) for BMUS generally increased in 2009 (Figure 4). The decreasing CPUE values were from the charter trips for shallow BMUS bottomfishing. Charter harvest, which made up a small proportion of the fishery, showed high variations in landings and CPUE throughout the times series. Since most charter trips that engage in bottomfishing are shallow-water trips that release their fish, and return primarily juveniles and various species of triggerfish, resulting in low catches and high effort and create high fluctuations in BMUS CPUE in the time series.

Looking at CPUE trends per family, there was a decrease of 25% for jacks, 15% for snappers while a 250% increase for groupers, and 50% increase for emperors.

Figure 4: Guam Bottomfish Catch per Unit Effort (lb/hour), 1990-2009

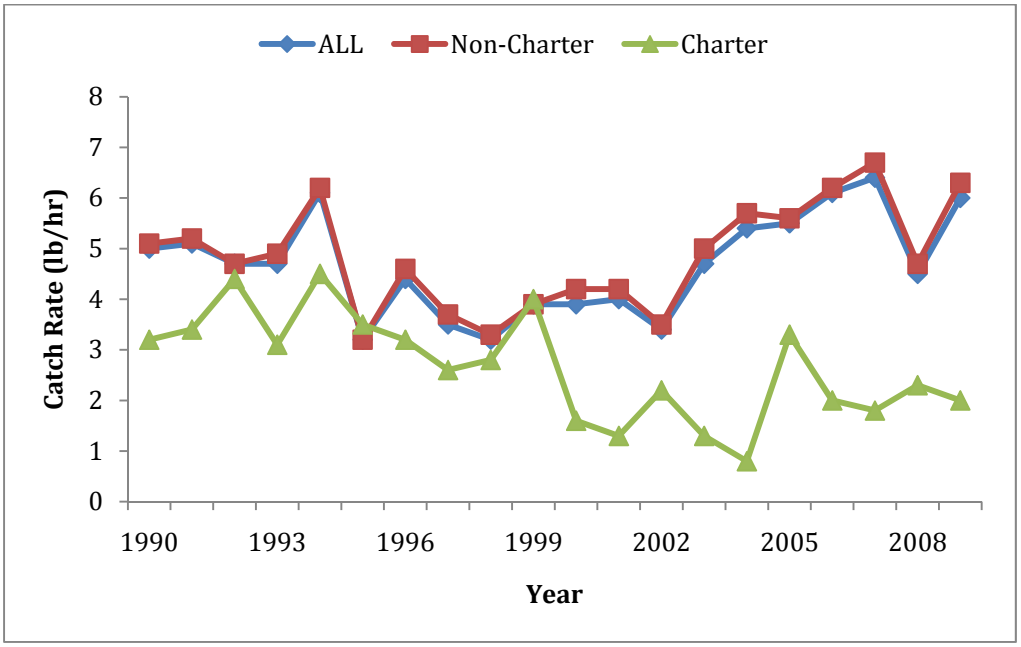


Table 4: Guam Bottomfish CPUE, Shallow, Deep and All, 1982-2009

Year	All Bottomfishing			Deep Bottomfishing			Shallow Bottomfishing		
	All	NC	C	All	NC	C	All	NC	C
1982	7.00	7.00		7.50	7.50		6.50	6.50	
1983	5.80	5.80	11.80	6.20	6.20		4.60	4.60	11.80
1984	7.70	7.70		9.20	9.20		7.40	7.40	
1985	5.70	5.70	3.80	7.60	7.60		5.10	5.10	3.80
1986	5.40	5.40	8.90	6.50	6.60	4.30	4.90	4.90	10.30
1987	6.10	6.00	8.20	7.90	7.90		5.50	5.50	8.20
1988	5.40	5.40	5.80	8.90	8.90		4.20	4.20	5.80
1989	5.20	5.30	3.90	5.80	5.80	6.60	5.10	5.30	3.80
1990	5.00	5.10	3.20	6.30	6.30		3.90	4.00	3.10
1991	5.10	5.20	3.40	5.90	5.90	2.50	4.60	4.80	3.40
1992	4.70	4.70	4.40	5.00	5.00		4.40	4.40	4.40
1993	4.70	4.90	3.10	6.80	6.80		3.80	3.90	3.10
1994	6.10	6.20	4.50	11.00	11.00		3.50	3.50	4.00
1995	3.20	3.20	3.50	6.70	6.80	3.30	2.70	2.60	3.50
1996	4.40	4.60	3.20	5.70	5.80	4.10	3.70	3.80	3.10
1997	3.50	3.70	2.60	4.60	4.60	4.30	3.10	3.30	2.50
1998	3.20	3.30	2.80	5.10	5.10	4.70	2.80	2.80	2.70
1999	3.90	3.90	4.00	9.00	8.70	11.30	2.70	2.60	3.00
2000	3.90	4.20	1.60	7.60	7.70	2.40	2.50	2.70	1.60
2001	4.00	4.20	1.30	6.80	6.80		3.40	3.60	1.30
2002	3.40	3.50	2.20	5.40	5.50	4.60	2.70	2.80	1.40
2003	4.70	5.00	1.30	6.50	6.50		4.60	5.00	1.30
2004	5.40	5.70	0.80	7.20	7.50	1.50	4.90	5.10	0.80
2005	5.50	5.60	3.30	9.40	9.50	5.00	3.10	3.20	2.20
2006	6.10	6.20	2.00	7.80	7.90	5.00	4.90	5.10	1.70
2007	6.40	6.70	1.80	13.80	13.80		5.20	5.50	1.50
2008	4.50	4.70	2.30	5.70	5.60	8.40	3.70	3.90	1.60
2009	**6.00**	**6.30**	**2.00**	**8.60**	**8.70**	**3.60**	**4.30**	**4.60**	**1.40**
Average	4.70	4.80	3.05	7.30	7.33	4.77	4.21	4.31	3.51
SD	1.21	1.18	1.98	1.99	1.98	2.47	1.18	1.19	2.74

NOTE: NC = non-charter; C = charter

2.1.2.3 Guam Effort

Effort (charter and non-charter vessels, combined number of trips) peaked in 1999 with nearly 10,000 trips then declined thereafter to approximately 4,000 trips (Figure 5). Fishing effort dictates the trend for bottomfish catches with both having peaks in 1995 and 1999 and an upswing in 2008 and 2009 (Figures 1 & 2).

Figure 5: Number of Vessels in Guam's Bottomfish Fishery, 1982-2009

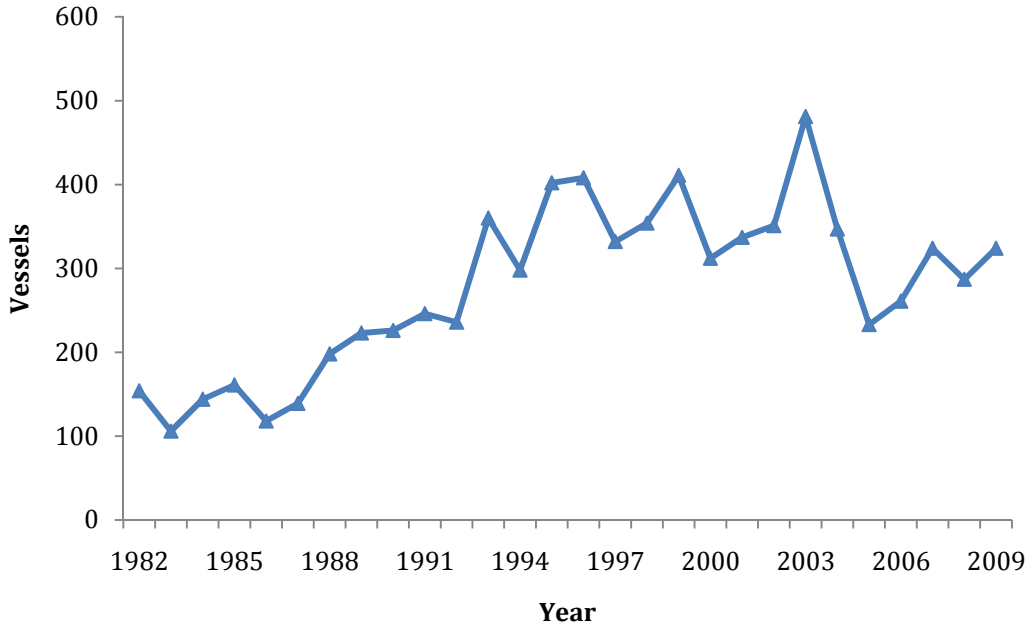
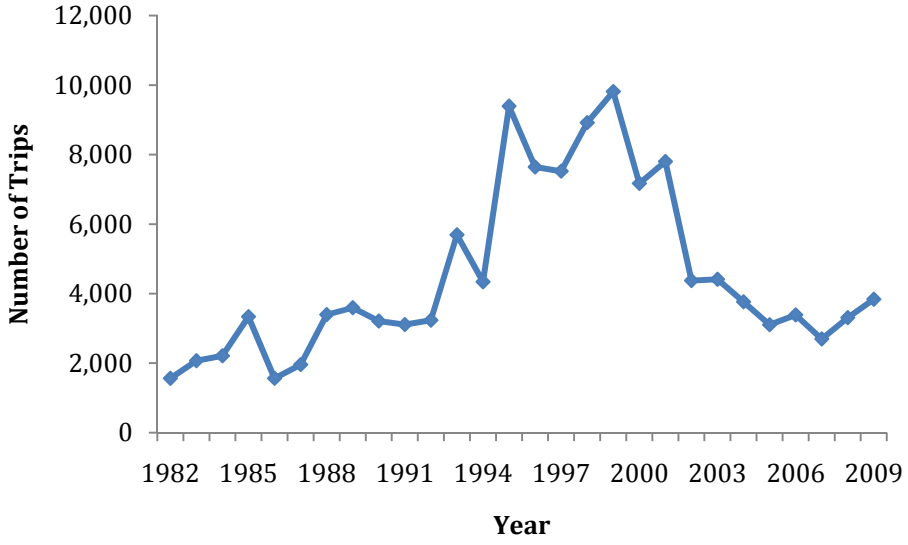


Figure 6: Guam Bottomfishing Trips (Charter & Non-charter combined), 1982-2009



2.1.2.4 Guam Bottomfish Revenue

The adjusted commercial revenue increased 41% to $57,894 (Table 6), the average price of bottomfish increased slightly to $3.58 per pound (Table 5), and the

adjusted revenue per trip for bottomfish increased 27% ($144). Revenue for all species increased 10%, $264 per trip. The commercial harvest (16,150 pounds) is 18% of the total bottomfish harvest (88,570 pounds).

Table 5: Guam Commercial Bottomfish Prices for 2009

Species Name	Ave Price ($/lb)
tarakiton tadong/meseyugh	2.63
tarakiton attelong/orong	2.55
Jacks	3.09
mafuti/atigh	2.98
Snapper	2.96
Tagafi (red snapper)	2.00
gogunafon/aiwe (gray snapper)	2.73
Bottomfish	3.16
buninas agaga'/falaghal moroobw (squirrelfish snapper)	3.82
buninas rayao amariyu/falaghal-maroobw (flower snapper)	4.00
Grouper	2.89
Kalikali (pink snapper)	3.21
lehi/maroobw (silverjaw)	3.77
abuninas/taighulupegh (longtail snapper)	4.98
buninas or pakapaka/falaghal-maroobw	3.98
Deep Bottom	1.50
All Bottomfish Species	**3.58**

Table 6: Guam Bottomfish Landings and Revenue, 1980-2009

Year	Harvest (Pounds)		Revenue ($)	
	Total	Commercial	Unadjusted	Adjusted
1980		9,434	11,528	64,455
1981		10,596	18,825	87,387
1982	37,639	6,947	13,412	59,213
1983	47,119	36,984	67,013	285,878
1984	58,095	23,291	44,213	173,493
1985	106,043	28,028	52,311	197,631
1986	49,632	12,110	21,849	80,360
1987	57,677	12,639	23,551	82,948
1988	77,621	15,933	29,818	99,831
1989	89,737	19,630	47,365	142,949
1990	86,602	18,916	50,479	133,415
1991	80,711	11,278	31,703	75,993
1992	93,392	10,668	30,355	66,082
1993	103,039	10,191	29,526	59,318
1994	110,801	30,356	105,126	180,606
1995	114,142	13,815	44,865	73,219
1996	146,035	7,389	19,531	30,351
1997	109,556	10,621	31,485	48,015
1998	114,964	14,737	47,770	73,279
1999	135,747	30,757	110,066	165,870
2000	147,500	21,924	77,474	114,429
2001	131,096	26,289	84,999	127,328
2002	78,132	18,297	56,090	83,518
2003	100,158	11,731	36,528	52,929
2004	81,490	25,054	73,466	100,354
2005	71,492	23,118	73,511	93,285
2006	69,039	17,208	58,090	66,048
2007	56,706	16,861	49,478	52,694
2008	72,176	11,526	40,180	41,024
2009	**88,570**	**16,150**	**$57,894**	**$57,894**
Average	89,818	17,416	47,950	98,993
St. Dev.	29,651	7,696	25,267	56,174

2.1.2.5 Guam Fishery Bycatch and Protected Species

In Guam, bycatch had been generally decreasing since data collection began in 2001 (Table 7). Bycatch information was obtained through intercepts surveys and with the number of pieces of bycatch species being compared with the number of all fish species caught by the boat-based bottomfishing method. Bycatch from Guam's bottomfish fishery is composed primarily of juvenile mullets, triggerfish, and groupers.

For the past five years Guam's fishery had less than five percent bycatch released and of that nearly all are released alive (Table 7).

Table 7: Guam Bottomfish Bycatch Summary, 2001-2009

Year	Released alive	Released dead/ injured	Total Number Released	Total Number Landed	Percent Bycatch *	Interviews with Bycatch	Total Number of Interviews	Percent of Inter-views 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**

2.1.2.6 Non-commercial Fishery

In Guam, the non-commercial fishery is substantially greater than the commercial fishery. During 2009, the commercial harvest (16,150 pounds) was just 18% of the total bottomfish harvest (88,570 pounds) and therefore, 72,420 lb is considered non-commercial catch.

2.2 CNMI Bottomfish Fishery

2.2.1. Introduction to CNMI's Bottomfish Fishery

CNMI's bottomfishery still consists primarily of small-scale local boats engaged in commercial and subsistence fishing, although a few (generally <5) larger vessels (30–60 ft) also 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 reef fishes (especially snappers and groupers) as well. Hand lines, home-fabricated hand reels and small 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 vessels fished at the northern islands. CNMI's bottomfish fishery occurs primarily around the populated islands and adjacent banks from Rota 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).

CNMI's bottomfish fishery continues to show a high turnover with changes in the number of 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 the coral reef stocks 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. There was a 10% decrease in overall bottomfish landings from 2008 to 2009.

Nearly all of the 8 larger vessels previously fishing the northern islands did not fish in 2009. There was no port-side sampling conducted on these commercial trips made by these larger vessels. These vessels use to catch the majority of the deep-water bottomfishes. Fishermen utilizing larger vessels have greater access to the deep-water bottomfish resources, especially in the northern islands of the CNMI. However, this sector of the industry requires more investment, consistent long-term effort, and knowledge to recoup the costs than the shallow-water bottomfish sector.

The bottomfish MUS for CNMI incorporated by the FEP are in Table 1.

2.2.2 CNMI Fishery Performance and Economic Data

2.2.2.1 CNMI Landings

During 2009 approximately nearly 38,000 lbs of bottomfish were landed in CNMI by 40 fishers with a total value just above $107,000; amounts below the 26-year everages (Table 8). Majority was landed in the first half of the year (January-May) as shown in Figure 7. Over time, catches have fluctuated widely with an average of around 40,000 lbs which is slightly higher than the 2009 total catch (Figure 8).

Of the shallow-water BMUS, landings were dominated by emperors (mafute) (Figure 9) and the deep-water BMUS landings were dominated by falaghal-maroobw and gindai (Figure 10).

Table 8: CNMI Bottomfish Fishery Statistics, 1983-2009

YEAR	TOTAL LANDINGS	CPUE (lb/trip)	CPI ADJUSTED REVENUE	CPI ADJUSTED PRICE
1983	28,529	43	116,161	4.07
1984	42,664	70	157,221	3.69
1985	40,975	117	141,260	3.45
1986	29,911	104	112,133	3.75
1987	49,715	169	171,585	3.45
1988	47,313	181	156,230	3.3
1989	24,438	73	88,448	3.62
1990	12,927	81	50,763	3.93
1991	7,093	47	30,297	4.27
1992	10,598	59	37,265	3.52
1993	18,461	84	62,495	3.39
1994	25,469	74	91,722	3.6
1995	36,101	93	154,307	4.27
1996	66,387	119	274,489	4.13
1997	64,143	137	261,771	4.08
1998	59,022	148	246,133	4.17
1999	55,991	156	245,154	4.38
2000	45,258	56	154,003	3.4
2001	71,256	68	262,154	3.68
2002	46,765	101	162,175	3.47
2003	41,903	89	144,140	3.44
2004	54,474	104	170,834	3.14
2005	70,405	76	228,821	3.25
2006	28,293	48	91,686	3.24
2007	39,476	60	114,983	2.91
2008	42,073	59	119,888	2.85
2009	**37,916**	**60**	**$107,366**	**$2.83**
AVERAGE	40,650	92	$146,425	$3.60
SD	17,450	38	68,766	0.44

Figure 7: 2009 CNMI Estimated Monthly Bottomfish Landings (1,000 lb)

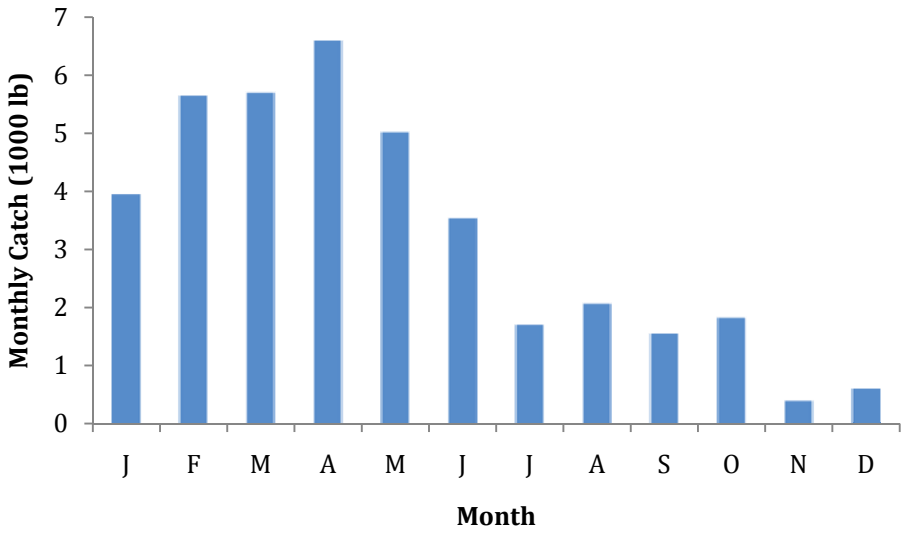


Figure 8: CNMI Bottomfish Landings (1,000 lb), 1981-2009

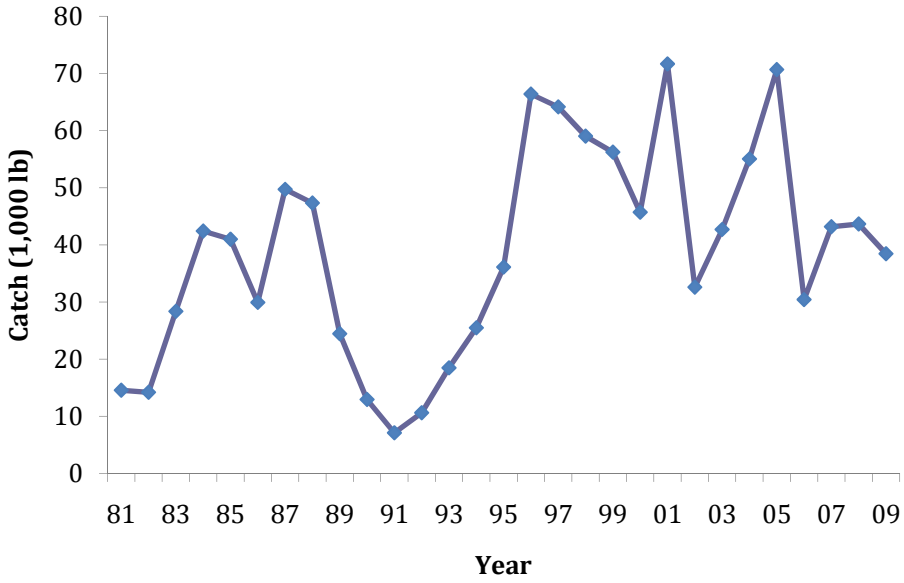


Figure 9: CNMI Commercial Landings of All Shallow-water Bottomfish, Emperors and Shallow-water Snappers, 1983-2009

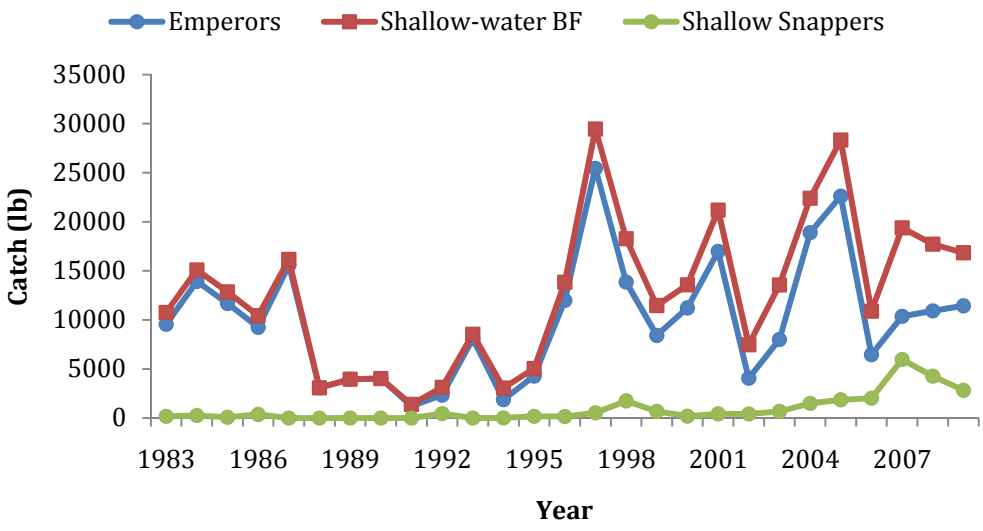
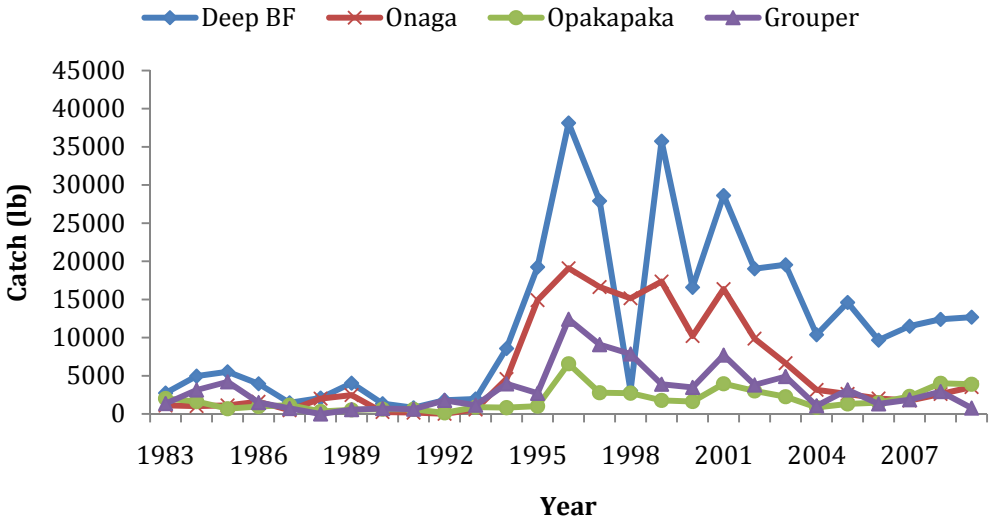


Figure 10: CNMI Commercial Bottomfish Landings of All Deep-water Bottomfish, Onaga, Opakapaka and Deep-water Grouper, 1983-2009

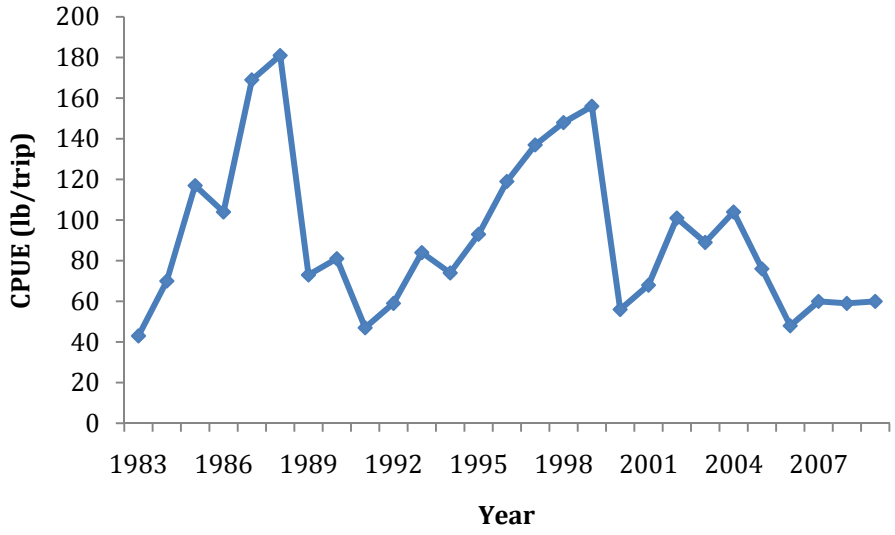


2.2.2.2 CNMI Bottomfish CPUE

For the past five years the CPUE had been significantly below the long-term average (Table 8, Figure 11), however, this may be primarily due to highliners entering and exiting the fishery. Bottomfishing requires more technical skill than pelagic trolling,

including knowledge of the location of specific bathymetric features. In addition, fishermen targeting the deep-water bottomfish, if successful, tend to fish for 1–4 years before leaving the fishery, whereas majority of fishermen who are 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 fishery's learning curve, degree of difficulty, and the relatively short duration and high turnover of participation all affect the CPUE.

Figure 11: Catch-per-unit of Effort in CNMI Bottomfish Fishery, 1983-2009



2.2.2.3 CNMI Effort

In terms of participation, the bottomfish fleet consists primarily of vessels less than 30 ft long usually fishing at a 50-mi radius from Saipan. The larger commercial vessels that are able to fish on extended trips and focus their efforts from Esmeralda Bank to Zealandia Bank landed majority of the deep-water bottomfish reported through the purchase receipt books. In 2009, 40 vessels reported bottomfish landings (Figure 12). The number of trips shows a similar pattern except the peak in 2001 where the most trips in the fishery's history occurred (Figure 13).

Figure 12: CNMI Annual Bottomfish Fishery Participation, 1983-2009

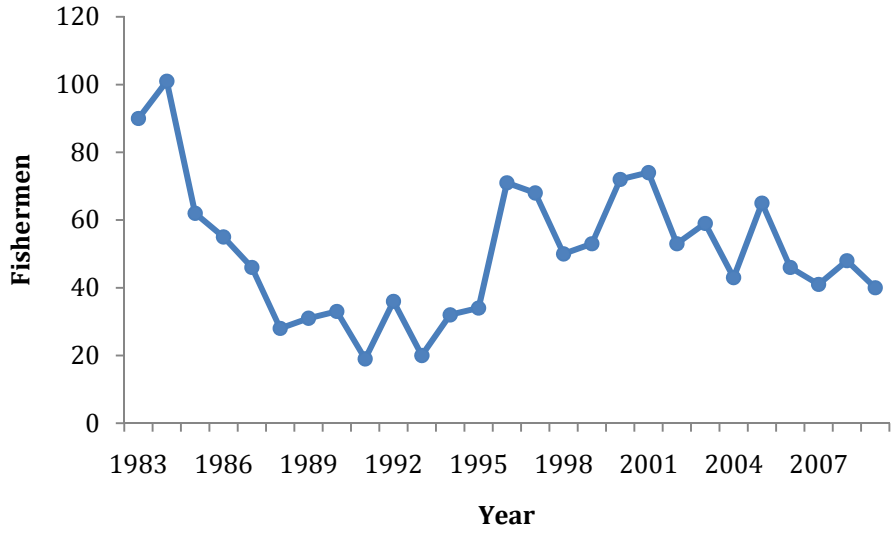
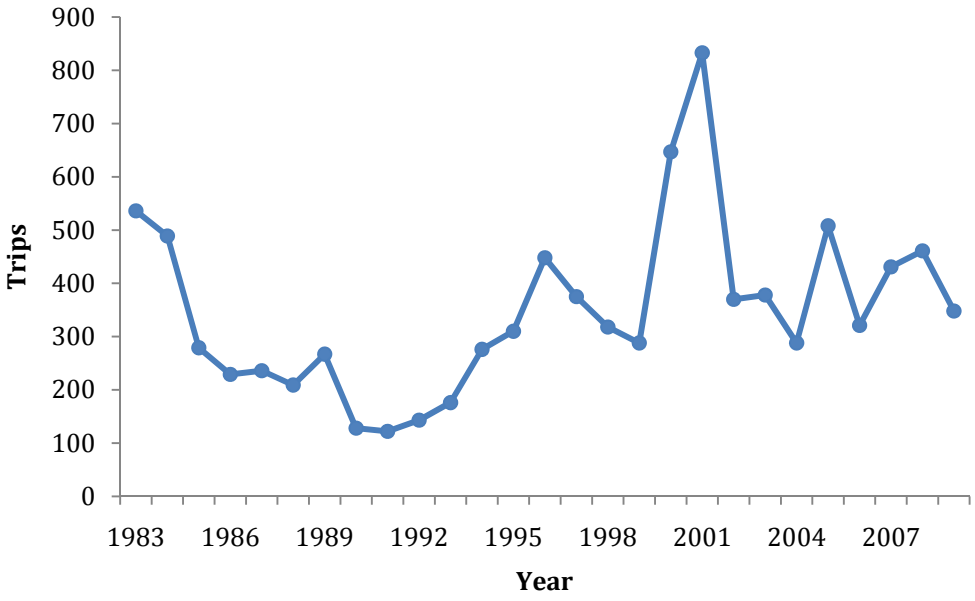


Figure 13: CNMI Annual Bottomfish Trips, 1983-2009



2.2.2.4 CNMI Bottomfish Revenue

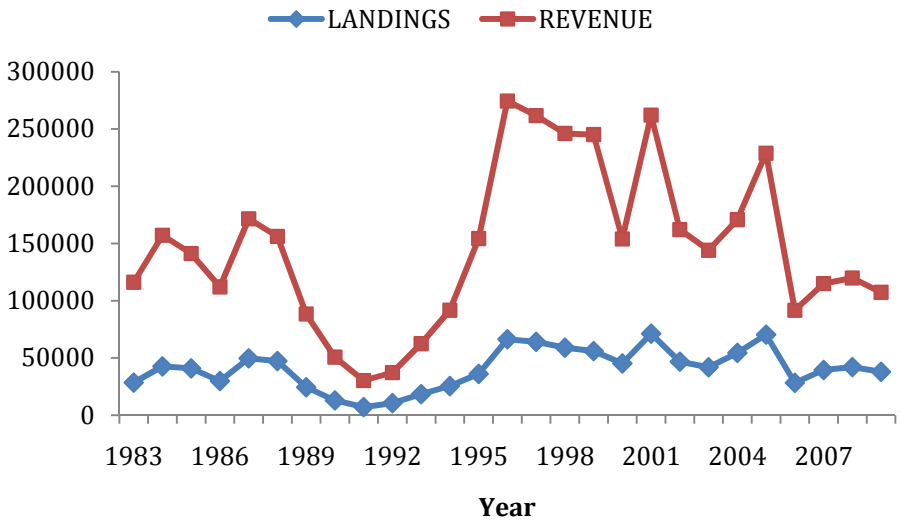
Revenues and prices for bottomfishes were relatively the same or slightly lower in 2009 than in 2008, but overall variability showed coherence with fluctuations in landings (Table 8, Figure 14). In 2009, the emperors/mafute was the main contributor to overall landings and revenue, followed by onaga, misc bottomfish, and opakapaka (Table 9).

Most fishes are sold as whole fish and very few as filets or steaks. The larger species are often purchased by hotels and restaurants, which are now seeing far fewer customers and often importing fishes from outside the CNMI. In addition, the local public appears to demand more for reef fishes. This report only represents the commercial aspect of the fishery as reported on sales invoices in CNMI. Charter vessels that do not sell their catch and recreational/subsistence catches are not included.

Table 9: CNMI Bottomfish Landings, Revenue, and Price 2009

Species	Landings (lb)	Revenue ($)	Average Price/lb
Emperor (mafute)	11,386	28,577	2.51
abuninas/taighulupegh	3,517	15,008	4.27
Misc. bottomfish	4,487	11,296	2.52
buninas /falaghal-maroobw	3,898	10,569	2.71
buninas rayao amariyu/falaghal-maroobw	2,572	9,263	3.60
Gindai	2,393	8,698	3.63
Kalikali	2,393	5,894	2.46
Misc. Jacks	2,092	5,132	2.45
gogunafon/aiwe	1,701	3,550	2.09
lehi/maroobw	1,042	2,945	2.83
funai/saas	1,126	2,790	2.48
Misc. Grouper	768	2240	2.92
tarakiton tadong/meseyugh	326	868	2.66
tarakiton attelong/orong	112	280	2.51
tarakitu/etam	55	136	2.50
Bigeye Emperor	48	120	2.50
TOTAL	**37,916**	**$107,366**	**$2.83**

Figure 14: CNMI Bottomfish Revenue ($) and Landings (lb), 1983-2009



2.2.2.5 CNMI Fishery Bycatch and Protected Species

Between 2000 to 2009, bycatch comprised less than 1% of the fishes taken and most fishers interviewed report no bycatch (Table 10). Of those who did report bycatch most was reported as released alive.

There is no observer program for Mariana Archipelago bottomfish fishing operations which are not known or expected to have much interaction with protected species. There were no reports of protected species interactions during 2009 bottomfish fishing in CNMI.

Table 10: CNMI Bottomfishing Bycatch, Non-Charter and Charter Boats, 2009

Species	Interviews w/ Bycatch	All Interviews	# Released Alive	Total catch	Bycatch Percentage
Non-Charter Boats	3	453			0.66%
Dogtooth Tuna			1	38	2.63%
Blackjack			1	52	1.92%
Blueline Snapper			4	484	0.83%
Pufferfish			0	5	0%
Freshwater Eels			0	1	0%
All Bycatch			6	580	1.03%
Compared w/ All caught				12,676	0.05%
Charter Boats	12	161			
Red Snapper			5	9	55.56%
Misc. Triggerfish			55	396	13.89%
Lyretail Grouper			5	43	11.63%
Jobfish (uku)			1	12	8.33%
Emperor (mafute)			7	204	3.43%
Blueline Snapper			3	139	2.16%
Redgill Emperor			6	309	1.94%
Black-tipped grouper			4	214	1.87%
Flagtail Grouper			4	219	1.83%
All Bycatch			90	1,545	5.83%
Compared w/ All Caught				2,360	3.81%

2.2.2.6 Non-commercial Fishery

In CNMI, the non-commercial fishery is primarily comprised of subsistence fishing for the shallow-water complex. Subsistence catch is not reported and as such at this time there are no accurate reports of landings or effort in this sector of the fishery.

2.3 Archipelagic Ecosystem Components

Ecosystem components that may become worth noting are expected to emanate from increased biosampling efforts (now ongoing) and through reports made in advisory panel (AP) and regional ecosystem advisory committee (REAC) meetings; or through other reported observations.

In addition, due to concerns about invasive species presence in drainages, the CNMI DFW entered into a contract with NOAA to conduct an assessment.

In Guam, increased incidents of beach pollution had led to more pollution advisories. In particular, Pago Bay marine activities and fishing was shut down due to runoff impacts after a large storm. The Guam REAC recommended that a study be conducted to assess impacts of Guam's sewage outfalls on coral reef ecosystems.

Regarding indigenous fishing rights, the Guam REAC recommended development of a community consultation process to discuss native fishing rights.

2.4 Archipelago Research

In Guam, a program to collect bottomfish data to provide ecosystem-based life history information is under development. A Pacific Islands Bio-Sampling Workshop was held at the Fishermen's Cooperative in Tamuning for prospective biological samplers from Guam during August 2009. Providing instruction was PIFSC staff, Fisheries Associates employed by the University of Hawaii Joint Institute for Marine and Atmospheric Research, staff of the Guam Fishermen's Co-op and the Council.

Participants in the Pacific Islands Bio-sampling Workshop learned appropriate techniques for collecting fish life history data. The aim of the workshop was to develop a fish sampling program like the one PIFSC operates in Hawaii. Participants were trained in protocols for sampling, record keeping, and other facets of biological data collection. Instructions were also given in methods of removing and storing gonads, otoliths, opercles, dorsal spines, muscle tissue and liver tissue; collection of fish length, weight and catch location data; and proper labeling techniques.

2.5 Stock Assessments

A stock assessment on bottomfish in Guam, CNMI and American Samoa was completed in 2007 for data through 2005 (Moffitt et al. 2007). It concluded that overall, the production model results suggest that the CNMI bottomfish complex was not overfished and did not experience overfishing during 1986- 2005. An update on the assessment needs to be done for this stock. They also concluded that it would be helpful to augment the data reporting systems to collect length frequency samples of individual bottomfish species to provide additional information on the average size and age of fish in the catch and support more sophisticated assessment methods. This information is currently being collected through the islands biosampling program. For Guam they concluded that overall, the production model results suggest that the Guam bottomfish complex has not been overfished since 1982 and has not experienced overfishing, except perhaps in 2000.

Participants of the Pacific Islands Bio-Sampling Workshop held in Guam

3.0 Mariana Archipelago Coral Reef Fisheries

3.0.1. Introduction to Archipelagic Coral Reef Fisheries

The following fishing gears are used to target coral reef fish in the Mariana Archipelago. This list does not include gears that are used primarily to catch invertebrates (i.e. hand gleaning/octopus hooking).

- Spear snorkel
- Spear SCUBA
- Hook and line
- Cast net
- Gill net (banned in 2003)
- Surround (atulai)
- Drag
- Fish weir
- Traps

The following is a list of species that comprise the major taxa harvested in coral reef fisheries of Guam and the CNMI. However, there may be some differences between Guam and the CNMI and species may have different degrees of importance among islands.

1. Moray eels (all species in the family Muraenidae)
2. Solderfish/Squirrelfish (all species in the family Holocentridae)
3. Groupers (all species in the family Serranidae except deep water BMUS)
4. Jacks (all species in the family Carangidae except atulai)
5. Snappers (all species in the family Lutjanidae, except deepwater BMUS
6. Sweetlips (all species in the family Haemulidae)
7. Emperors (all species in the family Lethrinidae)
8. Goatfish (all species in the family Mullidae)
9. Rudderfish (all species in the family Kyphosidae)
10. Mullets (all species in the family Mugilidae)
11. Barracuda (all species in the family Sphyraenidae)
12. Wrasses (all species in the family Labridae except *Cheilinus undulatus*)
13. Parrotfish (all species in the family Scaridae except *Bulbometopon muricatum*)
14. Surgeonfish (all species in the family Acanthuridae)
15. Rabbitfish (all species in the family Siganidae)
16. Triggerfish (all specie in the family Balistidae)
17. Atulai
18. Species of Special Concern
    a. Reef sharks (only reef sharks of the family Carcharhinidae)
    b. Napolean wrasse (*Cheilinus undulatus*)
    c. Bumphead parrotfish (*Bulbometopon muricatum*)

3.1 Guam's Coral Reef Fishery

3.1.1. Introduction

Guam's coral reef fishery utilized many different gear types, as listed in Section 3.0.1 and includes harvest of hundreds of coral reef MUS (listed in Appendix) mainly in the families listed above. Guam's coral reef fishery included catches by boat-based methods (Figure 12) dominated by bottomfishing and spear/snorkel. The shore-based methods were dominated by spear/snorkel (Figure 12).

3.1.2 Fishery Performance and Economic Data

3.1.2.1 Guam Landings

Guam's 2009 coral reef MUS landings amounted to an estimated (expanded) 136,547 lbs. Landings have varied greatly for the top six MUS categories over time (Figure 16). Parrotfish, surgeonfish, and jack catches by boat-based fishing methods have declined since 1999 (Figure 17). Table 11 shows landings from 2005-2009 with the greatest increase due to atulai landings (also shown in Figure 17). Catches from shore-based fishing methods declined steadily since the 1980's (Figure 18).

In 2009, about two times the amount of landings came from boat-based fishing (86,592 lbs) as opposed to shore-based methods (42,156 lbs). The top MUS was atulai with just over 38,000 lbs, the largest catch since the 1999 high (~136,000 lbs). Next was surgeonfish, emperors, jacks, parrotfish (Figure 15).

Figure 15: Guam Boat and Shore-based Expanded Catch Composition, 2009

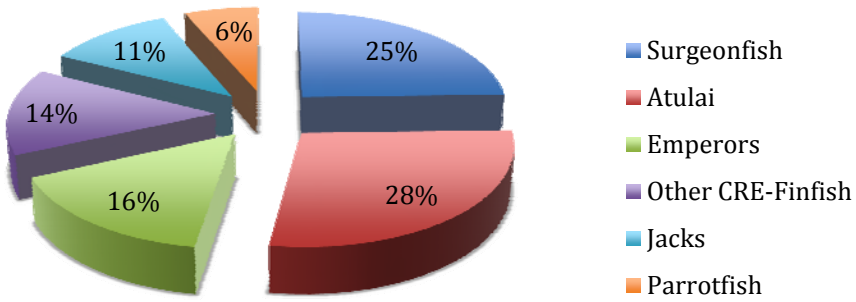


Figure 16: Guam Shore and Boat-based Expanded Catches, 1982-2009

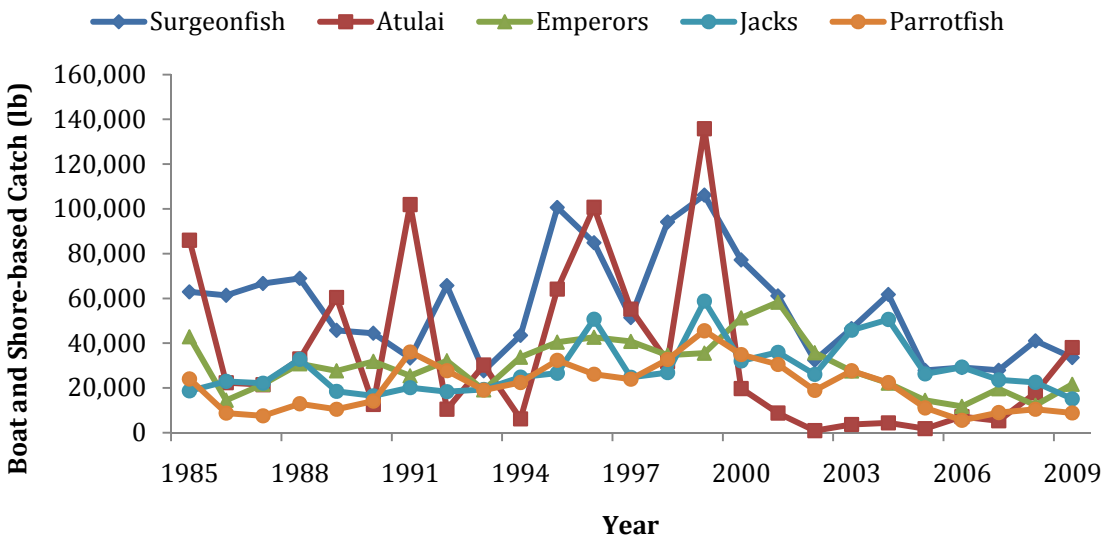


Figure 17: Guam Boat-based Expanded Catch of Coral Reef MUS 1982-2009

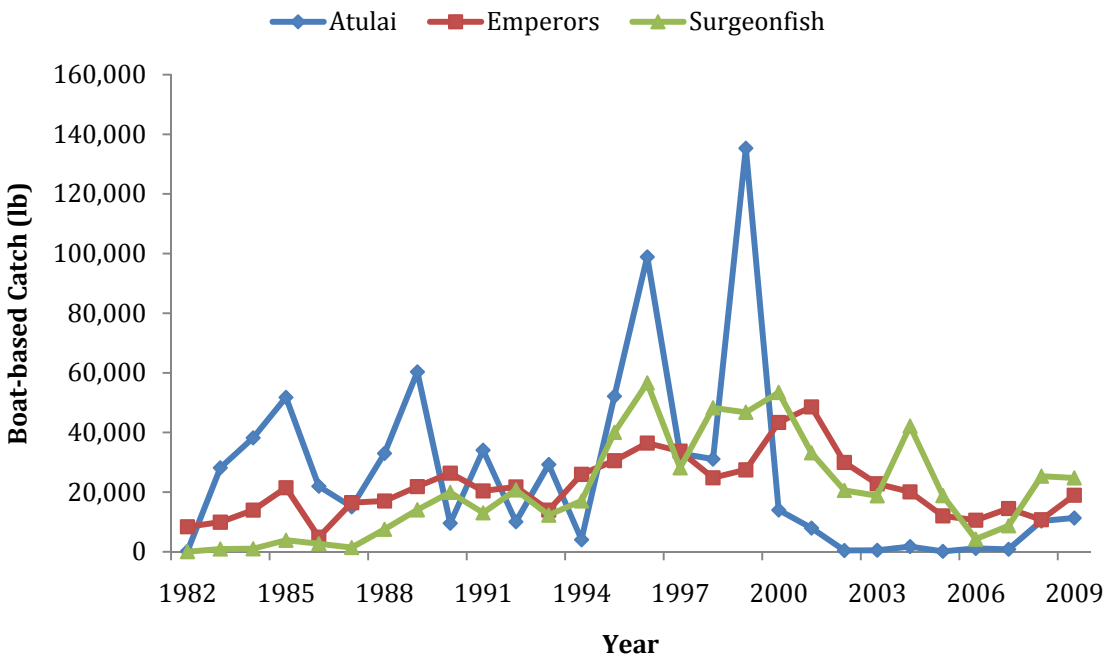
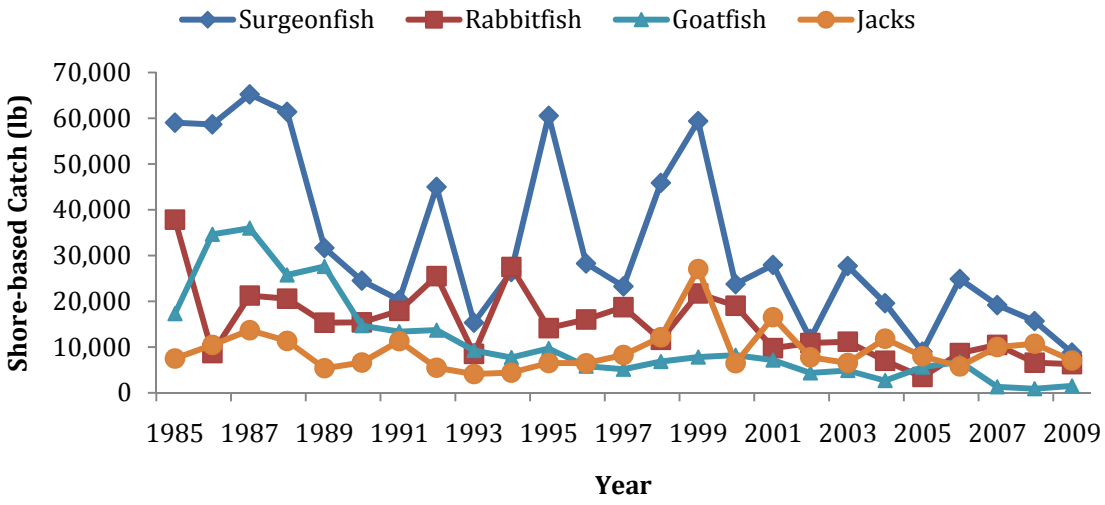


Table 11: Guam CRE MUS Expanded Catch (lb), 2005-2009

Species/Family	2005	2006	2007	2008	2009
Atulai	1,824	7,179	5,317	17,771	38,036
Emperors	14,449	11,756	19,640	12,245	21,610
Goatfish	9,262	11,514	2,592	7,497	4,000
Groupers	7,292	8,993	7,960	9,737	7,940
Jacks	26,242	29,295	23,591	22,500	15,115
Mullet	1,835	1,676	1,529	4,890	2,454
Parrotfish	11,084	5,556	8,992	10,480	8,799
Rabbitfish	3,608	8,879	10,473	8,064	6,548
Rudderfish	5,178	12,731	2,335	4,339	8,793
Snappers	8,974	10,653	5,088	10,236	4,635
Surgeonfish	27,848	29,124	27,900	41,045	33,573
Squirrelfish	2,385	1,918	1,138	3,200	3,640
Wrasse	1,360	1,994	326	411	923
Misc. reef fish	15	9	23	4,922	11,316
Misc. shallow bottomfish	975		1,940	2,246	6,612
Misc. bottomfish					237
Other CRE-Finfish	13,364	18,495	16,443	10,725	19,414
Napoleon wrasse	2,079	46	1,650	168	
Reef sharks	540	1,445	1,619	1,121	687
Crustaceans	2,217	1,527	1,982	1,132	865
Mollusks	10,934	8,055	8,943	6,103	14,610
Other invertebrates	1,023	2,809	764	80	123
Algae	36	123	120	67	119

Figure 18: Guam Shore-based Coral Reef Expanded Catch, 1985-2009



3.1.3.2 Guam CPUE

Catch rates (CPUE) in Guam's coral reef fishery show a lot of variability and no obvious discernible patterns. For the boat-based fishery, fishing utilizing bottomfishing method have the highest catch rates with emperors having the highest CPUE (Figure 19). In the boat-based trolling fishery, catch rates for jacks have declined significantly in the last 5 years while catch rates for other unidentified reef fishes has increased since 2007 (Figure 20).

Figure 19: Guam Boat-based CPUE for Coral Reef Fishing, Bottomfishing Method, 1982-2009

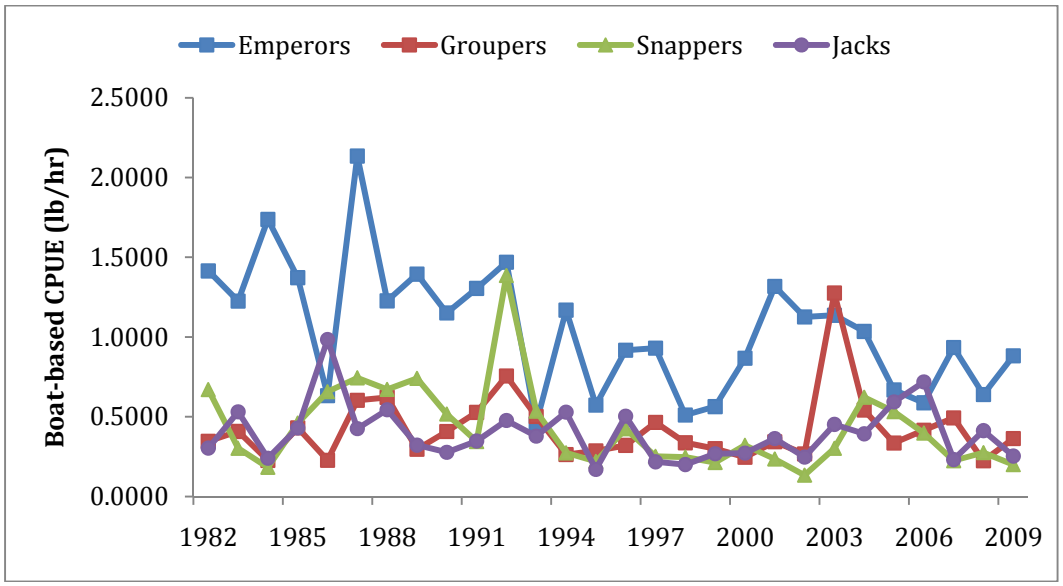
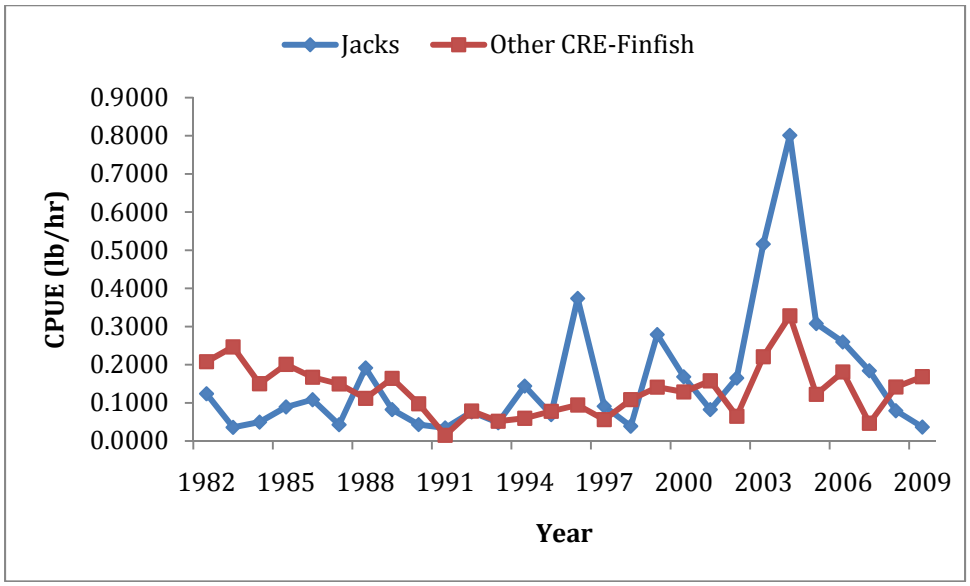


Figure 20: Guam Boat-based CPUE for Coral Reef Fishing, Trolling Method, 1982-2009



3.1.3.3 Guam Effort

There are currently no accurate data on effort in Guam's coral reef fishery.

3.1.3.4 Guam Revenue

During 2009, landings from Guam's coral reef fishery resulted in revenue estimated at $770,750 (Table 12). Revenue was dominated by unknown or unidentified reef fishes, parrotfishes, unicornfishes, and others, respectively (Figure 21, Table 12).

Figure 21: Relative Value of Guam's Coral Reef MUS, 2009

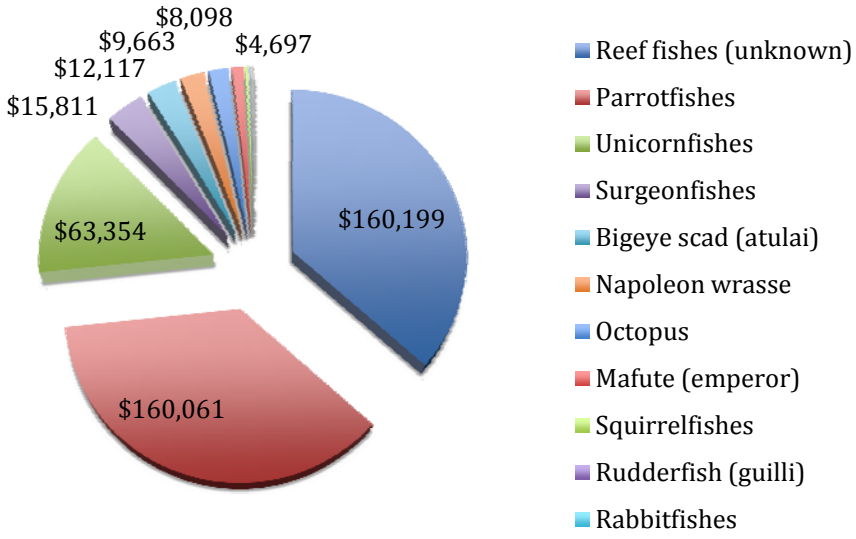


Table 12: Guam 2009 Coral Reef Fishery Estimated Revenue and Price/lb

Species/Family	VALUE ($)	PRICE/LB ($)
ATULAI	12,117	2.68
UNKNOWN REEF FISH	160,199	3.01
PARROTFISHES	160,061	3.25
UNICORNFISHES	63,354	2.95
SURGEONFISHES	15,811	2.69
NAPOLEON WRASSE	9,663	2.82
OCTOPUS	8,098	3.02
MAFUTE (EMPEROR)	4,697	2.98
SQUIRRELFISHES	1,597	2.98
RUDDERFISH (GUILLI)	430	3.00
RABBITFISH	406	3.48
SWEETLIPS	302	2.54
TOTAL	**$770,752**	NA

3.1.3.5 Guam Bycatch and Protected Species

No interactions between protected species and coral reef fisheries have been reported 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.

NMFS received a petition, in October 2009 to list 82 species of corals under the Endangered Species Act (ESA), and another petition, in January 2010, to list the bumphead parrotfish (*Bolbometopon muricatum*) as threatened or endangered and designate critical habitat under the ESA. NMFS determined that the petitions presented substantial scientific and commercial information indicating that the petition may warrant actions, and NMFS issued 90-day findings in the Federal Register (April 2, 2010; 75 FR 16713 for the bumphead parrotfish, and February 6, 2010; 75 FR 6616 for the corals). After which, NMFS initiated a status reviews of the 82 coral species (one species was dropped due to lack of information) and the bumphead parrotfish to determine if listings under the ESA are warranted.

3.1.3.6 Guam Non-commercial Fishery

In Guam, the non-commercial fishery catch is not reported and as such at this time there are no accurate reports of landings or effort in this sector of the fishery.

3.2 CNMI's Coral Reef Fishery

3.2.1 Introduction

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 and scuba spear fishing bans have been implemented in recent years.

3.2.2 Fishery Performance and Economic Data

3.2.2.1 CNMI Landings

During 2009, majority of coral reef MUS catch was caught by boat-based fishing using bottomfishing method/gear (Figure 22). The dominant fishing method/gear for shore-based fishing during 2009 was hook-and-line (Figure 24).

The dominant catch for shore and boat-based fishing combined was emperors followed by jacks, rabbitfish, surgeonfish, atulai etc., respectively (Figures 23, Table 13). The dominant catch for boat-based fishing was emperors, jacks, and atulai (Figure 25). For shore-based fishing the catch was dominated by rabbitfish, jacks, and emperor (Figure 26).

Snorkel spear accounted for around 10,000 lbs in both shore and boat-based methods (Figure 22).

Figure 22: CNMI Boat-based Coral Reef MUS Expanded Catch (lb) by Method, 2000-2009

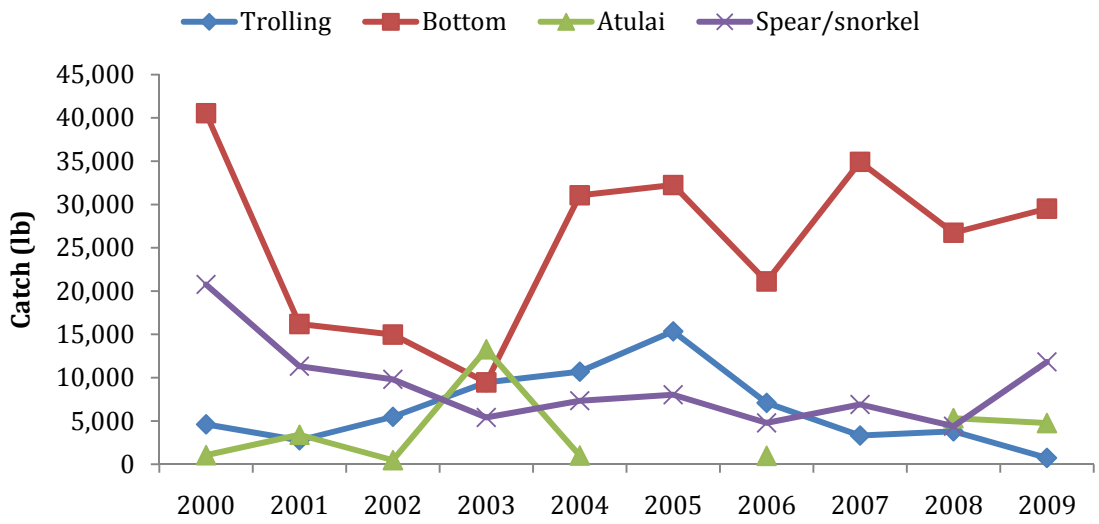


Figure 23: CNMI Shore and Boat-based Expanded Catch Composition, 2009

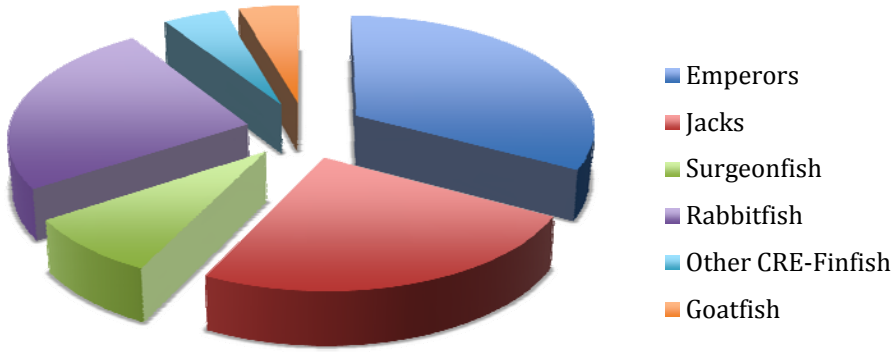


Figure 24: CNMI Shore-based Coral Reef MUS Expanded Catch by Method, 2005-2009

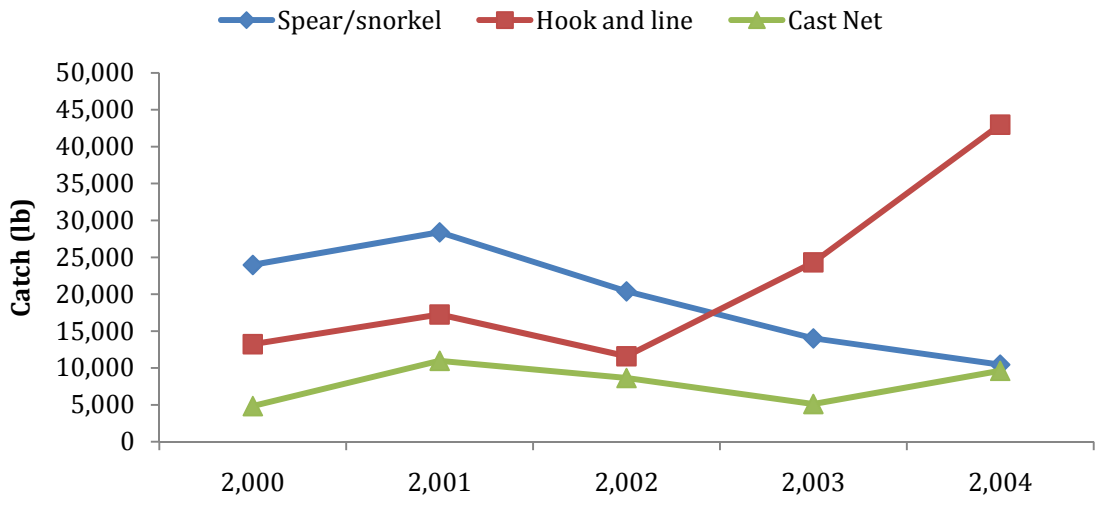


Figure 25: CNMI Coral Reef Boat-based Top 3 MUS Catch, 2000-2009

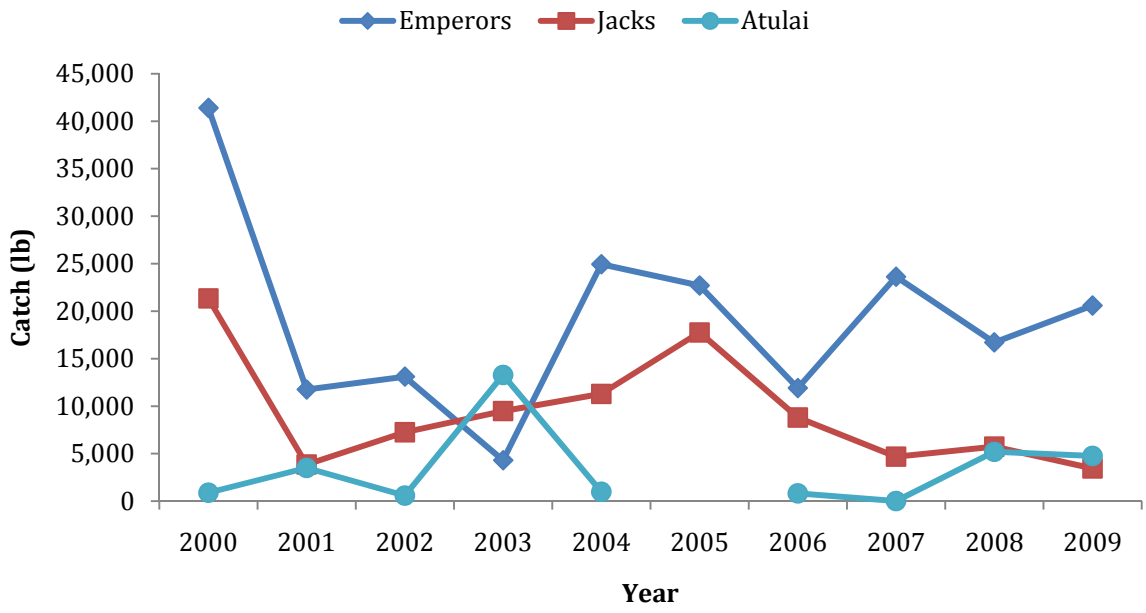


Figure 26: CNMI Coral Reef Shore-based Catch Top 3, 2005-2009

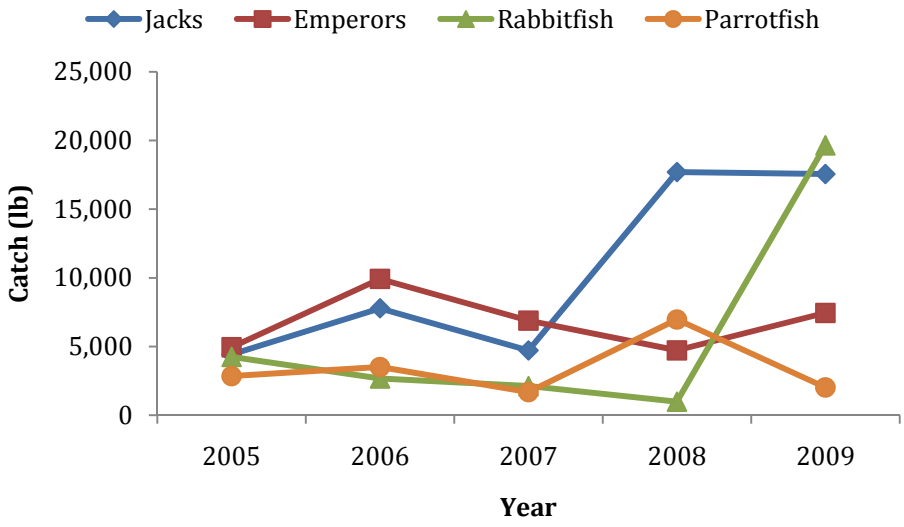


Table 13: CNMI Coral Reef Shore and Boat-based Expanded Catch, 2005-2009

CREMUS Group	2005	2006	2007	2008	2009
Atulai	236	5,327	2,789	6,959	5,509
Emperors	27,651	21,831	30,507	21,433	28,036
Goatfish	5,827	9,767	3,419	3,472	3,851
Groupers	5,405	4,541	4,710	2,235	2,901
Jacks	22,177	16,586	9,401	23,438	21,000
Mullet	2,424	3,602	4,019	1,463	3,578
Parrotfish	3,601	4,234	2,902	8,502	4,538
Rabbitfish	4,251	2,703	2,259	1,207	21,339
Rudderfish	903	574	989	509	3,665
Snappers	3,895	1,342	5,361	2,860	3,611
Surgeonfish	7,591	9,410	4,207	6,028	7,241
Squirrelfish	588	1,206	512	541	456
Wrasse	3,112	1,253	838	947	812
Misc. Reef fish	334	29	36	45	
Other CRE-Finfish	5,060	6,084	5,946	5,622	4,060
Napoleon Wrasse				54	
Mollusks	6,113	2,406	7,881	41	761

3.2.2.2 CNMI CPUE

Catch rates (i.e. CPUE (lb/hr)) in CNMI's coral reef fishery shows a lot of variability for certain MUS such as emperors and snappers caught by bottomfishing from boats (Figure 27) and most MUS caught by boat-based spear/snorkel (Figure 28).

Figure 27: CNMI Boat-based CPUEs (lb/hr), Bottomfishing Method, Top 3 MUS (top) and Top 4-6 MUS (bottom), 2000-2009

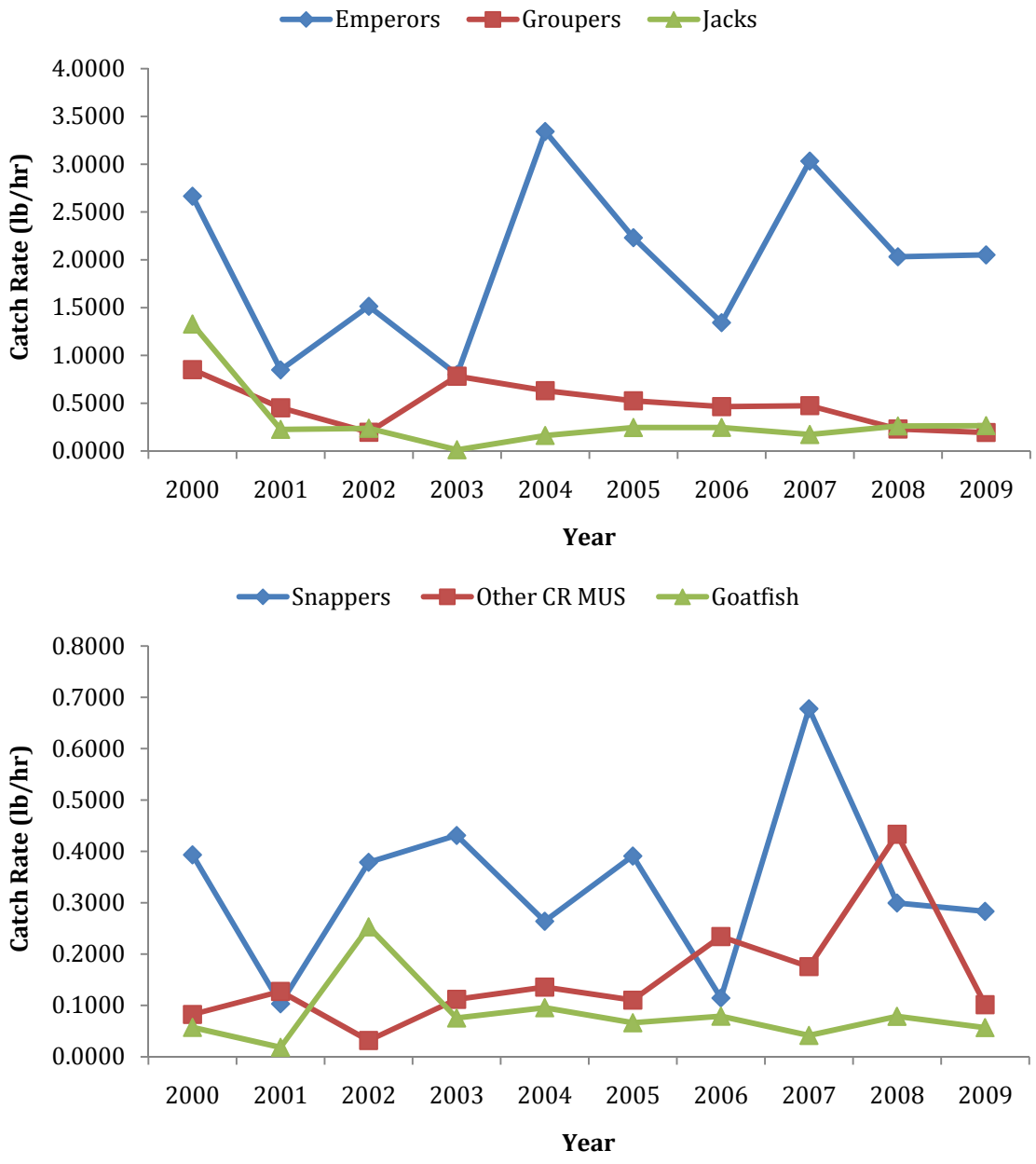
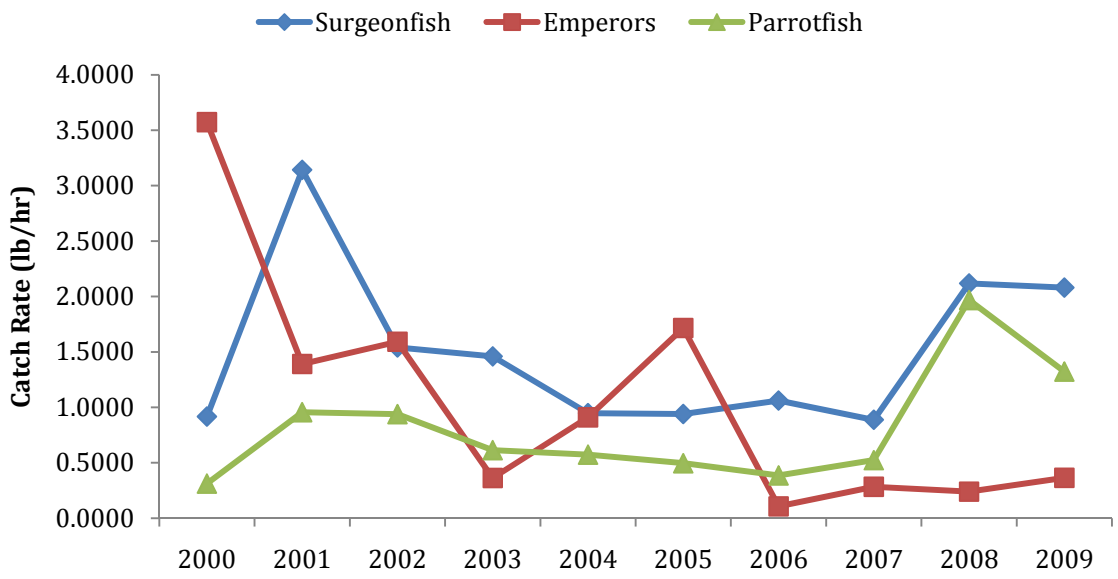
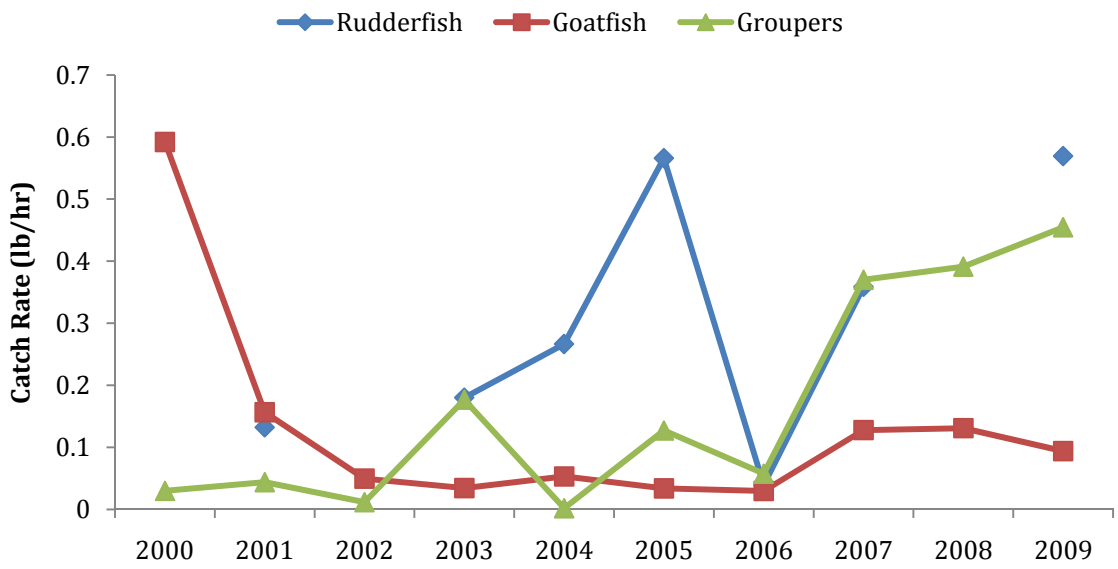


Figure 28:CNMI CPUEs (lb/hr) Spear/snorkel Method, Top 3 MUS (top) and Top 4-6 MUS (bottom), 2000-2009





3.2.2.3 CNMI Effort

There are currently no available data on effort in CNMI's coral reef fishery.

3.2.2.4 CNMI Revenue

The price-per-pound for coral reef MUS had declined over the past 26 years when adjusted for average inflation (Figure 29) despite increasing operating costs (e.g. fuel, ice). Unadjusted prices increased over this same period, but, were not enough to keep up with inflation. Total 2009 commercial revenue from coral reef MUS was estimated at around $274,000 and was dominated by unidentified reef fishes, parrotfishes, and atulai (Figure 30, Table 14).

Figure 29: CNMI Coral Reef Top 3 MUS Average Inflation-adjusted Price ($/lb), 1983-2009

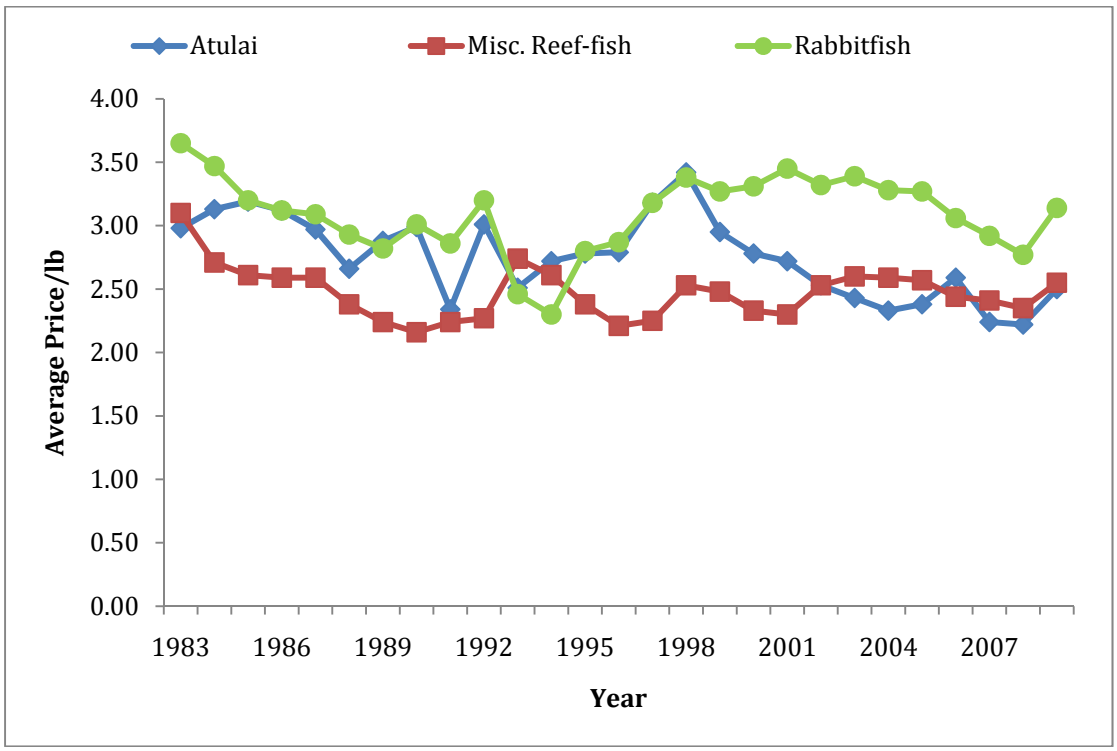


Figure 30: Estimated Top MUS in Value in CNMI's 2009 Commercial Reef Fish Catch

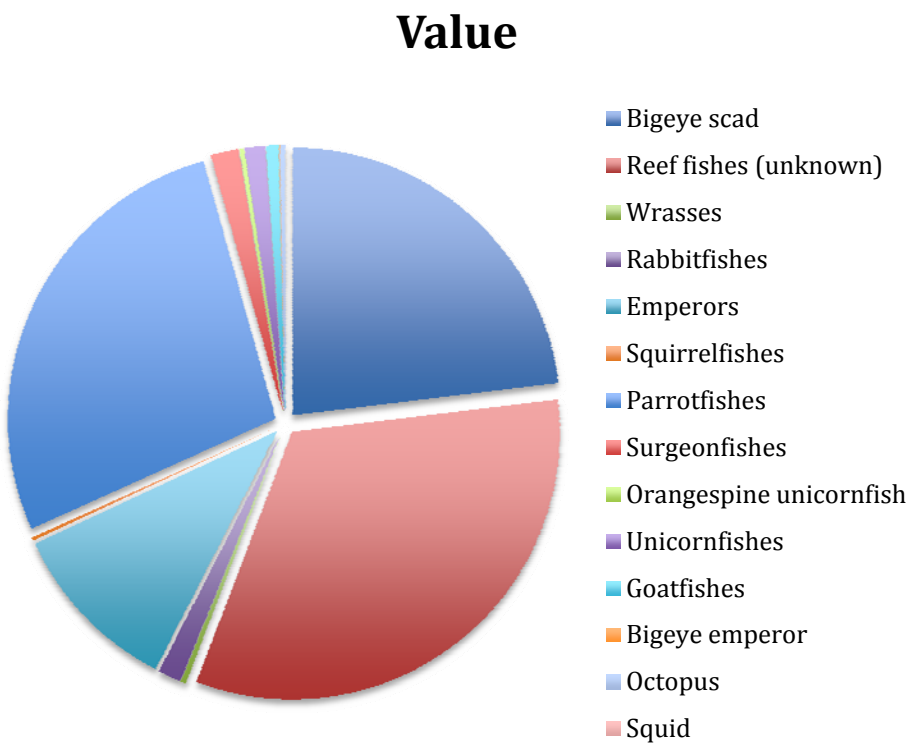


Table 14: 2009 Estimated Coral Reef MUS Revenue and Price/lb

Species/Family	VALUE ($)	PRICE/LB ($)
ATULE	62,584	2.50
UNKNOWN REEF FISH	88,800	2.55
WRASSES	873	2.39
RABBITFISH	3,806	2.95
EMPERORS	28,577	2.51
SQUIRRELFISH	536	2.50
PARROTFISHES	74,276	3.11
SURGEONFISHES	4,589	2.17
ORANGESPINE UNICORNFISH	782	2.50
OTHER UNICORNFISH	3,333	2.57
GOATFISHES	2,077	2.50
BIGEYE EMPEROR	120	2.50
OCTOPUS	903	2.06
SQUID	16	2.00
TOTAL	**$274,062**	NA

3.2.2.5 CNMI Bycatch and Protected Species

No interactions between protected species and coral reef fisheries have been reported 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.

NMFS received a petition, in October 2009 to list 82 species of corals under the Endangered Species Act (ESA), and another petition, in January 2010, to list the bumphead parrotfish (*Bolbometopon muricatum*) as threatened or endangered and designate critical habitat under the ESA. NMFS determined that the petitions presented substantial scientific and commercial information indicating that the petition may warrant actions, and NMFS issued 90-day findings in the Federal Register (April 2, 2010; 75 FR 16713 for the bumphead parrotfish, and February 6, 2010; 75 FR 6616 for the corals). After which, NMFS initiated a status reviews of the 82 coral species (one species was dropped due to lack of information) and the bumphead parrotfish to determine if listings under the ESA are warranted.

3.2.2.6 CNMI Non-commercial Fishery

In CNMI, the non-commercial fishery is primarily comprised of subsistence fishing for the shallow-water complex. Subsistence catch is not reported and as such at this time there are no accurate reports of landings or effort in this sector of the fishery

3.3 Mariana Archipelago Ecosystem Components

Different sources have identified factors which may be impacting coral reefs in the Mariana Archipelago, particularly around parts of Guam and Saipan, including:

- Sewage outfalls and overflows into nearshore waters
- Contamination from onsite wastewater disposal systems
- Rural runoff from unpaved roads and uplands causing sedimentation
- Urban runoff containing chemicals and nutrients
- Climate induced bleaching of coral reefs
- Damage and disturbance to reefs from tourism including divers and snorkelers, and jet-skis

3.4 Mariana Archipelago Research and Monitoring

3.4.1 Current and Ongoing Research/Monitoring

The Pacific Islands Fisheries Science Center's Coral Reef Ecosystem Division's (CRED) Reef Assessment and Monitoring Program (RAMP) conducts bathymetric mapping operations, biological surveys on coral reefs and other associated habitats on a biennial basis at 55 U.S. Pacific Islands, covering the majority of U.S. coral reef areas in the Pacific including the Mariana Archipelago (PIFSC 2010). CRED scientists use

consistent survey methods at all locations visited, and include both small-scale (belt or stationary point count) and large-scale (towed-diver) fish and benthic surveys. Since mid-2007, the survey design for small-scale surveys has been based on a stratified random sampling design within 0-30 m hard-bottom habitats. This information will be used as part of biomass estimates for the Council and the SSC to use in setting annual catch limits (ACLs) for coral reef fisheies.

In 2009, scientists from CRED and partner agencies completed the 66-day 2009 Mariana Archipelago Reef Assessment and Monitoring Program (MARAMP) research cruise, surveying the coral reef ecosystems of Wake Atoll, the Territory of Guam, and CNMI. This was the third biennial Pacific RAMP cruise to Wake and the fourth to the Marianas Archipelago. The waters of three of the CNMI islands surveyed are part of the recently designated as the Marianas Trench Marine National Monument.

Preliminary analyses of towed-diver survey data from the Mariana Archipelago reveal a lower density of fish shorter than 50 cm in 2009 compared to previous survey years. In addition, there were differences in relative abundance of fish between the uninhabited northern islands and the populated southern islands of the archipelago. The estimated density of sharks continued to exhibit a decline observed since surveys began in 2003.

Fine-scale biological assessments of the marine benthos suggest that levels of coral diversity, percent cover, and disease in 2009 are comparable to levels observed in previous assessments. Diversity of algae was lower in the northern islands, where turf algae replaced macroalgae as the dominant algal form. Surveys also revealed unusually high levels of cyanophytes like blue-green algae, particularly along the western-facing shores of Pagan Island. Although the factors causing these conditions are poorly understood, it is speculated that they may be related to iron-rich ash originating from recent volcanic activity. Alternatively, an increase in cyanophyte cover may simply be part of a previously undocumented natural cycle[2].

3.4.2 Research Needs

The following data gaps and needs identified for Guam at the WPR Fisheries Data Workshop:

- Data collection from boat-based spear and bottomfish
- Determination of reef species sales to the Guam Fishermen's Cooperative Association (sales currently lumped together as reef species so no individual data available)
- Determination of fishery catch and effort on or from military bases
- Data collection from scuba spearfishing
- Life history information for reef species
- Additional staff and resources
- Determination of federal versus territorial portion of the catch

[2] From PIFSC website at: http://www.pifsc.noaa.gov/qrb/2009_08/article_01.php

3.5 Stock Assessments

There are no existing 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
No stock assessments were done on coral reef fish stocks. The status of the species or species groups whether it is subject to overfishing or are overfished is largely unknown.

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.

4.0 Crustaceans Fishery

During 2009, there were 9 active Western Pacific Crustaceans permits for Permit Area 3 which includes waters of American Samoa, Guam and CNMI. The following table lists the Mariana Archipelago Crustaceans MUS established in the FEP.

Table 15: Mariana Archipelago Crustacean MUS

Local Name	English Common Name	Scientific Name
mahonggang	spiny lobster	*Panulirus penicillatus*
pa'pangpang	slipper lobster	Family Scyllaridae
NA	Kona crab	*Ranina ranina*
NA	deepwater shrimp	*Heterocarpus* spp.

4.1 Guam's Crustaceans Fishery

4.1.1. Introduction to Guam's Crustaceans Fishery

Crustaceans make up a major portion of Guam's non-finfish catch. The spiny lobster, primarily *P. pencillatus* and the slipper lobster, *Scyllarides squamosus*, are the two main components of the lobster catch and are harvested by spearfishing and "other" techniques (i.e., gleaning).

4.1.2 Fishery Performance and Economic Data

4.1.2.1 Guam Lobster Landings and Revenue

During 2009, a reported 1,242 pounds of lobster were landed generating revenue of $4,585 with an average of around $3.75 per pound. During 2009, December had the greatest landings perhaps for the holidays, followed by spring/summer months July and May (Figure 31). Revenue mirrors the landings data as the price-per-pound rarely fluctuates from $3.75/pound. Monthly revenue was below $1000 with December having the highest revenue (Figure 32).

Figure 31: Guam 2009 Monthly Lobster Landings

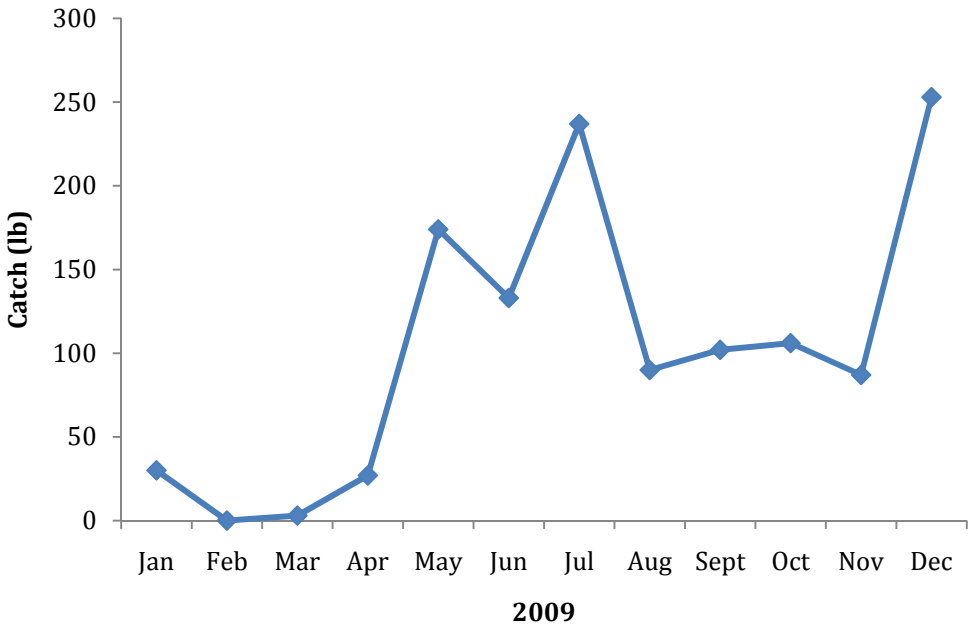
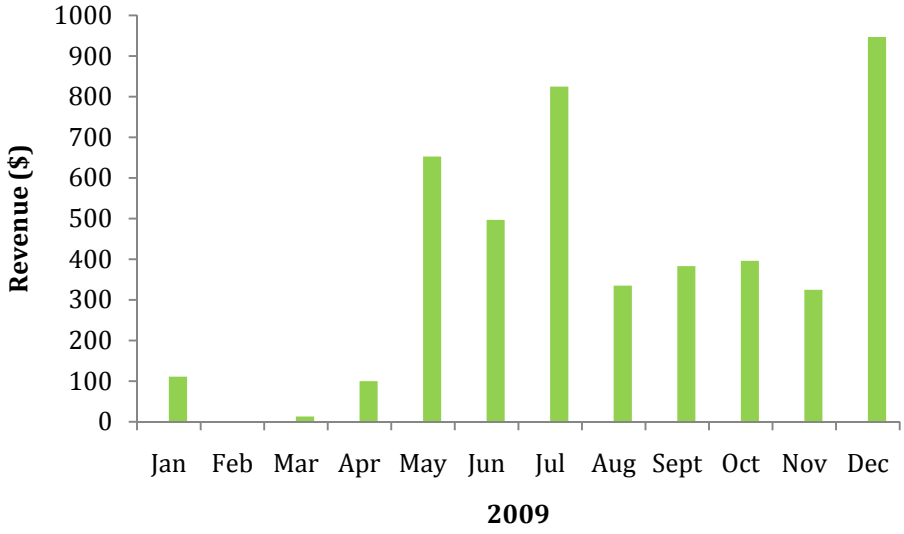


Figure 32: Guam 2009 Monthly Lobster Revenue



4.1.3 Bycatch and Protected Species

At this time, there is no reported bycatch associated with this fishery and there have been no observed or reported interactions with protected species. Most crustaceans are harvested by hand as certain gears/methods are prohibited (SCUBA, hookah, and Hawaiian sling spear) and therefore bycatch and interactions with protected species would not be expected to occur.

4.1.4 Guam Non-commercial Fishery

4.2 CNMI's Crustaceans Fishery

4.2.1. Introduction to CNMI's Crustaceans Fishery

In the CNMI, two types of crustacean fisheries have been pursued including a lobster fishery targeting spiny (*Panulirus pencillatus*) and slipper lobsters (Family Scyllaridae), and a deepwater shrimp (*Heterocarpus* spp.) fishery. Data collection is primarily from sales receipts obtained from vendors and fishermen. Lobster fishery data collection began in 1979 and in 1987 from the shrimp fishery. Most lobsters sold in the CNMI were caught by hand, however, formerly popular gears/methods used to harvest lobsters (SCUBA, hookah, and Hawaiian sling spear) are currently prohibited. Most lobster harvest is done by subsistence spear fishermen while targeting reef fish around Saipan using boats less than 20 ft in length (Tenorio 2003).

4.2.2 Fishery Performance and Economic Data

4.2.2.1 CNMI Lobster Landings

CNMI's annual lobster catch has varied greatly over the past three decades with a peak in 1984 and reduced landings in 2009 (Figure 34). Monthly catches vary widely as well (Figure 33). During 2009, the estimated annual commercial catch of lobsters was 1,046 lb comprised of 881 lb of spiny and 165 lb of slipper lobsters.

Figure 33: CNMI Monthly Spiny lobster Landings, 1981-2009

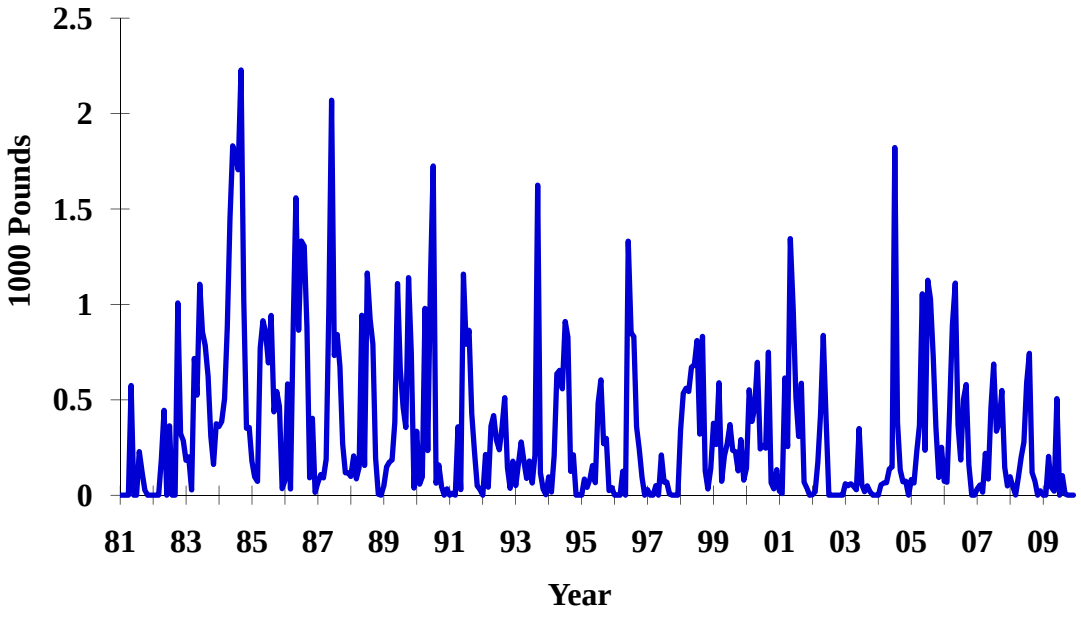
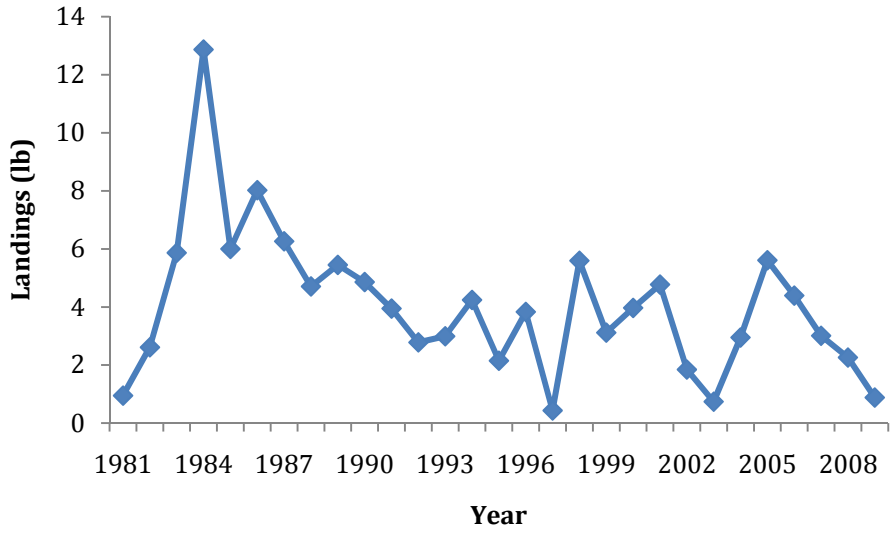


Figure 34: CNMI Lobster Landings (1000 lb), 1981-2009



4.2.2.2 CNMI Lobster Revenue

During 2009, estimated revenue form lobster catches was $4,385 for spiny lobsters with an average price of $5.00/lb. and $827 for slipper lobsters with an average $2.06/lb.

4.2.3 Bycatch and Protected Species

At this time, there is no reported bycatch associated with the crustaceans fishery and there have been no observed or reported interactions with protected species. Most crustaceans are harvested by hand as certain gears/methods are prohibited (SCUBA, hookah, and Hawaiian sling spear) and therefore bycatch and interactions with protected species would not be expected to occur.

4.2.4 Non-commercial Fishery

In CNMI, the non-commercial fishery is primarily comprised of subsistence fishing for the shallow-water complex. Subsistence catch is not reported and as such at this time there are no accurate reports of landings or effort in this sector of the fishery.

4.3 Archipelagic Ecosystem Components

There is currently no Mariana Archipelago ecosystems component information related to crustaceans to report.

4.4 Archipelagic Research

There is currently no Mariana Archipelago crustaceans research to report.

4.5 Stock Assessments

Overfished and Overfishing Determinations
To date, no stock assessment had been done on the Mariana Archipelago crustacean fisheries thus no determinations can be made if the crustacean stocks are overfished or subject to overfishing.

MSY and OY
No values for MSY and OY are available for crustaceans in the Mariana Archipelago.

5.1 Precious Corals Fishery

5.1.1. Introduction to Precious Corals Fishery

The following table lists the Mariana Archipelago Precious Coral MUS established in the FEP.

Table 16: Mariana Archipelago Precious Corals MUS

Local Name Chamorro/Carolinian	English Common Name	Scientific Name
NA	pink coral (also known as red coral)	*Corallium secundum*
NA	pink coral (also known as red coral)	*Corallium regale*
NA	pink coral (also known as red coral)	*Corallium laauense*
NA	gold coral	*Gerardia* spp.
NA	gold coral	*Narella* spp.
NA	gold coral	*Calyptrophora* spp.
NA	bamboo coral	*Lepidisis olapa*
NA	bamboo coral	*Acanella* spp.
NA	black coral	*Antipathes dichotoma*
NA	black coral	*Antipathes grandis*
NA	black coral	*Antipathes ulex*

5.1.2 Fishery Performance and Economic Data

There is currently no active fishery for precious corals in the Mariana Archipelago.

5.1.3 Research

At this time, no direct research has been conducted on precious corals in the Mariana Archipelago. Several studies on deep-water precious corals in Hawaii are ongoing including a study on growth validation of gold coral in the Hawaiian Archipelago (see the Hawaii Archipelago FEP Annual Report for details). This study showed gold corals to grow at much slower rates (0.23 cm per year) than previously believed which must be taken into account in any management decisions (Parrish and

Roark 2009).

5.1.4 Stock Assessments

There are currently no stock assessments for precious corals in the Mariana Archipelago.

6.0 Fishing Community

6.1 Community Demonstration Projects Program & Marine Education and Training

The Community Demonstration Projects Program (CDPP) Advisory Panel (AP) met on May 4 – 5, 2010, to review applications for funding under the Western Pacific Community Demonstration Project Program and the Western Pacific Marine Education and Training (MET) Mini Grant Program. Solicitations for applications were published on January 22, 2010 in the Federal Register. The Community Demonstration Project Program solicitation application deadlines were:

- Letter of Intent/pre-proposal, February 18, 2010,
- Review of pre-proposal and invitation to apply March 5, 2010
- Full application April 4, 2010.

Available Funding: $500,000 no minimum or maximum funding limit

Purpose: to foster and promote use of traditional indigenous fishing practices and/or develop or enhance community-based fishing opportunities.

Western Pacific Marine Education and Training mini grants deadline was:

- March 5, 2010, 5:00 PM Hawaii Standard time.
- Available Funding: $150,000, $15,000 funding limit
- Purpose: To improve communication, education and training on marine resource issues through the Western Pacific Region and increase education for marine-related professions among coastal community residents.

The Community Demonstration Project Program Advisory Panel consists of eight individuals two from each of the territorial areas in the Council's area of authority and responsibility:

American Samoa: Kitara Vaiau and Vaasa Simanu
Commonwealth of Northern Mariana Islands: Lino Olopai and Herman Tudela
Guam: Peter Perez and Dave Alvarez

Hawaii: Gary Beals and William Mossman

The process to review and rank the MET proposals and CDPP was to review each proposal through open discussion, individual ranking of the proposal using objective criteria to assign a numerical value, averaging the numerical points for an average score and listing the proposals in rank order at the end of the review. At that point the AP could reopen discussion and adjust the ranking to suit the consensus. Due diligence was applied in the initial review by Federal Program Officer(s) prior to the applications being distributed to the AP.

The MET Mini Grant proposals were ranked by the AP including two projects located in the Mariana Archipelago, as follows:

1. Traditional Fishing on Guam, MARS,	$ 15,000
7. CNMI Heritage Awareness Diving Awareness, PMRI	$ 14,810
Total amount expended for MET	$133,992
Unexpended MET funds	**16,008**
Total funds available for MET mini grants	$150,000

The Western Pacific Community Demonstration Projects:

There were seven proposals under the Demonstration Project Program. Funding is limited to $500,000 and $49,839.25 was left after funding the top four projects.

Funding limitations resulted in the four top-ranked proposals being funded including one project in Guam as follows:

3. Guam ADA Compliant Fishing Platform, GOSA	$158,673.75

6.2 Outreach and Education

The Council sponsored a high school summer course in Guam which involved 25 students over 2 weeks and included both classroom and field activities. The University of Guam College of Natural & Applied Sciences 4H Program, Western Pacific Regional Fishery Management Council, Guam Fishermen's Cooperative Association, Marianas Underwater Fishing Federation, University of Guam Marine Laboratory and others participated in teaching and field exercises such as spearfishing shown below.

Guam High School Summer Course Activity
Photo Courtesy of University of Guam College of Natural & Applied Sciences 4H Program

7.0 Administrative and Enforcement Actions

7.1 Administrative Actions

Amendment 10 to the Bottomfish FMP (prior to establishment of the FEPs) included permitting, reporting, and vessel monitoring system (VMS) requirements for bottomfish vessels in the CNMI. The final rule establishing Federal permitting and reporting requirements for all commercial bottomfish vessels fishing in the U.S. EEZ around CNMI became effective January 12, 2009 (73 FR 75615). The final rule also closes certain EEZ waters around the CNMI (0 to 50 nautical miles offshore CNMI southern islands and 0 to 10 nautical miles offshore the northern island of Alamagan) to bottomfish fishing by vessels over 40 ft (12.2 m) in length. Vessel monitoring system (VMS) units must be installed on those larger vessels when fishing in EEZ waters around the CNMI, and the operators of those larger vessels are required to submit Federal sales reports in addition to catch reports. The final rule implementing the federal permit and logbook reporting requirements published on April 2, 2009 (74 FR 15373).

In addition, the final rule establishing eligibility requirements and procedures for reviewing and approving community development plans for western Pacific fisheries was

published in September 2010 (75 FR 54044). The intent of the final rule is to promote the participation of island communities in fisheries that they have traditionally depended upon, but in which they may not have the capabilities to support continued and substantial participation.

7.2 Enforcement Actions

The major federal enforcement actions which occurred in CNMI's federal fisheries or EEZ waters during 2009 were related to pelagic fisheries and are therefore reported in the Pelagics FEP Annual Report.

7.3 Plan Team Recommendations

The Advisory Panel (AP) in 2009 recommended:

In light of the new CNMI bottomfish regulations, including the requirement for permits and reporting, the AP recommended workshops on the bottomfish regulations be held in the Marianas this year.

The AP also asked about transshipment (larger vessels in the closed areas (not fishing and gear stowed) sending out satellite smaller boats. The AP recommended that the Council address transshipment in the CNMI bottomfish fishing regulations. The AP agreed that the transshipment issues including reporting should be looked at by the Council.

8.0 Conclusion

Data gaps in CNMI's fisheries are beginning to be filled through improved reporting and the biosampling program. There is still insufficient information on life history, catch, and effort for many coral reef MUS from which to develop annual catch limits as required by 2011. It is likely that some sort of proxy will be developed and ACLs for species complexes will be used for coral reef fisheries.

The bottomfish stock was reported as healthy in the 2007 stock assessment, however, a more recent assessment using life history data collected in the biosampling program is needed.

The Mariana Archipelago will have increased impacts on its natural resources in the future with the proposed large-scale growth in military presence and frequency of training. Impacts on coastal waters from increased development and military buildup will need to be acknowledged and addressed to ensure fisheries are not impacted by habitat degradation. These issues are likely to be the major challenges fisheries in the Marianas Archipelago and fishing communities will face in the coming years.

9.0 References

Luck, D. and P. Dalzell. 2010. Western Pacific Region Reef Fish Trends, *A Compendium of Ecological and Fishery Statistics for Reef Fishes in American Samoa, Hawai'i and the Mariana Archipelago, in Support of Annual Catch Limit (ACL) Implementation.* October 4, 2010. Prepared for the Western Pacific Regional Fishery Management Council, 1164 Bishop St., Ste. 1400, Honolulu, Hawai'i.

Moffitt, R., J. Brodziak and T. Flores. 2007. Status of the Bottomfish Resources of American Samoa, Guam, and Commonwealth of the Northern Mariana Islands, 2005. NOAA's Pacific Islands Fisheries Science Center. Administrative Report H-07-04. October 2007.

PIFSC. 2010. US Pacific Reef Fish Biomass Estimates Based on Visual Survey Data. By Ivor Williams, NOAA's Pacific Islands Fisheries Science Center. PIFSC Internal Report IR-10-024. Issued 10 August 2010. 19 pp.

Tenorio, M.C. 2003. Crustaceans fisheries in the CNMI. Report for the Western Pacific Fishery Management Council. By the Division of Fish & Wildlife, Department of Lands and Natural Resources, Saipan, MP. 5 pp.

10.0 APPENDIX A: CORAL REEF MUS

Family Name	Local Name Chamorro/Carolinian	English Common Name	Scientific Name
Acanthuridae (Surgeonfishes)	NA	orange-spot surgeonfish	*Acanthurus olivaceus*
	hugupao dangulo/ mowagh	yellowfin surgeonfish	*Acanthurus xanthopterus*
	kichu/limell	convict tang	*Acanthurus triostegus*
	NA	eye-striped surgeonfish	*Acanthurus dussumieri*
	NA	blue-lined surgeon	*Acanthurus nigroris*
	NA	whitebar surgeonfish	*Acanthurus leucopareius*
	hiyok/filaang	blue-banded surgeonfish	*Acanthurus lineatus*
	NA	blackstreak surgeonfish	*Acanthurus nigricauda*
	NA	whitecheek surgeonfish	*Acanthurus nigricans*
	NA	white-spotted surgeonfish	*Acanthurus guttatus*
	NA	ringtail surgeonfish	*Acanthurus blochii*
	NA	brown surgeonfish	*Acanthurus nigrofuscus*
	NA	mimic surgeonfish	*Acanthurus pyroferus*
	NA	yellow tang	*Zebrasoma flavescens*
Acanthuridae (Surgeonfishes)	NA	striped bristletooth	*Ctenochaetus striatus*
	NA	twospot bristletooth	*Ctenochaetus binotatus*
	tataga/igh-falafal	bluespine unicornfish	*Naso unicornus*
	hangon/bwulaalay	orangespine unicornfish	*Naso lituratus*
	NA	humpnose unicornfish	*Naso tuberosus*
	NA	black tongue unicornfish	*Naso hexacanthus*
	NA	bignose unicornfish	*Naso vlamingii*
	NA	whitemargin unicornfish	*Naso annulatus*
	NA	spotted unicornfish	*Naso brevirostris*
	NA	humpback unicornfish	*Naso brachycentron*
	NA	gray unicornfish	*Naso caesius*
Balistidae	NA	titan triggerfish	*Balistoides viridescens*

Family Name	Local Name Chamorro/Carolinian	English Common Name	Scientific Name
(Triggerfishes)	NA	clown triggerfish	*Balistoides conspicillum*
	NA	orange striped triggerfish	*Balistapus undulatus*
	NA	pinktail triggerfish	*Melichthys vidua*
	NA	black triggerfish	*Melichthys niger*
	NA	blue triggerfish	*Pseudobalistes fuscus*
	NA	Picassofish	*Rhinecanthus aculeatus*
	NA	wedged Picassofish	*Balistoides rectangulus*
	NA	bridled triggerfish	*Sufflamen fraenatus*
Carangidae (Jacks)	atulai/peti	bigeye scad	*Selar crumenophthalmus*
	NA	mackerel scad	*Decapterus macarellus*
Carcharhinidae (Sharks)	NA	grey reef shark	*Carcharhinus amblyrhynchos*
	NA	silvertip shark	*Carcharhinus albimarginatus*
	NA	Galapagos shark	*Carcharhinus galapagensis*
	NA	blacktip reef shark	*Carcharhinus melanopterus*
	NA	whitetip reef shark	*Triaenodon obesus*
Holocentridae (Solderfish/ Squirrelfish	saksak/mweel	bigscale soldierfish	*Myripristis berndti*
	sagamelon	bronze soldierfish	*Myripristis adusta*
	sagamelon	blotcheye soldierfish	*Myripristis murdjan*
	sagamelon	brick soldierfish	*Myripristis amaena*
	sagamelon	scarlet soldierfish	*Myripristis pralinia*
	sagamelon	violet soldierfish	*Myripristis violacea*
	sagamelon	whitetip soldierfish	*Myripristis vittata*
	sagamelon	yellowfin soldierfish	*Myripristis chryseres*
	sagamelon	pearly soldierfish	*Myripristis kuntee*
	sagamelon	tailspot squirrelfish	*Sargocentron caudimaculatum*
	NA	file-lined squirrelfish	*Sargocentron microstoma*

Family Name	Local Name Chamorro/Carolinian	English Common Name	Scientific Name
	chalak	crown squirrelfish	*Sargocentron diadema*
	sagsag/leet	blue-lined squirrelfish	*Sargocentron tiere*
	sisiok	saber or long jaw squirrelfish	*Sargocentron spiniferum*
	sagsag/leet	spotfin squirrelfish	*Neoniphon* spp.
Kuhliidae (Flagtails)	NA	barred flag-tail	*Kuhlia mugil*
Kyphosidae (Rudderfish)	guili	rudderfish	*Kyphosus biggibus*
	guili/schpwul	rudderfish	*Kyphosus cinerascens*
	guilen puengi/reel	rudderfish	*Kyphosus vaigienses*
Labridae (Wrasses)	NA	floral wrasse	*Cheilinus chlorourus*
	tangison/maam	napoleon wrasse	*Cheilinus undulates*
	lalacha mamate/ porou	triple-tail wrasse	*Cheilinus trilobatus*
	NA	harlequin tuskfish or red-breasted wrasse	*Cheilinus fasciatus*
	NA	ring-tailed wrasse	*Oxycheilinus unifasciatus*
	NA	razor wrasse	*Xyrichtys pavo*
	NA	whitepatch wrasse	*Xyrichtys aneitensis*
	NA	cigar wrasse	*Cheilio inermis*
	NA	blackeye thicklip	*Hemigymnus melapterus*
	NA	barred thicklip	*Hemigymnus fasciatus*
	NA	three-spot wrasse	*Halichoeres trimaculatus*
	NA	checkerboard wrasse	*Halichoeres hortulanus*
	NA	weedy surge wrasse	*Halichoeres margaritacous*
	NA	surge wrasse	*Thalassoma purpureum*
	NA	red ribbon wrasse	*Thalassoma quinquevittatum*
	NA	sunset wrasse	*Thalassoma lutescens*

Family Name	Local Name Chamorro/Carolinian	English Common Name	Scientific Name
	NA	longface wrasse	*Hologynmosus doliatus*
	NA	rockmover wrasse	*Novaculichthys taeniourus*
Mullidae (Goatfishes)	NA	yellow goatfish	*Mulloidichthys spp.*
	satmoneti/wichigh	yellowfin goatfish	*Mulloidichthys vanicolensis*
	ti‘ao (juv.) satmoneti (adult)	yellowstripe goatfish	*Mulloidichthys flavolineatus*
	NA	banded goatfish	*Parupeneus* spp.
	satmonetiyo/failighi	dash-dot goatfish	*Parupeneus barberinus*
	satmoneti acho/ sungoongo	doublebar goatfish	*Parupeneus bifasciatus*
	NA	redspot goatfish	*Parupeneus heptacanthus*
	ti‘ao (juv.) satmoneti (adult)	white-lined goatfish	*Parupeneus ciliatus*
	ti‘ao (juv.) satmoneti (adult)	yellowsaddle goatfish	*Parupeneus cyclostomas*
	ti‘ao (juv.) satmoneti (adult)	side-spot goatfish	*Parupeneus pleurostigma*
	ti‘ao (juv.) satmoneti (adult)	multi-barred goatfish	*Parupeneus multifaciatus*
	NA	band tail goatfish	*Upeneus arge*
Mugilidae (Mullets)	aguas (juv.) laiguan (adult)	striped mullet	*Mugil cephalus*
	aguas (juv.) laiguan (adult)	Engel’s mullet	*Moolgarda engeli*
	aguas (juv.) laiguan (adult)	fringelip mullet	*Crenimugil crenilabis*
Muraenidae (Moray eels)	NA	yellowmargin moray eel	*Gymnothorax flavimarginatus*
	NA	giant moray eel	*Gymnothorax javanicus*
	NA	undulated moray eel	*Gymnothorax undulatus*
Octopodidae (Octopus)	gamsun	octopus	*Octopus cyanea*
	gamsun	octopus	*Octopus ornatus*
Polynemidae	NA	threadfin	*Polydactylus sexfilis*
Pricanthidae	NA	glasseye	*Heteropriacanthus*

Family Name	Local Name Chamorro/Carolinian	English Common Name	Scientific Name
(Bigeye)			*cruentatus*
	NA	bigeye	*Priacanthus hamrur*
Scaridae (Parrotfishes)	atuhong/roow	humphead parrotfish	*Bolbometopon muricatum*
	palakse/laggua	parrotfish	*Scarus* spp.
	gualafi/oscha	Pacific longnose parrotfish	*Hipposcarus longiceps*
	palaksin chaguan	stareye parrotfish	*Calotomus carolinus*
Scombridae	white tuna/ayul	dogtooth tuna	*Gymnosarda unicolor*
Siganidae (Rabbitfish)	hiting/manahok/llegh	forktail rabbitfish	*Siganus aregentus*
	hiting	golden rabbitfish	*Siganus guttatus*
	hiting galagu	gold-spot rabbitfish	*Siganus punctatissimus*
	NA	Randall's rabbitfish	*Siganus randalli*
	hiting/sesyon/palawa	scribbled rabbitfish	*Siganus spinus*
	hiting	vermiculate rabbitfish	*Siganus vermiculatus*
Sphyraenidae (Barracuda)	NA	Heller's barracuda	*Sphyraena helleri*
	NA	great barracuda	*Sphyraena barracuda*
Turbinidae (turban /green snails	aliling pulan/aliling tulompu	green snails	*Turbo* spp.
		turban shells	