Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

2005 Annual Report

June 2006
Western Pacific Regional Fishery Management Council
Honolulu, Hawaii

Cover photo:

A report of the Western Pacific Regional Fishery Management Council pursuant to National Oceanic and Atmospheric Administration Award No.**NA07FC0025**

Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

2005 Annual Report

June 30, 2006

Prepared by the Bottomfish Plan Team and Council Staff for the
Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813
Tel: (808) 522-8220, Fax: (808) 522-8220

Table of Contents

List of Tables

List of Figures

Appendices

Bottomfish and Seamount Groundfish Fisheries of the Western Pacific
2005 Annual Report

I. Introduction

The Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) on August 27, 1986 (51 FR 27413). The Western Pacific Regional Fishery Management Council (WPRFMC, or Council) developed the FMP to manage the bottomfish and seamount groundfish resources that are covered by the Magnuson Fishery Conservation and Management Act of 1976 and that occur in the US Exclusive Economic Zone (EEZ) around American Samoa, Guam, Hawaii, the Northern Mariana Islands, and the US possessions in the Western Pacific Region (Johnston Atoll, Kingman Reef and Palmyra, Jarvis, Howland, Baker, Midway, and Wake Islands).

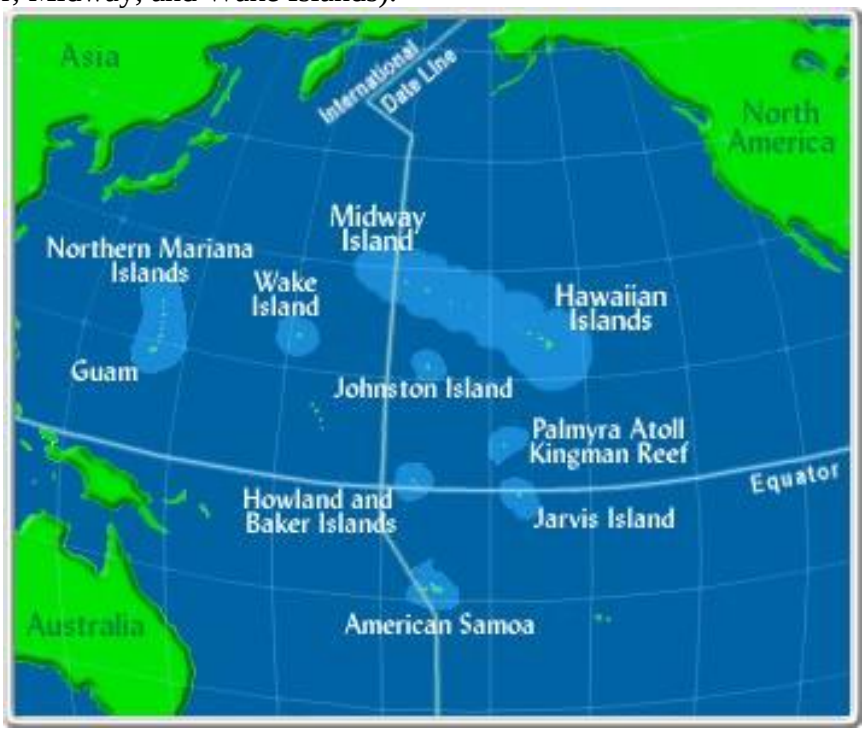


Figure 1: Map of the Western Pacific Region

This report contains fishery performance data from each of the four island groups through 2005, interpretations of trends or important events occurring in the fisheries and recommendations. This report was prepared using reports submitted by the following agencies. The Hawaii report is an integration of State of Hawaii Division of Aquatic Resources and NMFS summaries.

- Territory of American Samoa, Department of Marine and Wildlife Resources
- Territory of Guam, Division of Aquatic and Wildlife Resources
- Territory of Guam, Department of Commerce
- State of Hawaii, Division of Aquatic Resources
- Commonwealth of the Northern Mariana Islands, Division of Fish and Wildlife

- NMFS, Pacific Islands Region (including Pacific Islands Fisheries Science Center, Pacific Islands Regional Office and Office for Law Enforcement)
- US Coast Guard, District 14

A list of the Bottomfish Plan Team members during 2005 and other persons responsible for the compilation of this report are included in Appendix 1.

A. Background to the Annual Report

The 2005 annual report provides a set of descriptors and indicators of the bottomfish fisheries from American Samoa, Guam, Hawaii and the Northern Mariana Islands. The descriptors are designed to document recent trends in landings, effort, participation, revenue and prices. Should management action be recommended, descriptor information will aid in assessing potential impacts of the action on fishery participants. The indicators are quantifiable and measurable tools used to identify signs of stress in the stocks or the fishery. Based on changes over time in indicator levels, the Bottomfish Plan Team (BPT) may identify "yellow light" situations (i.e., where stress is first detected) and recommend that either management action or additional study be undertaken or “red light” situations where immediate management action is needed.

The annual report is organized as follows: The introduction section defines and briefly explains the descriptors and indicators. The next section briefly summarizes time trends in descriptor and indicator levels, through the current year, and recommends any areas of concern for each island area. Reports from each island area are appended. The introduction describes the history and present characteristics of the fishery. Results of the current year's descriptors and indicators are presented in detail, in relation to past temporal trends. Figures are supported with information on source of the data, methods of calculation, and data interpretation.

Table 1 lists scientific, common English and local/indigenous names for bottomfish management unit species (BMUS) for each area (American Samoa, Guam/Northern Marianas, and Hawaii).

Table 2 summarizes 2005 bottomfish statistics for the region. The report also includes statistics and information from each area including a summary of the area and its recommendations from the plan team.

Finally, additional appendices contain information on NMFS 2005 administrative and enforcement activities, USCG enforcement activities, protected species interactions, NMFS PIFSC scientific publications, a glossary and list of acronyms, and 2005 BPT membership.

Definition of Descriptors

The fishery descriptors are defined as follows:

Landings information

Time series information on aggregate catch for each island area shows recent trends in total bottomfish harvest. For American Samoa and Guam, estimates of both the commercial landings and the total landings (combined commercial, recreational and subsistence) are available. For Hawaii and the Northern Marianas, landings information represents only the commercial harvest.

In Hawaii, changes in species catch composition are provided for the Main Hawaiian Islands (MHI) and the Northwestern Hawaiian Islands (NWHI). Statistical tests for consistency in catch composition over time and between areas are included. Where possible, descriptor information has been presented for each NWHI management zone: Hoomalu and Mau. For 2005, pounds landed by species are presented in tabular form for each area except Hawaii. For Hawaii, NWHI BMUS landings by species are provided for 1986 through 2005.

Effort information
Effort is measured in number of trips for Hawaii and the Northern Marianas, and in both hours fished and trips taken for American Samoa and Guam.

Participation information
Estimates of the number of vessels making bottomfish landings are provided for all areas.

Economic information
Time trends in economic performance are characterized by plots of total ex-vessel revenue, aggregate average price levels, and for Hawaii, price trends over time for major species. In time-series of prices and revenues, it is appropriate to adjust value for the rate of inflation so that values throughout the time period are comparable (based on a consistent purchasing power for the dollar). Both the unadjusted and adjusted aggregate average price and aggregate revenues are plotted to clarify the relative change over time.

Definition of Indicators
Indicators were developed as tools for identifying signs of stress in the stocks or the fishery which deserve further investigation and/or a management response. Analyses consider how the indicators change over time. Indicators for Hawaii include 95% confidence intervals. To the degree possible, similar variance estimates are expected from the other areas in future annual reports. The indicators are defined as follows:

Aggregate Catch-Per-Unit-Effort
If the current year's aggregate catch-per-unit-effort (CPUE) is less than 50% of the average aggregate CPUE for the first three years of available data, there may be cause for concern. CPUE information is available for all areas; research CPUE is available for SE Hancock Seamount for all years since 1985, except in 1992 and 1994-2005.

Mean Fish Size
If there has been a significant reduction in mean fish size for a species over time, the stock may be stressed by the fishery. Mean size information is provided for nine species in Hawaii. No mean size information was available at this time for American Samoa, Guam or the Northern Marianas.

Percent Immature
If over 50% of the catch for a species is below the size of first maturity, the stock may be stressed by the fishery. Information for this indicator by species is available only from Hawaii.

Spawning Potential Ratio
The spawning potential ratio (SPR) is the ratio of the spawning stock biomass per recruit, at the current level of fishing, to the spawning stock biomass per recruit that would occur in the absence of fishing. According to the overfishing definition contained in the Bottomfish FMP (Amendment 3, 1990), if SPR is less than or equal to 0.20, recruitment overfishing has occurred (i.e., spawners have been reduced to 20%, or less, of their unexploited stock level). Data to calculate SPR were not available from Guam or the Northern Marianas. An estimate of the "worst case" SPR was calculated for American Samoa's bottomfish complex using Dory Project data to estimate the virgin population CPUE and information on percent of immature fish from Hawaii. In Hawaii, SPR was calculated for five major species in the Hoomalu and Mau Zones, of the NWHI, and the MHI; some SPR values changed slightly from previous year's reports due to improvement in the calculations. SPR for armorhead was calculated annually since 1985, except for 1992 and 1994-2005.

Economic Indicators
Revenue per trip plots is presented for all areas except the MHI. A more valuable indicator for the commercial fisheries, which may be available in the future, would be net revenue (ex-vessel revenue minus costs per trip). Net revenue is available only from the Hoomalu Zone and Mau Zone in Hawaii.

B. The Bottomfish Species of the Western Pacific Region

Bottomfish encompasses such premium snappers as Opakapaka and Onaga, favorites of fine dining chefs and diners, and represents some of the Pacific's most commercially important high quality species. While bottomfish species are generally found throughout the Western Pacific, the deepslope fishery in Hawaii – consisting of the State of Hawaii-controlled main Hawaiian Islands (MHI) and the Fishery's federal waters in Northwestern Hawaiian Islands (NWHI) – is the largest and most important Pacific resource for bottomfish in the U.S.

Most bottomfish species thrive in dark, cool waters from 90 to deeper than 600 feet over expansive hard-bottom ocean floor. Non-migratory as a species, bottomfish school, feed and spawn in area's rockyledges, undersea cliffs, drop offs, pinnacles and holes.

Five major species dominate the fishery in Hawaii:

Opakapaka
One of the most popular Pacific deepwater snappers, Opakapaka, also called Pink or Crimson Snapper, is the most abundant bottomfish caught in terms of landed weight and total catch value in Hawaii, its largest fishery in the Western Pacific. Renowned for its moist, delicate fillets in signature dishes of the Hawaii Regional Cuisine, Opakapaka is caught throughout the warm tropical waters of the Pacific.

Opakapaka is caught year-round with a peak season in the winter. This species has a relatively slow growth cycle, reaching a 15-pound adult size in about ten years. They are found near rocky bottoms in deep offshore waters of 20-100 fathoms (120-600 ft) during their life span.

Fishermen primarily use vertical hook-and-line gear to target this species. Advanced electronic navigation and fish-finding equipment may also be used to target this species. There is a minimal bycatch of other species, which if caught, is released alive. Relatively small boats for one-day trips close to port are used by most western Pacific fishermen. Larger vessels (35-60 ft) are used by permitted fishermen in the distant Northwestern Hawaiian Islands (NWHI) for trips averaging two to three weeks.

Onaga

Found throughout the Western Pacific, Onaga, or Long Tail Red Snapper, is most popular in Hawaii, where it is the second (behind Opakapaka) most important snapper species in total landed weight and value. It is highly valued by Hawaii's Japanese and Chinese populations as part of traditional celebrations, particularly New Year's. The "beauty queen" of snappers, Onaga is prized for its Chinese good-luck red color, silver white sides, and long swallow-like tail. It also consistently draws the highest price among bottomfish due to high consumer demand and limited seasonal availability.

This species is relatively slow growing, averaging 15 pounds by just over 9 years in age (compared to the Uku's 20-pound average by its fourth year). Onaga inhabits deep rocky bottoms offshore and is usually caught on or near the bottom in areas of steep drop-offs, ledges, and pinnacles. This fish can be found in warm tropical waters throughout the Pacific and Indian Oceans from southern Japan down toward Australia and from East Africa to the Hawaiian Islands.

Onaga has a limited season (October through March) and is the most difficult bottomfish to catch, say experienced fishermen, because it thrives at the deepst depths of 100-120 fathoms (600 to over 1,000 feet deep). Due to the deepness of its habitat, Onaga is almost exclusively caught with vertical hook-and-line gear. Advanced electronic navigation and fish-finding equipment may also be used to target this species. There is a minimal bycatch of other species, which if caught, is released alive. Relatively small boats for one-day trips close to port are used by most western Pacific fishermen. Larger vessels (35-60 ft) are used by permitted fishermen in the distant Northwestern Hawaiian Islands (NWHI) for trips averaging two to three weeks.

Ehu

The smallest of the premium Pacific snappers, Ehu or Short Tail Red Snapper, is found throughout the western Pacific and is prized in the Hawaiian Islands, along with Onaga, by Asian populations for its brilliant coloring and aesthetic symmetry. Orange-red in color, Ehu is usually distinguished by a lateral yellow stripe.

Ehu grows to a maximum of two feet in length and 12 pounds in weight (compared to a three-foot, 30-pound full-grown Onaga). This species grows slowly, reaching nine pounds by its 12th year (compared to a four-year-old Uku weighing 20 lbs). Ehu thrives over rocky bottoms in dark deeper, cool offshore waters beyond the reef and is most abundant in depths of 700 to over 1,000 feet. Ehu is third among all bottomfish (after Onaga and Opakapaka) in market price per pound, due to availability.

Fishermen primarily use vertical hook-and-line gear to target this species. Advanced electronic navigation and fish-finding equipment may also be used to target this species. There is a minimal bycatch of other species, which if caught, is released alive. Relatively small boats for one-day trips close to port are used by most western Pacific fishermen. Larger vessels (35-60 ft) are used by permitted fishermen in the distant Northwestern Hawaiian Islands (NWHI) for trips averaging two to three weeks. This species is usually caught feeding near Onaga populations, and has a limited winter season of October through March.

Uku

Often overshadowed by the vividly-colored Onaga and Opakapaka, Uku, also known as Grey Snapper or Jobfish, still ranks as the third most abundant snapper (behind Opaka and Onaga) in terms of landed weight and total catch value. Easiest to catch as the only major Pacific bottomfish that comes near the surface or shore to feed, Uku is also plentiful and has been known to occur in "spikes," sudden, unexplained surges in population.

Uku can be found in warm tropical waters of the IndoPacific, from East Africa throughout southeast Asia to southern Japan and Hawaii and southward to Australia. It is the only major shallow water Pacific snapper found in inshore reef areas from the surface down to a depth of about 80 fathoms (480 feet). This species grows quickly, averaging 20 pounds by its fourth year (compared to an 18-year-old Opakapaka averaging only 14 pounds).
Fishermen mostly use vertical hook-and-line gear to harvest Uku, but it is also the only commercial snapper in the western Pacific regularly caught near the surface with trolling lures. Uku is caught year-round, but is most plentiful in summer, the opposite of winter peaks for Opakapaka and Onaga. This species also usually ranks third behind Onaga and Opakapaka in total annual revenue generated among major species of bottomfish harvested in the western Pacific. The average price per pound for Uku is the lowest among Pacific snappers, but the abundance and year-round availability boosts its market value.

Hapuupuu

The only grouper among the five major commercially important bottomfish species, Hapuupuu, or Sea Bass, is prized for its firm, moist and sweet fillets often likened to the Hawaiian Spiny Lobster. Endemic to the Hawaiian Islands and Johnston Atoll, this grouper is found only in the Central Pacific. Hapuupuu can change color according to its habitat, a special trait of groupers, and is most often seen in the market as black. It can also range in color from dark brown to blackish brown and feature white spots as juveniles. Hapuupuu also consistently draws a moderate market price for its versatile uses and tastiness.

Hapuupuu thrives in deep water between 50 and 150 fathoms (300-900 feet) over hardbottom ocean floors. It grows relatively quickly, reaching ten pounds by its fifth year, and can grow up to four feet long and weigh up to 60 pounds.

Usually caught with handlines, Hapuupuu can also be caught with pole-and-line by experienced fishermen who can target bottomfish. Advanced electronic navigation and fish-finding equipment may also be used to target this species. There is a minimal bycatch of other species, which if caught, is released alive. Relatively small boats for one-day trips close to port are used by most

western Pacific fishermen. Larger vessels (35-60 ft) are used by permitted fishermen in the distant Northwestern Hawaiian Islands (NWHI) for trips averaging two to three weeks. The peak season for Hapuupuu is from fall to spring (October through April).

Table 1: Bottomfish Management Unit Species (BMUS)

(Absence of an indigenous name implies no local name established or area is not within the species' geographic range.)

Scientific	English Common	American Samoa	Guam/CNMI	Hawaii
Bottomfish:				
Aphareus rutilans	red snapper/silvermouth	palu-gutusiliva	maraap tatoong	lehi
Aprion virescens	gray snapper/jobfish	asoama	tosan	uku
Caranx ignobilis	giant trevally/jack	sapoanae	tarakito	white ulua/pau'u
C. lugubris	black trevally/jack	tafauli	trankiton attilong	black ulua
Epinephelus fasciatus	blacktip gouper	fausi	gadao matai	
E. quernus	sea bass			hapu'upuu
Etelis carbunculus	red snapper	palu-malau	guihan boninas	ehu
E. coruscans	red snapper	palu-loa	onaga	onaga
Lethrinus amboinensis	ambon emperor	filoa-gutumumu	mafuti/lililok	
L. rubrioperculatus	redgill emperor	filoa-pa'o'omumu	mafuti tatdong	
Lutjanus kasmira	blueline snapper	savane	sas/funai	ta'ape
Pristipomoides auricilla	yellowtail snapper	palu-i'usama	guihan boninas	yellowtail kalekale
P. filamentosus	pink snapper	palu-'ena'ena	guihan boninas	opakapaka
P. flavipinnis	yelloweye snapper	palu-sina	guihan boninas	yelloweye opakapaka
P. seiboldi	pink snapper		guihan boninas	kalekale
P. zonatus	snapper	palu-sega	guihan boninas/gindai	gindai
Pseudocaranx dentex	thicklip trevally		terakito	butaguchi/pig ulua
Seriola dumerili	amberjack		guihan tatdong	kahala
Variola louti	lunartail grouper	papa	bueli	
Seamount Groundfish:				
Beryx splendens	alfonsin			kinmedai (Japanese)
Hyperoglyphe japonica	ratfish/butterfish			medai (Jap.)
Pseudopentaceros richardsoni	armorhead			kusakari tsubodai (Jap.)

C. Bottomfish Gear Types and Fisheries of the Western Pacific Region

• Two to four fishing stations each with a handline rig of four to six hooks baited with squid or strip bait, a selective method that allows experienced fishermen to target bottomfish.

• Advanced electronic navigation and fishfinding equipment also used to target bottomfish.

• Due to targeting, minimal bycatch of other species, which if caught, released alive.

• Virtually 100% of marketable catch retained and sold. NWHI fishermen limited to boats 35-feet to a maximum of 60-feet for average trips of two to four weeks about nine times year.

• Relatively small boats for one-day trips close to port used by MHI fishermen, many of them part-time commercial or recreational.

II. Development and Description of the Fisheries in the Western Pacific Region

A. American Samoa

1. Traditional and Historical Bottomfish Fisheries

Long before the arrival of Europeans in the islands of Samoa, the indigenous people of those islands had developed specialized techniques for catching bottomfish from canoes. Some bottomfish, such as *ulua*, held a particular social significance and were reserved for the matai (chiefs; Severance and Franco 1989).

By the 1950s, many of the small boats in American Samoa were equipped with outboard engines, steel hooks were used instead of ones made of pearl shell, and monofilament fishing lines had replaced hand woven sennit lines. However, bottomfish fishing remained largely a subsistence practice. It was not until the early 1970s that the bottomfish fishery developed into a commercial venture (Ralston 1979). Surveys conducted around Tutuila Island from 1967 to 1970 by the American Samoa Office of Marine Resources indicated that the potential existed for developing a small-scale commercial bottomfish fishery. Four major fishing grounds were identified around the island of Tutuila: Taputapu, Matatula, Leone West Banks, and Steps Point (Severance and Franco 1989). In 1972, a government-subsidized boat-building program was initiated to provide local fishermen with gasoline and diesel powered 24–foot wooden dories capable of fishing for bottomfish in offshore waters. Twenty-three boats were eventually built and used by fishermen. By 1980, however, mechanical problems and other difficulties had reduced the dory fleet to a single vessel (Itano 1996).

In the early 1980s, the 28-foot *alia* catamaran, designed by the Food and Agriculture Organization of the United Nations, was introduced into American Samoa, and local boat builders began constructing these inexpensive but seaworthy fishing vessels. A recovery in the size of the fishing fleet, together with a government-subsidized development project aimed at exporting deep-water snapper to Hawaii, caused another notable increase in bottomfish landings (Itano 1996). Between 1982 and 1988, the bottomfish fishery made up as much as half of the total catch of the local commercial fishery. However, since 1988, the nature of American Samoa's fisheries

has changed dramatically, with a shift in importance from bottomfish fishing to trolling and longlining for pelagic species (WPRFMC 1999). Landings trends in the bottomfish fishery have also been periodically adversely impacted by hurricanes. The 1987 hurricane, in particular, damaged or destroyed a large segment of American Samoa's small-boat fishing fleet.

2. Bottomfish Fisheries Development

Today, the bottomfish fishery of American Samoa consists of approximately 19 part-time vessels that typically jig overnight using skipjack tuna as bait (WPRFMC 2004). The fishing technology employed by the fleet continues to be relatively unsophisticated. Most vessels are aluminum alia catatramans less than 30 foot length and many of the boats are outfitted with wooden hand reels that are used for both trolling and bottomfish fishing. In 1999, less than 10 percent of the boats carry a depth recorder, electronic fish finder, or global positioning system (Severance et al. 1999). Because few boats carry ice, they typically fish within 20 miles of shore. In recent years, however, a growing number of fishermen in American Samoa have been acquiring larger (> 35 ft) vessels with capacity for chilling or freezing fish and a much greater fishing range.

3. Administrative or Management Actions to Date

The Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective on August 27, 1986 (51 FR 27413). Initial bottomfish fishery management measures prohibited certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, and implemented a permit system for fishing for bottomfish in the waters of the Exclusive Economic Zone (EEZ) around the Northwestern Hawaiian Islands (NWHI) (the current moratorium on the seamount groundfish fishery was implemented on September 1, 1998 (63 FR 35162, June 29, 1998) and is in effect until August, 2004). The plan also established a management framework that provided for regulatory adjustments to be made, such as catch limits, size limits, area or seasonal closures, fishing effort limitations, fishing gear restrictions, access limitations, permit and/or catch reporting requirements, as well as a rules-related notice system. A proposed rule which would extend the moratorium on fishing at the Hancock Seamounts through 2010 was published on June 25, 2004 (69 FR 35570).

AMENDMENT 1 became effective on November 11, 1987 (52 FR 38102, October 14, 1987) and established a system to allow implementation of limited access systems for bottomfish fisheries in EEZ waters around American Samoa and Guam within the framework measures of the FMP.

AMENDMENT 3, which became effective on January 16, 1991 (56 FR 2503) defined recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20%. Amendment 3 also delineated a process by which overfishing would be monitored and evaluated.

AMENDMENT 6 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved include designations of essential fish habitat and descriptions of some fishing communities. Those provisions became effective on

February 3, 1999 (64 FR 19067). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities, overfishing definitions, and bycatch.

AMENDMENT 7 was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Bottomfish and Seamount Groundfish Management Unit Species (BMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 7 to the Bottomfish FMP. A final rule implementing the Coral Reef Ecosystem FMP (including Amendment 7 to the Bottomfish FMP) was published on February 24, 2004 (69 FR 8336).

Major Issues

• Ongoing monitoring of monk seal, even though no mortalities of this endangered animal or bycatch of its prey reported by NMFS during harvesting of bottomfish in NWHI.
• Increasing foreign bottomfish imports now fill one-third of bottomfish market in Hawaii.

B. Guam

1. Traditional and Historical Bottomfish Fisheries

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 2003a). 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 2003a). 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 2003a).

Smaller vessels (< 25 ft) mostly 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 2003c).

2. Bottomfish Fisheries Development

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.

3. Administrative or Management Actions to Date

The Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective on August 27, 1986 (51 FR 27413). Initial bottomfish fishery management measures prohibited certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, and implemented a permit system for fishing for bottomfish in the waters of the Exclusive Economic Zone (EEZ) around the Northwestern Hawaiian Islands (NWHI) (the current moratorium on the seamount groundfish fishery was implemented on September 1, 1998 (63 FR 35162, June 29, 1998) and is in effect until August, 2004). The plan also established a management framework that provided for regulatory adjustments to be made, such as catch limits, size limits, area or seasonal closures, fishing effort limitations, fishing gear restrictions, access limitations, permit and/or catch reporting requirements, as well as a rules-related notice system. A proposed rule which would extend the moratorium on fishing at the Hancock Seamounts through 2010 was published on June 25, 2004 (69 FR 35570).

AMENDMENT 1 became effective on November 11, 1987 (52 FR 38102, October 14, 1987) and established a system to allow implementation of limited access systems for bottomfish fisheries in EEZ waters around American Samoa and Guam within the framework measures of the FMP.

AMENDMENT 3, which became effective on January 16, 1991 (56 FR 2503) defined recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20%. Amendment 3 also delineated a process by which overfishing would be monitored and evaluated.

AMENDMENT 6 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved include designations of essential fish habitat and descriptions of some fishing communities. Those provisions became effective on February 3, 1999 (64 FR 19067). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities, overfishing definitions, and bycatch.

AMENDMENT 7 was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Bottomfish and Seamount Groundfish Management Unit Species (BMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 7 to the Bottomfish FMP. A final rule implementing the Coral Reef Ecosystem FMP (including Amendment 7 to the Bottomfish FMP) was published on February 24, 2004 (69 FR 8336).

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved by the National Marine Fisheries Service (NMFS) or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

Proposed **AMENDMENT 9** to the FMP would prohibit vessels greater than 50' in length overall from targeting Bottomfish Management Unit Species within 50 miles of Guam, and would require these vessels to obtain federal permits and to submit federal logbooks.

C. Hawaii

1. Traditional and Historical Bottomfish Fisheries

Bottomfish fishing was a part of the economy and culture of the indigenous people of Hawaii long before European explorers first visited the islands. Descriptions of traditional fishing practices indicate that Native Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques employed today.

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers (e.g. opakapaka), carangids (e.g. jacks), and a single species of grouper (hapuupuu) concentrated at

depths of 30–150 fathoms. The fishery can be divided into two geographical areas: (a) the inhabited MHI with their surrounding reefs and offshore banks and the (b) NWHI, a 1,200-nautical mile chain of largely uninhabited islets, reefs, and shoals. In the MHI, approximately 80 percent of the bottomfish habitat lies in state waters. Bottomfish fishing grounds within federal waters around the MHI include Middle Bank, most of Penguin Bank, and approximately 45 nautical miles of 100-fathom bottomfish habitat in the Maui–Lanai–Molokai complex. For management purposes, the NWHI fishery has been separated into the closer Mau Zone between 165° W and 161°20' W, and the more northwestern Hoomalu Zone to the west of 165° W.

In the small-boat bottomfish fishery that is active around the MHI, the distinction between recreational and commercial fishermen is extremely tenuous, with many otherwise recreational fishermen selling small amounts of fish to cover trip expenses. The number of vessels used each year to target bottomfish in MHI varies between 250 and 500. Commercial fishermen in the MHI often concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers. The use of bottom trawls, bottom gillnets, exposives, and poisons are prohibited.

In contrast, bottomfish fishing in the NWHI is conducted solely by commercial fishermen, and the vessels used tend to be larger than those fishing around the MHI, as the distance to fishing grounds is greater. Participation in the NWHI bottomfish fishery is controlled through limited access programs in each of the two management zones (Mau and Hoomalu). These zones were established to reduce the risk of biological overfishing and to improve the economic health and stability of the bottomfish fishery in the NWHI. The programs provide for a limited number of fishing permits to be issued each calendar year. Permits may not be sold, leased, or chartered. Based on the biological, economic, and social characteristics of the bottomfish fisheries in the two zones, the long-term target fleet sizes for the Hoomalu and Mau Zones have been determined to be seven and ten vessels, respectively. In 2004, four vessels fished in the Hoomalu Zone, and five vessels fished in the Mau Zone. All of these vessels are independent, owner-operated fishing operations.

Bottomfish gear and fishing strategies are highly selective for desired species and sizes. Bottomfishers use a hook-and-line method of fishing in which weighted and baited lines are lowered and raised with electric, hydraulic, or hand-powered reels. The main line is typically 400–450 pounds test, with hook leaders of 80–120 pound test monofilament. The hooks are circle hooks, and a typical rig uses six to eight hooks branching off the main line. The weight is typically 5–6 pounds. The hook leaders are typically 2–3 feet long and separated by about 6 feet along the main line. Squid is the bait typically used. It is sometimes supplemented with a chum bag containing chopped fish or squid suspended above the highest hook.

2. Bottomfish Fisheries Development

• NWHI currently provides more than half of Hawaii’s fresh harvested premium quality bottomfish for local and export markets.
• Recent State of Hawaii MHI fishery management plan sets restrictions and reserved areas to replenish locally depleted bottomfish stocks, notably Ehu and Onaga.
• NWHI harvests less than 55% of maximum sustainable yield (MSY) with potential for growth.

Market Value
• Occupies a lucrative market niche in Pacific Island economies, particularly the prime quality snappers, for fishermen, seafood dealers, retailers, and restaurateurs.
• Currently valued at just under $1 million per year.

3. Administrative or Management Actions to Date

The Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective on August 27, 1986 (51 FR 27413). Initial bottomfish fishery management measures prohibited certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, and implemented a permit system for fishing for bottomfish in the waters of the Exclusive Economic Zone (EEZ) around the Northwestern Hawaiian Islands (NWHI) (the current moratorium on the seamount groundfish fishery was implemented on September 1, 1998 (63 FR 35162, June 29, 1998) and is in effect until August, 2004). The plan also established a management framework that provided for regulatory adjustments to be made, such as catch limits, size limits, area or seasonal closures, fishing effort limitations, fishing gear restrictions, access limitations, permit and/or catch reporting requirements, as well as a rules-related notice system. A proposed rule which would extend the moratorium on fishing at the Hancock Seamounts through 2010 was published on June 25, 2004 (69 FR 35570).

AMENDMENT 2 became effective on September 6, 1988 (53 FR 299907, August 9, 1988) and divided the EEZ around the NWHI into two zones, the more distant Ho'omalu Zone and the closer Mau Zone. A limited access system was established for the Ho'omalu Zone, with non-transferable permits and landing requirements for permit renewal and for new entry into the fishery. Access to the Mau Zone was left unrestricted, except for vessels permitted to fish in the Ho'omalu Zone. Under Amendment 2, new entrants to both fisheries must complete a protected species workshop prior to receiving their permits The Mau Zone is intended to serve as an area where fishermen can gain experience fishing in the NWHI, thereby enhancing their eligibility for subsequent entry into the Ho'omalu Zone.

AMENDMENT 3, which became effective on January 16, 1991 (56 FR 2503) defined recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20%. Amendment 3 also delineated a process by which overfishing would be monitored and evaluated.

AMENDMENT 4 became effective on May 26, 1991 (56 FR 24351, May 30, 1991). It implemented a requirement for vessel owners or operators to notify the National Marine Fisheries Service at least 72 hours before leaving port if they intend to fish in a "protected species study zone" that extends 50 nautical miles (nm) around the NWHI. This notification allows federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary.

AMENDMENT 5 became effective on May 28, 1999 (64 FR 22810, April 28, 1999). It established a limited entry program for the Mau Zone in the NWHI with non-transferable permits and landing requirements for permit renewal. Included in requirements for permit issuance was attendance by the primary vessel operator at a protected species workshop. Amendment 5 also established a Community Development Program (CDP) under which 20% of Mau Zone permits are reserved for CDP participants, as well as instituting a maximum vessel length of 60' for replacement vessels in the Ho'omalu or Mau Zones.
Amendment 6 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved include designations of essential fish habitat and descriptions of some fishing communities. Those provisions became effective on February 3, 1999 (64 FR 19067). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities, overfishing definitions, and bycatch.

In June 1998 the State of Hawaii implemented several management measures for bottomfish in the state waters of the Main Hawaiian Islands (Hawaii Administrative Rule, Chapter 13-94). Because bottomfish are managed under the FMP on an archipelagic-wide basis and because there are bottomfishing grounds in federal waters that are adjacent to state waters, these measures directly impact the stocks managed under the Bottomfish FMP. The new rules apply to seven species of bottomfish and include gear restrictions, bag limits for non-commercial fishermen, closed areas, and a requirement that all bottomfishing vessels be registered with the state.
Of relevance to the management of the NWHI bottomfish fishery is the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established December 4, 2000 through Executive Order (EO) 13178 (65 FR 76903, December 7, 2000), as modified by EO 13196 on January 18, 2001 (66 FR 7395, January 23, 2001). The Reserve is managed by the Department of Commerce under the National Marine Sanctuaries Act. The EO includes prohibitions on commercial and recreational fishing, including the taking of living coral and dead coral, in certain "Reserve Preservation Areas" within the Reserve. It also includes provisions that cap the number of permits and the "annual aggregate take" for particular types of fishing based on historical levels of permit issuance and "take." These numbers and takes have not yet been determined. The EO also calls for the Secretary of Commerce to initiate the process to designate the Reserve as a National Marine Sanctuary.

AMENDMENT 7 was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Bottomfish and Seamount Groundfish Management Unit Species (BMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 7 to the Bottomfish FMP. A final rule

implementing the Coral Reef Ecosystem FMP (including Amendment 7 to the Bottomfish FMP) was published on February 24, 2004 (69 FR 8336).

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved by the National Marine Fisheries Service (NMFS) or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

A proposed **REGULATORY ADJUSTMENT** to the FMP would suspend the minimum landing requirements for annual permit renewal in the NWHI Hoomalu and Mau Zone limited access programs.

A second proposed **REGULATORY ADJUSTMENT** to the FMP under development would establish provisions for allowing new entry into the Mau Zone, with eligibility criteria based on historical participation in the Hawaii bottomfish fishery. These criteria would apply to also apply to applicants under the Community Development Program.

D. Commonwealth of the Northern Marianas Islands

1. Traditional and Historical Bottomfish Fisheries

The CNMI bottomfish fishery can be categorized into two segments: deep (> 160 m) and shallow (< 160 m) water fishing. The deep water fishery is primarily commercial, targeting snappers, the *Eteline* and *Pristipomoides* complexes, and the eight-banded grouper. The shallow water bottomfish fishery, which targets the red-gilled emperor, *Lethrinus rubrioperculatus*, is mostly commercial but also includes recreational and subsistence fishermen. Some trips last for more than a day, but the majority of bottomfishing trips by small vessels are one day.

The CNMI bottomfish fishery occurs primarily around the islands and banks from Rota Island to Zealandia Bank north of Sariguan. Historically, the CNMI has had a relatively small fishing fleet consisting primarily of small-scale local boats engaged in commercial, subsistence, and recreational fishing. CNMI's Department of Fish and Wildlife (DFW) has reported that 150 skiffs are used for subsistence fishing and eight vessels ranging from 29 to 70 feet have been used commercially. However, the 2004 DFW "trip tickets" recorded a total of 43 vessels, both large and small, fishing commercially. The skiffs are generally less than 24 feet in length which restricts them to fishing one day trips during the daylight hours within a 30-mile radius of Saipan (WPRFMC 2003). Due to their distance from port, CNMI small boat fishermen are reluctant to fish western seamounts. Handlines, home fabricated hand reels, and electric reels are commonly used for small-scale fishing operations.

Prior to 1994, large vessel ventures were short lived. These vessels have landed as much as 70 percent of the total reported commercial bottomfish landings (Trianni 200). The number of large-vessel commercial bottom-fishing ventures active in the Northern Islands increase to eight during 2000, but only four are presently active (WPRFMC 2005). Of these four, two primarily sell their catches on the island of Saipan (mostly to the large hotels in Tinian).

The larger commercial vessels are able to make multiday trips to the Northern Islands, focusing their effort from Esmeralda Bank to Zealandia. Electric reels and hydraulics are the common gear used for these larger operations. No known commercial vessels have ice-making or freezer capabilities. Two ventures, comprising three vessels, a 65-foot vessel, and two 50-foot vessels, fished the Northern Islands deep-water complex in 1997, landing large volumes of onaga and eight-banded grouper. By the end of 1999, two of the three bottomfishing vessels left the fishery. Four vessels have entered the fishery since late 2000, with two vessels occasionally targeting sharks (M. Trianni personal communication).

Landings of bottomfish decreased in 2002 (34.3% fewer pounds in 2002 than in 2001) from the fishery's 2001 peak landings (See Figure 11). This fishery continues to show a high turnover with changes in the highliners participating in the fishery and an increased number of local fishermen focusing on reef fishes in preference to bottomfish. Fishermen are also moving towards an increasing number of multi-purpose trips that focus primarily on reef fishes 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 (M.Trianni personal communication).

2. Bottomfish Fisheries Development

Over the past 6 years, 64 percent of *mafute* fishermen and 62 percent of onaga fishermen making commercial sales participated for only a single year, and no fishermen participated in all 6 years (regardless of how small the sales;WPRFMC 2005). 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 start-up costs than does the shallow-water bottomfish sector. This industry could continue to expand with support from a training program in bottomfishing that addresses the following: proper fish handling and maintenance of product quality, use of fathometers, nautical charts, modern electronic equipment such as GPS, fish finders, electric reels, anchoring techniques, marketing, and financial planning. Moreover, side-band sonar mapping of the banks used by commercial fishermen from FDM to Rota should assist the growth of this sector (M.Trianni, personal communication).

3. Administrative or Management Actions to Date

The Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish Fisheries in the Western Pacific Region became effective on August 27, 1986 (51 FR 27413). Initial bottomfish fishery management measures prohibited certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets; established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, and implemented a permit system for fishing for bottomfish in the waters of the Exclusive Economic Zone (EEZ) around the Northwestern Hawaiian Islands (NWHI) (the current moratorium on the seamount groundfish fishery was implemented on September 1, 1998 (63 FR 35162, June 29, 1998) and is in effect until August, 2004). The plan also established a management framework that provided for regulatory adjustments to be made, such as catch limits, size limits, area or seasonal closures, fishing effort limitations, fishing gear restrictions, access limitations, permit and/or catch

reporting requirements, as well as a rules-related notice system. A proposed rule which would extend the moratorium on fishing at the Hancock Seamounts through 2010 was published on June 25, 2004 (69 FR 35570).

AMENDMENT 3, which became effective on January 16, 1991 (56 FR 2503) defined recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20%. Amendment 3 also delineated a process by which overfishing would be monitored and evaluated.

AMENDMENT 6 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved include designations of essential fish habitat and descriptions of some fishing communities. Those provisions became effective on February 3, 1999 (64 FR 19067). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities, overfishing definitions, and bycatch.

AMENDMENT 7 was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Bottomfish and Seamount Groundfish Management Unit Species (BMUS) in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 7 to the Bottomfish FMP. A final rule implementing the Coral Reef Ecosystem FMP (including Amendment 7 to the Bottomfish FMP) was published on February 24, 2004 (69 FR 8336).

A number of FMP amendments and framework adjustments are in various stages of preparation and approval. Although they have not been approved by the National Marine Fisheries Service (NMFS) or implemented through regulations, the following descriptions give an indication of the actions being proposed and considered.

Proposed **AMENDMENT 8** to the FMP would include the federal waters around the Commonwealth of the Northern Mariana Islands and the Pacific Remote Island Areas under the FMP and would designate 49 additional bottomfish species as BMUS.

III. The Current Status of Bottomfish Fisheries of the Western Pacific Region

In 2005, it was determined that the Hawaii archipelago multispecies bottomfish complex was subject to overfishing as defined in the MSA, with the MHI being the area where the overfishing problem primarily occurs (70 FR 34452, June 14, 2005). The Council was given one year to take action to end overfishing, and is now considering a range of alternatives to meet this requirement. That action and those alternatives are the subject of a separate federal action and NEPA analysis.

Table 2: Regional Summary of 2005 Bottomfish Species

	American Samoa	Guam	CNMI	Hawaii			
				All	MHI	Mau	Hoomalu
Bottomfish Landings (lb)	21,157	61,601	70,034				
Revenue ($)	16,744	69,186	189,478				
No. Of Boats	16	233	62		**NOT AVAILABLE**		
No. Of Trips	256	2957	506				
CPUE	6.7 lbs/hr	4.8 lbs/hr	76 lb/trip				

IV. Region-Wide Recommendations 2005

1. Recommends that the Council write to the Guam/CNMI/Hawaii administration or government, requesting the necessary legislative and administrative actions be taken to provide legal authority to the local fishery departments to monitor and collect information from all fishing sectors.

2. Recommends that the Council investigate the implications of fishermen reporting interactions with protected species on federal reporting forms, against a background of there being no-incidental take statement for those fisheries.

3. Recommends the formation of an inter-agency working group, to address the relevant evaluation, monitoring and assessment issues, related to over-fishing in the MHIs, including, but not limited to, those raised by the 91st meeting of the SSC. Both fishery dependent and fishery independent methodologies should be employed. This approach should be applied to management actions taken throughout the region.

4. Recommends that the Council encourages the State to complete analysis of the opakapaka tagging project.

5. Recommends that the Council support the collection of bottomfish genetic material for HIMB population studies.

V. Data Modules

A. American Samoa

Summary

American Samoa's bottomfish fishery was relatively bigger between 1982 and 1985 when this fisheries was new and booming (Figure 1). In 1988 a decline in bottomfish fisheries occurred as many skilled and full-time commercial fishermen converted to trolling. Profits and revenues in bottomfishing suffered devastating blows from four separate hurricanes; Tusi in 1987,Ofa in February of 1990 and Val in December of 1991 and Heta in January of 2004 (Figure 2). The gradual depletion of newly discovered banks and migration of many fishermen into other fishing vendors resulted in the decline of landings in the mid 1980s (Figure 1). Fuel prices have gradually soared in the past four years causing yet another strain in the bottomfish fisheries (Figure 3). The average price of bottomfish has also declined due to the shift of local bottomfish demand to imported bottomfish competing closely with local prices. In 2004, 60% of coolers imported from the independent state of Samoa on the Lady Naomi Ferry are designated for commercial purposes; from the Commercial Invoice System 50% of these coolers are bottomfish

The fluxuation of the already small American Samoa bottomfish fishery is a result of a combination of factors from natural causes to changes in the economy. In 2005 a total of 16 local boats landed an estimated 21,157 pounds of both commercial and recreational bottomfish in the teritory, where 30% of the total landing was sold commercially. Revenues from the commerical fishery in 2005 was estimated around $16,744 with all catch being sold locally. The CPUE for this year (6.7 lb/hr) ws the lowest ever but not less than 50% of the aggregate CPUE for the first 3 years of this fishery. Effort (hours and trips) has been increasing since 1998 as some of the alias that normally troll and/or longline perform bottomfishing either when trolling and longline prices and catches decline.

Regarding some of the SFA amendments: Commercial Bottomfish Landings and Revenues statistics for American Samoa is presented in Figure 2. No bottomfish Recreational trip was recorded this year. Recreational fishing is more associated with the pelagic fisheries and usually never occur in this fishery. There was no chartered bottomfish trip during this year and no bottomfish by catch was recorded this year (Table 3). In the Preliminary Draft of EFH, Amendment for Bottomfish, WPRFMC Feb.1998, the approximate MSY estimate for American Samoa [196 nautical miles 100-fathom isobath] is estimated at 79,000 lbs. per year. Only about 40% was reached this year.

Indicators derived from current data do not dictate immediate management response at this time.

Introduction

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, record 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.

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

Recommendations

2004 Recommendation:

1. Technicians require intensive fish identification training, requesting council to compose training workshop for all Western Pacific members to standardize data.
2. Establish a centralized fish market for fishermen and businessmen.
3. DMWR should mandate fishermen and store owners to allow technicians to conduct interviews.
4. FoxPro data collecting system should enter data using scientific names and not use common names or local names.
5. A data sampling port should be established near the boat docks to not only centralize interviews but to maximize the quantity of interviews.

Status of 2004 Recommendation:

1. Request submitted to council, pending a response.

2. DMWR is in the process of working out a fish market within the local central land grant market. Talks and specifications are being discussed between directors of both departments.
3. DMWR has also considered this issue and is in the initial phases of processing it into an actual requirement.
4. System has been modified to where scientific name or common name can be entered.
5. Approval has been granted and estimations for materials and project is being collected.

2005 Recommendation:

1. Request a development of a bottomfish fishery evaluation project for the soul purpose of being able to identify goals, problems and constraints within various contributing elements such as but not limited to fishery resource, marketing, infrastructure, government, and economics. Propose solution sequences and feasibility, costs and benefits. Identify sources of funding, key agencies and people important to accomplishing goals.

2. Request assistance in establishing a training manual including sampling protocol and fish identification, enhancing communication skills, encouraging commitment with the overall goal of ensuring quality data collection.

Table AS-1. American Samoa Historical Summary of Annual Statistics

Selected Historical Annual Statistics

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	$221331	$3.56	100.0	27
1983	126327	10.0	125167	$519868	$4.15	100.8	38
1984	94104	10.7	92841	$316475	$3.41	102.7	48
1985	143225	8.1	102670	$265727	$2.59	103.7	47
1986	92740	8.3	91959	$216064	$2.35	107.1	37
1987	31232	11.9	30740	$78989	$2.58	111.8	21
1988	63136	17.3	60388	$164268	$2.72	115.3	32
1989	47646	16.7	36330	$90662	$2.49	120.3	33
1990	14776	9.3	12948	$32211	$2.49	129.6	24
1991	18893	9.1	17948	$43286	$2.42	135.3	23
1992	14521	9.3	14469	$41751	$2.89	140.9	14
1993	17862	7.3	15898	$42829	$2.69	141.1	26
1994	46071	7.8	42221	$107015	$2.53	143.8	25
1995	35737	9.8	35279	$79912	$2.26	147.0	35
1996	38647	14.8	38016	$88624	$2.34	152.5	35
1997	40557	14.7	39006	$104699	$2.69	156.4	37
1998	15884	14.0	14405	$43884	$3.05	158.4	30
1999	19385	12.9	17070	$51913	$3.05	159.9	34
2000	28658	10.2	26565	$65030	$2.45	166.7	38
2001	48862	15.2	38647	$106116	$2.74	168.8	29
2002	42096	7.6	37554	$91631	$2.44	169.2	17
2003	26791	15.3	12743	$27696	$2.17	177.5	19
2004	27875	7.5	16517	$33631	$2.04	187.2	25
2005	21157	6.7	7204	$16744	$2.32	194.7	16
Averages	46714	11.0	41192	$118765	$2.68		29.6
Std. Dev.	34278	3.2	31531	$114282	$0.47		8.89

Table AS-2. **American Samoa 2005 Estimated Total Bottomfish Landings by Species.**

Interpretation: With the technicians improved ability to identify fish species better, additional species have been included in the species list. Past and present data however does not indicate any major changes in the composition of the bottomfish species landed.

Source: DMWR Boat-Based 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 Boat-Based 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.**

Species	Pounds
BMUS	
Blue lined snapper	1032
Squirrel Snapper (Ehu)	1350
Flower Snapper (Gindai)	286
Gray jobfish	1693
Pink Snapper (Opakapaka)	1004
Smalltooth Jopbfish (Lehi)	831
Longtail Snapper (Onaga)	2629
Yelloweye opakapaka.	59
Yellowtail snapper	460
Blacktip grouper	64
Lunartail grouper	1146
Ambon emperor	1261
Redgill emperor	1233
Amberjack	7
Black jack	551
BMUS SUBTOTALS	**13605**
OTHER	
Black snapper	20
Yellow Margined snapper	34
Blood snapper	89
Blue lined gindai	127
Brown jobfish	8
Paddletail snapper	3121
Kusakar's snapper	157
Multidens snapper	24
Onespot snapper	117
Pristipomoides/Etelis	1
Rufous snapper	241
Stone's snapper	335
Twinspot/red snapper	1
Yelloweye Snapper	622
Groupers (misc)	210
Flagtail grouper	19
Peacock grouper	249
Spotted grouper	133
Tomato grouper	320
Yellowspot grouper	208
Bigeye squirrelfish	16
Longnose emperor	959
Bigeye trevally	485
Whitemouth trevally	53
Blueline bream	2
OTHER SUBTOTALS	**7552**
TOTAL BOTTOMFISH	**21157**

Table AS-3. American Samoa 2005 Estimated Commercial Landings by Species.

Interpretation: There have been no major changes in individual species prices in the past eight years. DMWR keeps track of fish prices for imported fish and those missed by the Offshore Creel Survey through a separate data collection system – the Commercial Invoice System. From this data processing system the average price of bottomfish imported from Western Samoa were lower than locally caught bottomfish. However, this year the margin is only ten cents. It implies the improvement in import fish quality and it's rising competition to local fishermen. The decrease in price since 1998 is a result of not only competition from imported fish but also increase competition.

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.

Species	Pounds	Price/Lb.	Value
BMUS			
Blue lined snapper	383	$2.18	$836
Squirrel Snapper (Ehu)	555	$2.23	$1238
Flower Snapper (Gindai)	40	$3.00	$121
Gray jobfish	453	$2.06	$933
Pink Snapper (Opakapaka)	1004	$2.44	$2450
Smalltooth Jopbfish (Lehi)	533	$2.27	$1213
Longtail Snapper (Onaga)	710	$2.69	$1911
Yellowtail snapper	220	$1.95	$429
Blacktip grouper	20	$2.99	$60
Lunartail grouper	508	$2.08	$1058
Ambon emperor	186	$2.73	$508
Redgill emperor	591	$2.51	$1482
Black jack	175	$2.78	$486
BMUS SUBTOTALS	**5379**	**$2.37**	**$12723**
OTHER			
Black snapper	20	$2.10	$42
Yellow Margined snapper	34	$2.00	$68
Blue lined gindai	34	$3.00	$103
Paddletail snapper	670	$1.95	$1307
Kusakar's snapper	9	$2.13	$19
Onespot snapper	21	$1.94	$41
Pristipomoides/Etelis	1	$3.00	$2
Rufous snapper	178	$2.65	$471
Stone's snapper	146	$3.00	$437
Twinspot/red snapper	1	$2.00	$3
Yelloweye Snapper	39	$3.00	$118
Groupers (misc)	200	$2.01	$403
Flagtail grouper	14	$2.00	$28
Peacock grouper	21	$1.73	$36
Spotted grouper	36	$2.60	$92
Tomato grouper	112	$2.68	$300
Bigeye squirrelfish	10	$2.26	$23
Longnose emperor	112	$1.87	$210
Bigeye trevally	163	$1.90	$309
Whitemouth trevally	2	$2.41	$4
Blueline bream	2	$2.47	$6
OTHER SUBTOTALS	**1825**	**$2.20**	**$4020**
TOTAL BOTTOMFISH	**7204**	**$2.32**	**$16744**

Table AS-4. American Samoa 2005 Bottomfish Bycatch

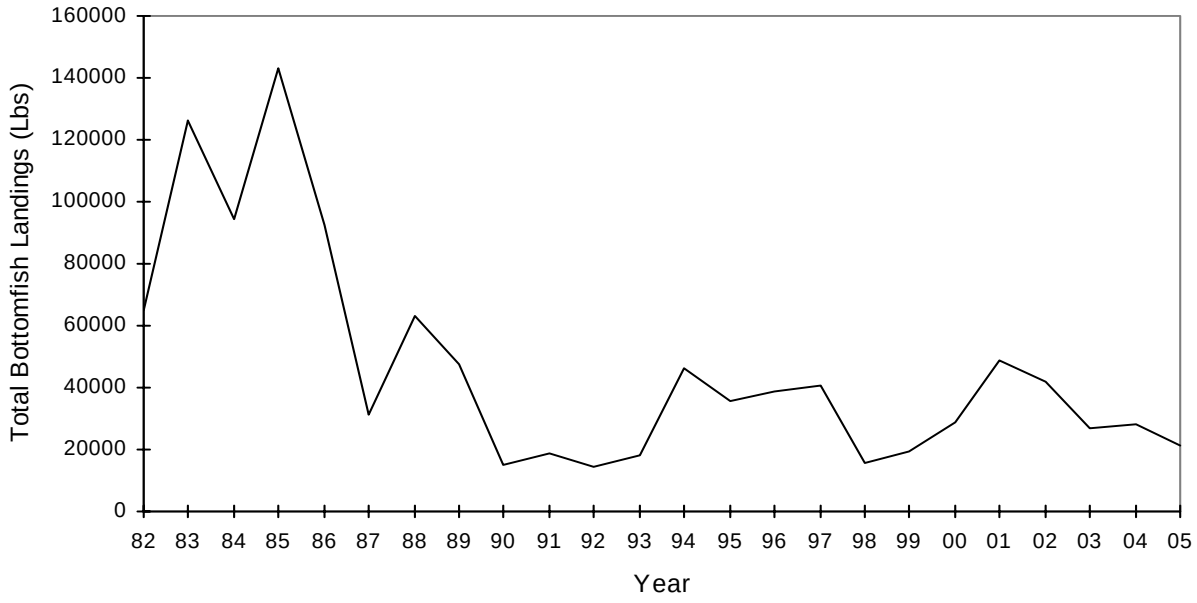
	Bycatch						Interviews		
Species	Alive	Dead Inj	Unk	Total	Catch	%BC	With BC	All	%BC
All Species (Comparison)					3724	0.000	0	568	0.00

Interpretation: No bycatch was reported in 2004.

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

Figure AS-1. American Samoa Total Bottomfish Landings



Interpretation: Landings have varied throughout the years as a result of changes in the fisheries, natural events and change is social economics. From 1982-1985 bottomfish landings was at the highest ever due to it being a new fishery and exportation of deep red snappers to Hawaii. The steep drop from 1985 to 1987 occurred as a result of the introduction of trolling, a much lucrative fishery compared to bottomfish. Hurricane Tusi in 1987, Ofa in 1990, Val in 1991, Heta in 2004 and Olaf in 2005 caused severe damages to the fishery that echoed in the following years. In the past five years, landings have declined steadily as fuel prices increased. Local markets depend heavily on imported bottomfish because of their consistency in meeting demands, consistent sizes and cheaper than local bottomfish. The 2005 decline mirror the 33% decrease in the number of boats participating. The affects of two consecutive hurricanes in the past two years have highly contributed to the continuous decline in landings for 2004 and 2005.

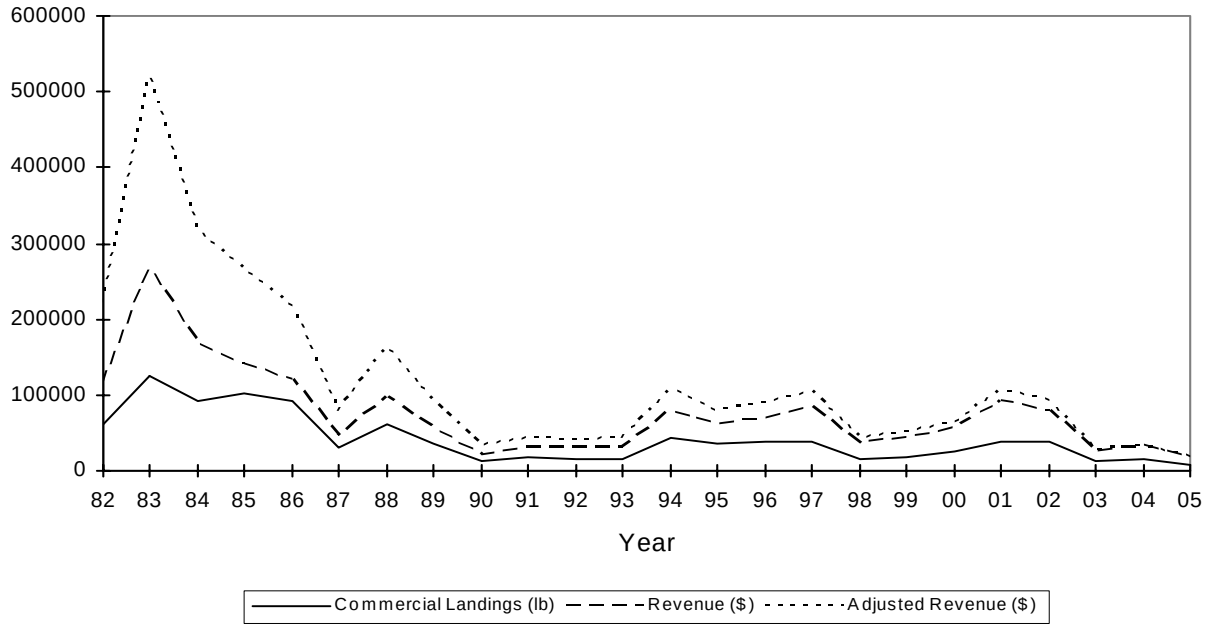
Source: DMWR Boat-Based Creel Survey Database

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

Year	Landings(lb)
1982	64942
1983	126327
1984	94104
1985	143225
1986	92740
1987	31232
1988	63136
1989	47646
1990	14776
1991	18893
1992	14521
1993	17862
1994	46071
1995	35737
1996	38647
1997	40557
1998	15884
1999	19385
2000	28658
2001	48862
2002	42096
2003	26791
2004	27875
2005	21157
Average	46714
Std. Dev.	34278

was in 1982-84 and the last three months of the 1985 landings were calculated as it is now.

Figure AS-2. American Samoa Estimated Commercial Bottomfish Landings



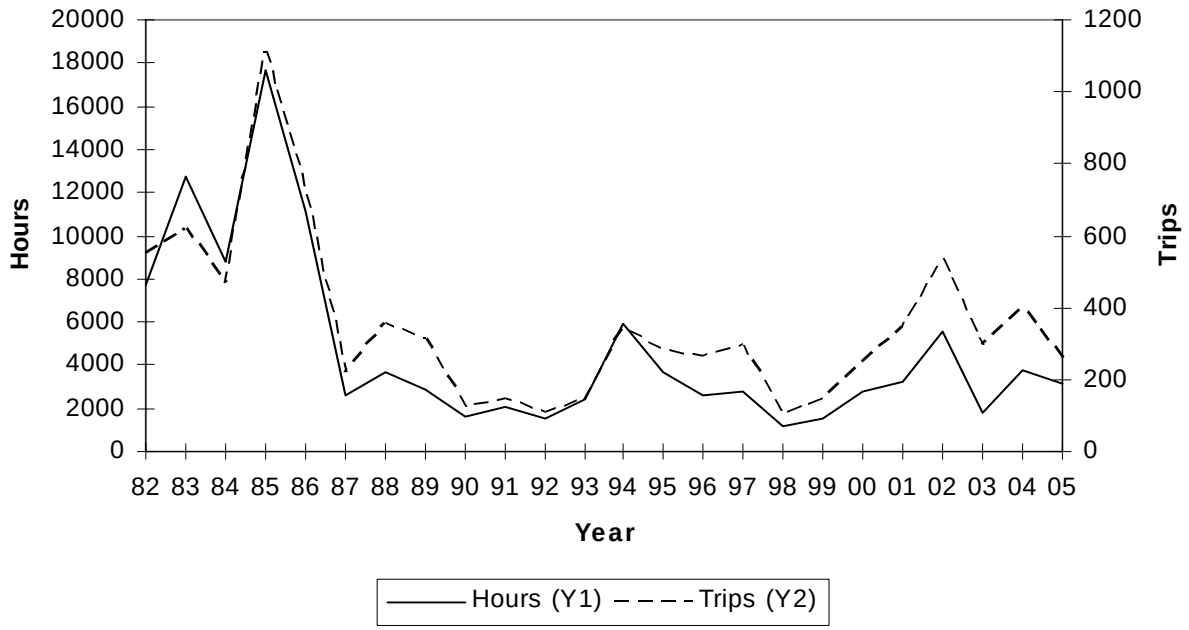
Interpretation: Commercial landings mirror the total fishery's low catches in recent years compared to the robust 1982-1986 period. The peak in 1983 portrays the high prices of deep-water snappers exported to Hawaii. The trough in 1987, 1990, 1991, 2004, and 2005 can be attributed to effects of the three hurricanes that occurred these years. Relative to total landings, commercial landings decreased even more substantially in 2005, because the percent of the catch sold by bottomfish fishermen dropped from an average of about 97% in 1982-88 to 30% in 2005. A dramatic drop in commercial landings is a result of gradual commercial shift of demand catered by imported fish, gas prices, loss of experienced fishermen and many venturing into other lucrative fisheries.

Year	Commercial Landings (lb)	Revenues	CPI Adj.	Adjusted Revenue
1982	62016	$113678	1.950	$221672
1983	125167	$269083	1.935	$520676
1984	92841	$166917	1.898	$316808
1985	102670	$141495	1.880	$266010
1986	91959	$118847	1.821	$216421
1987	30740	$45344	1.744	$79079
1988	60388	$97258	1.692	$164560
1989	36330	$56034	1.622	$90886
1990	12948	$21445	1.507	$32318
1991	17948	$30081	1.441	$43347
1992	14469	$30211	1.383	$41782
1993	15898	$31035	1.382	$42891
1994	42221	$79036	1.356	$107173
1995	35279	$60356	1.326	$80032
1996	38016	$69400	1.278	$88694
1997	39006	$84096	1.248	$104951
1998	14405	$35707	1.231	$43955
1999	17070	$42621	1.220	$51998
2000	26565	$55676	1.171	$65197
2001	38647	$92034	1.155	$106300
2002	37554	$79610	1.153	$91790
2003	12741	$25243	1.097	$27692
2004	16576	$32310	1.040	$33602
2005	6124	$14521	1.000	$14521
Average	41149	$74668		$118848
Std. Dev.	31578	$56307		$114529

Source: DMWR Boat-Based Creel Survey and Commercial Invoice System Data

Calculation: A relatively complex set of algorithms are used to estimate the commercial landings from estimates of total landings created by the boat-based 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 from 1986 to 1992 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.

Figure AS-3. American Samoa Estimated Bottomfish Hours and Trips



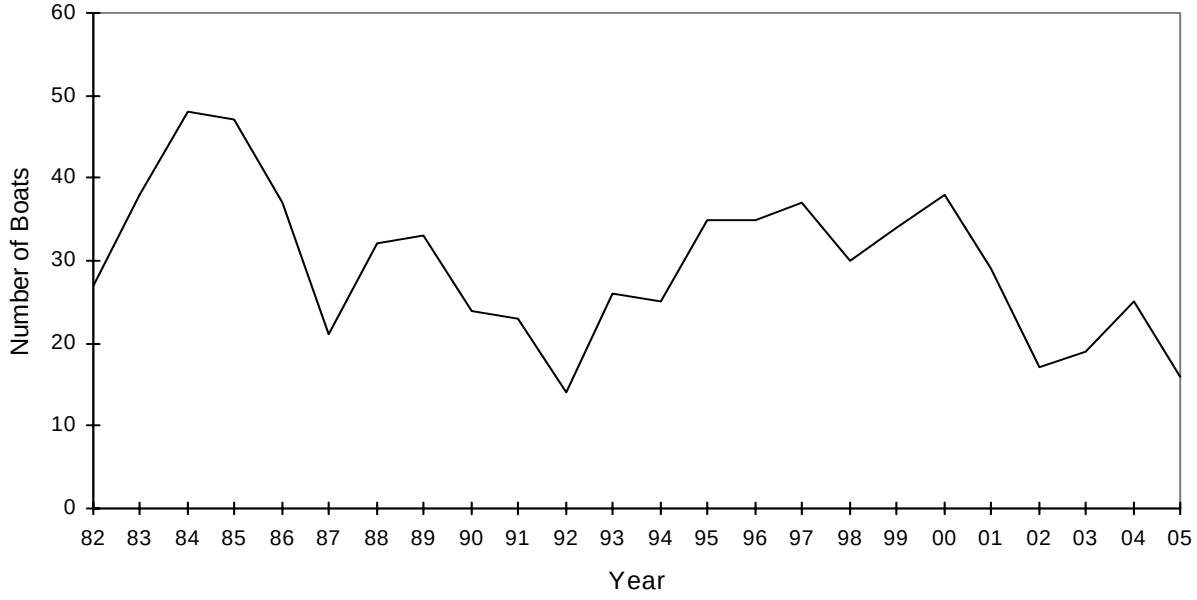
Interpretation: Rather than indicating a problem with the resource, this decline depicts an actual trend of commercial boat owners and fishermen seeking other more lucrative and stable work. The sharp decline in the bottomfish landings since 1986, noted in Fig.1 is mirrored in this figure by a sharp decline in the level of effort expended in this fishery. 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. With so few vessels in the bottomfish fishery this year, there is that much more hours invested in the effort to create a profit efficiently. With small boat longlining slowing down, notice the increase in hours and trips in 2004 and 2005 in bottomfishing.

Source: DMWR Boat-Based Creel Survey Database

Year	Hours	Trips
1982	7671	548
1983	12695	621
1984	8796	468
1985	17682	1116
1986	11150	729
1987	2632	220
1988	3654	353
1989	2854	314
1990	1588	126
1991	2075	147
1992	1554	109
1993	2459	145
1994	5937	345
1995	3641	279
1996	2618	266
1997	2752	295
1998	1134	100
1999	1506	144
2000	2814	248
2001	3205	342
2002	5524	538
2003	1752	296
2004	3732	400
2005	3139	256
Average	4690	350
Std. Dev.	4042	228

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.

Figure AS-4. American Samoa Annual Estimated Number of Boats Landing Bottomfish



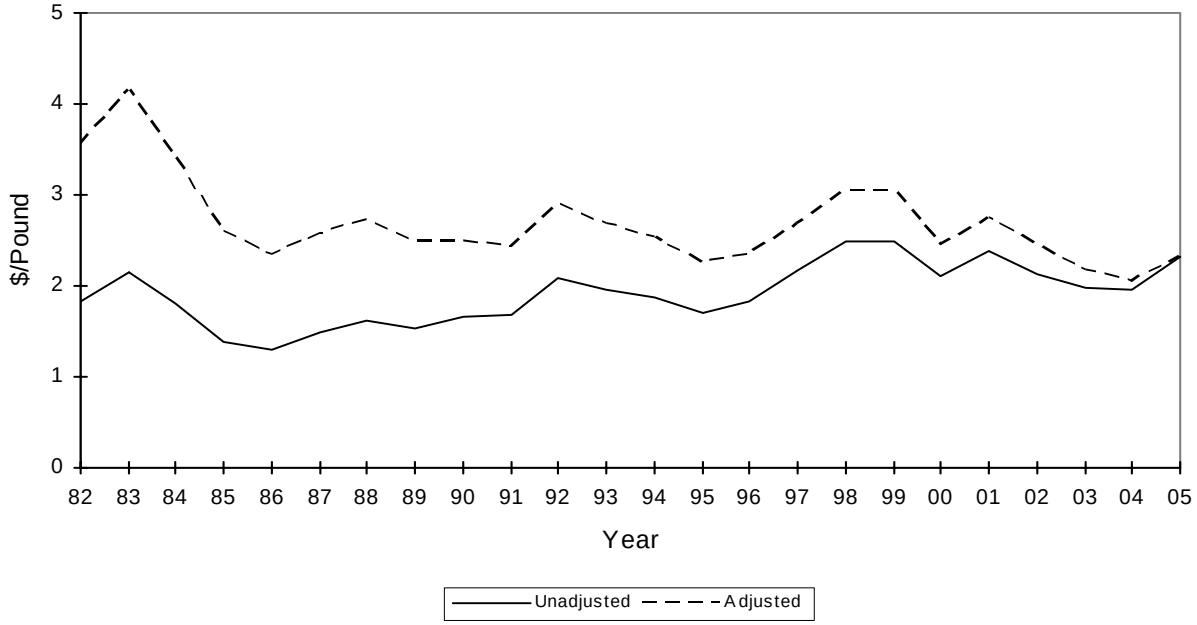
Interpretation: The decline in the fishery since 1985-86 is reflected by a decline in the number of boats participating in it. The 1987 and 2005 hurricanes caused great damage to the Manu'a fleet, plus some of the Tutuila fleet. Several boats that contributed to the 1989 bottomfish annual landings did 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, trips by two 14-foot vessels that didn't bottomfish in 1992, and the entry of one new Alia into the sampling area. A few new Alias were bought from western Samoa and entered the fishery in 1995-1996. The continued increase in the number of bottomfish Alias electing to longline, attracted by the relatively higher revenues obtained mainly from albacore sold to the canneries, is reflected in the significant drop in the number of boats bottomfishing in 1998. In 2005, a 64% decrease in boats landing any bottomfish species suggests some alias have either switched back to longlining or dropped out of the fishery altogether.

Source: DMWR Boat-Based 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.

Year	Boats
1982	27
1983	38
1984	48
1985	47
1986	37
1987	21
1988	32
1989	33
1990	24
1991	23
1992	14
1993	26
1994	25
1995	35
1996	35
1997	37
1998	30
1999	34
2000	38
2001	29
2002	17
2003	19
2004	25
2005	16
Average	30
Std. Dev.	9

Figure AS-5. American Samoa Average Price of Bottomfish



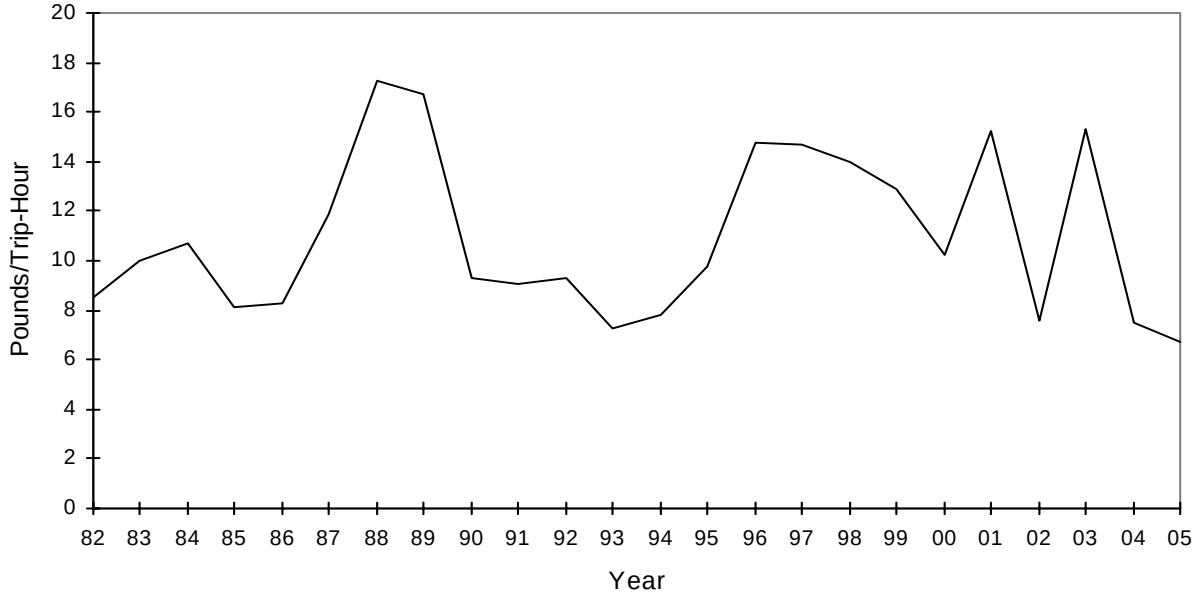
Interpretation: Prices were generally higher between 1982 and 1984 during the exportation of high-priced deepwater snappers to Hawaii. After this period, inflation-adjusted local prices have generally been stable. Prices of locally caught bottomfish are generally higher than imported fish, and could have been even higher had the local markets not been flooded by imported fish, which are usually of lower quality. The only imported bottomfish in 1994 were from western Samoa and these were sold at an average price of $1.67/lb, this year it is $1.85/lb. Imported bottomfish (mainly from western Samoa) have always shared the demand for bottomfish in American Samoa, however recently, it has become obvious how markets are consistently being supplied from western Samoa. Since 1999 there has been a general increase (16% in 1999 and 48% this year) in pounds of fish (miscellaneous bottomfish and pelagics) imported from western Samoa creating a (increase supply) price drop in the markets. A relatively unchanged price/lb was recorded for this year.

Source: DMWR Boat-Based Creel Survey and Commercial Invoice System Data

Year	Unadjusted Price/Lb	Adjusted Price/Lb
1982	$1.83	$3.56
1983	$2.15	$4.15
1984	$1.80	$3.41
1985	$1.38	$2.59
1986	$1.29	$2.35
1987	$1.48	$2.58
1988	$1.61	$2.72
1989	$1.54	$2.49
1990	$1.66	$2.49
1991	$1.68	$2.42
1992	$2.09	$2.89
1993	$1.95	$2.69
1994	$1.87	$2.53
1995	$1.71	$2.26
1996	$1.83	$2.34
1997	$2.16	$2.69
1998	$2.48	$3.05
1999	$2.50	$3.05
2000	$2.10	$2.45
2001	$2.38	$2.74
2002	$2.12	$2.44
2003	$1.98	$2.17
2004	$1.96	$2.04
2005	$2.32	$2.32
Average	$1.91	$2.68
Std. Dev.	$0.33	$0.47

Calculation: From 1982 to 1992 the average price of all bottomfish species combined is calculated by dividing total bottomfish revenue by total sold weight from boat-based creel survey data. From 1993 to the current year Commercial Invoice System Data is used. 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.

Figure AS-6. American Samoa Annual Bottomfish CPUE



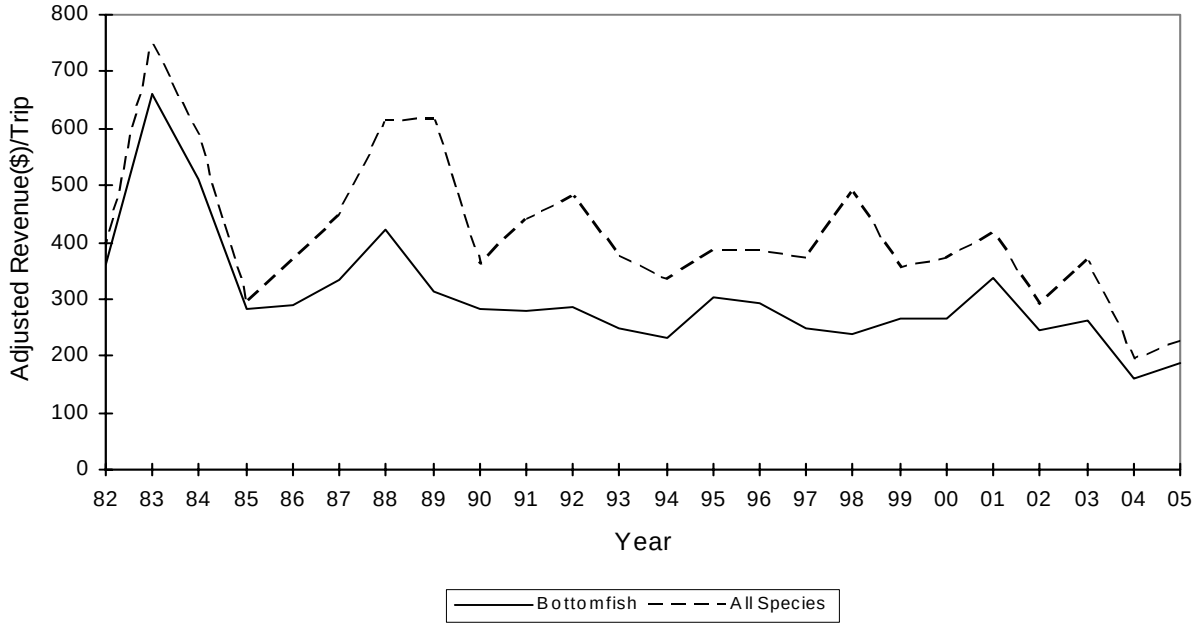
Interpretation: The initial increased CPUE in 1983 and 1984 occurred during the intense fishing of some new fishing grounds for deepwater snappers for export to Hawaii. A relatively high number of boats and local fishermen participated in the fishery during this period. The decline in 1985 and 1986 might be expected following the ardent harvesting of the limited fishing grounds. The decline in CPUE from 1989 to 1991 can be partially attributed to a combination of some new inexperienced fishermen entering the fishery and the exit of experienced and full-time commercial fishermen. CPUE has essentially remained stable during 1990-1992, increased for a few years and was relatively stable in 1996-1998. Bottomfishing techniques and gear have generally remained the same in the past years with the alias being the highliners since the early 1970's. The 1996 high CPUE estimates (and most probably the 1988-89 CPUE increase) can be attributed mainly to improved sampling and may also be related to favorable environmental conditions. The past five year's CPUE was not less than 50% of the average aggregate CPUE for the first three years of available data and this years' CPUE is the lowest ever recorded. This year a drastic drop is noted in CPUE due to the fact that commercial bottom fish is heavily supplied from western Samoa while the bottomfish fishery in American Samoa is mostly forced to become recreational and subsistence and not so much commercial. Furthermore, a combination of many factors contribute to the drop, such as inexperience fishermen, everyone fishing in the same banks (more effort - less fish), data collection inconsistencies, hurricane aftermath effects, shift in fish preference from bottomfish to reef.

Source: DMWR Boat-Based Creel Survey Data

Year	CPUE
1982	8.50
1983	10.00
1984	10.70
1985	8.10
1986	8.30
1987	11.90
1988	17.30
1989	16.70
1990	9.30
1991	9.10
1992	9.30
1993	7.30
1994	7.80
1995	9.80
1996	14.80
1997	14.70
1998	14.00
1999	12.90
2000	10.20
2001	15.20
2002	7.60
2003	15.30
2004	7.50
2005	6.70
Average	10.96
Std. Dev.	3.23

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 adding each CPUE from each trip as an observation and dividing by the number of trips.

Figure AS-7. American Samoa Average Inflation-Adjusted Revenue Per Trip Landing Bottomfish.



There have been no notable changes in revenues since 1990. 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 ***Prisitipomoides***) for export to Hawaii. The relative importance of bottomfish has generally been declining since 1985 as most of the full-time commercial fishermen

Year	Bottomfish Unadjusted	Bottomfish Adjusted	All Species Unadjusted	All Species Adjusted
1982	$185	$360	$196	$381
1983	$341	$659	$388	$750
1984	$269	$509	$309	$586
1985	$151	$283	$157	$294
1986	$159	$290	$202	$367
1987	$191	$333	$257	$447
1988	$249	$421	$362	$612
1989	$193	$312	$382	$617
1990	$188	$282	$241	$362
1991	$194	$280	$304	$438
1992	$206	$285	$348	$481
1993	$181	$250	$271	$374
1994	$170	$230	$247	$335
1995	$230	$304	$290	$385
1996	$229	$293	$301	$385
1997	$201	$250	$299	$372
1998	$193	$238	$397	$488
1999	$218	$266	$291	$354
2000	$228	$266	$318	$371
2001	$293	$338	$360	$415
2002	$214	$246	$250	$288
2003	$238	$261	$335	$368
2004	$155	$161	$187	$194
2005	$188	$188	$226	$226
Average	$211	$304	$288	$412
Std. Dev.	$43	$101	$66	$125

quit this fishery with the remaining opting for trolling and lately, longlining. The supply of locally caught bottomfish has been supplemented by bottomfish imported from Western Samoa.
These values are higher in this year's report than they were in previous year's reports because the trips included are only those that sold their catch commercially to be more consistant with the revenue/trip values from other islands which are based on the commercial receipt system.

Source: DMWR Boat-Based 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 7 plots the inflation-adjusted bottomfish and all species revenue per trip for the period 1982-2001.

B. Guam

Introduction

Bottomfishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. It can be separated into two distinct fisheries separated by depth and species composition. The shallow water complex (<500 feet) makes up a larger portion of the total bottomfish effort and harvest, comprised primarily of 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*. In recent years, certain deepwater species are being harvested in greater quantities than shallow water species.

The majority of people in this fishery are either subsistence or part-time commercial, operate boats less than 25 feet in length, target primarily the shallow water bottomfish complex, and combine some trolling to supplement their overall fish catch. The demand for reef fish and bottomfish has increased in recent years, making it profitable to sell locally caught bottomfish. The demand for local bottomfish, when combined with environmental pressures, may be stressing local bottomfish stocks. On Guam, BMUS are harvested in significant numbers by other methods such as gillnets, castnets, and spearing. Jacks are harvested from their juvenile stage in pulse fisheries several times a year, while spearing has had a significant impact on large groupers that no longer caught by the bottomfishing method.

An environmental investigation was conducted at the former US Coast Guard Long Range Navigation (LORAN) station at Cocos Island. The Coast Guard found approximately eleven (11) discarded electrical capacitors and other materials at the former LORAN station during their inspection in April 2005. Cocos Island is located at the southern most tip of Cocos Lagoon, approximately two (2) miles from the island of Guam. Cocos lagoon, the only lagoon on Guam, is heavily fished by local, subsistence, and commercial fishermen, providing fish for consumption by the village of Merizo and for sale by commercial fishermen of that village. This lagoon also accounts for a significant proportion of bottomfish and BMUS species harvested on Guam. A general environmental site assessment, the collection and analysis of surface and subsurface soil samples, the collection of sediment from the adjacent inter-tidal zone area, and the collection of biota, twelve (12) fish, from the area were done. Analysis for PCBs, PAHs, and four metals (cadmium, chromium, lead, and mercury) will be done by the USCG and presented at a Merizo town meeting in early 2006.

The bottomfish harvest values reported in this module are significantly less than those reported in the 2004 report. Individuals in the four bottomfish family groups (groupers, snappers, emperors, jacks) are coded as a five number code, with all members initially flagged as bottomfish due to their family group. Inclusion of many of these species in other plan team reports, primarily the coral reef plan team, made it necessary to manually remove species of the four bottomfish family groups considered “coral reef species,” decreasing bottomfish catch throughout the time series. In addition, the rainbow runner (*Elagatis bipinnulatus*) was also removed from its designation as a bottomfish, although it is often caught bottomfishing and is a member of the trevally family. A similar decrease in the time series was done previously when the mackerel scad (*Selar crumenopthalmus*) was removed from this plan team report.

The datasets for the reported bottomfish values from creel surveys are obtained from Guam's two data collection efforts: the offshore creel surveys and the inshore creel surveys. The offshore creel survey obtains fishery information from boat-based methods, primarily trolling, bottomfishing, and jigging. However, methods not considered boat-based are often encountered by fishermen using boats are used to access remote shorelines, reef margins, and Cocos lagoon to do spearing, gillnetting, and shoreline castnetting. The inshore creel survey obtains fishery information from shore-based fishermen, primarily hook-and-line, nets (gillnets, castnets, surround nets, etc.), and shore-based spearing. Both boat-based and shore-based methods harvest BMUS species. Jacks are of significant importance to both creel surveys since they are the only bottomfish family harvested from their juvenile stage as an important pulse fishery.

Summary

Bottomfish harvest, effort, and participation generally decreased in 2005. Bottomfishing CPUE, boat-based charter harvest, and the price of bottomfish, however, increased in 2005.

The total bottomfish and total BMUS harvests decreased 17% and 2% respectively in 2005. Harvest from the bottomfishing method also decreased in 2005, decreasing 15%. The boat-based bottomfish and BMUS harvests decreased 15% and 2% respectively, while the shore-based bottomfish and BMUS harvests decreased 29% and 78% respectively. The boat-based non-charter bottomfish and BMUS harvests decreased 17% and 3% respectively, while the charter bottomfish and BMUS harvests increased 133% and 86% respectively. All harvest values, except for the shore-based BMUS harvest, fell below average for the 24-year time series.

Fishing effort also showed a decreased in 2005, with total hours and total trips decreasing 18% and 21% respectively. Charter and non-charter hours both decreased 18%, with the charter and non-charter trips decreasing 14% and 23% respectively. The number of unique boats in the fishery further decreased in 2005, decreasing 33% to 233 unique boats. Boats participating in the fishery were general increasing throughout the time series, but their numbers have decreased the past two years.

The overall bottomfishing CPUE showed an increase of 20% to 4.8 lbs/hr, with the deepwater CPUE increasing 31% (9.4 lbs/hr) and shallow water CPUE decreasing 37% to 3.1 lbs/hr. A significant proportion of the bottomfish catch in recent years appears to be deepwater snappers. Snappers made up 45% of the bottomfish catch, approximately 31,000 pounds, while jacks, groupers, and emperors made up 18%, 17%, and 18% of the bottomfish catch respectively. There was a 46% decrease in the number of bottomfish reported as bycatch on bottomfishing trips intercepted during creel surveys, 66 live fish discarded compared with 122 live fish released in 2004.

The commercial harvest of bottomfish decreased 17% in 2005, after a 114% increase in 2004. Adjusted revenues showed the same trend, decreasing 6% after increasing 86% in 2004. Revenue per bottomfish trip, however, increased 20%, with revenue per trip for all species increasing 5%. Both adjusted revenue values remain well below the 26-year average. The average price of bottomfish, however, increased 9% in 2005. Locally caught bottomfish, including BMUS, still compete with imported fish which can be larger and less expensive to purchase.

Summary of Historical Annual Statistics

Year	Landings* Total (Lbs)	CPUE (Lbs/Hour)	CPI	Adjusted Revenue ($)	Adjusted Price ($/Lb)	Number of Boats
1980			134.0	48,454	5.14	
1981			161.4	65,681	6.20	
1982	37,639	7.1	169.7	44,514	6.41	154
1983	47,119	6.2	175.6	214,911	5.81	106
1984	58,095	7.4	190.9	130,429	5.60	144
1985	88,113	5.7	198.3	148,563	5.30	161
1986	36,774	5.2	203.7	60,412	4.99	118
1987	45,924	5.9	212.7	62,364	4.93	139
1988	62,273	5.0	223.8	75,052	4.71	198
1989	82,756	5.5	248.2	107,472	5.47	223
1990	78,349	4.5	283.5	100,301	5.30	226
1991	69,619	4.8	312.5	57,129	5.07	246
1992	82,682	5.8	344.2	49,660	4.66	236
1993	95,815	4.2	372.9	44,585	4.37	360
1994	103,046	5.5	436.0	135,823	4.47	298
1995	103,344	2.5	459.2	55,004	3.98	402
1996	138,621	4.1	482.0	22,812	3.09	408
1997	100,105	3.6	491.4	36,082	3.40	332
1998	100,736	2.7	488.9	55,031	3.73	354
1999	117,067	3.2	497.9	124,485	4.05	411
2000	138,398	3.7	508.1	85,841	3.92	312
2001	117,177	3.9	501.2	95,539	3.63	337
2002	68,289	3.0	504.5	62,597	3.42	351
2003	92,880	4.7	521.4	39,450	3.36	481
2004	72,844	4.0	563.2	73,466	2.93	347
2005	**61,601**	**4.8**	**563.2**	**69,186**	**3.18**	**233**
Average	83,303	4.7	355.7	79,417	4.50	274
Standard Deviation	28,806	1.3	149.1	43,083	1.00	106

*Landings by boat-based bottomfishing activity only.

Status of 2004 Recommendations

1. Completing the baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus,* has not been completed. Severe staff shortages have prevented the Bank A data from being analyzed. Currently, Guam's Fisheries office has three (3) staff biologists overseeing the entire section.

2005 Recommendations

1. Completing the baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus*, should be completed. Analyzing the data from the Bank A trips has been contracted out since 2003. Agriculture's Fisheries staff will work with WPacFIN and Council staff to obtain a lead analyst writer to finalize the report.

2. Breakdown CPUE with the assistance of WPacFIN (Figure 6) to include "BMUS-overall CPUE," "BMUS-Deepwater CPUE," and "BMUS-Shallow CPUE."

Table 1. *Expanded Boat-Based Creel Survey Composition Of Bottomfish Management Unit Species (BMUS) for 2005

Management Unit Species	Harvest* (Pounds)
BMUS	
Lehi (*A. rutilans)*	2,090
Uku (*A. virescens)*	4,791
Ehu (*E. carbunculus)*	3,488
Onaga (*E. coruscans)*	15,309
Yellowtail Kalekale (*P. auricilla)*	1,069
Opakapaka (*P. filamentosu)*	458
Yelloweye Opakapaka (*P. flavipinnis)*	265
Gindai (*P. zonatus)*	637
Ta'ape (*L. kasmira)*	479
Giant Trevally (*C. ignobilis)*	217
Black Jacks (*C. lugubris)*	482
Amberjack (*S. dumerili)*	288
Blacktip Grouper (*E. fasciatus)*	1,495
Lyretail Grouper (*V. louti)*	2,479
Redgill Emperor (*L. rubrioperculatus)*	2,214
BMUS Total	**35,761**
Non-BMUS Bottomfish	
Other Snappers	1,558
Other Jacks	7,718
Other Groupers	6,778
Other Emperors	8,804
Non-BMUS Bottomfish Total	**24,858**
Non-Specific Bottomfish**	
Misc Bottomfish	0
Shallow Bottomfish	975
Deep Bottomfish	6
Non-Specific Bottomfish Total	**981**
Bottomfish Total	**61,601**

*The commercial harvest value for a species replaces the creel harvest value if the commercial value is higher. Therefore, the BOTTOMFISH TOTAL value may differ from BOTTOMFISH TOTAL values reported later in this module which are obtained from combining expanded boat-based and shore-based harvests of bottomfish.

**These three (3) generic categories are used when fisheries staff are unable to survey bottomfish catches. This occurs when the fisherman is in a rush or declines for his catch to be surveyed, yet providing information on effort and participation. The catch information required in this situation is whether the fisherman was targeting the deep, shallow, or mixed complexes.

Table 2. Commercial Bottomfish Average Prices for 2005

Species Name	Average Price ($/Lb)
Amberjack	2.70
Black Jack	2.29
Jacks	2.47
Emperor (mafute)	2.57
Snapper	2.62
Tagafi (red snapper)	1.91
Uku (gray jobfish)	2.45
Bottom Fish	0.50
Alfonsin	1.00
Ehu (Squirrelfish snapper)	3.91
Gindai	3.74
Grouper	2.71
Kalekale (Yelloweye snapper)	3.06
Lehi (silverjaw)	3.64
Onaga (Longtail snapper)	4.77
Opakapaka (Pink snapper)	3.97
All Bottomfish Species	**3.18**

Figure 1a. Harvest of All Bottomfish Species

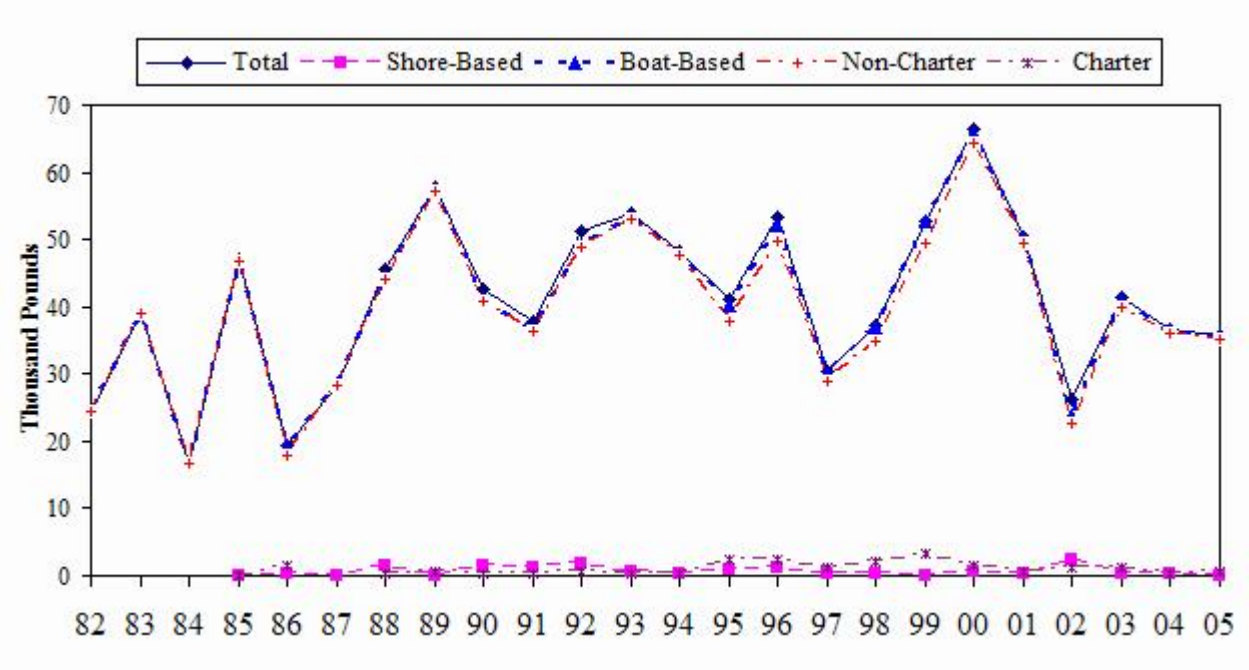
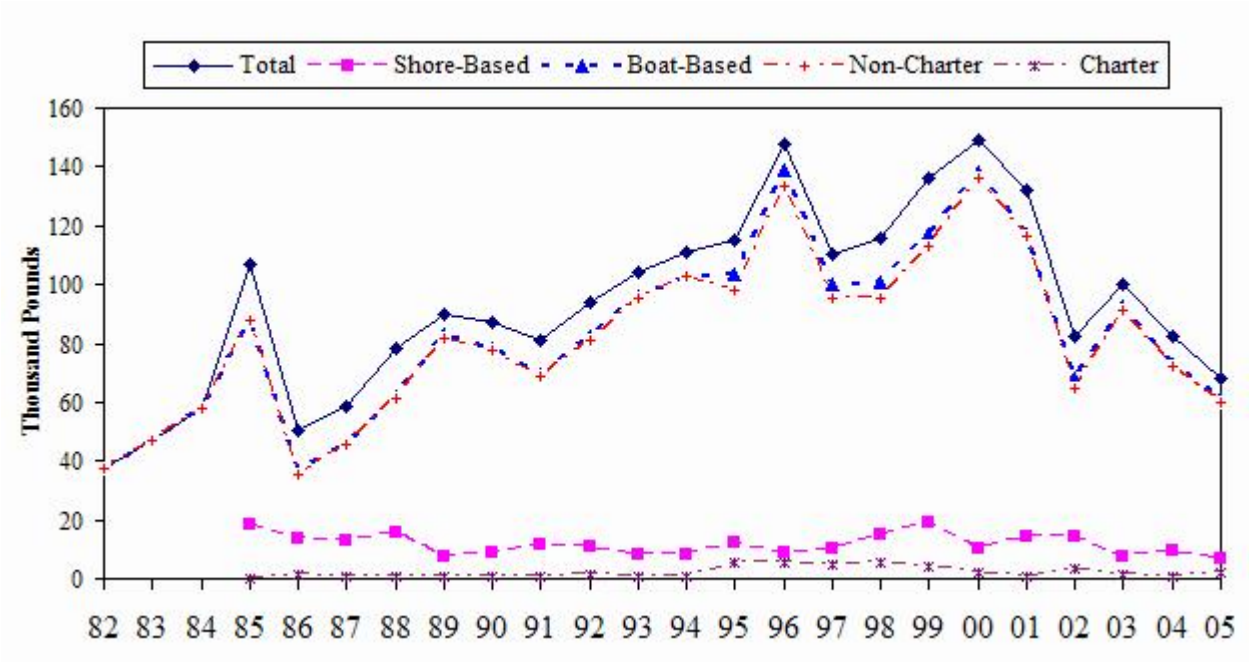


Figure 1b. Harvest of BMUS Species



Interpretations: The total bottomfish and BMUS harvest decreased 17% (68,192 pounds from 82,138 pounds) and 2% (35,829 pounds from 36,703 pounds) respectively. The two total harvest values are obtained from both shore-based and boat-based creel surveys that encounter methods that harvest bottomfish and BMUS species.

The shore-based bottomfish harvest decreased 29% (6,591 pounds from 9,294 pounds), while the boat-based bottomfish harvest decreased 15% (61,601 pounds from 72,844 pounds). The boat-based non-charter harvest decreased 17% (59,872 pounds from 72,101 pounds) while the boat-based charter harvest increased 133% ((1,728 pounds from 743 pounds). The boat-based harvest made up 90% of the bottomfish catch, with non-charter fishing activity making up 97% of the boat-based harvest.

The shore-based BMUS harvest decreased 78% (68 pounds from 311 pounds), while the boat-based BMUS harvest decreased 2% (35,761 pounds from 36,392 pounds). The boat-based non-charter harvest decreased 2% (35,087 pounds from 36,029 pounds) while the boat-based charter harvest increased 86% (675 pounds from 363 pounds). Boat-based methods account for 99% of the 2005BMUS harvest, with non-charter boats harvesting 98% of the boat-based catch.

Source: The DAWR boat-based and shore-based creel surveys, with the data as expanded by computer-based algorithms by method of fishing. All unidentified catch was allocated to species categories based on their percentage of the total catch.

Calculations: 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).

Harvest of All Bottomfish Species (Pounds)

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	106,564	18,451	88,113	87,935	177
1986	50,085	13,311	36,774	35,362	1,412
1987	58,696	12,772	45,924	45,509	415
1988	78,168	15,895	62,273	61,506	768
1989	89,942	7,186	82,756	82,015	741
1990	86,965	8,616	78,349	77,942	407
1991	81,125	11,506	69,619	68,600	1,019
1992	93,723	11,041	82,682	81,224	1,459
1993	103,993	8,178	95,815	95,057	757
1994	111,012	7,966	103,046	102,480	566
1995	115,376	12,032	103,344	98,179	5,165
1996	147,422	8,801	138,621	133,508	5,113
1997	110,324	10,219	100,105	95,330	4,775
1998	115,731	14,995	100,736	95,131	5,605
1999	136,251	19,184	117,067	113,011	4,057
2000	148,770	10,372	138,398	136,068	2,330

2001	131,752	14,575	117,177	116,374	803
2002	82,268	13,979	68,289	64,780	3,509
2003	100,347	7,467	92,880	91,246	1,634
2004	82,138	9,294	72,844	72,101	743
2005	**68,192**	**6,591**	**61,601**	**59,872**	**1,728**
Average	93,404	11,544	83,303	81,503	2,056
Standard Deviation	31,001	3,645	28,806	27,819	1,828

Harvest of BMUS Species (Pounds)

Year	Total	Shore-Based	Boat-Based	Non-Charter	Charter
1982	24,500		24,500	24,500	
1983	38,915		38,915	38,915	
1984	16,626		16,626	16,626	
1985	46,923	34	46,889	46,744	146
1986	19,490	199	19,291	17,919	1,372
1987	28,384	64	28,320	28,320	
1988	45,696	1,368	44,328	43,952	376
1989	57,813	65	57,748	57,251	497
1990	42,654	1,541	41,113	40,955	159
1991	37,853	1,102	36,751	36,426	326
1992	51,114	1,862	49,252	48,733	519
1993	53,895	586	53,309	52,987	322
1994	48,317	245	48,072	47,768	304
1995	41,122	764	40,358	37,917	2,441
1996	53,205	1,154	52,051	49,794	2,257
1997	30,461	417	30,044	28,772	1,272
1998	37,140	187	36,953	34,725	2,228
1999	52,830	50	52,780	49,544	3,236
2000	66,436	576	65,860	64,429	1,431
2001	50,379	170	50,209	49,485	724
2002	26,302	2,445	23,857	22,593	1,264
2003	41,337	171	41,166	39,838	1,328
2004	36,703	311	36,392	36,029	363
2005	**35,829**	**68**	**35,761**	**35,087**	**675**
Average	40,997	637	40,439	39,555	1,062
Standard Deviation	12,473	687	12,428	12,264	887

Figure 2a. Total and Commercial Bottomfish Harvest

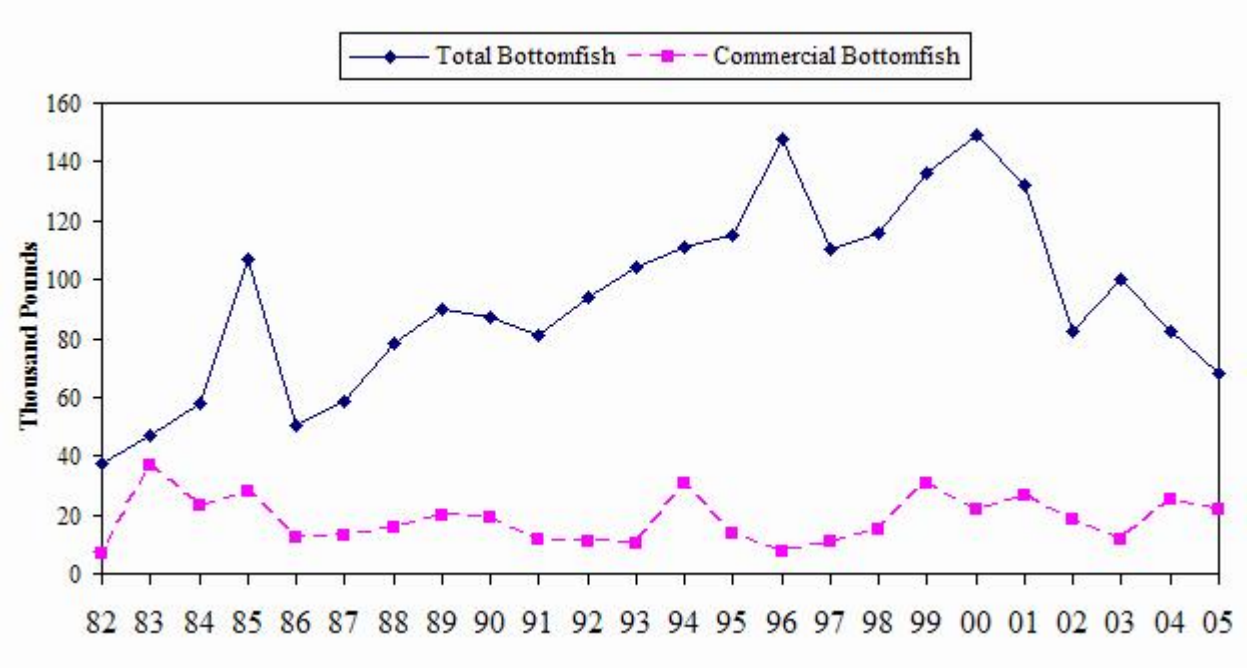
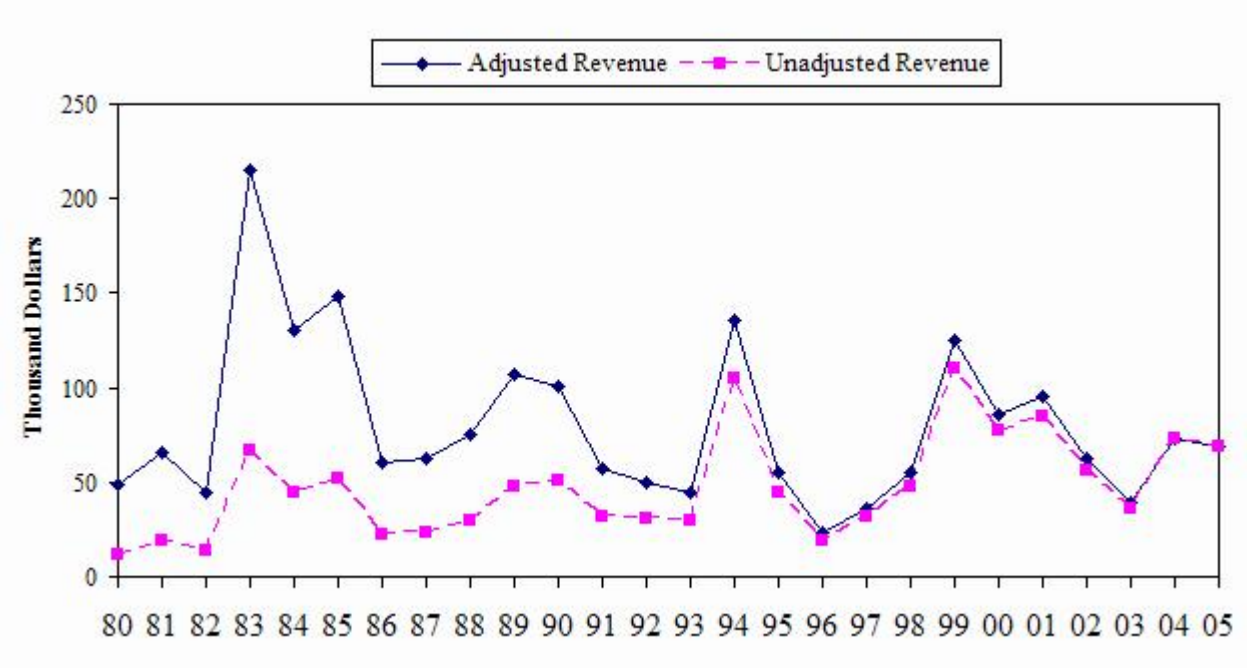


Figure 2b. Commercial Bottomfish Revenue



Interpretations: The commercial bottomfish harvest and adjusted revenues decreased 13% and 6% respectively in 2005. Significant increases in the price of fuel, an increase in bad weather days in 2005, and a general decline in bottomfish catches since 2000 may have contributed to

the decreases seen in the commercial harvest and adjusted revenues. Adjusted revenues in 2005 fell below the 26-year average.

Source: The estimated total landings are from the DAWR boat-based and shore-based creel survey systems, and the commercial data are from the WPacFIN-originated commercial landings system.

Calculations: The total commercial bottomfish landings and revenue for each year were calculated by summing the weight and value fields in the commercial landings database and then multiplying by an estimated percent coverage expansion factor. This annual expansion factor was subjectively created and includes an analysis of the "disposition of catch" data available from the DAWR offshore creel survey, an evaluation of the fishermen in the fishery and their entry and exit patterns, general dockside knowledge of the fishery, status of marketing conditions and its structure, overall number of records in the data base, and a measure of best educated guesses.

Total BMUS and Commercial Bottomfish Harvest (Pounds) and Revenue

Year	Harvest (Pounds)		Revenue ($)	
	Total	Commercial	Unadjusted	Adjusted
1980		9,434	11,528	48,454
1981		10,596	18,825	65,681
1982	37,639	6,947	13,412	44,514
1983	47,119	36,984	67,013	214,911
1984	58,095	23,291	44,213	130,429
1985	106,564	28,028	52,311	148,563
1986	50,085	12,110	21,849	60,412
1987	58,696	12,639	23,551	62,364
1988	78,168	15,933	29,818	75,052
1989	89,942	19,630	47,365	107,472
1990	86,965	18,916	50,479	100,301
1991	81,125	11,278	31,703	57,129
1992	93,723	10,668	30,355	49,660
1993	103,993	10,191	29,526	44,585
1994	111,012	30,356	105,126	135,823
1995	115,376	13,815	44,865	55,004
1996	147,422	7,389	19,531	22,812
1997	110,324	10,621	31,485	36,082
1998	115,731	14,737	47,770	55,031
1999	136,251	30,757	110,066	124,485
2000	148,770	21,924	77,474	85,841
2001	131,752	26,289	84,999	95,539
2002	82,268	18,297	56,090	62,597
2003	100,347	11,731	36,528	39,450
2004	82,138	25,054	73,466	73,466
2005	**68,192**	**21,758**	**69,186**	**69,186**
Average	93,404	17,668	47,251	79,417
Standard Deviation	31,001	8,162	26,859	43,083

Figure 3a. Estimated Bottomfish Boat Hours

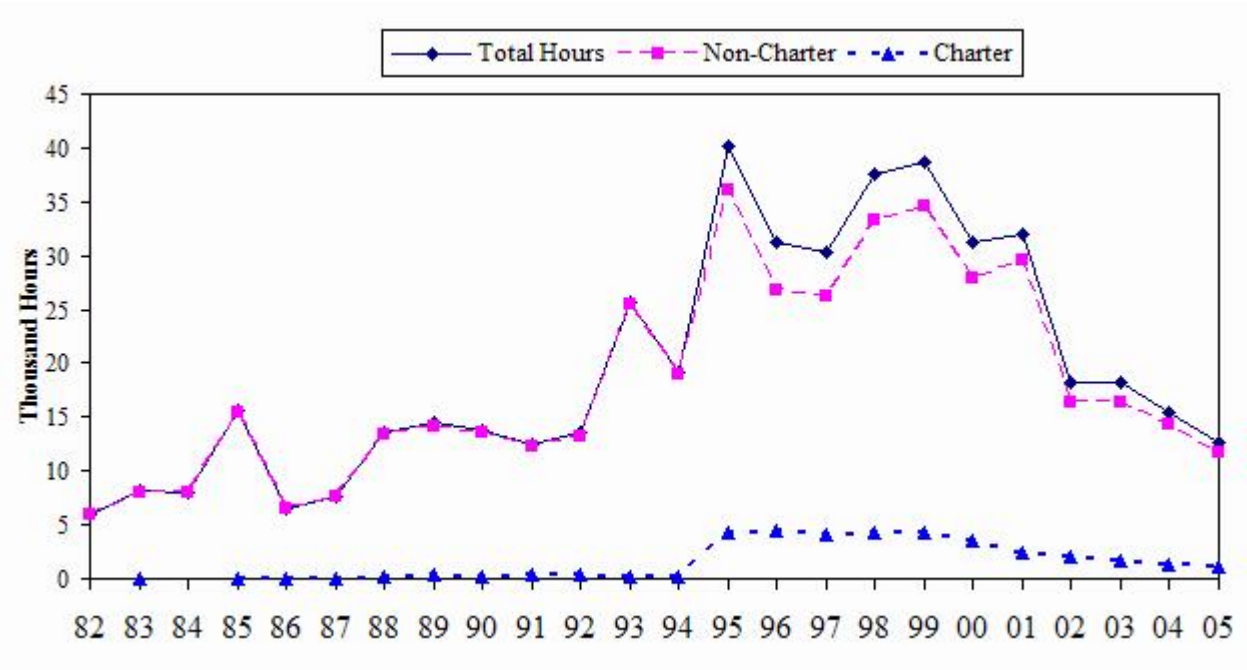
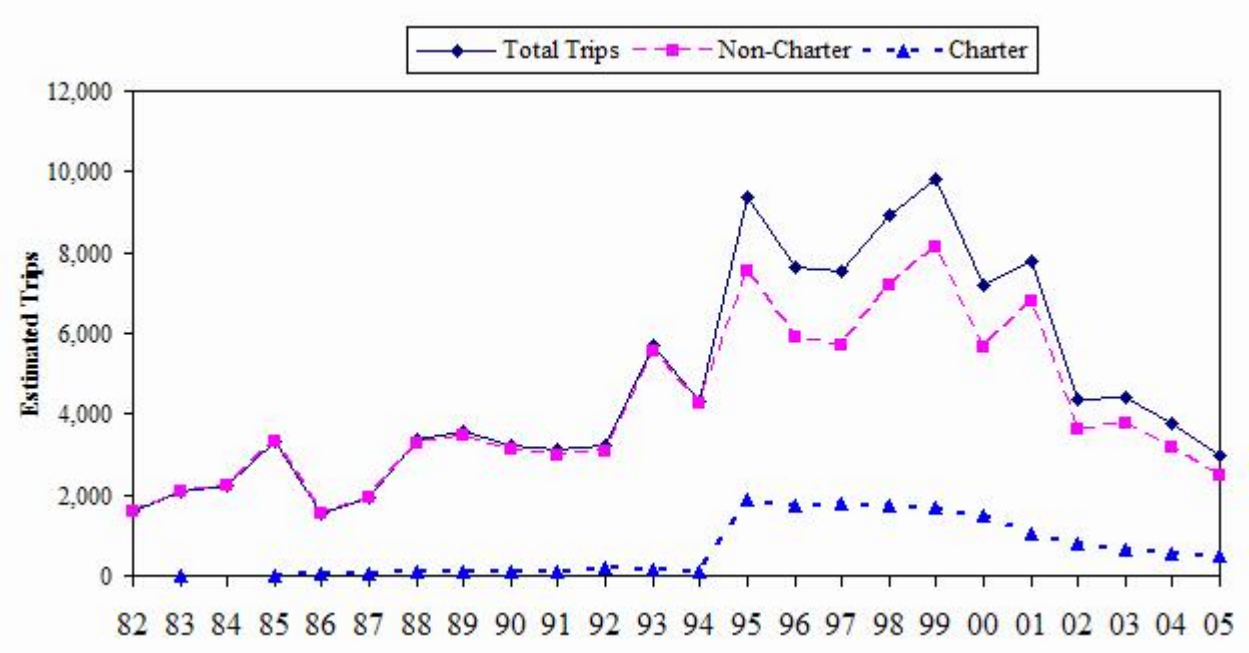


Figure 3b. Estimated Bottomfish Trips



Interpretations: Bottomfishing effort, bottomfishing trips and hours, decreased in 2005. A general decrease in effort has been observed since 2000. In 2005, bottomfishing trips decreased 21% (2,957 trips from 3,763 trips), with non-charter and charter trips decreasing 23% (2,471

trips from 3,195 trips) and 14% (486 trips from 568 trips) respectively. The total bottomfishing hours, non-charter hours, and charter hours all decreased 18%. Non-charter activity made up 92% of bottomfishing hours and 84% of all bottomfishing trips.

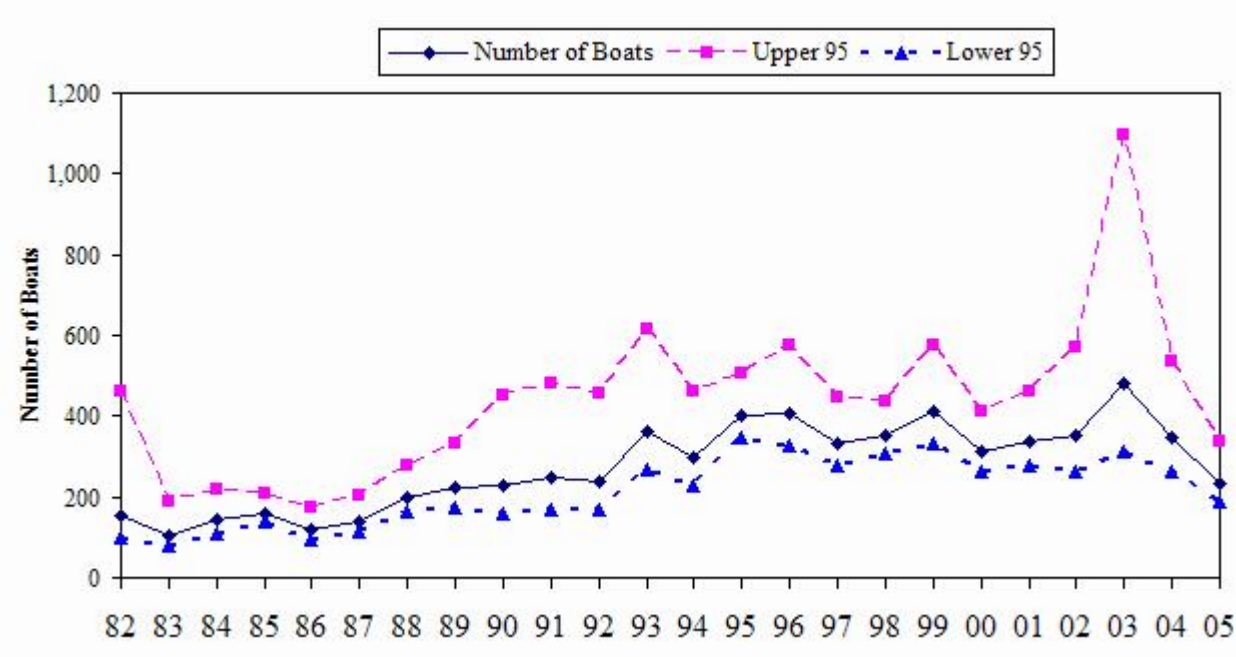
Source: The DAWR boat-based creel survey data for bottomfishing method.

Calculations: The estimated number of boat trips and boat hours for bottomfishing methods are derived directly from the boat-based creel survey expansion algorithms.

Estimated Bottomfish Boat Hours and Trips

Year	Bottomfishing Hours			Bottomfishing Trips		
	Total	Non-Charter	Charter	Total	Non-Charter	Charter
1982	5,936	5,936		1,563	1,563	
1983	8,093	8,048	45	2,068	2,058	11
1984	8,029	8,029		2,210	2,210	
1985	15,568	15,520	49	3,336	3,324	12
1986	6,583	6,556	27	1,561	1,535	26
1987	7,675	7,620	55	1,956	1,930	25
1988	13,525	13,343	182	3,395	3,286	109
1989	14,534	14,216	319	3,594	3,470	123
1990	13,753	13,568	185	3,209	3,122	87
1991	12,527	12,217	310	3,109	2,986	123
1992	13,588	13,177	411	3,234	3,054	180
1993	25,707	25,429	278	5,692	5,551	142
1994	19,072	18,883	189	4,338	4,245	93
1995	40,218	35,987	4,230	9,393	7,513	1,879
1996	31,178	26,792	4,386	7,642	5,898	1,744
1997	30,248	26,234	4,014	7,522	5,719	1,803
1998	37,597	33,231	4,366	8,918	7,204	1,714
1999	38,727	34,499	4,228	9,814	8,137	1,678
2000	31,277	27,818	3,459	7,170	5,664	1,506
2001	32,041	29,618	2,423	7,800	6,774	1,026
2002	18,306	16,307	1,999	4,376	3,602	774
2003	18,132	16,384	1,748	4,411	3,745	665
2004	15,500	14,247	1,254	3,763	3,195	568
2005	**12,697**	**11,674**	**1,023**	**2,957**	**2,471**	**486**
Average	19,605	18,139	1,599	4,710	4,094	672
Standard Deviation	10,881	9,373	1,718	2,601	1,972	713

Figure 4. Bottomfish Fishery Participation



Interpretations: The number of unique boats in the fishery has leveled off in recent years, but generally increases during years with ideal weather conditions, available marketing opportunities, and a thriving economy. In 2005, the number of unique boats in the fishery decreased 33% to 233 boats, falling below the 24-year time series average.

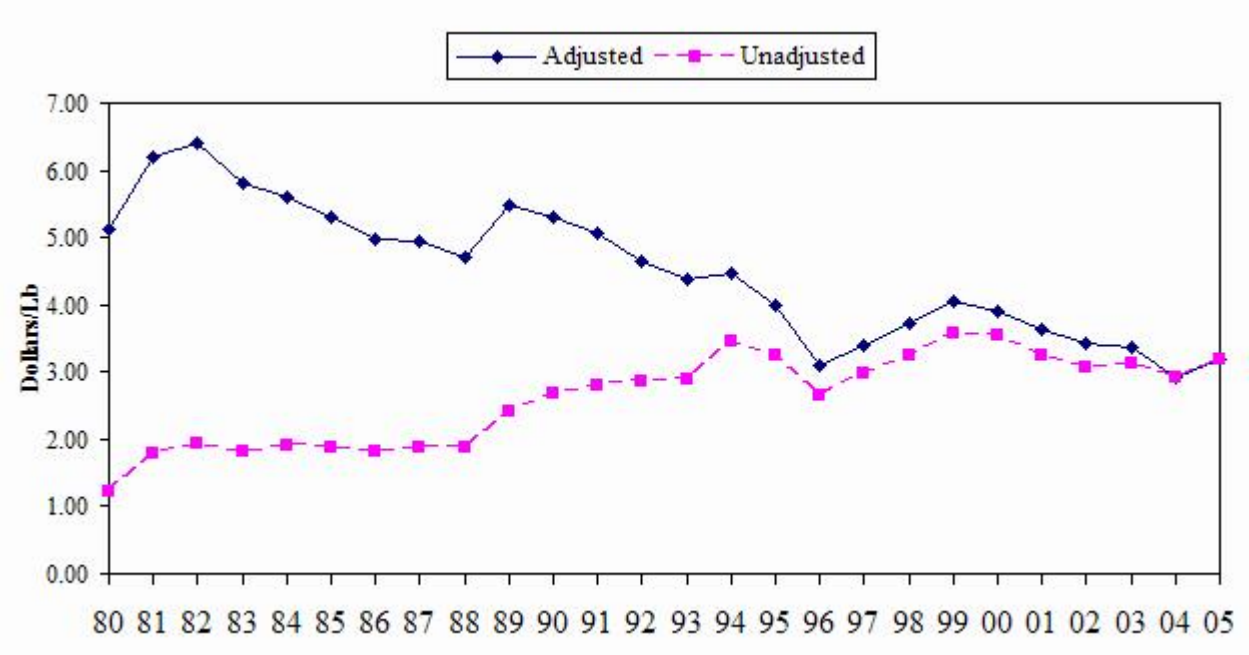
Source: Boat-based creel survey boat log data from the program's three sampled ports. The data was converted and processed using the WPacFIN-generated boat estimator model.

Calculations: The 2005 value was obtained by first running the above-mentioned model 1,000 times using a randomly selected order of the days sampled at all three ports combined, then eliminating the upper and lower 25 estimates to remove outlier estimates; and finally calculating the mean and standard deviation for the remaining 950 estimates.

Bottomfish Fishery Participation

Year	Number of Boats	Upper 95	Lower 95
1982	154	459	99
1983	106	190	80
1984	144	218	111
1985	161	207	138
1986	118	175	93
1987	139	202	112
1988	198	278	162
1989	223	333	172
1990	226	450	159
1991	246	482	170
1992	236	456	167
1993	360	615	266
1994	298	463	226
1995	402	507	346
1996	408	573	327
1997	332	447	276
1998	354	435	308
1999	411	573	333
2000	312	413	263
2001	337	463	276
2002	351	568	264
2003	481	1,096	310
2004	347	535	263
2005	**233**	**337**	**186**
Average	274	436	213
Standar Deviation	106	195	85

Figure 5. Average Bottomfish Prices



Interpretations: The decreases in adjusted fish prices observed prior to 1996 may have been the result of a consistent supply of reasonably priced fish and competition among vendors during those years. Roadside vendors importing fish from other islands competed with and may have discouraged local vendors from increasing the price of locally caught bottomfish.

The adjusted average price for bottomfish has been showing a general decrease, with unadjusted prices showing a general increase. However, the average adjusted price for bottomfish increased 9% in 2005. The average price for bottomfish, $3.18, is below the 26-year time series average of $4.50.

Source: The commercial landings data from the major wholesalers.

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 2005 CPI value was 585.6.

Year	Unadjusted	Adjusted
1980	1.22	5.14
1981	1.78	6.20
1982	1.93	6.41
1983	1.81	5.81
1984	1.90	5.60
1985	1.87	5.30
1986	1.80	4.99
1987	1.86	4.93
1988	1.87	4.71
1989	2.41	5.47
1990	2.67	5.30
1991	2.81	5.07
1992	2.85	4.66
1993	2.90	4.37
1994	3.46	4.47
1995	3.25	3.98
1996	2.64	3.09
1997	2.96	3.40
1998	3.24	3.73
1999	3.58	4.05
2000	3.53	3.92
2001	3.23	3.63
2002	3.07	3.42
2003	3.11	3.36
2004	2.93	2.93
2005	**3.18**	**3.18**
Average	2.61	4.50
Standard Deviation	0.68	1.00

Figure 6a. CPUE: Overall, Charter, and Non-charter

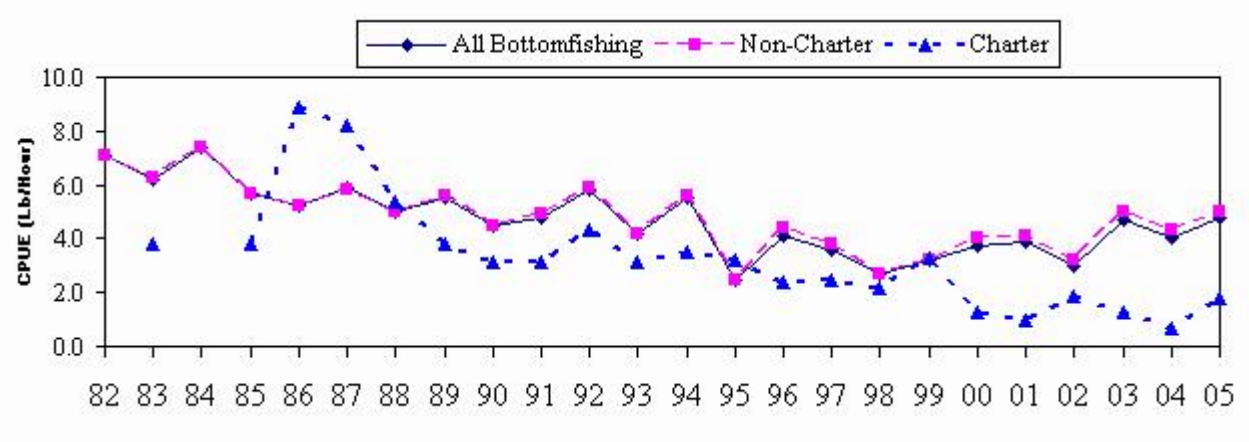


Figure 6b. Deepwater CPUE: Overall, Charter, and Non-charter

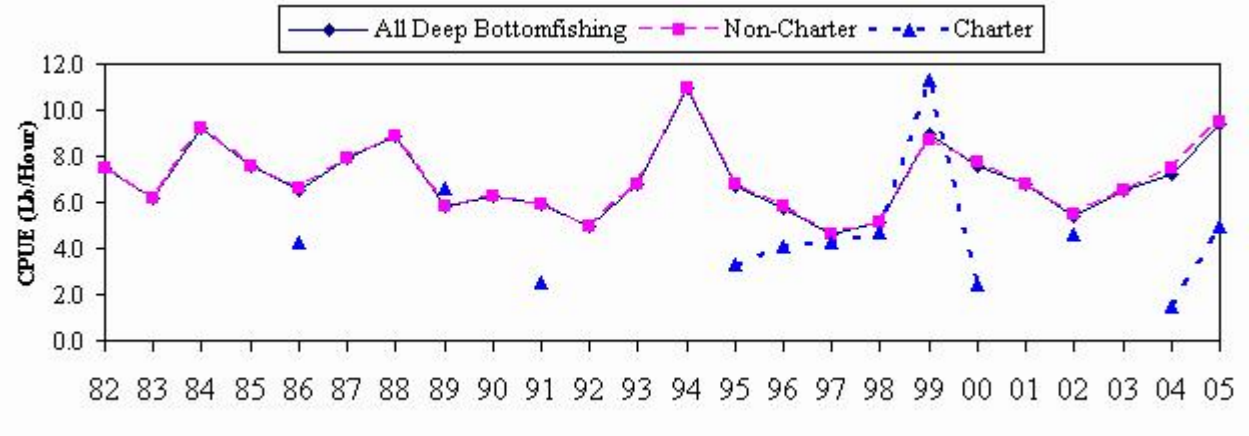
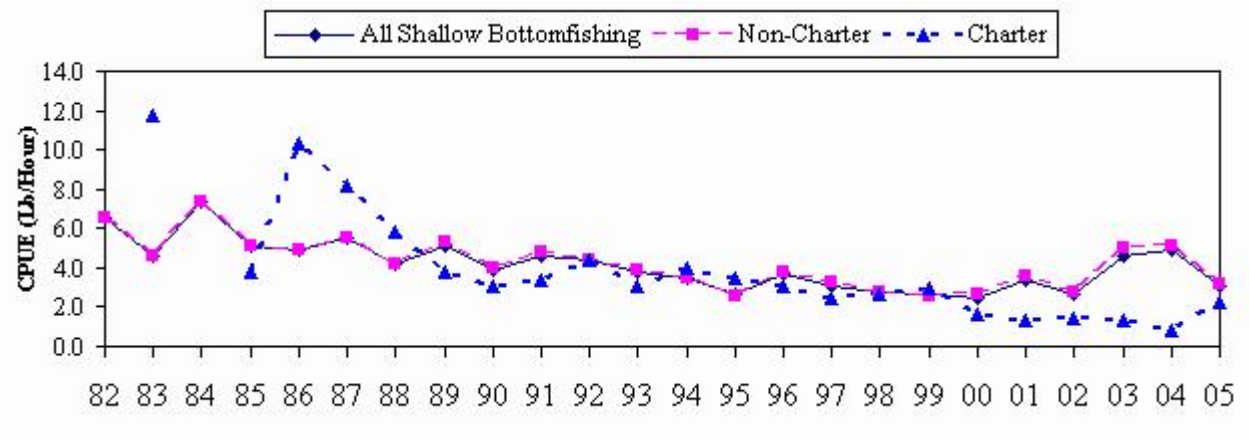


Figure 6c. Shallow Water CPUE: Overall, Charter, and Non-charter



Interpretations: Prior to 1999, the CPUE for bottomfishing was reported as a single value. However, yellow light situations in 1995 and 1998 made it necessary to divide the CPUE into charter and non-charter components to separate out the activity of charter boats. Commercial boats fishing out of the Agat Marina had high effort and low catches in the early 1990's, skewing the overall CPUE. Separating out the charter fishery should result in a CPUE value more representative of bottomfishing activity.

Historically, bottomfishing CPUE fluctuated between 4-6 pounds per hour fished. In 1995 and 1998, the overall and non-charter CPUE fell below 2.8 pounds per hour due to an increase in the number of recreational and subsistence-type vessels entering the fishery, mostly targeting the shallow-water complex. Both 1995 and 1998 CPUE values were less than a half of the aggregate CPUE average of 5.6 pounds per hour for the first three years reported using the new expansion system, placing the fishery in yellow light conditions during those years.

The overall bottomfishing CPUE, including non-charter and charter, and deepwater CPUE, including non-charter and charter, increased in 2005. The overall bottomfish, overall non-charter, and overall charter CPUE's increased 20% (4.0 to 4.8 lbs/hr), 16% (4.3 to 5.0 lbs/hr), and 157% (0.7 to 1.8 lbs/hr) respectively. The deepwater total, non-charter, and charter bottomfishing CPUE's increased 31% (7.2 to 9.4 lbs/hr), increased 27% (7.5 to 9.5 lbs/hr), and increased 233% (1.5 to 5.0 lbs/hr) respectively.

The overall shallow water CPUE and shallow water non-charter CPUE both decreased 37% in 2005, from 4.9 lbs/hr to 3.1 lbs/hr and 5.1 lbs/hr to 3.2 lbs/hr respectively. The shallow water charter CPUE increased 175% (0.8 to 2.2 lbs/hr). The overall decrease observed with the shallow water CPUE may be due to stress on local bottomfishing stocks. The overall and deep bottomfishing CPUE values are above the 24-year averages, while the overall and non-charter shallow bottomfishing CPUE's fell below the 24-year averages.

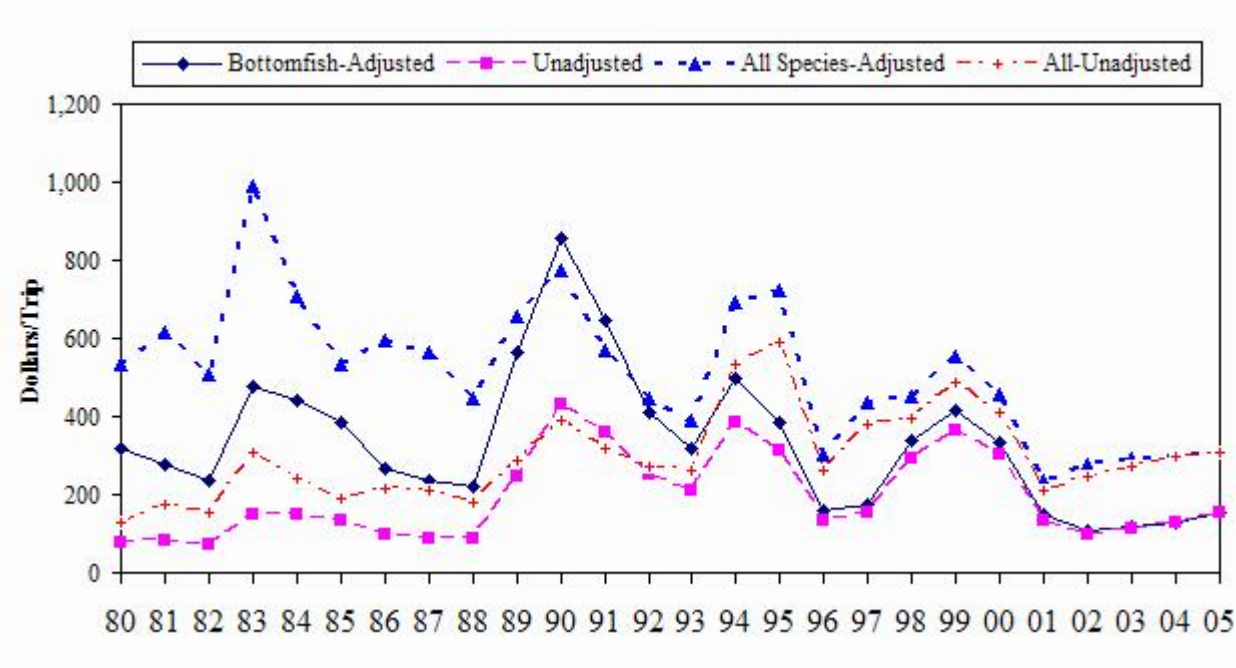
Source: The DAWR creel survey data for the bottomfishing method.

Calculations: 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).

Catch per Unit Effort (Pounds/Hour)

Year	All Bottomfishing			Deep Bottomfishing			Shallow Bottomfishing		
	All	NC	C	All	NC	C	All	NC	C
1982	7.10	7.10		7.50	7.50		6.50	6.50	
1983	6.20	6.30	3.80	6.20	6.20		4.60	4.60	11.80
1984	7.40	7.40		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	5.20	5.20	8.90	6.50	6.60	4.30	4.90	4.90	10.30
1987	5.90	5.80	8.20	7.90	7.90		5.50	5.50	8.20
1988	5.00	5.00	5.40	8.90	8.90		4.20	4.20	5.80
1989	5.50	5.60	3.80	5.80	5.80	6.60	5.10	5.30	3.80
1990	4.50	4.50	3.10	6.30	6.30		3.90	4.00	3.10
1991	4.80	4.90	3.10	5.90	5.90	2.50	4.60	4.80	3.40
1992	5.80	5.90	4.30	5.00	5.00		4.40	4.40	4.40
1993	4.20	4.20	3.10	6.80	6.80		3.80	3.90	3.10
1994	5.50	5.60	3.50	11.00	11.00		3.50	3.50	4.00
1995	2.50	2.50	3.20	6.70	6.80	3.30	2.70	2.60	3.50
1996	4.10	4.40	2.40	5.70	5.80	4.10	3.70	3.80	3.10
1997	3.60	3.80	2.50	4.60	4.60	4.30	3.10	3.30	2.50
1998	2.70	2.70	2.20	5.10	5.10	4.70	2.80	2.80	2.70
1999	3.20	3.20	3.30	9.00	8.70	11.30	2.70	2.60	3.00
2000	3.70	4.00	1.30	7.60	7.70	2.40	2.50	2.70	1.60
2001	3.90	4.10	1.00	6.80	6.80		3.40	3.60	1.30
2002	3.00	3.20	1.90	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	4.00	4.30	0.70	7.20	7.50	1.50	4.90	5.10	0.80
2005	4.80	5.00	1.80	9.40	9.50	5.00	3.10	3.20	2.20
Average	4.71	4.81	3.30	7.03	7.05	4.55	4.15	4.23	3.87
Standard Deviation	1.29	1.26	2.05	1.59	1.58	2.52	1.25	1.25	2.84

Figure 7. Average Revenue per Trip



Interpretations: The 2005 inflation-adjusted average revenue per trip for bottomfish increased 20% and increased 5% for all species. The demand for bottomfish and BMUS species continues to exceed the availability of locally-caught bottomfish.

Source: The commercial landings data from vendors participating in DAWR's commercial receipt book program.

Calculations: 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.

Average Revenue per Trip

Year	Bottomfish ($/Trip)		All Species ($/Trip)	
	Unadjusted	Adjusted	Unadjusted	Adjusted
1980	76	319	127	532
1981	80	278	176	615
1982	72	238	153	509
1983	148	475	309	990
1984	149	440	241	710
1985	136	385	187	532
1986	96	265	215	594
1987	88	234	212	562
1988	88	221	178	447
1989	248	563	289	655
1990	430	855	390	774
1991	357	644	316	569
1992	250	410	272	446
1993	211	318	260	392
1994	387	500	534	690
1995	313	384	589	722
1996	135	158	261	305
1997	154	177	381	437
1998	293	337	394	454
1999	366	414	488	552
2000	302	335	412	456
2001	134	151	209	235
2002	97	108	247	276
2003	110	119	271	293
2004	128	128	295	295
2005	**154**	**154**	**310**	**310**
Average	192	331	297	513
Standard Deviation	110	178	116	179

Figure 8a. Jacks/Trevallys (Caranx, Carangoides): Harvest

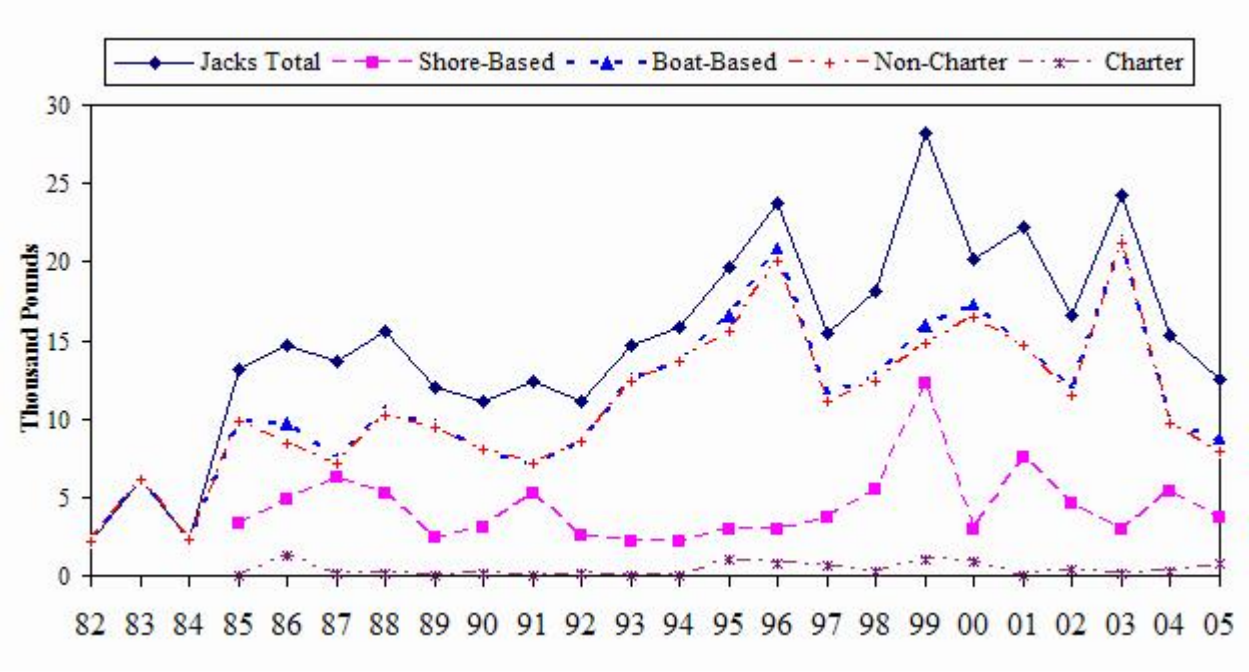


Figure 8b. Jacks/Trevallys (Caranx, Carangoides): CPUE

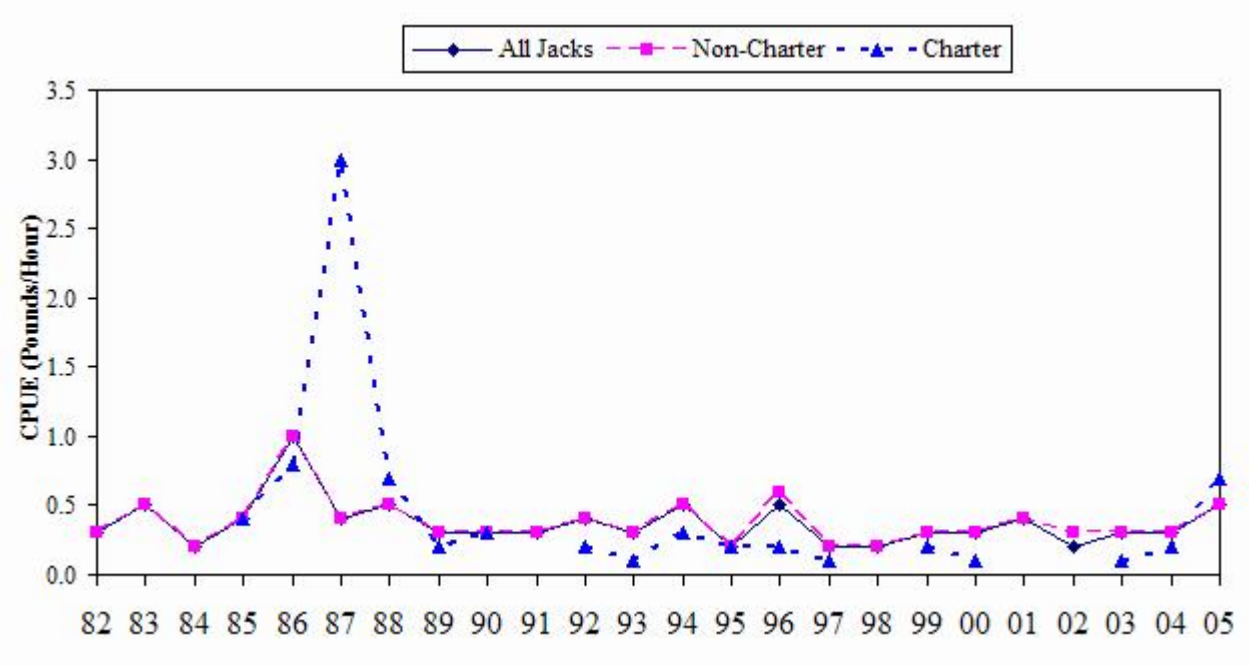


Figure 8c. Average Size Harvested: *Caranx melampygus*

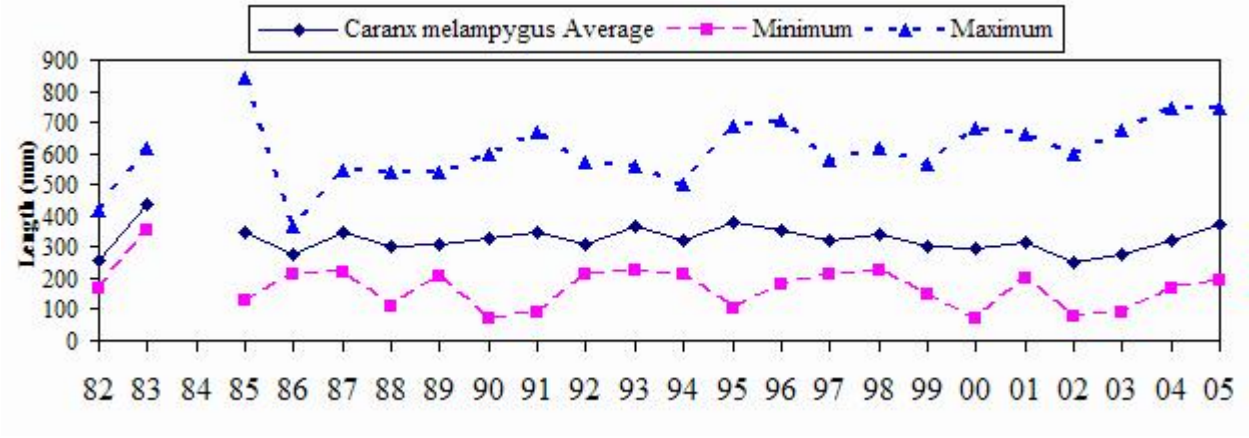


Figure 8d. Average Size Harvested: *Caranx ignobilis*

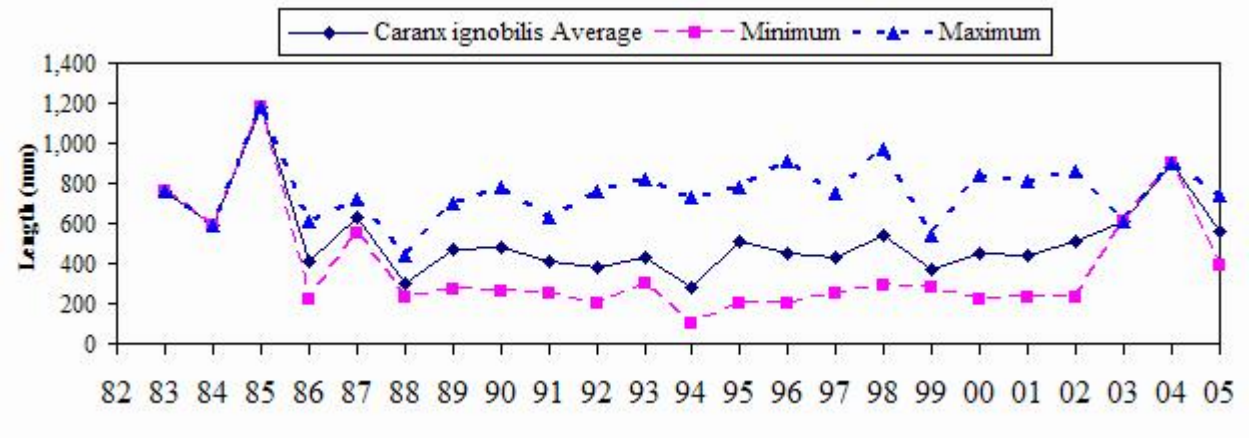
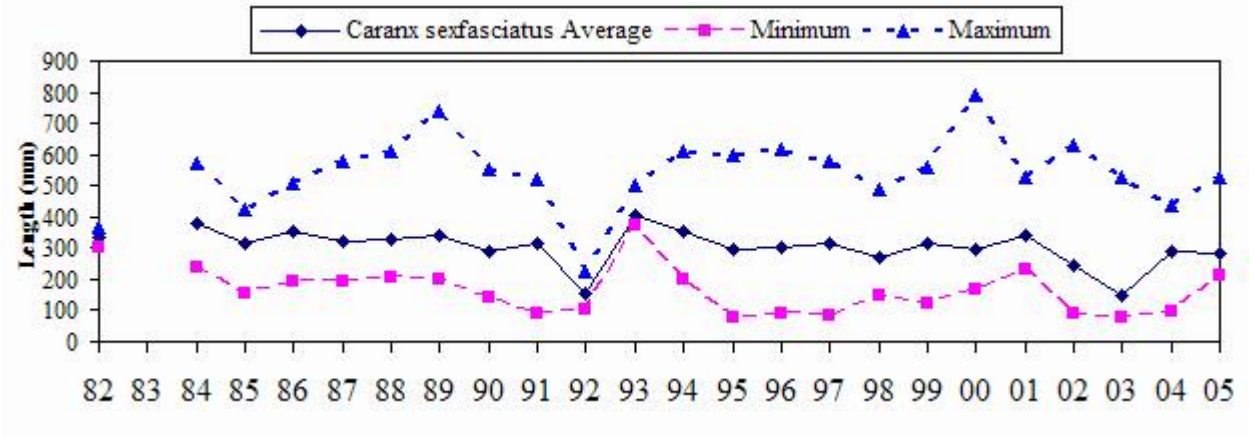


Figure 8e. Average Size Harvested: *Caranx sexfasciatus*



Interpretations: The 2005 total harvest of jacks decreased 19% from 15,295 pounds to 12,459 pounds. The shore-based harvest decreased 31% (3,754 pounds from 5,403 pounds) while the total boat-based and non-charter boat-based harvests decreased 12% (8,705 pounds from 9,892 pounds) and decreased 18% (7,942 pounds from 9,681 pounds) respectively. The boat-based charter harvest increased 262%, but only accounts for 6% of the total harvest (763 pounds). For boat-based fishing activity, the overall and non-charter CPUE values both increased 67%, 0.5 lbs/hr from 0.3 lbs/hr. The boat-based charter CPUE increased 250% (0.7 lbs/hr from 0.2 lbs/hr). Boat-based methods harvested 70% of all jacks, with non-charter boats harvesting 91% of boat-based methods. Jacks made up 18% of the bottomfish harvest.

The average sizes for the three most commonly caught jacks showed a 15% increase for *C. melampygus*, a 37% decrease for *C. ignobilis*, and a 3% decrease for *C. sexfasciatus*. However, only two (2) individuals of *C. ignobilis* were encountered during DAWR's boat-based and shore-based creel surveys in 2005. The average sizes for *C. melampygus* and *C. ignobilis* are above the average for the 24-year time series, while the average size for *C. sexfasciatus* is below the average for the 24-year time series.

Jacks are the only bottomfish group that is target from its juvenile stage. Juvenile jacks are harvested as by shoreline castnets and casting as a pulse fishery occurring several times a year. Significant numbers of adult and sub-adult jacks are also harvested by gillnets and spearing.

Source: The DAWR boat-based and shore-based creel survey data.

Calculations: The yearly catch-per-unit-effort (CPUE) is calculated by using the year-end survey totals and dividing the total weight of jacks landed by the total number of hours spent bottomfishing.

Jacks Harvest (Pounds) and CPUE (Pounds/Hour)

Jacks	Total Harvest	Shore-Based Harvest	Boat-Based Harvest			Boat-Based CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	2,230		2,230	2,230		0.3	0.3	
1983	6,074		6,074	6,074		0.5	0.5	
1984	2,250		2,250	2,250		0.2	0.2	
1985	13,126	3,313	9,813	9,792	21	0.4	0.4	0.4
1986	14,625	4,892	9,733	8,402	1,331	1.0	1.0	0.8
1987	13,617	6,267	7,350	7,177	173	0.4	0.4	3.0
1988	15,616	5,211	10,405	10,269	136	0.5	0.5	0.7
1989	12,034	2,473	9,561	9,500	61	0.3	0.3	0.2
1990	11,144	3,090	8,054	7,988	66	0.3	0.3	0.3
1991	12,422	5,245	7,177	7,164	13	0.3	0.3	
1992	11,135	2,525	8,610	8,530	80	0.4	0.4	0.2
1993	14,644	2,190	12,454	12,424	30	0.3	0.3	0.1
1994	15,767	2,114	13,653	13,606	47	0.5	0.5	0.3
1995	19,604	2,998	16,606	15,530	1,076	0.2	0.2	0.2
1996	23,761	2,956	20,805	20,054	751	0.5	0.6	0.2
1997	15,404	3,732	11,672	11,078	593	0.2	0.2	0.1
1998	18,174	5,492	12,682	12,420	261	0.2	0.2	
1999	28,165	12,254	15,911	14,840	1,071	0.3	0.3	0.2
2000	20,183	2,901	17,282	16,413	868	0.3	0.3	0.1
2001	22,166	7,515	14,651	14,622	29	0.4	0.4	
2002	16,535	4,617	11,918	11,552	366	0.2	0.3	
2003	24,270	2,940	21,330	21,186	144	0.3	0.3	0.1
2004	15,295	5,403	9,892	9,681	211	0.3	0.3	0.2
2005	**12,459**	**3,754**	**8,705**	**7,942**	**763**	**0.5**	**0.5**	**0.7**
Average	15,029	4,375	11,201	10,864	385	0.4	0.4	0.5
Standard Deviation	6,296	2,326	4,914	4,748	421	0.2	0.2	0.7

Average Size (mm)

Year	*Caranx melampygus*				*Caranx ignobilis*				*Caranx sexfasciatus*			
	Avg	Max	Min	n	Avg	Max	Min	n	Avg	Max	Min	n
1982	256	420	170	15					334	368	299	2
1983	437	615	355	6	760	760	760	1				
1984					590	590	590	1	377	570	240	3
1985	347	845	127	52	1,185	1,185	1,185	1	314	426	152	7
1986	274	365	209	15	411	615	225	4	353	510	191	13
1987	346	545	218	25	627	720	550	3	323	580	193	16
1988	303	540	110	40	305	445	234	4	330	610	203	20
1989	311	540	208	27	470	700	270	15	341	740	200	15
1990	325	600	70	36	480	780	260	12	290	550	140	6
1991	349	670	90	38	406	630	250	7	317	520	90	17
1992	309	570	210	27	381	760	200	18	153	225	100	4
1993	369	557	225	24	427	820	300	23	407	502	375	6
1994	319	500	212	24	281	730	97	16	356	610	200	16
1995	380	690	105	39	510	780	205	9	293	600	75	60
1996	357	710	180	54	451	915	200	13	303	620	89	34
1997	323	580	215	59	432	753	255	5	312	580	85	55
1998	340	620	225	46	541	975	290	5	269	490	145	20
1999	304	565	145	46	374	540	282	4	312	560	125	21
2000	296	680	70	70	453	845	221	10	294	790	170	25
2001	316	660	202	51	438	810	226	7	343	529	230	12
2002	248	596	76	40	507	858	227	12	247	630	88	16
2003	273	675	92	37	612	612	612	1	149	530	77	40
2004	323	748	169	69	902	902	902	1	288	440	98	24
2005	**371**	**748**	**190**	**41**	**565**	**740**	**390**	**2**	**280**	**527**	**214**	**12**
Average	325	610	168	38	526	759	380	8	304	544	164	19
Standard Deviation	43	108	69	17	200	156	267	6	60	115	77	15

Figure 9a. Snappers (Lutjanus, Pristipomoides, Aphareus, Etelis): Harvest

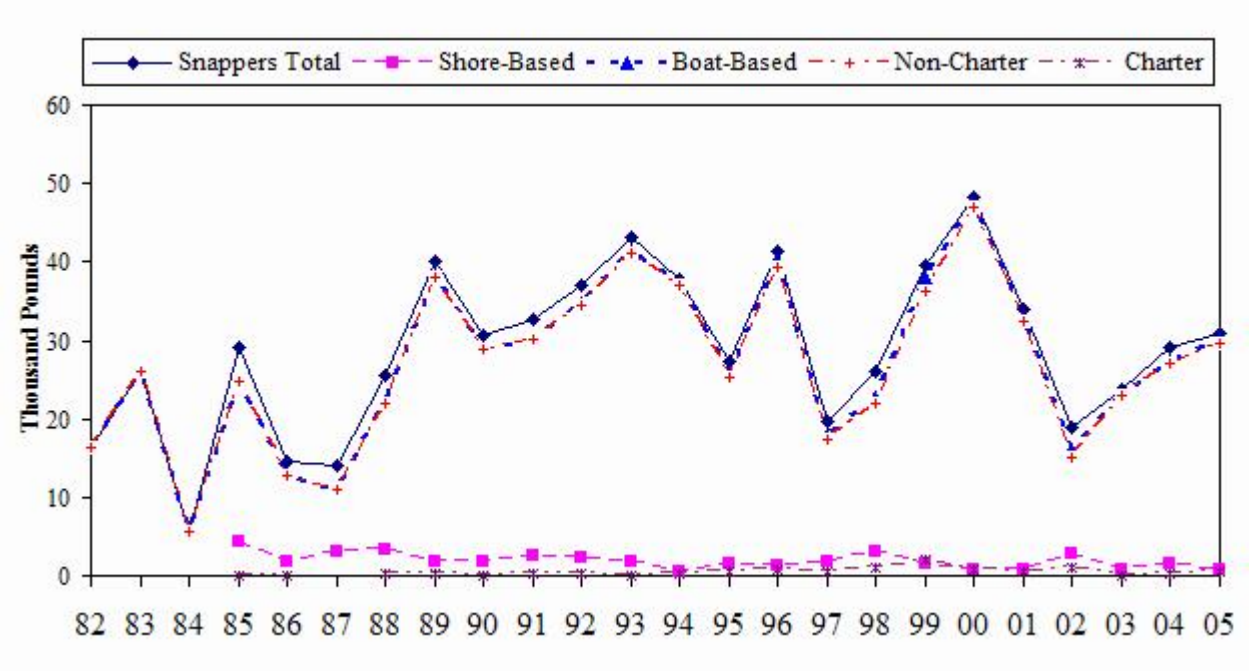


Figure 9b. Snappers (Lutjanus, Pristipomoides, Aphareus, Etelis): CPUE

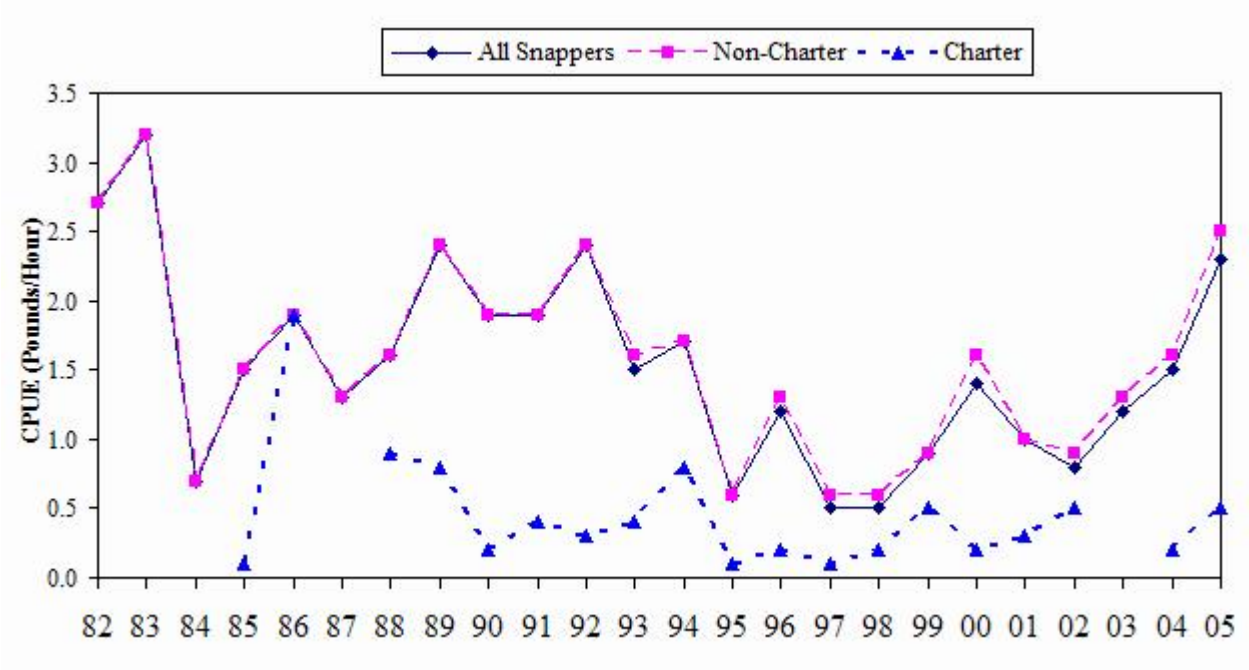


Figure 9c. Average Size Harvested: Etelis carbunculus

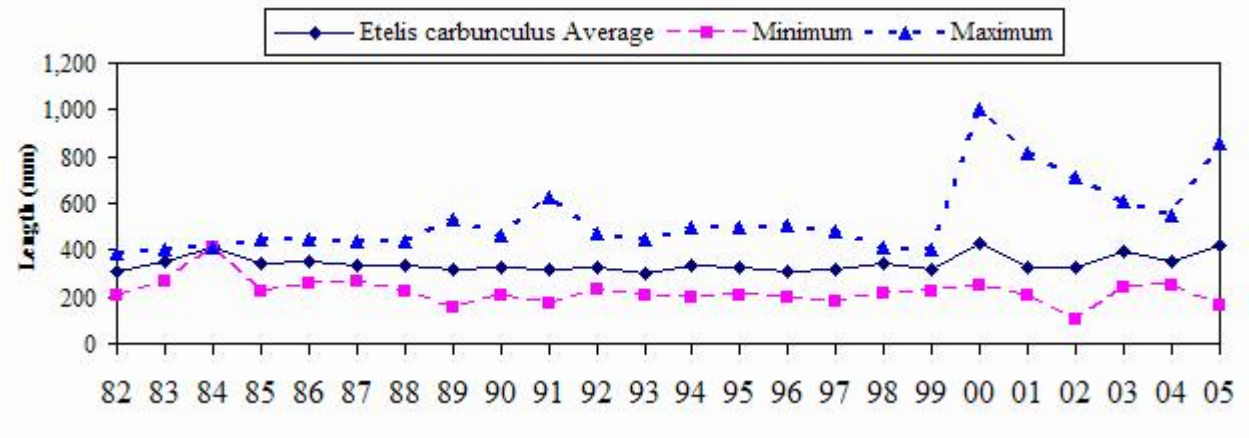


Figure 9d. Average Size Harvested: Lutjanus kasmira

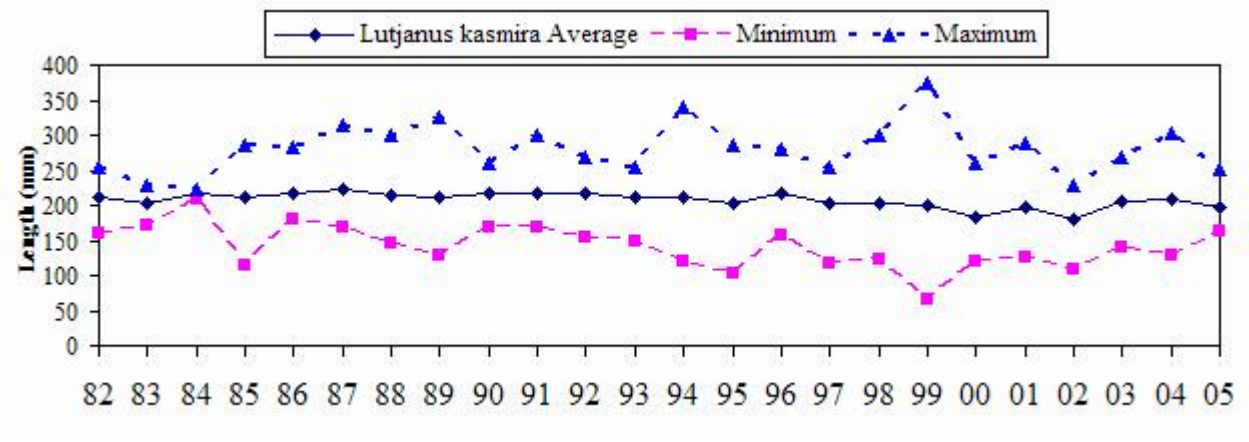
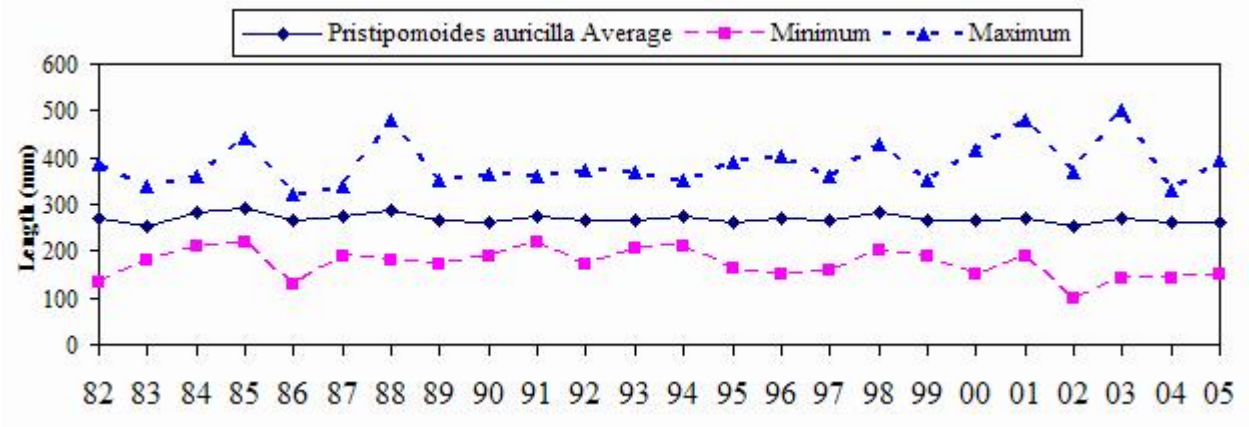


Figure 9e. Average Size Harvested: *Pristipomoides auricilla*



Interpretations: The total snapper harvest increased 6%, from 29,044 pounds to 30,915 pounds. The shore-based harvest decreased 55% (737 pounds from 1,649 pounds) while the boat-based total, non-charter and charter harvests increased 10% (30,096 pounds from 27,395 pounds), increased 9% (29,580 pounds from 27,132 pounds), and increased 96% (515 pounds from 263 pounds) respectively. Boat-based fishing methods account for 98% of the total snapper

catch. From boat-based bottom fishing, the total, non-charter and charter CPUE values increased 53% (2.3 lbs/hr from 1.5 lbs/hr), increased 56% (2.5 lbs/hr from 1.6 lbs/hr), and increased 150% (0.5 lbs/hr from 0.2 lbs/hr) respectively. Snappers made up 45% of the bottomfish harvest, significantly higher than jacks (18%), groupers (17%), and emperors (18%).

The average sizes for the three most commonly caught snappers showed a 21% increase for *E. carbunculus*, a 5% decrease for *L. kasmira*, and a 1% increase for *P. auricilla*. The average sizes for *E. carbunculus* and *P. auricilla* are above the average for the 24-year time series, while the average size for *L. kasmira* fell below the average for the 24-year time series.

Source: The DAWR boat-based and shore-based survey data.
Calculations: The yearly catch-per-unit-effort (CPUE) is calculated by using the year-end survey totals and dividing the total weight of snappers landed by the total number of hours spent bottomfishing.

Snappers Harvest (Pounds) and CPUE (Pounds/Hour)

Snappers	Total Harvest	Shore-Based Harvest	Boat-Based Harvest			Boat-Based CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	16,308		16,308	16,308		2.7	2.7	
1983	26,138		26,138	26,138		3.2	3.2	
1984	5,510		5,510	5,510		0.7	0.7	
1985	29,074	4,236	24,838	24,834	4	1.5	1.5	0.1
1986	14,675	1,816	12,859	12,807	52	1.9	1.9	1.9
1987	14,118	3,058	11,060	11,060		1.3	1.3	
1988	25,620	3,443	22,177	22,014	162	1.6	1.6	0.9
1989	40,009	1,711	38,298	38,033	265	2.4	2.4	0.8
1990	30,691	1,785	28,906	28,862	44	1.9	1.9	0.2
1991	32,782	2,527	30,255	30,016	239	1.9	1.9	0.4
1992	37,079	2,315	34,764	34,594	170	2.4	2.4	0.3
1993	43,108	1,798	41,310	41,190	120	1.5	1.6	0.4
1994	37,725	551	37,174	37,020	154	1.7	1.7	0.8
1995	27,349	1,527	25,822	25,219	603	0.6	0.6	0.1
1996	41,339	1,203	40,136	39,259	878	1.2	1.3	0.2
1997	19,615	1,769	17,846	17,412	434	0.5	0.6	0.1
1998	25,986	3,138	22,848	21,917	931	0.5	0.6	0.2
1999	39,620	1,537	38,083	36,129	1,954	0.9	0.9	0.5
2000	48,323	792	47,531	46,879	652	1.4	1.6	0.2
2001	33,891	845	33,046	32,438	608	1.0	1.0	0.3
2002	18,772	2,710	16,062	15,009	1,053	0.8	0.9	0.5
2003	23,859	891	22,968	22,965	3	1.2	1.3	
2004	29,044	1,649	27,395	27,132	263	1.5	1.6	0.2
2005	**30,833**	**737**	**30,096**	**29,580**	**515**	**2.3**	**2.5**	**0.5**
Average	28,811	1,907	27,143	26,764	455	1.5	1.6	0.5
Standard Deviation	10,496	984	10,571	10,427	477	0.7	0.7	0.4

Average Size (mm)

Year	*Etelis carbunculus*				*Lutjanus kasmira*				*Pristipomoides auricilla*			
	Avg	Max	Min	n	Avg	Max	Min	n	Avg	Max	Min	n
1982	312	390	206	17	213	254	160	34	268	385	135	54
1983	351	404	262	10	203	230	171	13	252	340	179	89
1984	410	410	410	1	217	222	208	3	283	360	210	6
1985	342	450	220	38	212	285	115	67	291	440	220	51
1986	349	450	255	16	218	284	180	17	264	320	130	19
1987	335	440	265	17	222	315	168	45	273	340	190	27
1988	336	440	220	32	216	300	145	120	287	480	180	28
1989	313	530	155	41	211	325	130	92	264	350	170	151
1990	324	465	209	42	218	260	170	50	261	365	190	105
1991	317	630	170	47	216	300	170	53	272	360	220	97
1992	326	470	230	12	217	270	155	53	267	372	170	57
1993	299	450	210	32	211	255	150	38	267	370	205	86
1994	332	500	200	44	212	340	119	76	273	350	210	87
1995	329	494	210	18	202	285	102	85	260	390	165	57
1996	308	510	200	28	216	280	158	53	270	401	152	76
1997	320	480	180	30	202	255	118	51	267	360	160	52
1998	342	411	217	9	204	300	122	91	285	430	200	64
1999	314	405	222	11	200	375	65	78	267	350	190	65
2000	432	1,000	246	18	182	260	120	29	264	416	150	47
2001	328	818	207	28	197	290	127	39	270	481	190	46
2002	322	710	100	31	181	230	110	24	253	370	100	42
2003	396	606	240	23	205	270	139	33	269	501	140	40
2004	348	550	250	17	209	302	130	39	261	330	140	40
2005	**421**	**860**	**162**	**32**	**198**	**251**	**162**	**42**	**263**	**396**	**150**	**36**
Average	342	536	219	25	208	281	141	51	269	386	173	59
Standard Deviation	36	160	55	12	11	36	31	28	10	49	31	32

Figure 10a. Groupers (Epinephelus, Cephalopholis, Variola): Harvest

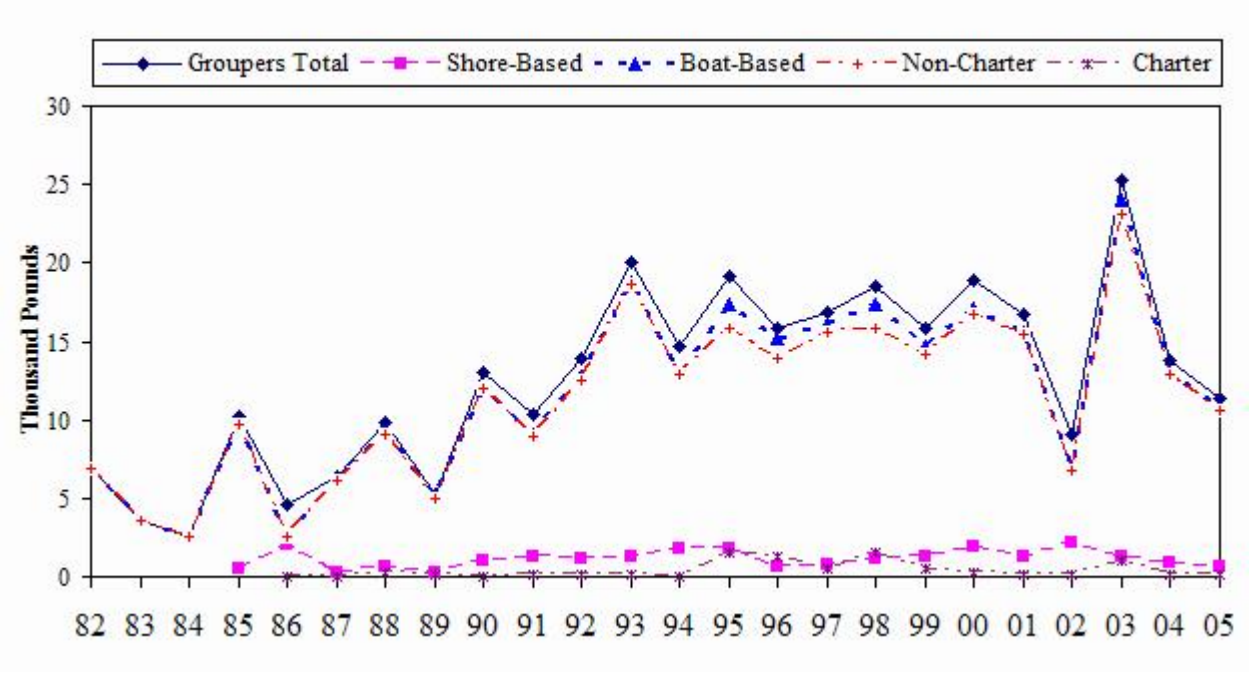


Figure 10b. Groupers (Epinephelus, Cephalopholis, Variola): CPUE

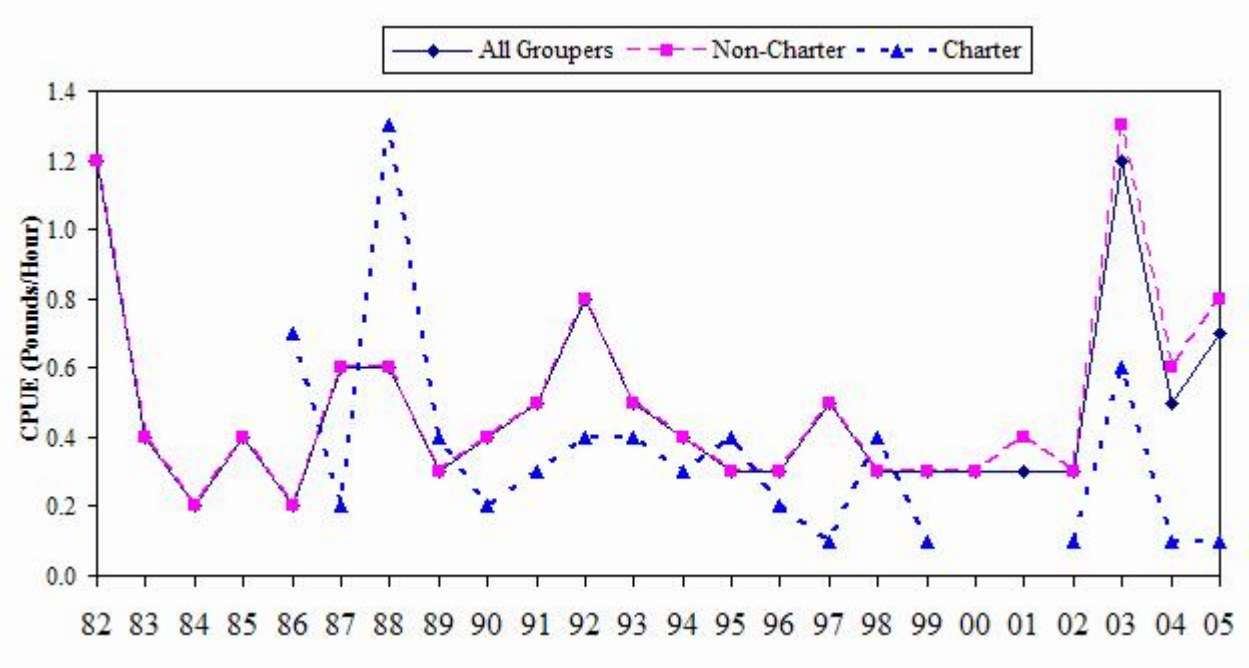


Figure 10c. Average Size Harvested: Epinephelus fasciatus

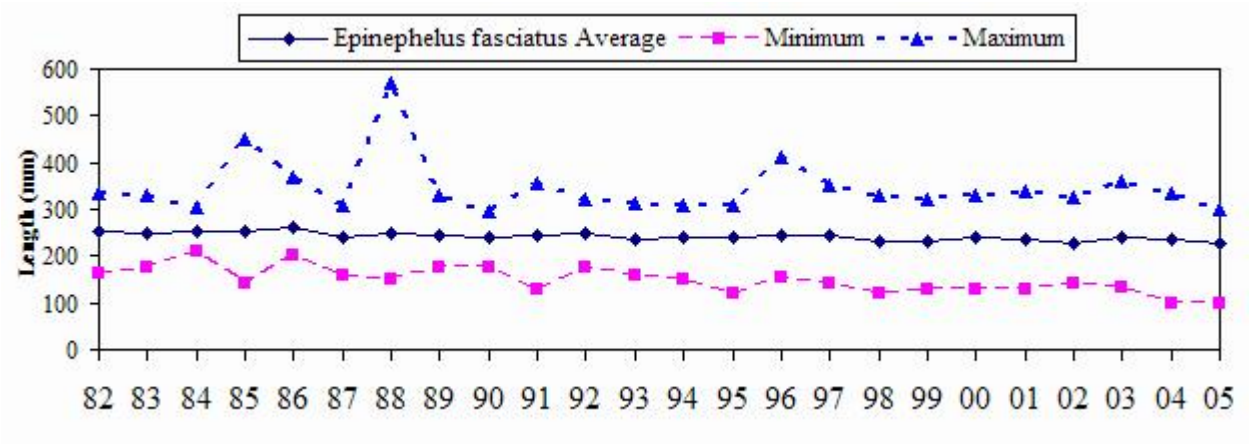


Figure 10d. Average Size Harvested: *Epinephelus merra*

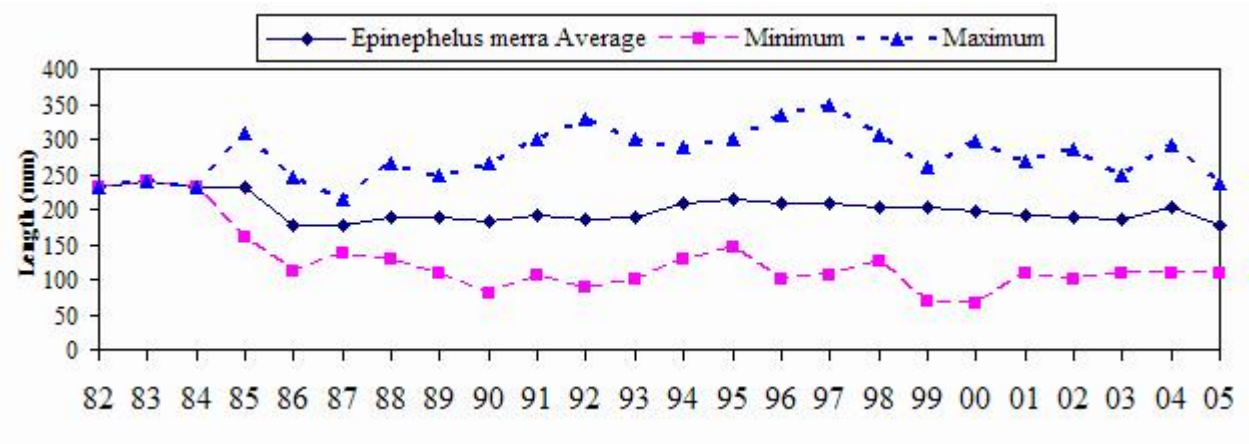
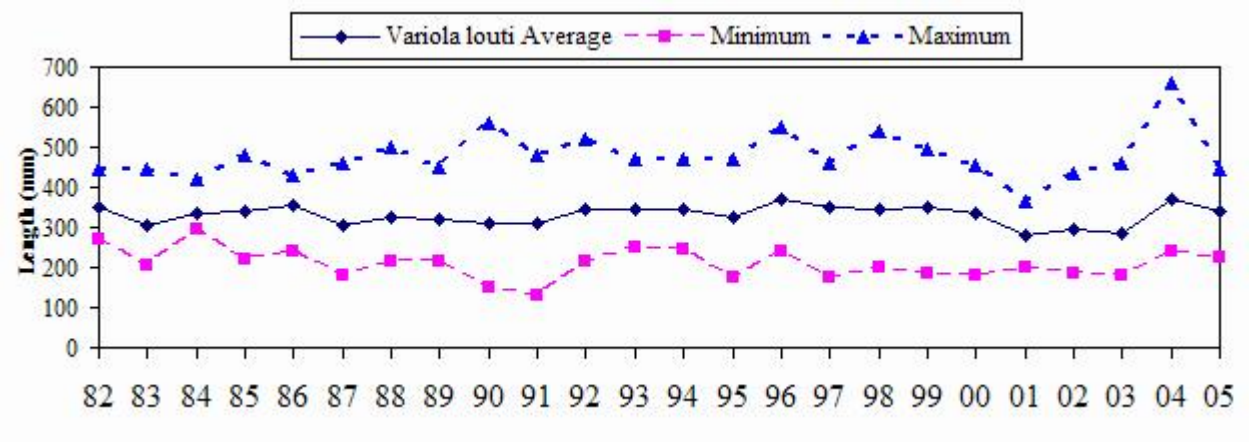


Figure 10e. Average Size Harvested: *Variola louti*



Interpretations: The harvest of groupers decreased in 2005. The total harvest decreased 17% (11,384 pounds from 13,797 pounds), the shore-based harvest decreased 24% (632 pounds from 883 pounds), and boat-based harvest decreased 17% (10,752 pounds from 12,964 pounds). The boat-based non-charter and charter harvests decreased 17% (10,649 pounds from 12,845 pounds) and 13% (104 pounds from 119 pounds) respectively. From boat-based methods, the overall and non-charter CPUE values increased 40% (0.7 lbs/hr from 0.5 lbs/hr) and 33% (0.8 lbs/hr from 0.6 lbs/hr). The CPUE for charter boats remained at 0.1 lbs/hr. Groupers made up 17% of the overall bottomfish catch.

The average sizes for the three representative groupers decreased 4% for *E. fasciatus*, decreased 13% for *E. merra*, and decreased 8% for *V. louti*. The average sizes for *E. fasciatus* and *E. merra* fell below average for the 24-year time series, while *V. louti* remains above the average for the 24-year time series.

Source: The DAWR boat-based and shore-based creel survey data.

Calculations: The yearly catch-per-unit-effort (CPUE) is calculated by using the year-end survey totals and dividing the total weight of groupers landed by the total number of hours spent bottomfishing.

Groupers Harvest (Pounds) and CPUE (Pounds/Hour)

Groupers	Total Harvest	Shore-Based Harvest	Boat-Based Harvest			Boat-Based CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	6,873		6,873	6,873		1.2	1.2	
1983	3,537		3,537	3,537		0.4	0.4	
1984	2,497		2,497	2,497		0.2	0.2	
1985	10,232	562	9,670	9,670		0.4	0.4	
1986	4,579	1,983	2,596	2,577	19	0.2	0.2	0.7
1987	6,321	243	6,078	6,068	10	0.6	0.6	0.2

1988	9,890	621	9,269	9,036	233	0.6	0.6	1.3
1989	5,279	221	5,058	4,918	140	0.3	0.3	0.4
1990	13,025	1,058	11,967	11,937	30	0.4	0.4	0.2
1991	10,332	1,256	9,076	8,918	158	0.5	0.5	0.3
1992	13,912	1,206	12,706	12,532	175	0.8	0.8	0.4
1993	20,097	1,334	18,763	18,665	98	0.5	0.5	0.4
1994	14,677	1,727	12,950	12,892	58	0.4	0.4	0.3
1995	19,183	1,817	17,366	15,824	1,542	0.3	0.3	0.4
1996	15,829	653	15,176	13,888	1,288	0.3	0.3	0.2
1997	16,881	802	16,079	15,552	527	0.5	0.5	0.1
1998	18,550	1,187	17,363	15,822	1,541	0.3	0.3	0.4
1999	15,877	1,258	14,619	14,110	509	0.3	0.3	0.1
2000	18,957	1,875	17,082	16,768	314	0.3	0.3	
2001	16,775	1,233	15,542	15,476	66	0.3	0.4	
2002	9,083	2,168	6,915	6,800	114	0.3	0.3	0.1
2003	25,322	1,284	24,038	23,048	990	1.2	1.3	0.6
2004	13,797	833	12,964	12,845	119	0.5	0.6	0.1
2005	**11,384**	**632**	**10,752**	**10,649**	**104**	**0.7**	**0.8**	**0.1**
Average	12,620	1,141	11,622	11,288	402	0.5	0.5	0.4
Standard Deviation	5,927	556	5,625	5,339	512	0.3	0.3	0.3

Average Size (mm)

Year	*Epinephelus fasciatus*				*Epinephelus merra*				*Variola louti*			
	Avg	Max	Min	n	Avg	Max	Min	n	Avg	Max	Min	n
1982	251	335	161	47	231	231	231	1	351	443	270	33
1983	250	330	175	48	239	239	239	1	307	445	203	33
1984	253	305	210	27	232	232	232	1	334	420	295	6
1985	255	450	141	143	232	309	161	13	338	480	218	41
1986	262	370	202	27	177	246	112	7	358	430	240	6
1987	242	307	160	62	177	215	137	14	303	460	180	35
1988	248	570	150	208	188	265	130	29	325	500	215	53
1989	245	330	175	95	189	250	110	22	321	450	215	42
1990	241	295	175	103	184	265	80	86	311	560	150	65
1991	245	355	130	101	193	301	105	80	310	480	130	32
1992	250	320	175	104	185	329	90	78	344	520	215	39
1993	238	312	160	114	190	300	100	98	347	470	250	29
1994	239	310	150	153	209	290	130	128	346	470	245	28
1995	242	310	120	235	216	300	146	184	325	470	175	21
1996	246	410	153	146	209	333	100	113	372	550	240	34
1997	245	350	140	109	208	350	105	125	348	460	174	25
1998	233	330	120	197	203	305	125	132	344	540	200	19
1999	231	320	130	172	202	260	70	107	351	495	185	16
2000	239	330	128	80	196	297	65	127	336	455	180	24
2001	235	340	130	107	192	270	108	136	281	365	200	20

2002	229	325	140	96	187	285	100	100	297	433	185	20
2003	240	360	134	72	187	249	110	89	286	460	180	18
2004	236	334	100	54	203	292	110	125	372	660	242	35
2005	**227**	**300**	**100**	**63**	**176**	**236**	**110**	**31**	**342**	**444**	**225**	**20**
Average	242	346	148	107	200	277	125	76	331	478	209	29
Standard Deviation	9	59	28	56	19	36	47	55	25	58	38	14

Figure 11a. Emperors (Lethrinus, Gnathodentex, Gymnocranius, Monotaxis): Harvest

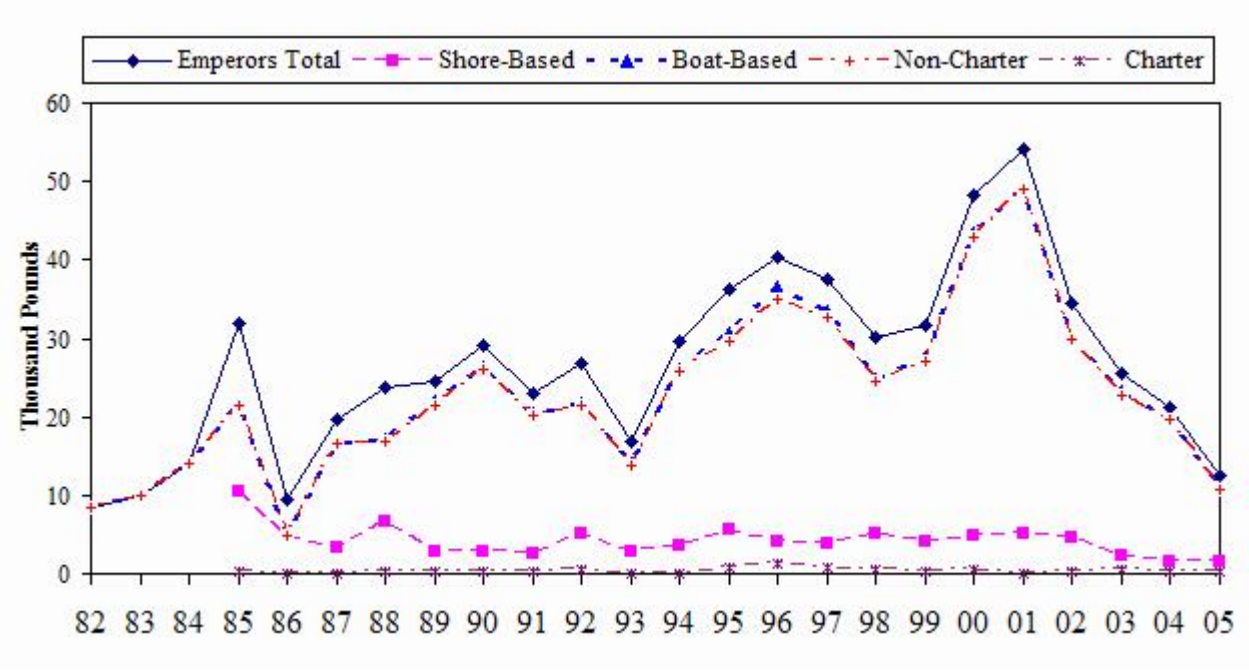


Figure 11b. Emperors (Lethrinus, Gnathodentex, Gymnocranius, Monotaxis): CPUE

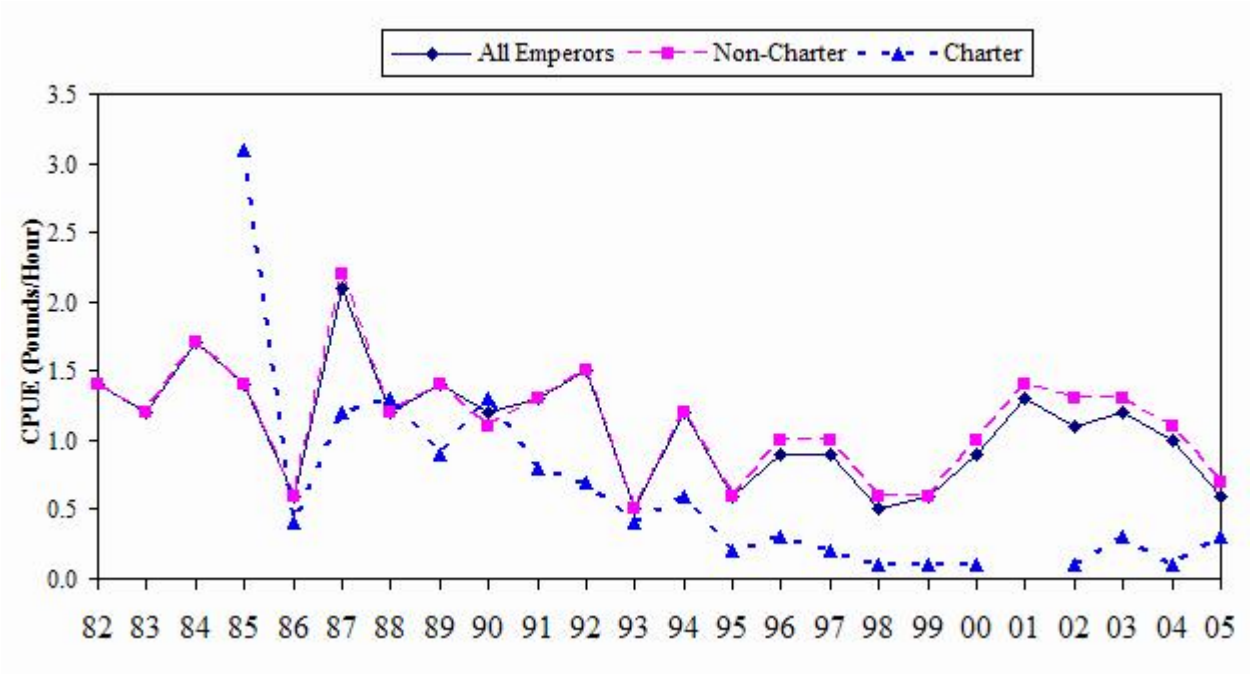


Figure 11c. Average Size Harvested: *Lethrinus olivaceus*

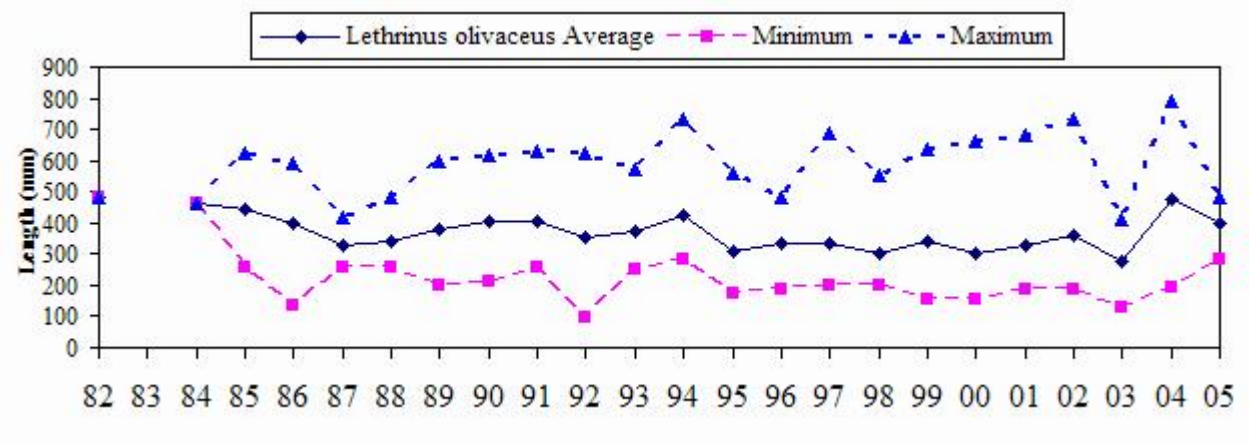


Figure 11d. Average Size Harvested: *Lethrinus obsoletus*

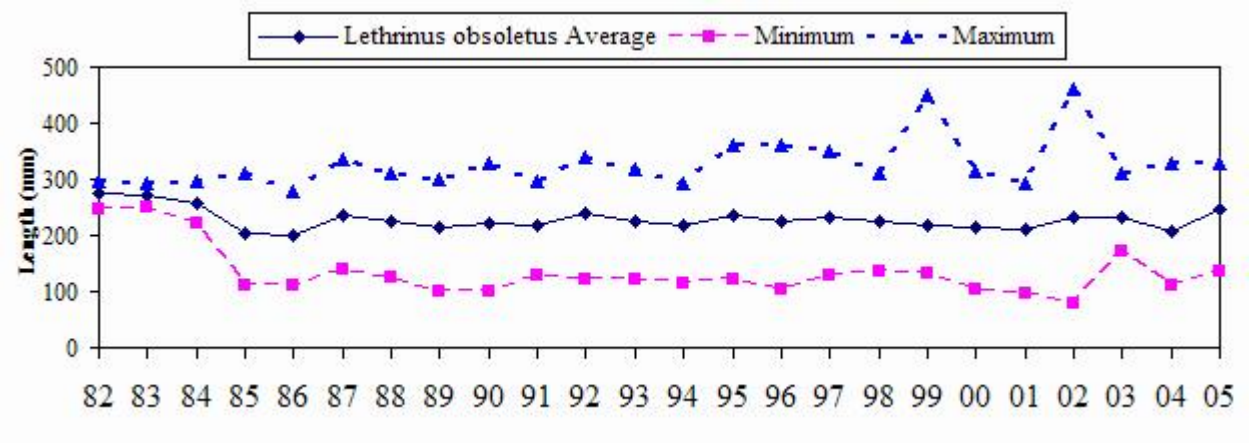
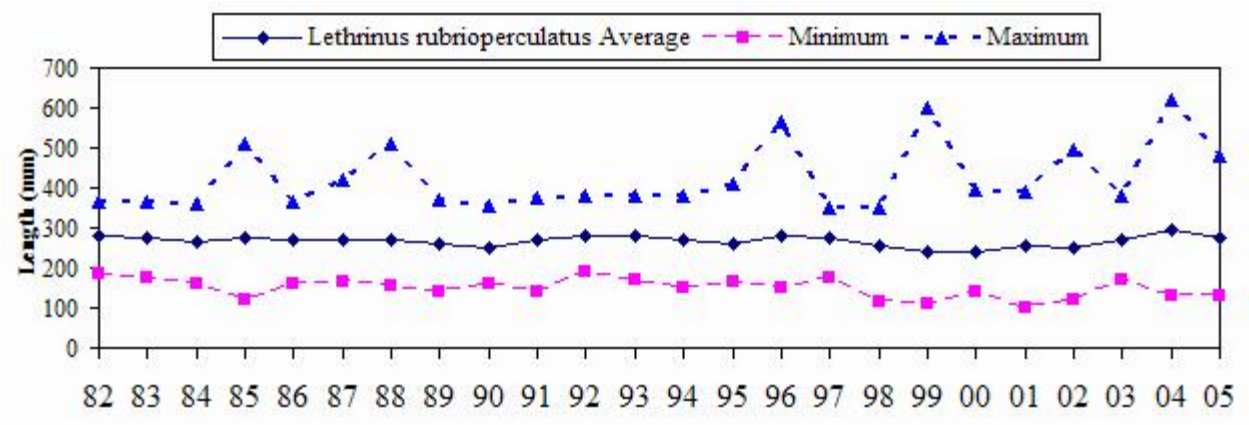


Figure 11e. Average Size Harvested: *Lethrinus rubrioperculatus*



Interpretations: The total harvest of emperors decreased 41% (12,645 pounds from 21,193 pounds), with the shore-based harvest increasing 15% (1,468 pounds from 1,409 pounds) and the boat-based harvest decreasing 44% (11,018 pounds from 19,784 pounds). The boat-based non-charter harvest decreased 46% (10,671 pounds from 19,634 pounds) while the boat-based charter

harvest increased 133% (347 pounds from 149 pounds). Boat-based methods harvested 88% of the emperor catch.
For boat-based methods, the CPUE for total, non-charter, and charter harvests decreased 40% (0.6 lbs/hr from 1.0 lbs/hr), decreased 36% (0.7 lbs/hr from 1.1 lbs/hr), and increased 200% (0.3 lbs/hr from 0.1 lbs/hr) respectively. Boat-based methods account for 88% of all emperors harvested, with non-charter boats harvesting 97% of the boat-based catch. Emperors made up 18% of the bottomfish catch.

The average sizes for *L. olivaceous and L. rubrioperculatus* decreased 16% and 7% respectively, while the average size for *L. obsoletus* increased 19%. *L. olivaceous*, a larger species of emperor, shows wider fluctuations in average size throughout the time series, while the average sizes for the other two emperor species show less fluctuation. The average sizes for these three emperor species are above their average for the 24-year time series.

Source: The DAWR boat-based and shore-based creel survey data.

Calculations: The yearly catch-per-unit-effort (CPUE) is calculated by using the year-end survey totals and dividing the total weight of bottomfish landed by the total number of hours spent bottomfishing.

Emperors Harvest (Pounds) and CPUE (Pounds/Hour)

Emperors	Total Harvest	Shore-Based Harvest	Boat-Based Harvest			Boat-Based CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1980								
1981								
1982	8,384		8,384	8,384		1.4	1.4	
1983	9,930		9,930	9,930		1.2	1.2	
1984	13,985		13,985	13,985		1.7	1.7	
1985	31,828	10,341	21,487	21,335	152	1.4	1.4	3.1
1986	9,510	4,620	4,890	4,880	10	0.6	0.6	0.4
1987	19,769	3,204	16,565	16,499	66	2.1	2.2	1.2
1988	23,646	6,619	17,027	16,791	237	1.2	1.2	1.3
1989	24,618	2,780	21,838	21,562	276	1.4	1.4	0.9
1990	29,061	2,683	26,378	26,144	233	1.2	1.1	1.3
1991	22,911	2,478	20,433	20,177	256	1.3	1.3	0.8
1992	26,730	4,995	21,735	21,349	385	1.5	1.5	0.7
1993	16,821	2,857	13,964	13,841	123	0.5	0.5	0.4
1994	29,552	3,574	25,978	25,855	123	1.2	1.2	0.6
1995	36,235	5,692	30,543	29,704	839	0.6	0.6	0.2
1996	40,398	3,989	36,409	35,081	1,328	0.9	1.0	0.3
1997	37,455	3,916	33,539	32,764	776	0.9	1.0	0.2
1998	30,009	5,178	24,831	24,394	438	0.5	0.6	0.1
1999	31,598	4,135	27,463	27,123	341	0.6	0.6	0.1
2000	48,168	4,805	43,363	42,867	496	0.9	1.0	0.1
2001	54,030	4,982	49,048	48,949	100	1.3	1.4	

2002	34,421	4,485	29,936	29,755	182	1.1	1.3	0.1
2003	25,542	2,352	23,190	22,693	497	1.2	1.3	0.3
2004	21,193	1,409	19,784	19,634	149	1.0	1.1	0.1
2005	**12,486**	**1,468**	**11,018**	**10,671**	**347**	**0.6**	**0.7**	**0.3**
Average	26,595	4,122	22,988	22,682	350	1.1	1.1	0.6
Standard Deviation	11,828	1,972	10,736	10,575	311	0.4	0.4	0.7

Average Size (mm)

Year	*Lethrinus olivaceus*				*Lethrinus obsoletus*				*Lethrinus rubrioperculatus*			
	Avg	Max	Min	n	Avg	Max	Min	n	Avg	Max	Min	n
1982	485	485	485	1	276	295	245	10	281	365	185	242
1983					270	293	251	5	274	367	173	125
1984	462	462	462	1	258	295	220	2	263	360	160	55
1985	445	625	260	11	202	309	109	33	276	510	121	182
1986	398	590	134	10	201	280	109	21	268	365	160	46
1987	329	420	260	4	235	335	140	29	271	420	165	208
1988	343	483	256	11	225	310	125	47	271	510	155	352
1989	377	600	200	14	213	300	100	39	259	370	140	193
1990	404	620	215	18	220	330	100	68	250	355	160	306
1991	404	630	255	12	218	295	130	52	270	374	140	210
1992	356	625	94	18	241	340	121	63	278	380	190	173
1993	373	570	250	8	225	319	120	75	278	380	170	102
1994	427	731	280	24	217	294	115	125	270	379	150	157
1995	309	560	171	31	236	360	121	185	261	410	165	238
1996	332	480	185	21	224	360	103	156	282	565	150	116
1997	331	687	200	31	233	350	130	141	275	350	175	63
1998	301	555	200	26	224	310	135	98	254	350	115	114
1999	338	635	156	30	216	450	131	83	241	600	110	134
2000	305	665	153	61	216	315	105	135	242	396	140	85
2001	331	680	187	48	210	292	98	133	255	390	100	124
2002	360	731	189	40	231	460	80	104	252	496	120	133
2003	275	412	131	22	234	310	170	45	269	380	170	52
2004	473	789	196	15	208	330	110	21	297	622	130	63
2005	**399**	**481**	**282**	**12**	**248**	**330**	**135**	**25**	**276**	**478**	**130**	**53**
Average	372	588	226	20	228	328	133	71	267	424	149	147
Standard Deviation	58	103	93	15	19	45	45	53	13	83	24	82

Table 12a. 2005 Bottomfish Bycatch: Non-charter and Charter

Species Name	Number Released			Total	Bycatch (%)
	Alive	Dead/Injured	Both		
Non-Charter					
Epinephelus howlandi	2		2	3	66.67
Epinephelus merra	1		1	20	5.00
Non-Charter Bycatch Total	3		3	23	13.04
Comparison with All Species Caught				1,434	0.21
Charter					
Serranidae	3		3	3	100.00
Epinephelus fasciatus	6		6	23	26.09
Mullidae	16		16	16	100.00
Mulloidichthys flavolineatus	8		8	8	100.00
Parupeneus multifasciatus	10		10	11	90.91
Balistidae	4		4	5	80.00
Melichthys vidua	10		10	10	100.00
Odonus niger	5		5	5	100.00
Rhinecanthus rectangulus	1		1	1	100.00
Charter Bycatch Total	63		63	82	76.83
Comparison with All Species Caught				235	26.81
All Bycatch Total	66		66	105	62.85
Comparison with All Species				1,669	3.95

12b. Bottomfish Bycatch: Summary

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

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

Interpretation: In 2005, the number of fish discarded as bycatch encountered decreased 46% from 122 pieces to 66 pieces. Bycatch is composed primarily of juvenile groupers, triggerfish, and goatfish. Approximately 95% of the 2005 bottomfishing bycatch came from charter boats.

Source: The DAWR boat-based and shore-based creel survey data.

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

C. Hawaii

This section was not available at the time of first publication of the 2005 Bottomfish Annual Report (June 30, 2006). It will be included in future publications when it is made available.

D. Commonwealth of the Northern Marianas Islands

Summary

There was a 29% increase in bottom fish landings from 2004 to 2005 figures. The number of trips during which bottomfishes were caught increased above the 23-yr mean, but the average bottomfish catch per trip decreased by 27%. 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.

There were several days in 2004 and 2005 where the sea conditions were very rough, as large storms and typhoons passed close to the CNMI. In addition, nearly all of the 8 larger vessels previously fishing the northern islands did not fish in 2004 and 2005. There was no port-side sampling conducted on these commercial trips made by these larger vessels in 2005. These vessels use to catch the majority of the deep-water bottomfishes, although in 2002 one high liner for onaga used small vessels to fish locally off Saipan.

Revenues and prices for bottomfishes were higher in 2005 than in 2004, with the inflation-adjusted revenue increasing by 33% and the inflation-adjusted average price per pound also increasing but less than the 23-yr mean.

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. This industry could continue to expand with support from a training program in bottomfishing that addresses the following: proper fish handling and maintenance of product quality, use of fathometers, nautical charts, and modern electronic equipment such as GPS, fish finders, electric reels, marketing, and financial planning.

Between the years 2000 to 2005, bycatch was part of 7.22% of the fishes taken, but was all reported to be released alive.

Historical Annual Statistics for CNMI Bottomfishes

Year	Landings Total (Lbs)	CPUE (Lbs/Trip)	CPI	CPI Adjusted Revenue ($)	CPI Adjusted Price ($/Lb)	Number of Fishermen
1983	28,529	43	140.90	97,052	3.40	90
1984	42,664	70	153.20	131,265	3.08	101
1985	40,975	117	159.30	118,409	2.89	62
1986	29,911	104	163.50	93,538	3.13	55
1987	49,715	169	170.70	142,838	2.87	46
1988	47,313	181	179.60	130,336	2.75	28
1989	24,438	73	190.20	73,965	3.03	31
1990	12,927	81	199.33	42,354	3.28	33
1991	7,093	47	214.93	25,481	3.59	19
1992	10,598	59	232.90	31,143	2.94	36
1993	18,461	84	243.18	52,235	2.83	20
1994	25,469	74	250.00	76,905	3.02	32
1995	36,101	93	254.48	128,991	3.57	34
1996	66,387	119	261.98	230,216	3.47	71
1997	64,143	137	264.95	219,207	3.42	68
1998	59,022	148	264.18	206,111	3.49	50
1999	55,991	156	267.80	206,659	3.69	53
2000	45,258	56	273.23	129,414	2.86	72
2001	71,256	68	271.01	218,462	3.07	74
2002	46,765	101	271.55	135,146	2.89	53
2003	41,903	89	268.92	120,315	2.87	59
2004	54,474	104	271.28	142,362	2.61	43
2005	**70,034**	**76**	**271.90**	**189,478**	**2.71**	**62**
Average	41,279	98		127,908	3.11	52
Standard Deviation	19,101	39		61,905	0.32	22

Introduction

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 27 participating local fish purchasers in 2005; 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 likely the result of reduction in the number of vendors, businesses closing and a decrease in voluntary compliance with the program.

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.

2004 Recommendation and Progress

1) To request NMFS and the Council continue to assist the CNMI by supporting the MARAMP cruises to the northern islands of the CNMI.

The cruise took place on September 2005

2005 Recommendation

1)

Figures, Interpretations, Calculations, and Tables

Figure 1.—Commercial bottomfish landings, allocated to sector of the fishery (or categorized as "assorted bottomfishes").

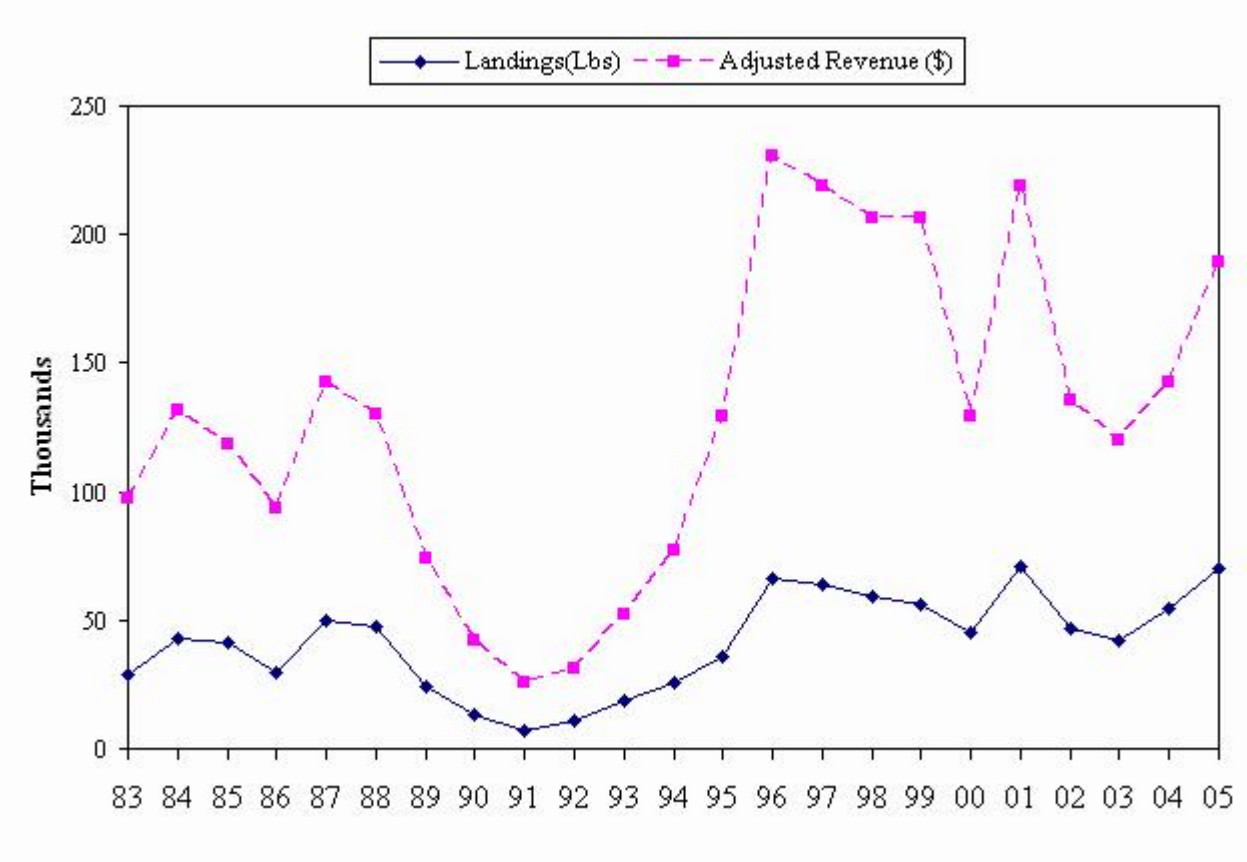


Figure 2.—Commercial bottomfish landings of deep-water species.

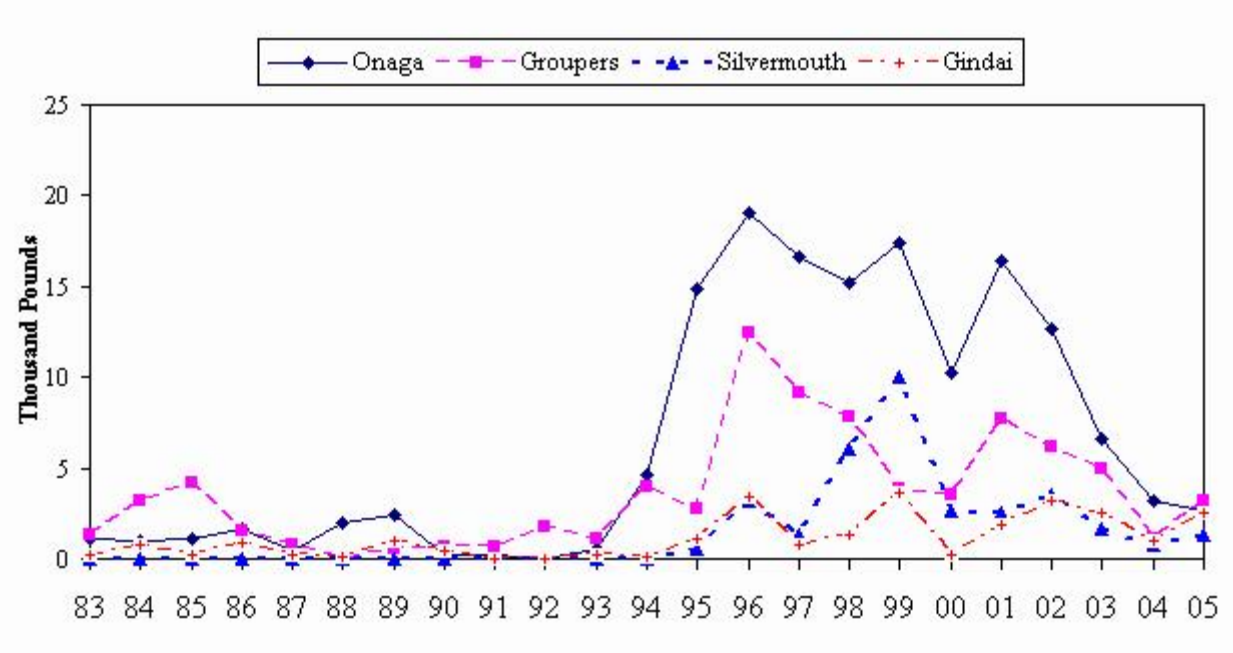
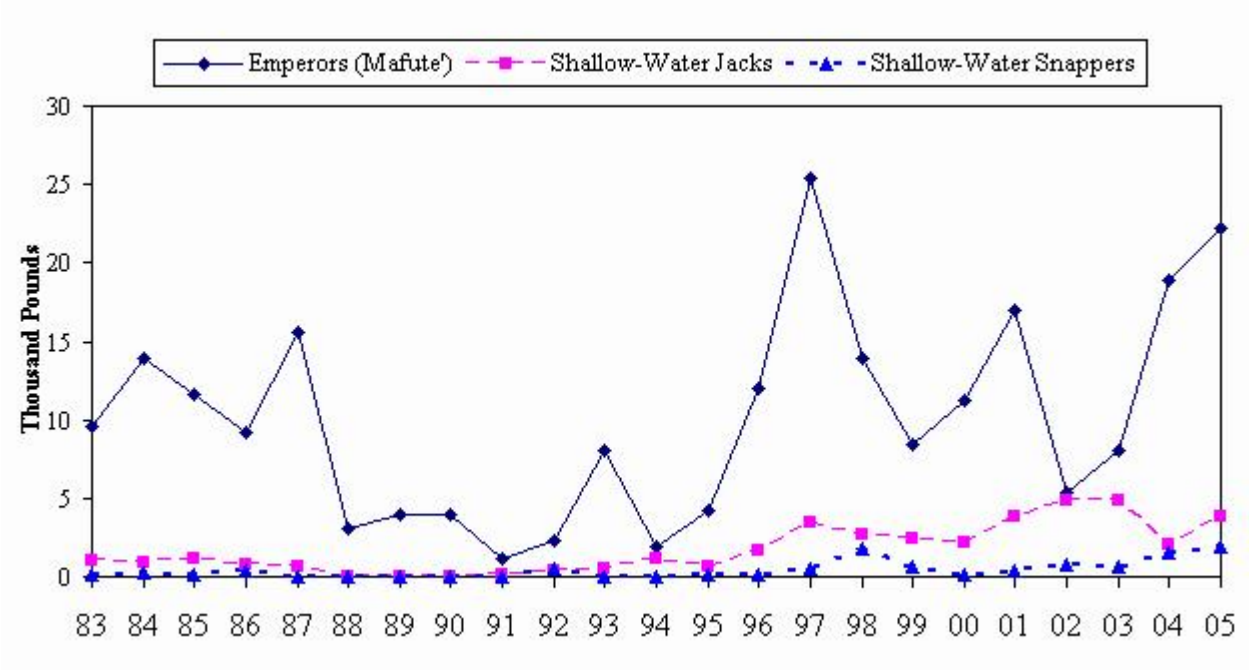


Figure 3.—Commercial bottomfish landings of shallow-water species.



Interpretation: Taken as a whole, the number of pounds of bottomfishes sold (landings) increased in 2005 by 29% from that of 2004. In part, this may be explained by an increase in landings of shallow-water bottom fish, mostly emperors. A majority of the larger vessels conducting deep-water bottom fishing did not fish in the northern islands in 2004 and 2005. And for 2005, the number of fishermen landing bottomfishes in the CNMI has increased to above the 23-year mean.

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 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 2003, 2004 and 2005 to below the 23-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 sharper decrease of 78% in 2004. In 2005, a significant increase of 193% occurred. Most of these landings were from the smaller vessels fishing near the main island of Saipan. Silvermouth (*Aphareus rutilans*) have been reported since 1995, and landings have fluctuated considerably. Landing for 2005 were below the 23 year mean. Opakapaka (Pristipomoides zonatus, and likely some P. flavipinnes) landings have varied somewhat in the last 10 years, with the 2004 landings decreasing by 62% however 2005 indicates a 55% increase. Ehu (*Etelis carbunculus*) landings increased slightly 16% from last year. Ehu are commonly caught around Saipan by the smaller fishing vessels. Kalikali (*Pristipoimoides auricilla* and *P. sieboldii*) appeared in the sales invoice for the first time in 2002. 2003 landings were an order of magnitude greater than previous years and 2004 landing increased by 5%. This upward trend continued in 2005 by 15%.

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 20 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. 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%. However 2005 landings increased tremendously by 313% . 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 slightly lower in 2005 than the previous year. 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. Jobfish (*Aprion virescens*) have been reported in 8 of the last 20 years, and in 2004 landings were the highest ever reported surpassing the previous year by 100%. 2005 for uku was just below last years. 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.

Bottomfish Management Unit species (BMUS) that were specifically itemized on the sales receipts (and including emperors, the vast majority of which are BMUS species *Lethrinus rubrioperculatus*) increased from 1983 through 1987. They then dropped to a low in 1991 and generally climbed again through 2001. The reported landings of BMUS species decreased in 2002 by 28.3%, and decreased a further 14.3% in 2003 and 29% in 2004. However BMUS species increased 23% for 2005.

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: 2005 annual summaries for each species from sales invoice datasheets are totaled and then inflated by 30% to represent the CNMI as a whole (assuming 60% coverage of the commercial sales on Saipan and that Saipan is 90% of the market).

Table 1.—Commercial landings (in pounds) of all bottomfishes, BMUS species identified to species on invoices, all shallow-water bottomfishes, all deep-water bottomfishes, and selected deep-water bottomfishes.

Table 1. Commercial landings (Lbs) of Bottomfishes

year	btm	bmus	btm_s	btm_d	onaga	grpr_d	lehi	paka	gindai	ehu	kali
1983	28,529	3,407	10,762	2,748	1,118	1,363	0	2,022	267	0	0
1984	42,664	3,463	15,089	4,965	1,026	3,141	0	1,639	798	0	0
1985	40,975	2,223	12,855	5,535	1,117	4,210	0	681	208	0	0
1986	29,912	3,822	10,431	3,965	1,598	1,494	0	987	874	0	0
1987	49,715	1,889	16,176	1,464	472	721	0	1,146	271	0	0
1988	47,313	2,413	3,078	2,086	2,001	0	0	326	85	0	0
1989	24,438	4,021	3,963	4,046	2,478	563	0	538	1,006	0	0
1990	12,927	1,273	4,021	1,348	253	703	0	628	393	0	0
1991	7,093	781	1,387	804	175	629	0	606	0	0	0
1992	10,598	607	3,125	1,794	21	1,773	0	136	0	0	0
1993	18,461	1,722	8,537	1,971	593	1,146	0	898	232	0	0
1994	25,470	5,476	3,055	8,589	4,578	3,953	0	824	58	0	0
1995	36,102	17,736	5,043	19,261	14,910	2,715	521	1,019	1,114	0	0
1996	66,388	32,446	13,839	38,133	19,093	12,409	3,179	6,570	3,452	0	0
1997	64,144	22,133	29,452	27,913	16,631	9,086	1,375	2,780	821	0	0
1998	59,023	27,593	18,278	30,665	15,158	7,864	6,028	2,729	1,295	197	124
1999	55,991	34,648	11,464	35,750	17,351	3,901	9,986	1,772	3,686	821	6
2000	45,258	14,968	13,582	16,592	10,199	3,474	2,659	1,633	214	45	0
2001	71,256	25,264	21,195	28,625	16,358	7,719	2,585	3,951	1,916	8	0
2002	46,766	24,518	11,003	26,113	12,655	6,149	3,479	3,932	3,157	263	410
2003	41,904	17,988	13,567	19,549	6,649	4,906	1,624	2,262	2,550	729	3,090
2004	54,474	12,872	22,403	10,391	3,160	1,073	737	849	1,042	1,137	3,242
2005	**70,028**	**15,780**	**27,968**	**14,615**	**2,625**	**3,152**	**1,293**	**1,317**	**2,495**	**1,324**	**3,725**
Average	41,279	12,045	12,186	13,344	6,531	3,572	1,455	1,706	1,128	197	461
Standard Deviation	19,101	11,257	7,897	12,417	6,888	3,203	2,434	1,493	1,171	397	1,153

btm: Total bottomfish; bmus: Total bmus: BMUS species; btm_s: All shallow-water bottomfishes; btm_d: All deep-water bottomfishes; onaga: Onaga; grpr_d: Grouper; lehi: Silvermouth; paka: Opakapaka; gindai: Gindai; ehu: Ehu; and kali: Kalikali

Table 2.—Commercial landings (in pounds) of fishes only identified as assorted bottomfishes, and selected shallow-water bottomfishes.

Table 2. Commercial landings (Lbs) of Bottomfishes

year	btm_as	empr	jack_as	amber	giant_j	brass_j	blk_jack	uku	jack_s	taape	snapr
1983	12,998	9,555	1,031	0	0	0	0	0	1,031	0	175
1984	20,971	13,925	906	0	0	0	0	0	906	0	259
1985	21,904	11,676	962	135	0	0	0	81	1,098	0	81
1986	14,528	9,250	818	0	0	0	0	363	818	0	363
1987	30,929	15,568	607	0	0	0	0	0	607	0	0
1988	41,823	3,078	0	0	0	0	0	0	0	0	0
1989	15,891	3,963	0	0	0	0	0	0	0	0	0
1990	6,931	4,021	0	0	0	0	0	0	0	0	0
1991	4,296	1,212	175	0	0	0	0	0	175	0	0
1992	5,543	2,338	337	0	0	0	0	450	337	0	450
1993	7,055	8,083	454	0	0	0	0	0	454	0	0
1994	13,002	1,870	1,169	0	0	0	0	16	1,169	0	16
1995	10,779	4,276	596	0	0	0	0	171	596	0	171
1996	7,846	11,990	1,697	0	0	0	0	152	1,697	0	152
1997	3,998	25,445	3,482	0	0	0	0	526	3,482	0	526
1998	7,351	13,853	2,362	317	0	0	0	1,746	2,679	0	1,746
1999	7,004	8,419	2,019	343	0	0	0	683	2,363	0	683
2000	13,451	11,223	2,142	28	0	0	0	190	2,169	0	190
2001	17,485	16,987	3,761	21	0	0	0	425	3,782	0	425
2002	5,718	5,364	4,584	184	48	52	0	389	4,868	352	771
2003	6,526	7,999	3,685	322	26	725	138	597	4,896	75	672
2004	20,831	18,889	477	488	91	27	931	1,194	2,015	102	1,499
2005	**26,128**	**22,240**	**1,969**	**411**	**84**	**0**	**1,405**	**1,102**	**3,868**	**758**	**1,860**
Average	14,043	10,053	1,445	98	11	35	108	352	1,696	56	437
Standard Deviation	9,567	6,650	1,348	160	27	151	343	463	1,559	171	559

Btm_as: Assorted bottomfish; empr: Emperor (mafute'); jack_a: As jacks; amber: Amberjack; giant_j: Giant trevally; blk_jack: Black jack; uku: Jobfish; jack_s: All shallow water jacks; taape: Blueline snapper; and shallow-water snappers

Table 3.—Commercial landings of bottomfishes, and their associated revenues and prices for 2005.

Species	Landings (Lbs)	Revenue ($)	Average Price ($/Lb)
Amberjack	411	1,090	2.65
Blackjack	1,405	3,674	2.62
Blueline Snapper	758	1,946	2.57
Bottom Fish	26,128	68,091	2.61
Ehu (red Snapper)	1,324	4,306	3.25
Emperor (mafute/misc.)	22,240	58,177	2.62
Giant Coral Trout	6	13	2.00
Giant Trevally	84	209	2.50
Gindai (flower Snap)	2,495	8,187	3.28
Grouper (misc.)	3,152	9,833	3.12
Jacks (misc.)	1,968	4,792	2.43
Jobfish (uku)	1,102	2,398	2.18
Kalikali (yellowtail)	3,725	9,365	2.51
Onaga (red Snapper)	2,625	10,044	3.83
Opakapaka (pink Snp)	1,317	3,798	2.88
Silvermouth (deep Lehi)	1,293	3,557	2.75
Total	**70,034**	**189,478**	**2.71**

Interpretation: The total average price per pound increased for all landings of bottomfishes from $2.61/lb in 2004 to $2.71/lb in 2005. Onaga commanded the best price this year, with only gindai and ehu within 50¢ per pound. 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 show a greater demand for reef fishes. 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: Landings in pounds are from a simple database summation of reported purchases of each species of bottomfish. Total bottomfish landings sum across all bottomfish species. Revenue in dollars is from a simple summation of the value field. The landings and revenues values listed for 2005 are inflated by 30% to represent the CNMI as a whole (assuming 60% coverage of the commercial sales on Saipan and that Saipan is 90% of the market).

Figure 4.—Commercial bottomfish landings and inflation-adjusted revenue.

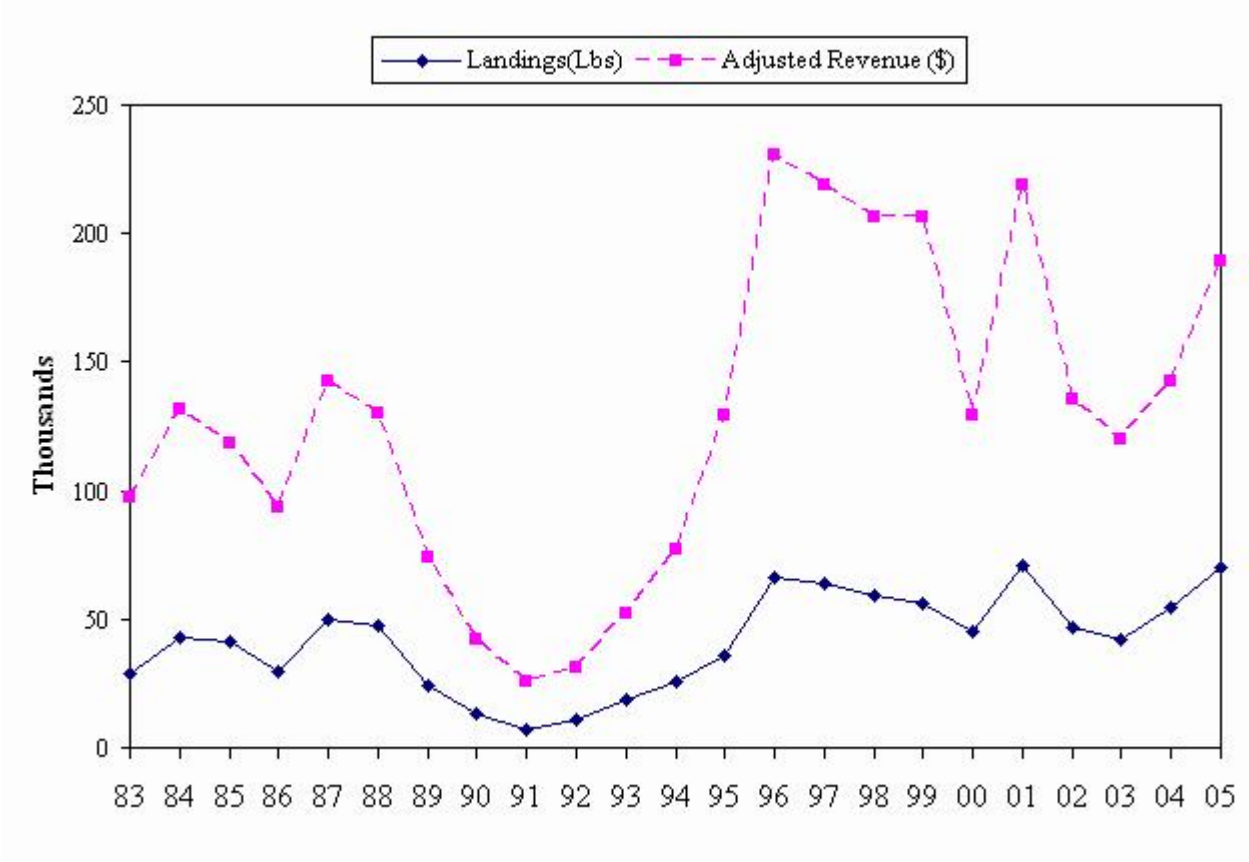
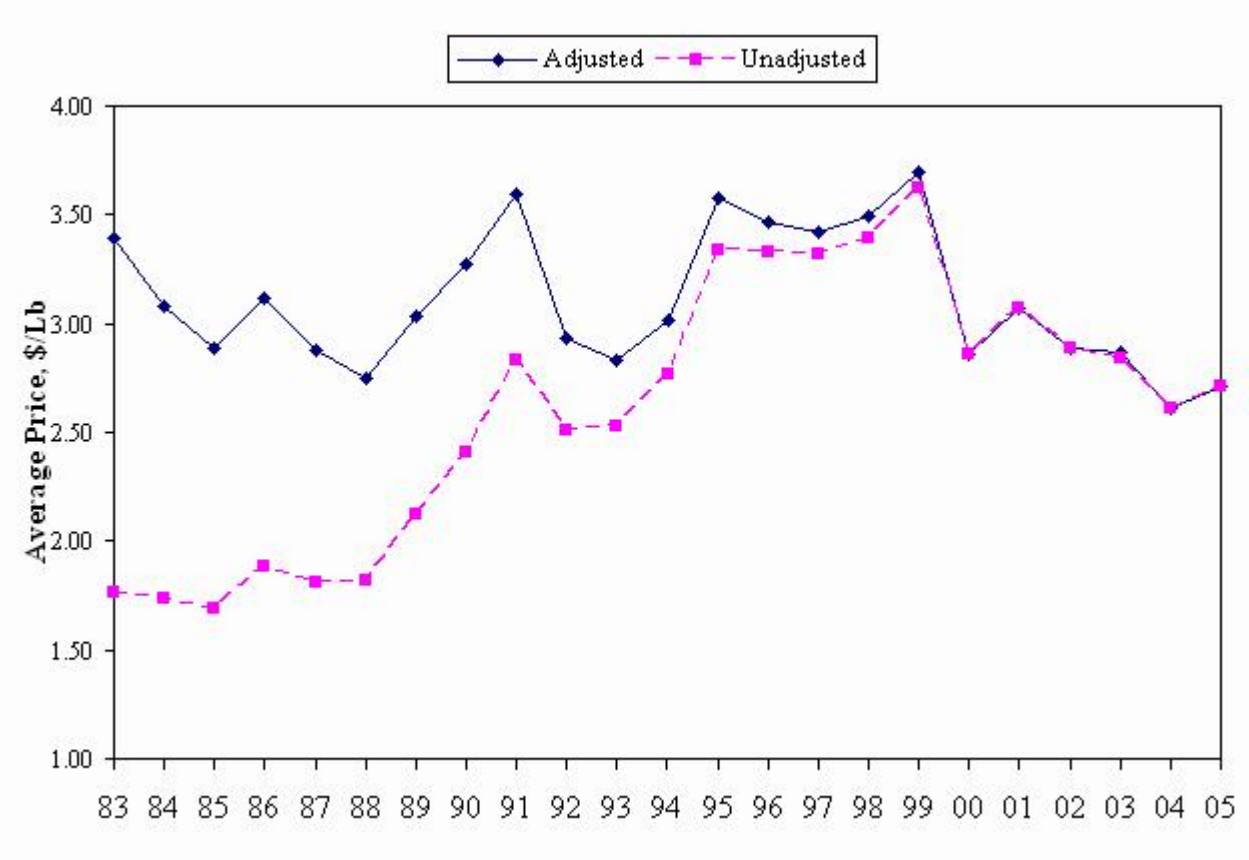


Figure 5.—Average price of bottomfish.



Interpretation: Landings, revenues, and adjusted revenues for 2004 all rose above the 23-year mean. Although the landings, revenues, and adjusted revenues for bottomfishes has been comparatively high for the last 9 years compared to the preceding 13 years, there have been considerable changes in the composition of the fishery during the last 9 years.

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 2005increased by 33%. 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. The bottomfishes are a smaller portion of their sales and seem to be co-lateral catch (i.e., if caught in sufficient numbers while focusing on other species, then they too will be sold). 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 23-yr mean. The unadjusted price is higher than the 23-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.

Table 5.—Commercial landings, consumer price indices (CPIs), revenue, and prices for all bottomfishes.

Commercial landings, CPIs, Price, and Revenue for CNMI Bottomfishes

Year	Landings Total (Lbs)	CPI	CPI Adjusted Factor	Unadjusted Revenue ($)	CPI Adjusted Revenue ($)	Unadjusted Price ($/Lb)	CPI Adjusted Price ($/Lb)
1983	28,529	140.90	1.93	50,286	97,052	1.76	3.40
1984	42,664	153.20	1.77	74,161	131,265	1.74	3.08
1985	40,975	159.30	1.71	69,245	118,409	1.69	2.89
1986	29,911	163.50	1.66	56,348	93,538	1.88	3.13
1987	49,715	170.70	1.59	89,835	142,838	1.81	2.87
1988	47,313	179.60	1.51	86,315	130,336	1.82	2.75
1989	24,438	190.20	1.43	51,724	73,965	2.12	3.03
1990	12,927	199.33	1.36	31,143	42,354	2.41	3.28
1991	7,093	214.93	1.27	20,064	25,481	2.83	3.59
1992	10,598	232.90	1.17	26,618	31,143	2.51	2.94
1993	18,461	243.18	1.12	46,638	52,235	2.53	2.83
1994	25,469	250.00	1.09	70,555	76,905	2.77	3.02
1995	36,101	254.48	1.07	120,552	128,991	3.34	3.57
1996	66,387	261.98	1.04	221,362	230,216	3.33	3.47
1997	64,143	264.95	1.03	212,822	219,207	3.32	3.42
1998	59,022	264.18	1.03	200,108	206,111	3.39	3.49
1999	55,991	267.80	1.02	202,607	206,659	3.62	3.69
2000	45,258	273.23	1.00	129,414	129,414	2.86	2.86
2001	71,256	271.01	1.00	218,462	218,462	3.07	3.07
2002	46,765	271.55	1.00	135,146	135,146	2.89	2.89
2003	41,903	268.92	1.01	119,124	120,315	2.84	2.87
2004	54,474	271.28	1.00	142,362	142,362	2.61	2.61
2005	**70,034**	**271.90**	**1.00**	**189,478**	**189,478**	**2.71**	**2.71**
Average	41,279			111,494	127,908	2.60	3.11
Standard Deviation	19,101			67,600	61,905	0.61	0.32

Figure 6.—Number of fishermen (boats) making bottomfish landings.

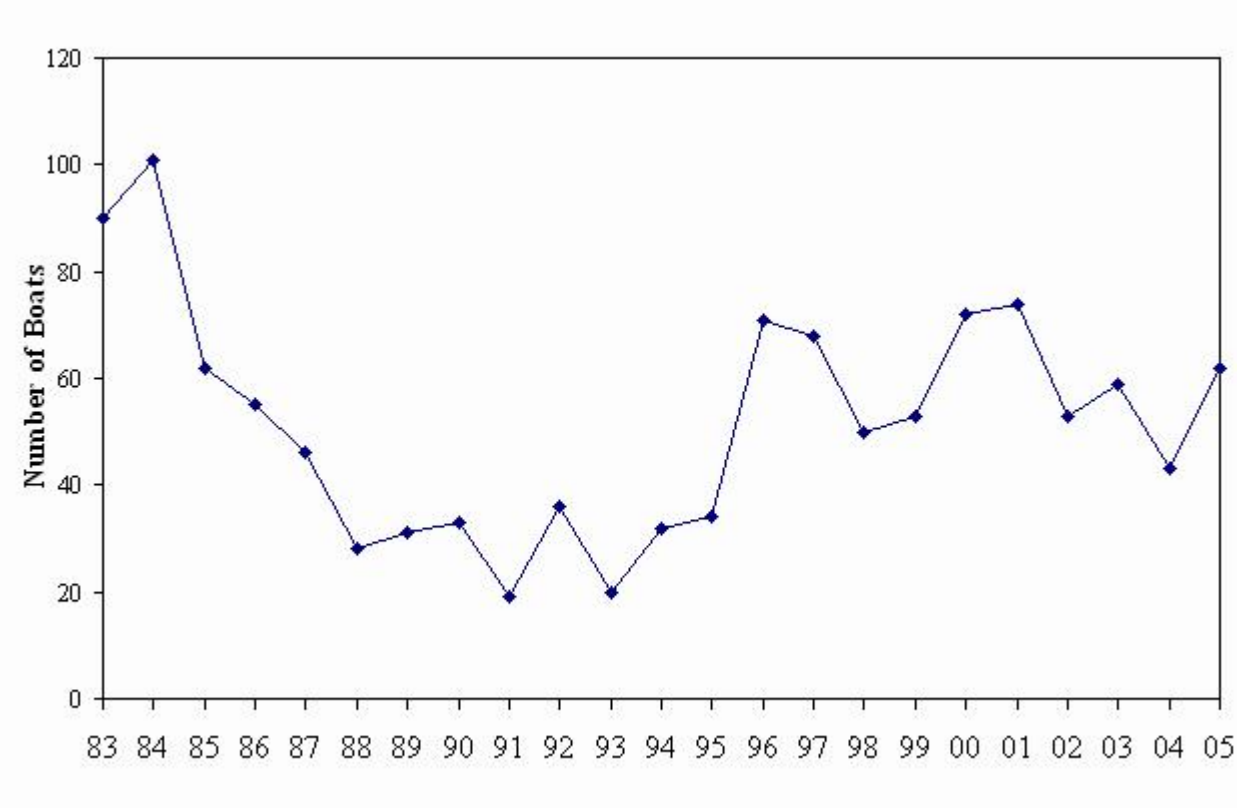


Figure 7.—Number of bottomfish trips.

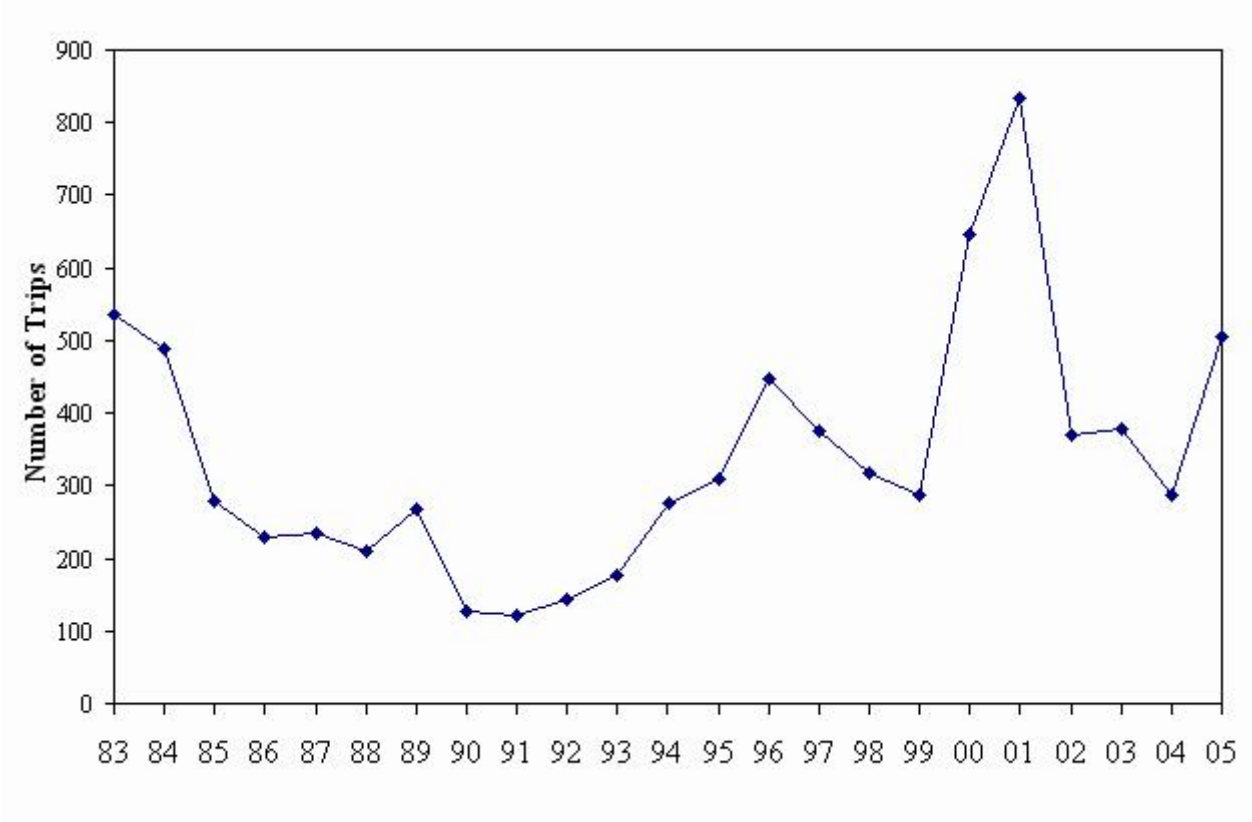

Number of Trips
900
800
700
600
500
400
300
200
100
0
83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 00 01 02 03 04 05

Figure 8.—Bottomfish catch in average pounds per trip.

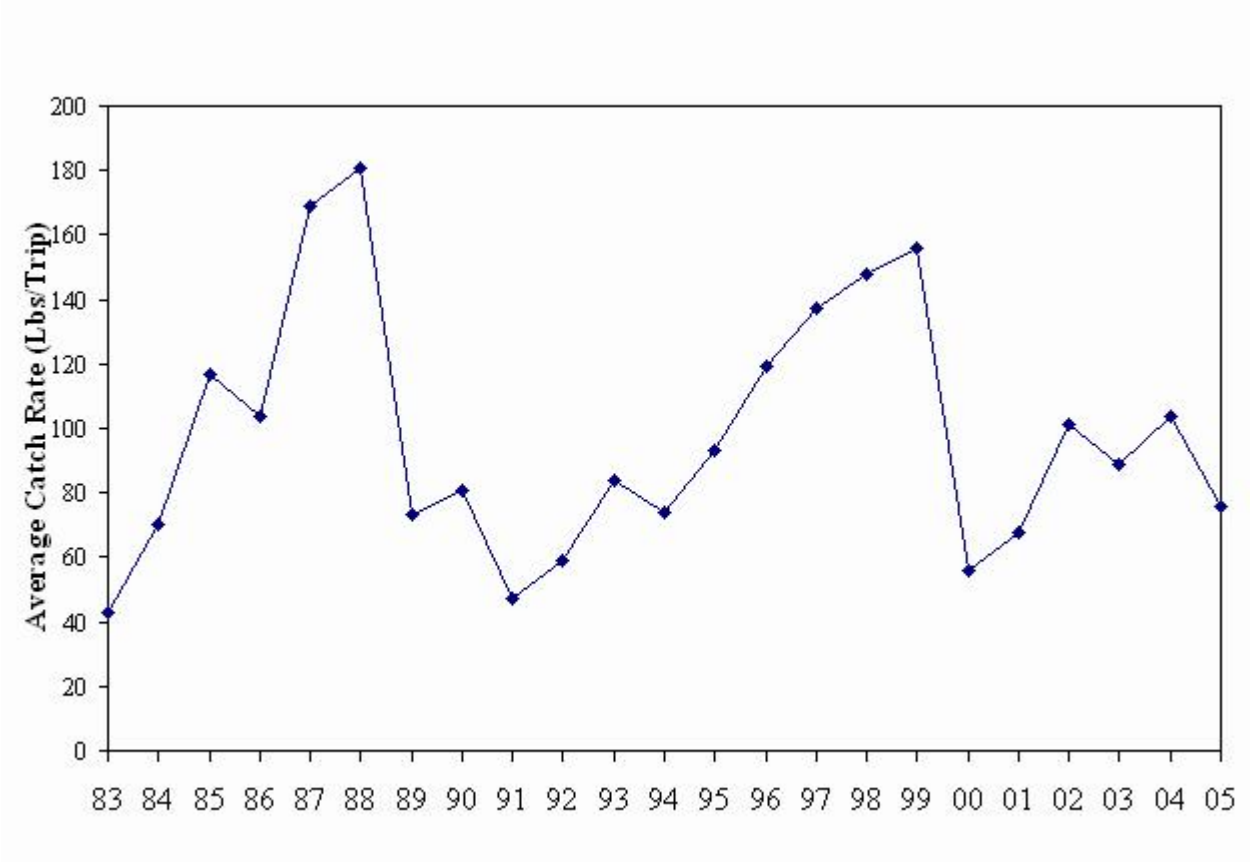
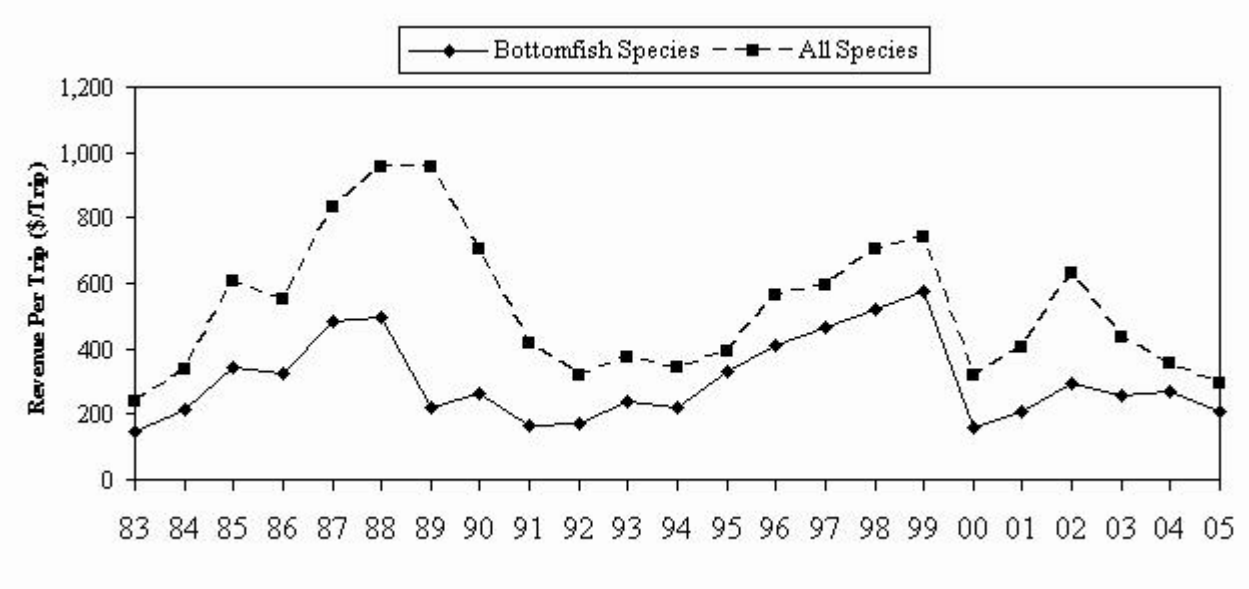


Figure 9.—Average inflation-adjusted revenue per trip landing bottomfish.



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 23 years. This year there were more fishermen selling bottomfish than last year, and the 2005 number is slightly higher than 23-year mean. Most of these fishermen are using small vessels and when catching bottomfish, 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. 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.

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. This year the average pounds of bottomfish sold per trip decreased by 27% lower than 23-year mean.

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.

Inflation-adjusted bottomfish revenues recovered slightly from the marked decrease of 2000, although they were 13.0% lower in 2003 than in 2002, 2004 was higher by 7%. This year's revenues were 32% higher than the 23-year mean.

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.

Table 6.—Number of fishermen (used as a proxy for number of boats), number of trips, catch rate, revenue per trip, inflation-adjusted revenue per trip for bottomfish, and inflation-adjusted revenue per trip for all species when bottomfishing.

Commercial landings, CPIs, Price, and Revenue for CNMI Bottomfishes

Year	Number of Fishermen	Number of Trips	Catch Rate (lbs/Trip)	Unadjusted $/Trip	Adjusted $ /Trip	All Species Adjusted ($/Trip)
1983	90	536	43	75	145	237
1984	101	489	70	121	214	335
1985	62	279	117	199	340	605
1986	55	229	104	197	327	553
1987	46	236	169	305	485	832
1988	28	209	181	330	498	954
1989	31	267	73	155	222	955
1990	33	128	81	195	265	704
1991	19	122	47	132	168	414
1992	36	143	59	149	174	317
1993	20	176	84	212	237	376
1994	32	276	74	205	223	341
1995	34	310	93	311	333	393
1996	71	448	119	395	411	563
1997	68	375	137	454	468	596
1998	50	318	148	503	518	702
1999	53	288	156	563	574	742
2000	72	647	56	160	160	319
2001	74	833	68	210	210	407
2002	53	370	101	292	292	629
2003	59	378	89	252	255	434
2004	43	288	104	272	272	358
2005	**62**	**506**	**76**	**206**	**206**	**293**
Average	52	341	98	256	304	524
Standard Deviation	22	173	39	125	128	212

Table 7. Bycatch During Bottomfishing (2000 --2005)

Species Name	Interview with Bycatch	All Interview	Released Alive	Total Catch	Bycatch Percentage
Non-Charter	**2**	**220**			0.91%
Dogtooth Tuna			1	18	5.56%
Blueline Snapper			4	213	1.88%
Blackjack			1	29	3.45%
All Species with Bycatch			**6**	**260**	**2.31%**
Compared with All Caught				**5756**	**.10%**
Charter	**12**	**84**			14.29%
Redgill Emperor			6	240	2.50%
Triggerfish (misc.)			55	165	33.33%
Emperor (mafute/misc.)			7	129	5.43%
Red Snapper			5	9	55.56%
Blueline Snapper			3	64	4.69%
Lyretail Grouper			5	19	26.32%
Flagtail Grouper			4	116	3.45%
Maitai (blk-tipped Grper)			4	139	2.88%
Jobfish (uku)			1	5	20.00%
All Species with Bycatch			**90**	**886**	**10.16%**
Compared with All Caught				**1247**	**7.22%**

Table 8

Offshore Daytime Creel Survey Bycatch Summary

Year 2005

		Number Caught					Trip		
	Species	**Released**	**Dead/Injd**	**Both**	**All**	**BC%**	**With BC**	**All**	**BC%**
Non Charter							1	87	1.15
	Blueline Snapper	4	0	4	66	6.06	0		
Charter							0	26	0.00
	None Recorded								
	Total			**4**		**6.06**			
	Compared With All Species			**0**	**1859**	**.22**			

Interpretation: Almost all fishes caught in the CNMI are considered food fishes, including many that show a high incidence of ciguatera locally, including lyretail grouper (*Variola louti*) and red snapper (*Lutjanus bohar*). Table 7 shows the total bycatch for 6 years (2000–2005) of interviews of fishermen during boat-based creel surveys. Table 8 shows the entire reported bycatch during bottomfishing for 2005. The interviews are divided into vessels engaged in non-charter (including commercial, non-commercial, and subsistence fishermen) and charter fishing. In 2003 and 2004 and most of 2005, there was only a single charter vessel engaged in bottomfishing. The charter fishing sector largely caters to the tourist population, of which the majority is Japanese. This sector targets shallow-water bottomfishes and reef. If it occurs, bycatch in both sectors was released alive.