Appendix 2

Guam

CONTENTS

Introduction

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, 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*.

Bottomfishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. Bottomfish activity can be highly seasonal during the summer when sea conditions are generally calmer, although calm sea conditions can occur every month of the year, which results in an increase in bottomfish activity. Fishing activity increases dramatically on the east side of the island, a more productive fishing area, during periods of calm weather. 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. In recent years, the consumption of reef fish has increased on Guam, making it profitable to sell locally caught bottomfish. This demand, however, appears to be stressing bottomfish stocks around Guam. Bottomfish and BMUS species are not caught by only by bottomfishing, but also by other methods such as gillnetting and spearfishing.

The Agana Boat Basin, centrally located on the western leeward coast, is the island's primary launch site for boats fishing areas off the central and northern leeward coasts and the northern banks. Most commercial fishing boats operate from here. The Merizo boat ramp, Seaplane Ramp in Apra Harbor, Umatac boat ramp, and Agat Marina are launch sites which provide access to the southern coast, Apra Harbor, Cocos Lagoon, and the southern banks. The Agat Marina, 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. A makeshift ramp at Ylig Bay provides access to fishing areas on the eastern side of the island, and is heavily used during periods of calm weather. Surveying the Ylig ramp during the summer has been proposed since significant quantities of BMUS species are landed there by bottomfishing or spearfishing. However, a lack of adequate lighting, no public phone for emergencies, and other safety issues make surveying this area challenging. At present, Department of Agriculture's Fisheries Section conducts its offshore creel surveys at the Agana Boat Basin, the Agat Marina, and the Merizo boat ramp.

Four fisheries staff left the Fisheries office for career advancement at other government agencies during 2002: two biologists, the fisheries technical supervisor, and a fisheries technician. Although a biologist was hired during 2002, the number of surveys at the Agana Boat Basin was decreased due to a lack of adequate staff to provide the necessary coverage for all Fisheries projects. Rather than sample two weekdays and two weekends a month at Agana, sampling was reduced to one weekday and one weekend a month. DAWR plans to hire additional staff during 2003 and reinstate the original sampling regimen at the Agana Boat Basin during fiscal year 2004.

Charter bottomfishing boats still comprise a large proportion of participation and effort. Charter boats operating out of the Agat marina still have as many as two to three trips daily, although heavily dependent on Asian visitors. These boats, however, have been operating in the same area near the marina year after year. A majority of their catch is made up of juvenile goatfish, triggerfish, and groupers, most of which is discarded as bycatch. Other fish of different genera are rarely scene by these charter boats, such as snappers,

wrasses, and emperors. The fishing effort from these boats appears to have added to the overfishing in the immediate area. Gillnetting is often scene in the adjacent reef flat. Large fish are rarely caught but are often kept, and the small juveniles are occasionally kept to serve as sashimi to their guests. These boats appear to include non-fishing activities to supplement their charter trips.

The testing of fish potentially contaminated by PCB around Orote Point was to be completed during 2002. This was not completed, as a more intensive testing regimen was required by the Guam Environmental Protection Agency. The study by the Navy should be completed during 2003 and reported in next year's report. The area originally restricted to fishing has been decreased after preliminary PCB testing.

A significant increase in the number of bad weather days was observed in 2002. Guam was had direct hits by Supertyphoon Chata'an in the late spring and by Supertyphoon Pongsona at the beginning of December. The typhoons did significant damage to boats, temporarily closed two major boating access ramps, and virtually eliminated charter fishing. Local fishermen also reported poor catches immediately after both storms. These factors may have caused the significant decrease in bottomfish participation, effort, and catch for the 2002.

Agriculture's Fisheries Section began collecting information on bycatch as part of its offshore creel census at the beginning of 2000 as a requirement of the bottomfish FMP. This will provide information on the effect bottomfishing may have on fish species that are caught but discarded, a practice observed quite frequently with the charter sector, and beginning to be observed with the non-charter sector. The release of small fish back into the marine environment is a small but significant action taken by some fishermen as a response to declining numbers and smaller sizes of preferred food fish.

The demand for both deep and shallow-water bottomfish continues to exceed the locally caught supply. The cultural value of the shallow and deep-water complex remains high due to the popularity of this assemblage of fish as food items, especially during the Lenten season, family gatherings, and large celebrations. Some of the demand for bottomfish is offset with imports from the Philippines and Micronesia. This demand, however, may be contributing to the overall decline in nearshore and reef-associated bottomfish populations. Bottomfish and BMUS species are also being impacted by other boat-based methods such as spearfishing, and shore-based methods such as gillnetting. Abandoned gillnets is a regular problem on Guam and is known to catch BMUS species, although not a significant number.

Summary

The new offshore creel survey expansion system utilizes a database format to expand the offshore survey data. The new format separates the charter and non-charter components, allows for the distinction between shallow and deep bottomfish complexes, and provides for the collection of bycatch data. This improvement, combined with recent revisions of expansion algorithms, crosschecking features, and size distribution analysis have contributed to the increased efficiency in the production and reliability of the Guam annual reports. These types of data outputs have become important in recent years as overall fish stocks appear to be declining and management decisions are being made based on the voluntary fishery data that is collected. Although complemental statistics of confidence and analysis of biological and species composition data are not possible at this time, DAWR's Fisheries Section is continuing work with the WPacFIN program coordinator to further develop the expansion system to eventually include production of such analyses.

Work was done to integrate the inshore creel census data with the offshore creel census data to obtain a more accurate estimate of BMUS species that are harvested islandwide. This module combined the bottomfish catch from shore-based methods ("inshore catch") and boat-based methods ("offshore catch") to obtain a total catch of bottomfish and BMUS species. Also, size distribution for representative fish from the four major bottomfish groups (groupers, emperors, trevallys, and snappers) are provided. This was done to observe if a size decrease is occurring with BMUS and bottomfish species that are harvested. This provides an additional tool to observe the health of bottomfish stocks in addition to looking at total harvest.

The bottomfish fishery data in 1998 indicated that Guam's aggregate CPUE for all bottomfishing may have been in a "yellow light" condition, an indicator of fishery stress. However, the charter and non-charter components were expanded separately in 1999 and a "yellow light" condition was not observed with the non-charter component. The bottomfish charters, primarily the Agat Marina bottomfish charters, may have skewed the overall CPUE toward a "yellow light" condition due to the high effort and low catch of this component of bottomfishing. Nonetheless, anecdotal evidence from local fishermen and creel census data do show that the bottomfish fishery is stressed. The sizes of bottomfish that are harvested are decreasing, especially those of the shallow water and coral reef complex. Unfortunately, these fish are usually not released despite their small size, although more fishermen are beginning to realize the importance of releasing juvenile fish and less desirable species.

Total and BMUS bottomfish harvest decreased in 2002. Total bottomfish landings decreased 33%, with non-charter decreasing 39%. Charter catch increased 58%, but make up a small portion of the overall harvest. Total BMUS landings decreased 40%, with the non-charter and charter components decreasing 45% and 31% respectively. Offshore made 84% of both the total bottomfish catch and BMUS catch. The CPUE for all bottomfish decreased 21%, while the non-charter and charter CPUE decreased 20% and increased 19% respectively.

The commercial sale of BMUS species decreased 44% in 2002, with the adjusted revenue decreased 46%. The number of fishing vendors selling local fish decreased during 2002, and sales were affected by a lack of electricity and available ice after the supertyphoons. The number of boats bottomfishing, the number of bottomfish trips, and the number of hours spent fishing increased 4%, decreased 44%, and decreased 43% respectively.

Due to Guam's declining tourist visitor arrivals and declining revenue, subsistence and commercial fishing may increase in order to offset the potential loss of jobs in the government and private sector. Also, Agriculture's Fisheries section will report data collected at Guam's fishing preserves to the local legislature in 2003. Local laws, other than those restricting fishing in Guam's marine preserves, are not pro-active in overall fishery conservation, since there are no size, number, species, or seasonal restrictions. In addition, fires, farming, and clearing activities are responsible for depositing vast amounts of silt on coral reefs every year. During 2002, the Achang Marine preserve allowed the take of seasonal juvenile jacks within the preserve boundaries, decreasing the number of no-take preserves from three to two. Although there is a cultural component for this seasonal harvest, this may negatively impact the preserves intent to restore the stocks of jacks. The Tumon Bay preserve allows for the take of jacks, while the Pati Point preserve allows the take of all species caught by rod and reel from shore, many of which are BMUS and bottomfish species.

Summary of Historical Annual Statistics

Year	Total Bottomfish Landings (lbs)*	CPUE (lbs/hour)	CPI	Adjusted Revenue ($)	Adjusted Price/lb ($)	Number of Boats
80			134.0	43,185	4.58	
81			161.4	58,547	5.53	
82	40,080	7.2	169.7	39,672	5.71	154
83	46,976	6.3	175.6	191,591	5.18	106
84	57,197	7.3	190.9	116,281	4.99	144
85	104,526	5.7	198.3	132,451	4.73	161
86	49,748	5.2	203.7	53,836	4.45	118
87	57,806	5.8	212.7	55,581	4.40	139
88	83,668	4.9	223.8	66,882	4.20	198
89	91,201	5.6	248.2	95,820	4.88	223
90	83,334	4.5	283.5	89,398	4.73	226
91	81,491	4.8	312.5	50,915	4.51	246
92	96,692	5.8	344.2	44,257	4.15	236
93	104,044	4.2	372.9	39,742	3.90	360
94	115,473	5.6	436.0	121,000	3.99	298
95	118,576	2.5	459.2	49,037	3.55	402
96	160,196	4.1	482.0	20,332	2.75	408
97	113,945	3.7	489.7	32,273	3.04	332
98	112,181	2.6	487.1	49,251	3.34	354
99	147,837	3.2	496.0	111,387	3.62	411
00	156,853	3.7	505.9	76,854	3.51	312
01	132,260	3.8	499.4	85,424	3.25	337
02	**88,740**	**3.0**	**502.0**	**46,145**	**3.15**	**351**
Average	97,293	4.7	329.9	72,603	4.18	263
Std. dev.	35,078	1.4	138.7	40,358	0.81	102

*****includes bottomfish harvest obtained by Inshore Creel survey, except for the years 1982-1984.

Recommendations

Status of 2001 recommendations

1. Integrating the offshore and inshore creel census data and the fine-tuning of the offshore expansion program is ongoing. Invaluable technical assistance from NMFS has enabled DAWR to move closer towards providing statistics of confidence, and analyses of mean fish size, and separation between the shallow and deepwater bottomfish complexes. Inputting the remaining historical offshore data that should have been completed in 2001 is still ongoing. The loss of four fisheries staff during 2002 and an increase in other fisheries projects has delayed this recommendation from being completed during 2002.

2. Completing the baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus*, remains the single most important data deficiency for the shallow water bottomfish resource for the Mariana Islands. The continual loss of fisheries staff, including senior biologists and the Chief Scientist for that trip, since 2000 and an increase in other fisheries projects have prevented the data from being analyzed.

3. The establishment of mean fish size, percent immature, and SBB indicators for both deep and shallow water bottomfish complexes has not been completed during 2001, although the offshore expansion program is being fine-tuned and integration of the offshore and inshore creel survey data has began. Guam's offshore coordinator and NMFS Honolulu lab staff continues to make progress towards completing this recommendation.

2002 Recommendations

1. Completing the baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus*, remains the single most important data deficiency for the shallow water bottomfish resource for the Mariana Islands. DAWR's fisheries staff has discussed making progress towards completing this study when additional staff is available to ease the workload of the existing staff.

2. DAWR should establish mean fish size, percent immature, and SBB indicators for both deep and shallow water bottomfish complexes. Fine-tuning of this program should be completed in 2003

Tables

Figures and Tables

Table 1. Expanded Offshore Creel Survey Composition Of Bottomfish Management Unit Species (BMUS) for 2002

Management Unit Species	Total Harvest*(lbs)
Lehi (*A. rutilans*)	1,376
Uku (*A. virescens*)	1,170
Ehu (*E. carbunculus*)	2,531
Onaga (*E. coruscans*)	5,821
Yellowtail Kalekale (*P. auricilla*)	1,197
Opakapaka (*P. filamentosus*)	283
Yelloweye Opakapaka (*P. flavipinnis*)	756
Gindai (*P. zonatus)*	697
Ta'ape (*L. kasmira*)	191
Other Snappers	1,156
Jacks (*C. ignobilis, C. lugubris*)	1,204
Amberjack (*S. dumerili)*	29
Other Jacks	3,297
Groupers (*C. urodeta, E. fasciatus, V. louti*)	2,702
Other Groupers	2,543
Emperors (*L. rubrioperculatus*)	4,620
Other Emperors	16,039
Total	**55,759**

*Bottomfishing method only

Table 2. Commercial Bottomfish Average Prices for 2002

Species	Average $/lb
Amberjack	2.68
Ehu	3.72
Kalikali	3.00
Lehi	3.88
Onaga	4.75
Opakapaka	3.76
Uku	2.56
Gindai	3.88
Black Jack	2.50
Misc. Jacks	2.56
Groupers	2.97
Emperors	2.69
Snappers	2.57
Red Snapper (Tagafi)	2.50
Misc. Bottomfish	2.90

Figure 1a. Harvest of All Bottomfish Species

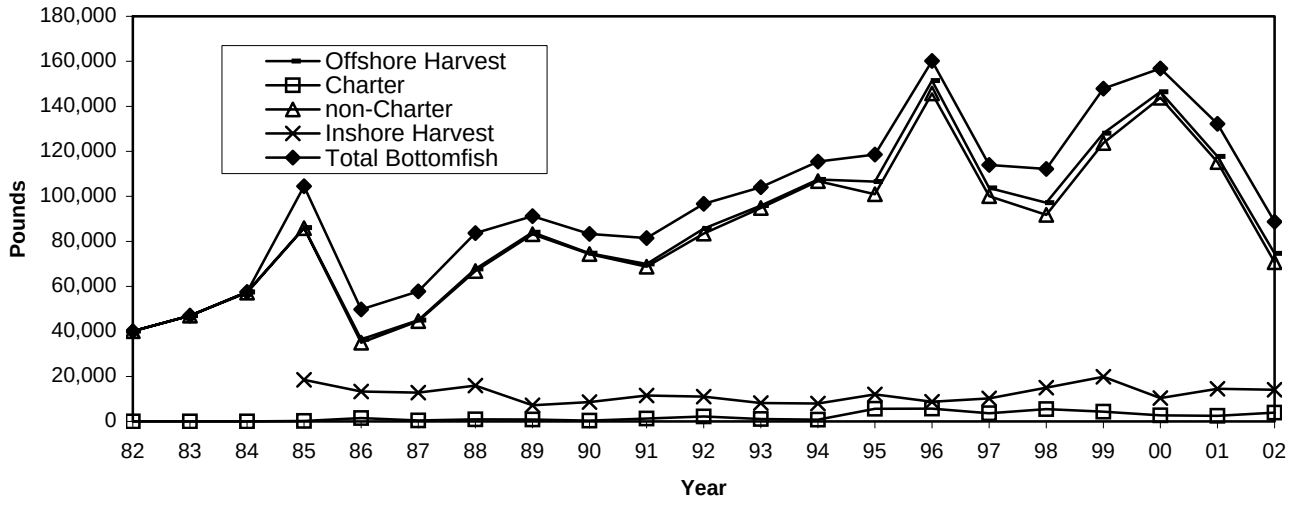
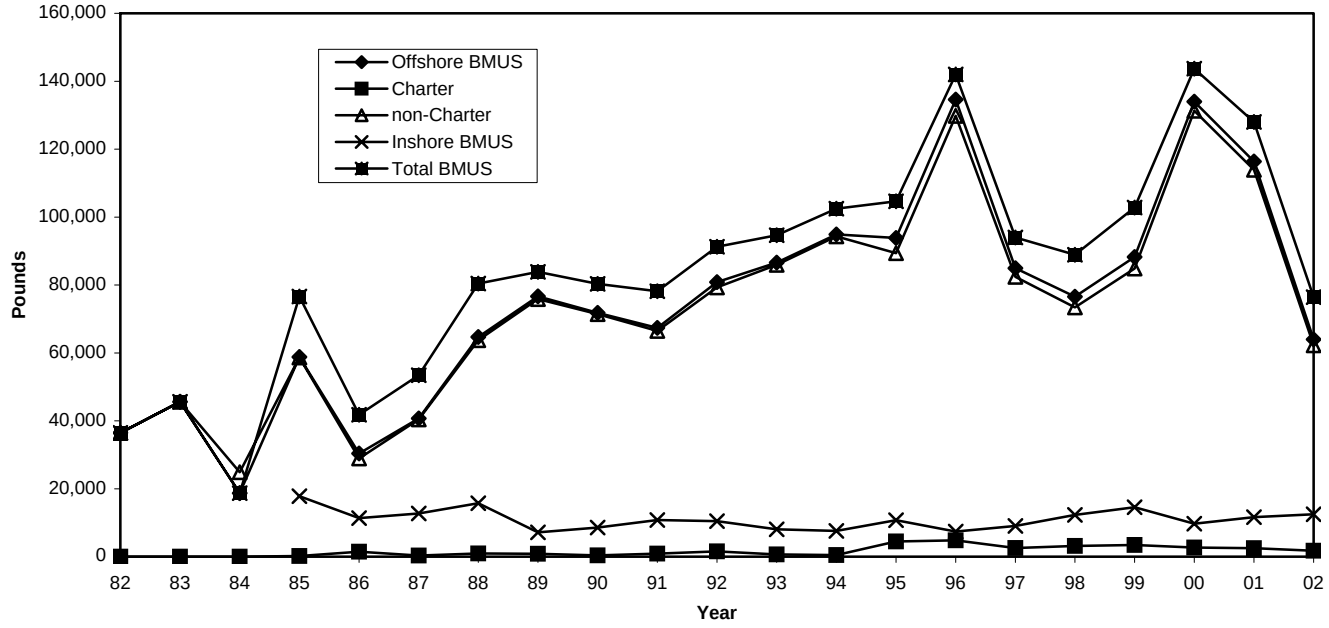


Figure 1b. Harvest of BMUS Species



Interpretations: Historically, annual fluctuations of BMUS landings were usually due to highliners entering or leaving the fishery during a given year. The peak in 1985 of BMUS species harvested was the result of a number of highliner fishermen who fished in 1985 and then left the following year.

In 2002, a decrease in bottomfish and BMUS harvest was observed. Total bottomfish decreased 33%, with the non-charter and charter sectors decreasing 39% and increased 58% respectively. BMUS harvest decreased 40%, with non-charter and charter sectors decreasing 45% and 31% respectively. Offshore methods made up 84% of the total bottomfish and BMUS catch for 2002.

Source: The DAWR offshore creel survey data as expanded by computer-based algorithms by method of fishing. All unidentified catch was allocated to species categories based on the species percentage of the total catch.

Calculations: The estimated total landings of the bottomfish species are selected from the expanded creel survey species composition files. However, the expanded estimates of catch by species must include at least 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).

Year	Total Bottomfish Harvest (lbs)	Offshore Creel Harvest (lbs)	Inshore Creel Harvest (lbs)	Non-charter Harvest (lbs)	Charter Harvest (lbs)
82	40,080	40,080		40,060	20
83	46,976	46,976		46,976	0
84	57,523	57,523		57,197	0
85	104,526	86,075	18,451	85,887	188
86	49,748	36,441	13,307	34,966	1,475
87	57,806	45,034	12,772	44,576	458
88	83,668	67,773	15,895	66,842	931
89	91,201	84,016	7,185	83,168	848
90	83,334	74,718	8,616	74,334	384
91	81,491	69,985	11,506	68,739	1,246
92	96,692	85,657	11,035	83,476	2,181
93	104,044	95,887	8,157	94,838	1,049
94	115,473	107,512	7,961	106,757	755
95	118,576	106,561	12,015	100,980	5,581
96	160,196	151,444	8,752	145,769	5,674
97	113,945	103,707	10,238	100,099	3,607
98	112,181	97,187	14,994	91,745	5,442
99	147,837	128,008	19,829	123,678	4,330
00	156,853	146,481	10,372	143,808	2,673
01	132,260	117,735	14,525	115,252	2,482
02	**88,840**	**74,655**	**14,085**	**70,724**	**3,931**
Average	97,293	86,831	12,205	84,756	2,060
Std. deviation	35,078	32,822	3,618	31,587	1,956

Year	Total BMUS Harvest (lbs)	Offshore Creel Harvest (lbs)	Inshore Creel Harvest (lbs)	Non-charter BMUS Harvest (lbs)	Charter BMUS Harvest (lbs)
82	36,449	36,449		36,429	20
83	45,609	45,609		45,609	0
84	18,707	18,707		24,884	0
85	76,623	58,816	17,807	58,643	174
86	41,775	30,411	11,364	28,936	1,475
87	53,430	40,722	12,708	40,410	311
88	80,422	64,696	15,726	63,764	931
89	83,844	76,678	7,166	75,831	848
90	80,353	71,791	8,562	71,437	354
91	78,159	67,358	10,801	66,464	894
92	91,275	80,826	10,449	79,287	1,539
93	94,659	86,595	8,064	85,930	665
94	102,452	94,886	7,566	94,316	470
95	104,629	93,875	10,754	89,392	4,483
96	142,022	134,624	7,398	129,819	4,805
97	94,015	84,946	9,069	82,381	2,565
98	88,899	76,580	12,319	73,412	3,168
99	102,801	88,258	14,543	84,830	3,428
00	143,707	133,984	9,723	131,311	2,673
01	128,025	116,386	11,639	113,904	2,492
02	**76,434**	**63,971**	**12,463**	**62,252**	**1,720**
Average	84,014	74,579	11,007	73,297	1,572
Std. deviation	32,533	30,971	2,954	29,432	1,480

Figure 2a. Total and Commercial BMUS Harvest

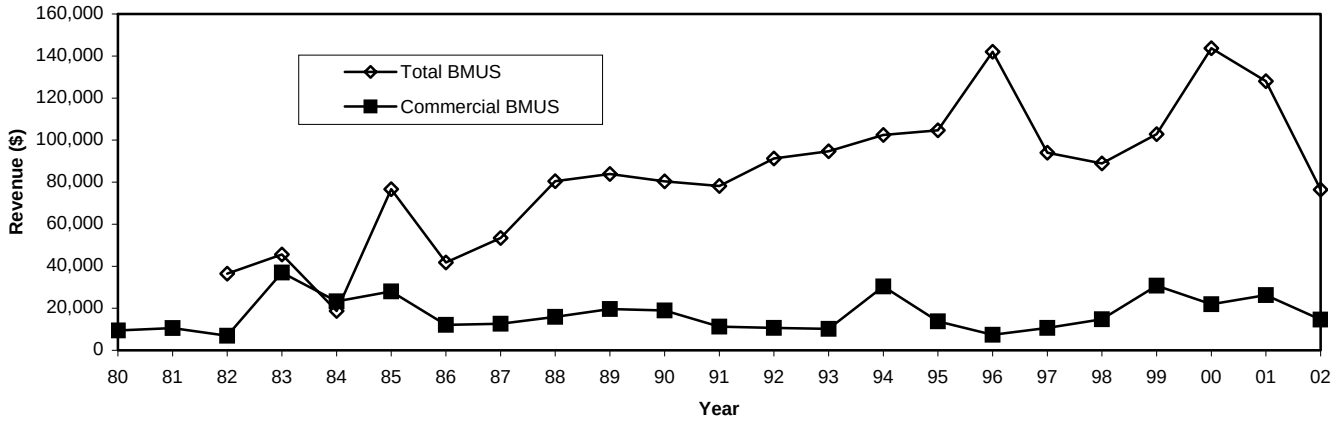
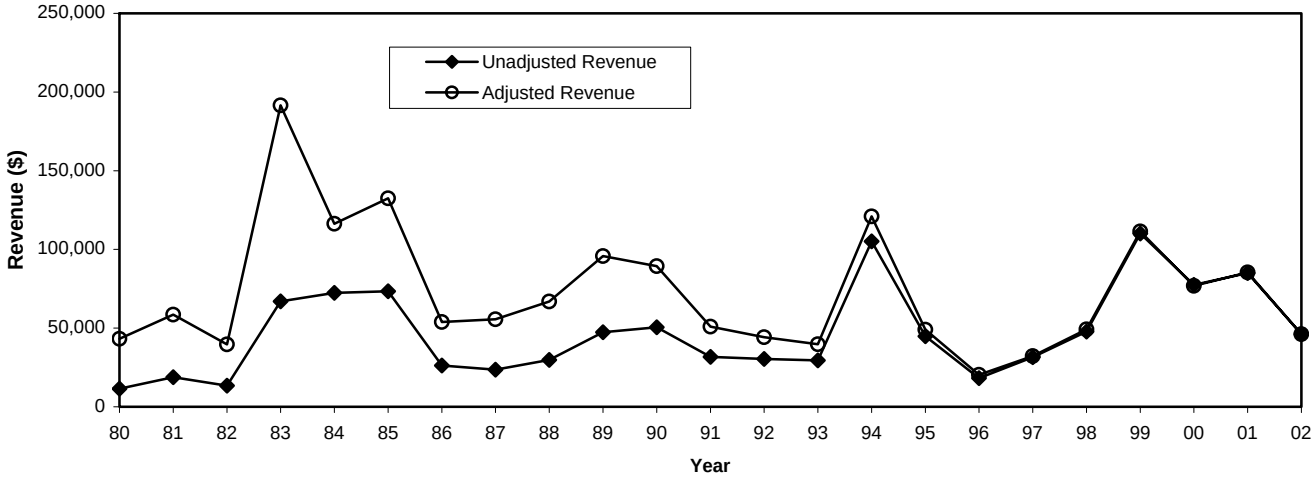


Figure 2b. Commercial BMUS Revenue



Interpretations: Highliners have been responsible for the peaks in the commercial BMUS landings, especially in 1983, 1985, 1994, 1998, and 1999. The threefold increase in the commercial BMUS harvest and revenue in 1994 was the result of highliner vessels entering into the fishery that year. The 39% reduction in BMUS harvest and 56% decline in commercial harvest for 1995 is best explained by the absence or reduced effort of approximately six highliners who were responsible between 1992 and 1996 for 18% of the total BMUS harvests between 1992 and 1996, and 68% of the unexpanded commercial landings. Harvest records for these highliners indicate a 45% reduction in 1995 of their total bottomfish harvest, dropping from 13,349 pounds in 1994, down to 6,023 pounds in 1995. This decline in highliner landings accounts for about two-thirds of the 1995 reduction in commercial BMUS harvest.

The peak in 1996 followed by a 46% decline the following year in total BMUS harvest is believed to have been influenced more by weather conditions than any other factor. In 1997, storms decreased the number of calm fishing days.

In 2002, there were two direct hits by supertyphoons and an increase in the number of bad weather days that

decreased bottomfishing. Total BMUS harvest decreased 40%, with the commercial harvest decreasing 44%. Adjusted revenue decreased 46%.

Source: The estimated total landings are from the DAWR creel survey system, 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.

Year	Total BMUS Harvest (lbs)*	Commercial BMUS Harvest (lbs)	Unadjusted Revenue ($)	Adjusted Revenue ($)
80		9,434	11,528	43,185
81		10,596	18,825	58,547
82	36,449	6,947	13,412	39,672
83	45,609	36,984	67,013	191,501
84	18,707	23,291	72,349	116,281
85	76,623	28,028	73,438	132,451
86	41,775	12,110	26,219	53,836
87	53,430	12,639	23,551	55,581
88	80,422	15,933	29,818	66,882
89	83,844	19,630	47,365	95,820
90	80,353	18,916	50,479	89,398
91	78,159	11,278	31,703	50,915
92	91,275	10,668	30,355	44,257
93	94,659	10,191	29,526	39,742
94	102,452	30,356	105,126	121,000
95	104,629	13,815	44,865	49,037
96	142,022	7,389	18,229	20,332
97	94,015	10,621	31,485	32,273
98	88,899	14,737	47,770	49,251
99	102,801	30,757	110,066	111,387
00	143,707	21,924	77,474	76,854
01	128,025	26,289	84,999	85,424
02	**76,434**	**14,639**	**46,145**	**46,145**
Average	84,014	17,268	47,467	72,603
Std. deviation	32,533	8,432	28,465	40,358

*includes harvest from Inshore Creel Survey

Figure 3a. Estimated Bottomfish Boat Hours

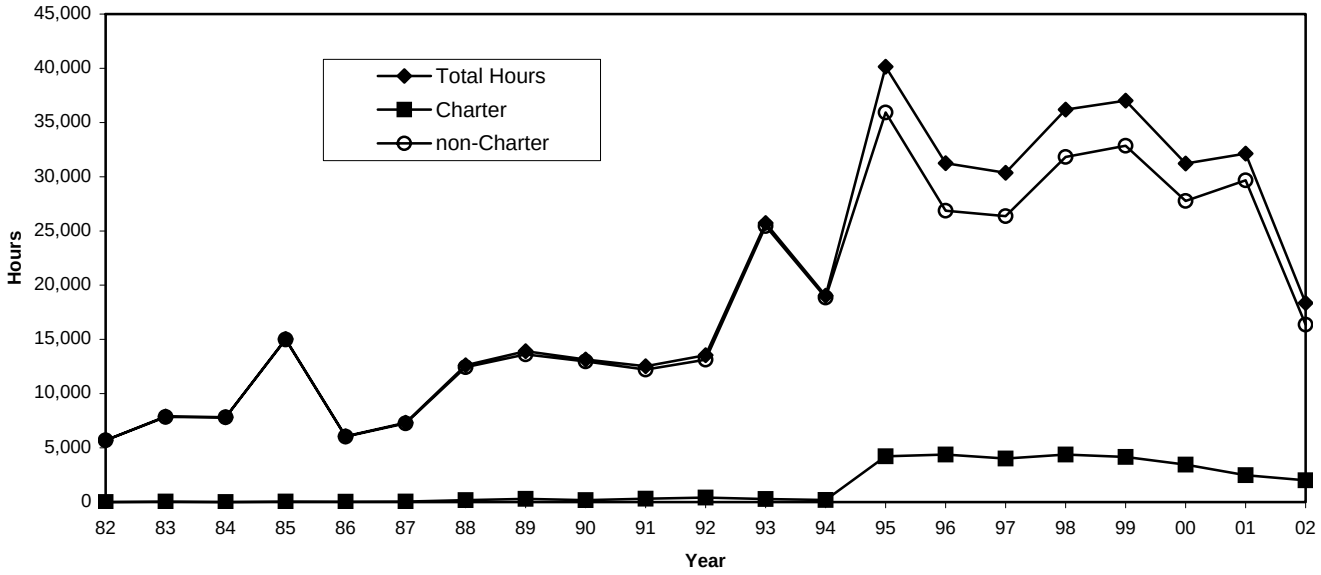
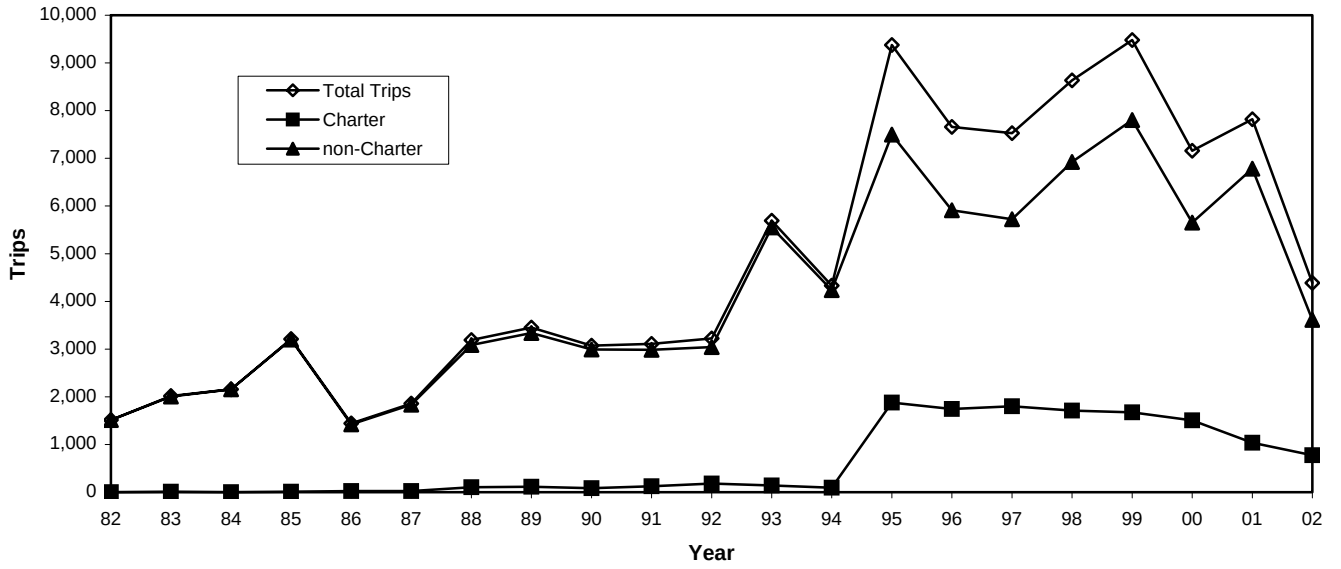


Figure 3b. Estimated Bottomfish Trips



Interpretations: The threefold increase in boating hours and doubling of bottomfish trips in 1995 may have been due to the 60% increase in the number of boats entering the fishery that year, the number of calm days that year compared with previous years, and the inclusion of the Agat Marina into the offshore survey in 1994. That year, the charter boat component of the bottomfish fishery accounted for 23% of the total number of bottomfishing trips and 13% of the hours fished. This increase was due to several charter bottomfishing vessels operating out of Agat that made multiple trips on each survey day. The number of charter trips decreased after 1997, possibly due to tourists participating in less expensive types of recreation. The slight declines in bottomfishing trips and hours in 1996 and 1997 were due to a number of typhoons that hit Guam those years. A return to more normal weather patterns in 1999 best explains the increases that year. The

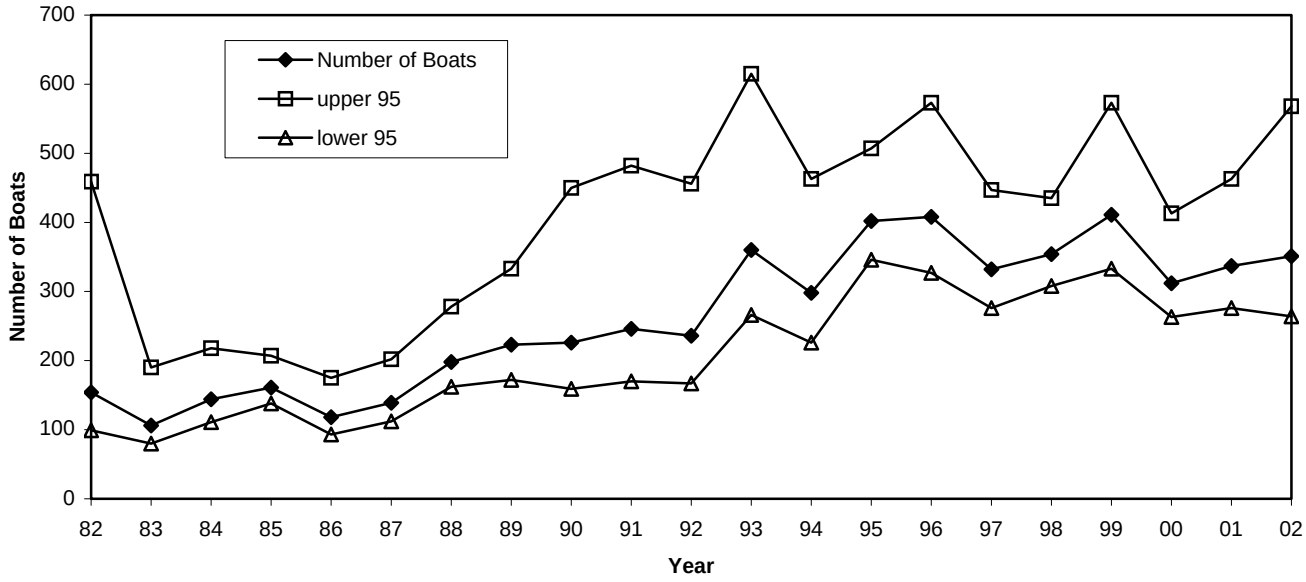
decreases in boating hours and trips observed in 2000 could be due to fishermen dropping out of the fishery due to poor catches in the shallow bottom complex. In 2002, overall hours and trips decreased significantly, 43% and 44% respectively, with non-charter hours and trips decreasing 45% and 47% respectively. The charter hours and trips also decreased, significantly 18% and 25% respectively. This sector, which is tourist dependent, continues to decrease due to a decrease in tourist numbers, a shift to less expensive activities by tourists, and the number of storms preventing tourists from visiting Guam year round.

Source: The DAWR creel survey data for bottomfishing method.

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

Year	Total Hours	Non-charter hours	Charter hours	Total Trips	Non-charter trips	Charter trips
85	15,037	14,989	48	3,212	3,201	11
86	6,058	6,033	25	1,444	1,422	23
87	7,313	7,264	49	1,857	1,835	22
88	12,611	12,435	176	3,190	3,085	105
89	13,910	13,615	295	3,452	3,338	114
90	13,143	12,967	176	3,071	2,988	83
91	12,527	12,217	310	3,109	2,986	123
92	13,550	13,138	412	3,234	3,054	180
93	25,733	25,458	275	5,692	5,551	141
94	19,038	18,849	189	4,331	4,238	93
95	40,153	35,927	4,226	9,376	7,498	1,878
96	31,249	26,863	4,386	7,657	5,912	1,745
97	30,370	26,360	4,010	7,527	5,724	1,803
98	36,198	31,822	4,376	8,636	6,924	1,712
99	37,019	32,860	4,159	9,479	7,804	1,675
00	31,216	27,760	3,457	7,159	5,654	1,505
01	32,140	29,665	2,428	7,820	6,783	1,038
02	**18,357**	**16,357**	**2,000**	**4,387**	**3,613**	**774**
Average	19,858	18,378	1,480	4,777	4,156	621
Std. deviation	11,440	9,817	1,820	2,736	2,052	759

Figure 4. Bottomfish Fishery Participation



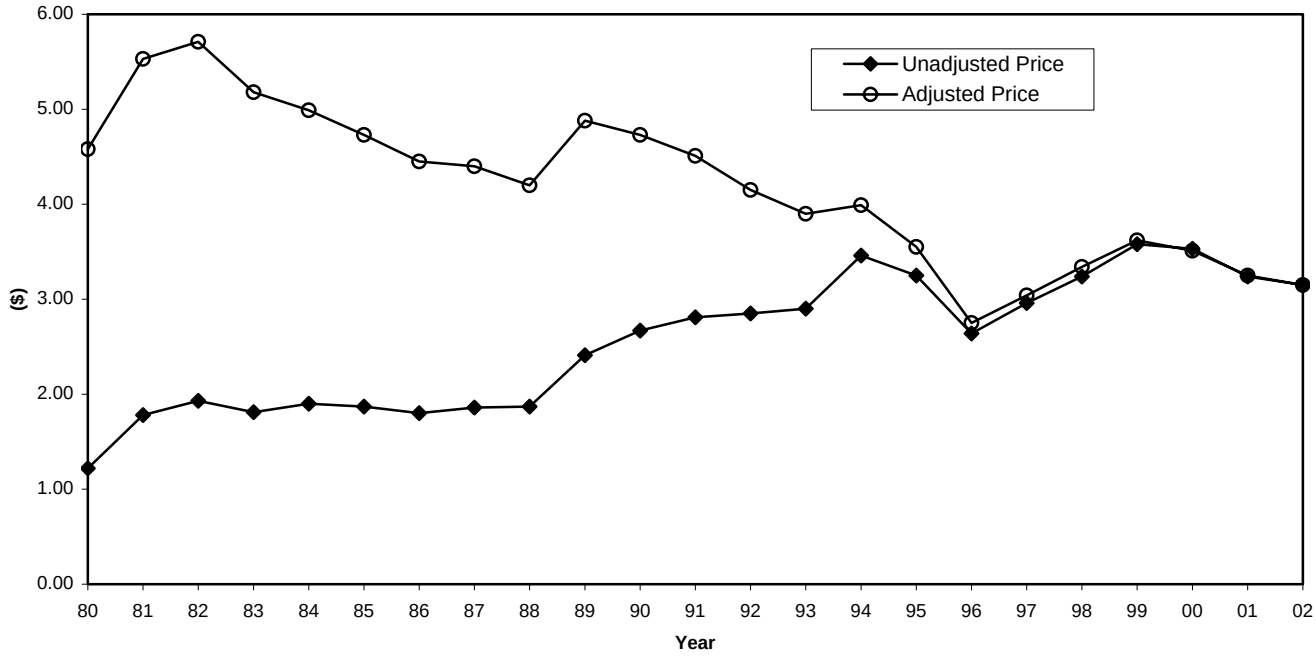
Interpretations: The number of boats participating in this fishery has leveled off in recent years, but generally increases during years having ideal weather conditions, available marketing opportunities, and a thriving economy. The 57% increase in participation from 1992 and 1993 could be due to the inclusion of the Merizo Pier as a survey site, as well as a healthy economy that made it possible for more residents to afford boats. Another 57% increase occurred in 1995 due to the inclusion of the Agat Marina as an offshore creel survey site in October 1994. Although two major storms damaged boats during 2002, the number of unique boats bottomfishing increased slightly at 4%.

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

Calculations: The 2002 figure 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 rid the model of occasional outlier estimates; and finally calculating the mean and standard deviation for the remaining 950 estimates. The removal of the outliers conducted in the second step lowered the original estimated number of boats after the model was run 1,000 times by about 1%, but more important, reduced the standard deviation by approximately 20%.

Year	Lower95	Number of boats	Upper 95
82	99	154	459
83	80	106	190
84	111	144	218
85	138	161	207
86	93	118	175
87	112	139	202
88	162	198	278
89	172	223	333
90	159	226	450
91	170	246	482
92	167	236	456
93	266	360	615
94	226	298	463
95	346	402	507
96	327	408	573
97	276	332	447
98	308	354	435
99	333	411	573
00	263	312	413
01	276	337	463
02	**264**	**351**	**568**
Average	207	263	405
Std. Deviation	87	102	141

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. These roadside vendors were shut down by the Department of Public Health due to health concerns, which resulted in the rise of locally caught bottomfish prices since less expensive fish from Micronesia could not be easily imported. However, fish from Micronesia and the Philippines is allowed to enter the local market, competing with locally caught fish. The adjusted average price for bottomfish has been increasing slightly from 1996 to 1999, and could likely have been the result of increased demand for a dwindling supply of locally caught fish. A slight decrease in fish prices occurred in 2002, decreasing 3%.

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 CPI and CPI Adjustment Factor was 499.4 and 1.01 for 2001, and 502.00 and 1.00 for 2002 respectively.

Year	Unadjusted Price $/lb	Adjusted Price $/lb
80	1.22	4.58
81	1.78	5.53
82	1.93	5.71
83	1.81	5.18
84	1.90	4.99
85	1.87	4.73
86	1.80	4.45
87	1.86	4.40
88	1.87	4.20
89	2.41	4.88
90	2.67	4.73
91	2.81	4.51
92	2.85	4.15
93	2.90	3.90
94	3.46	3.99
95	3.25	3.55
96	2.64	2.75
97	2.96	3.04
98	3.24	3.34
99	3.58	3.62
00	3.53	3.51
01	3.24	3.25
02	**3.15**	**3.15**
Average	2.55	4.18
Std.deviation	0.70	0.81

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

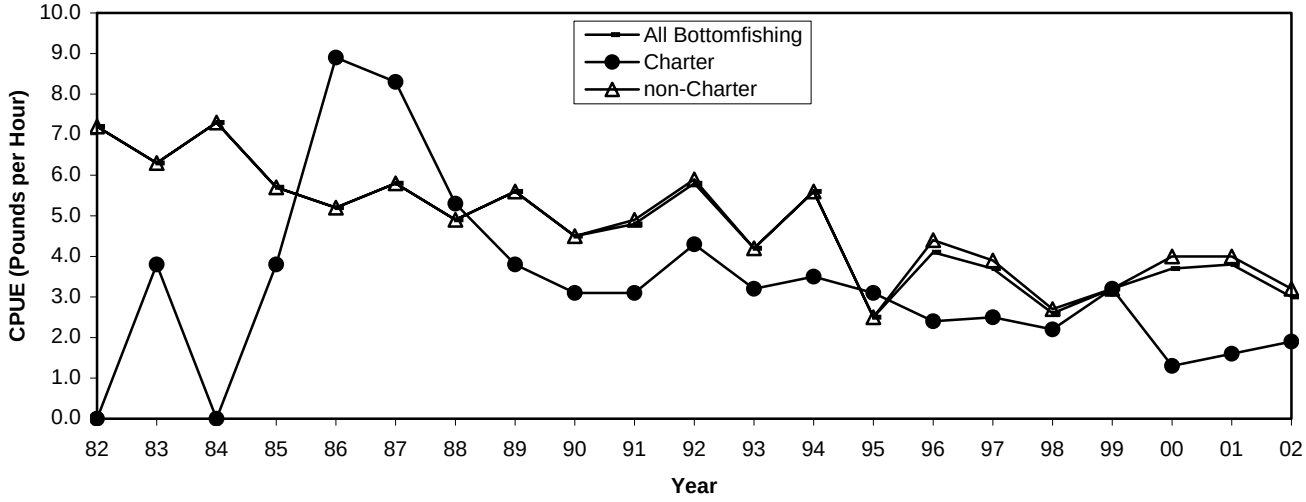


Figure 6b. Deepwater CPUE: Overall, Charter, and Non-charter

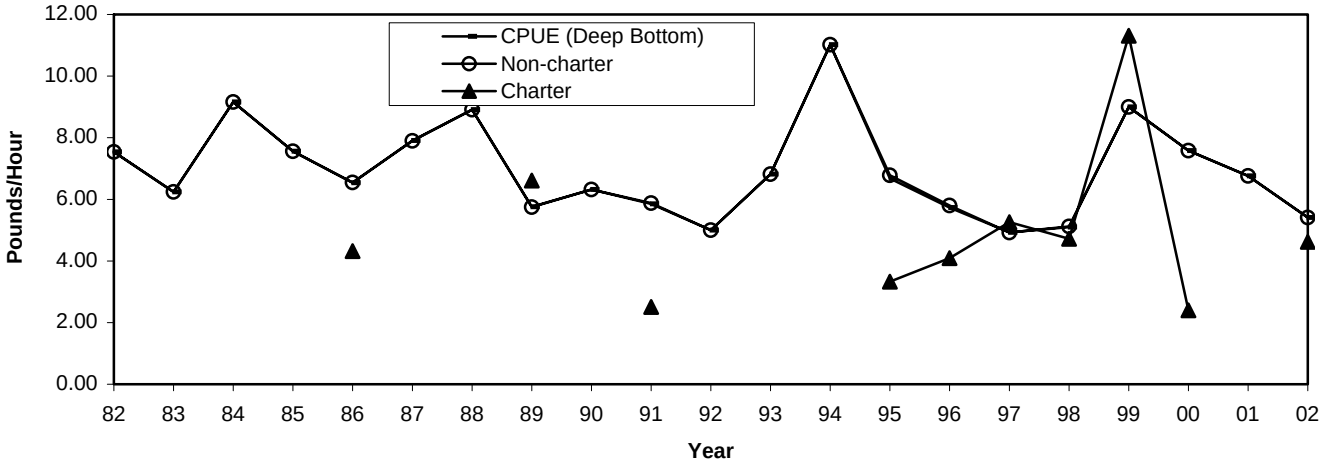
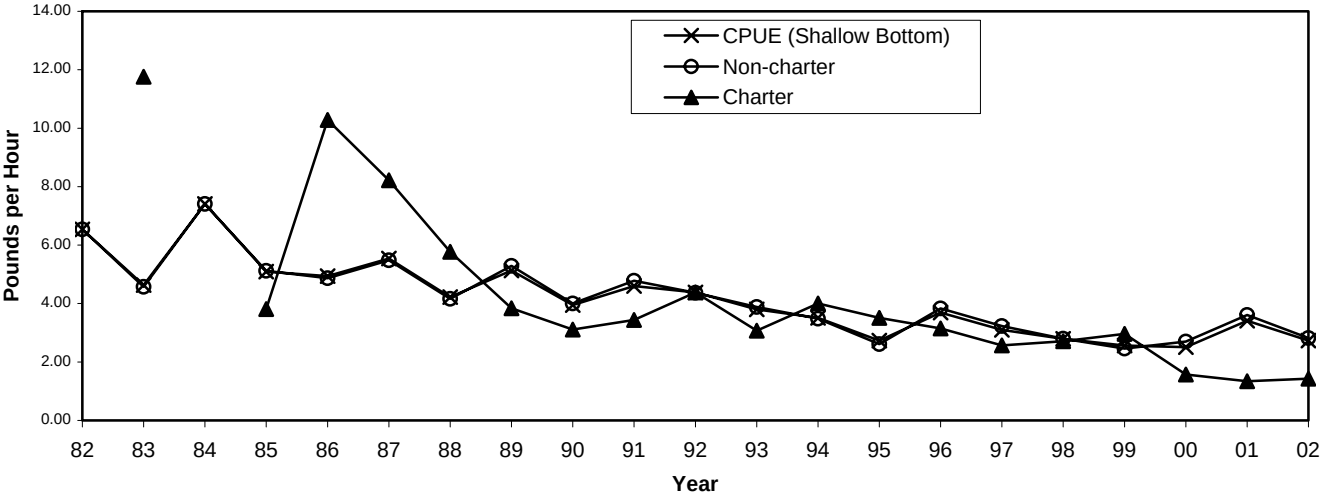


Figure 6c. Shallow Water CPUE: Overall, Charter, and Non-charter



Interpretations: Prior to 1999, the CPUE for bottomfishing was reported as a single value. Because of yellow light situations in 1995 and 1998, the fishery was divided into charter and non-charter components. This was done to separate out the activity of charter boats in Agat that had high effort and low catches that may have skewed the overall CPUE. These boats would sometimes have over 30 guests and fish in the same area year after year, resulting in poor catch rates. Separating out the charter fishing resulted in a CPUE value more representative of bottomfishing.

Historically, CPUE fluctuated between 4-6 pounds per hour and has, until the last five years, remained fairly stable. 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; most of which target the shallow-water bottomfish complex. Both 1995 and 1998 CPUE figures 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 those years. This indicates stress on the fishery, despite the rise in CPUE since 1999. A significant decrease in overall CPUE was observed in 2002, 21%. The charter CPUE increased 19% while the CPUE for non-charter boats decreased 20%. The 2001 CPUE values for all these CPUE values are still well below the 21-year average. For deep bottomfishing, overall and non-charter CPUE decreased 20%. For shallow bottomfishing, overall CPUE decreased 20%, non-charter CPUE decreased 22%, and charter CPUE increased 7%.

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

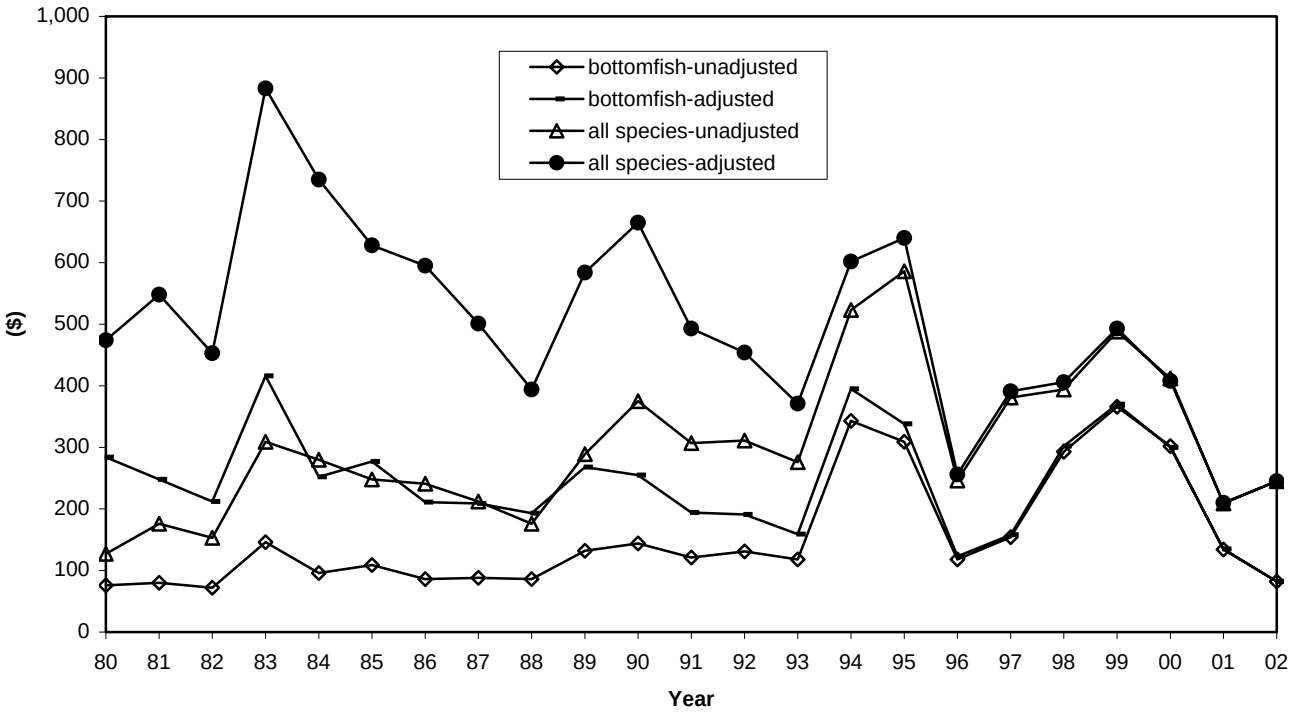
Calculations: The yearly catch-per-unit-effort (CPUE) is calculated by using the year-end survey totals and dividing the total weight of bottomfish landed by the total number of hours spent bottomfishing.

	Catch per Unit Effort (lbs/hr)		
Year	**All Bottomfishing**	**Non-charter**	**Charter**
82	7.2	7.2	0
83	6.3	6.3	3.8
84	7.3	7.3	0
85	5.7	5.7	3.8
86	5.2	5.2	8.9
87	5.8	5.8	8.3
88	4.9	4.9	5.3
89	5.6	5.6	3.8
90	4.5	4.5	3.1
91	4.8	4.9	3.1
92	5.8	5.9	4.3
93	4.2	4.2	3.2
94	5.6	5.6	3.5
95	2.5	2.5	3.1
96	4.1	4.4	2.4
97	3.7	3.9	2.5
98	2.6	2.7	2.2
99	3.2	3.2	3.2
00	3.7	4.0	1.3
01	3.8	4.0	1.6
02	**3.0**	**3.2**	**1.9**
Average	4.7	4.8	3.3

	Std.deviation	1.4		1.3	2.2	

Year	Deep Bottom	Non-charter CPUE	Charter CPUE	Shallow Bottom	Non-charter CPUE	Charter CPUE
82	7.54	7.54		6.54	6.54	
83	6.24	6.24		4.63	4.57	11.76
84	9.16	9.16		7.41	7.41	
85	7.56	7.56		5.09	5.12	3.81
86	6.54	6.55	4.32	4.94	4.87	10.28
87	7.91	7.91		5.54	5.48	8.22
88	8.91	8.91		4.22	4.16	5.77
89	5.76	5.75	6.61	5.13	5.29	3.84
90	6.32	6.32		3.95	4.00	3.11
91	5.85	5.88	2.51	4.60	4.78	3.44
92	5.00	5.00		4.38	4.37	4.38
93	6.82	6.82		3.80	3.88	3.07
94	11.02	11.02		3.51	3.48	4.00
95	6.68	6.78	3.33	2.73	2.61	3.51
96	5.73	5.80	4.09	3.69	3.83	3.15
97	4.93	4.92	5.26	3.10	3.23	2.57
98	5.10	5.12	4.72	2.79	2.80	2.71
99	9.00	8.74	11.31	2.56	2.46	2.96
00	7.58	7.66	2.40	2.51	2.70	1.57
01	6.76	6.76		3.41	3.61	1.34
02	**5.41**	**5.47**	**4.62**	**2.73**	**2.82**	**1.43**
Average	6.9	7.0	4.9	4.4	4.2	4.3
Std. deviation	1.6	1.6	2.6	1.3	1.3	2.9

Figure 7. Average Revenue per Trip



Interpretations: The 2002 inflation-adjusted average revenue per trip for the "bottomfish" and "all species" categories decreased 40% and increased 17% respectively. Decreases in revenue in previous years were due to several highliners selling their catch to vendors not participating the commercial receipt book program, and an increase in the amount of imported bottomfish from Micronesia that began around 1991 with the addition of frequent airline routes to Guam. The increase in the inflation-adjusted average revenue per trip in 1994 is best explained by the success of a few highliner vessels during that year. Locally caught bottomfish has an advantage with marketing due to the closure of roadside vendors selling imported fish and a preference to purchase locally caught fish.

Source: The commercial landings data from vendors participating in Fisheries' 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.

Year	$/Trip, Unadjusted Bottomfish	$/Trip, Adjusted Bottomfish	$/Trip, Unadjusted All Species	$/Trip, Adjusted All Species
80	76	284	127	474
81	80	248	176	548
82	72	212	153	453
83	146	416	309	883
84	96	252	280	735
85	109	277	248	628
86	86	211	241	595
87	88	209	212	501
88	86	193	176	394
89	132	268	289	584
90	144	255	375	665
91	121	194	307	493
92	131	191	311	454
93	118	159	276	371
94	343	395	523	602
95	309	338	586	640
96	118	123	246	256
97	154	158	381	391
98	293	302	394	406
99	366	370	488	493
00	302	300	412	408
01	134	135	209	210
02	**82**	**82**	**245**	**245**
Average	156	242	303	497
Std. deviation	94	87	119	160

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

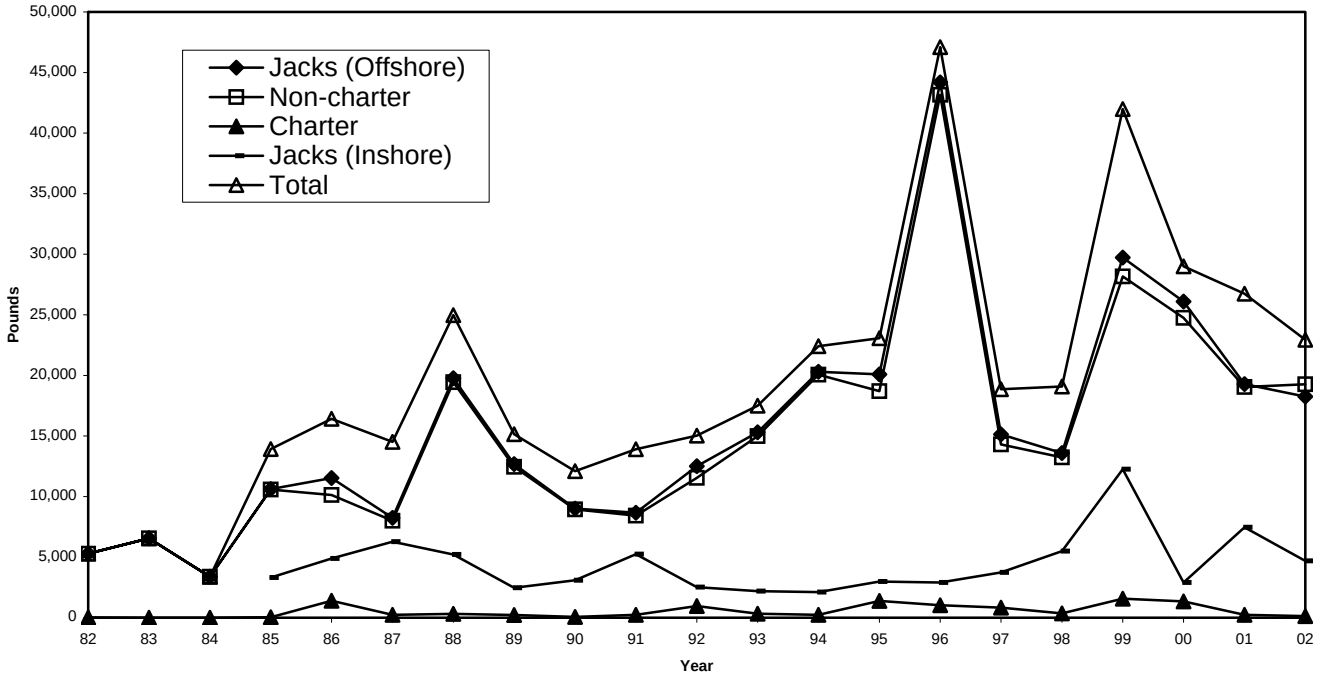


Figure 8b. Jacks/Trevallys *(Caranx, Carangoides*): CPUE

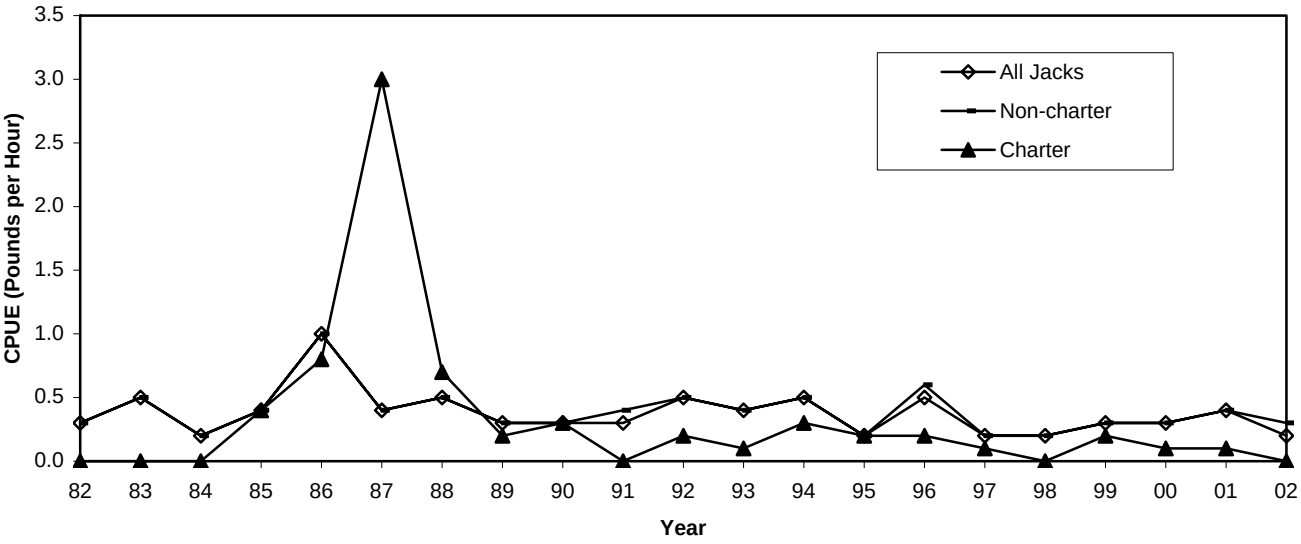


Figure 8c. Average Size Harvested: *Caranx melampygus*

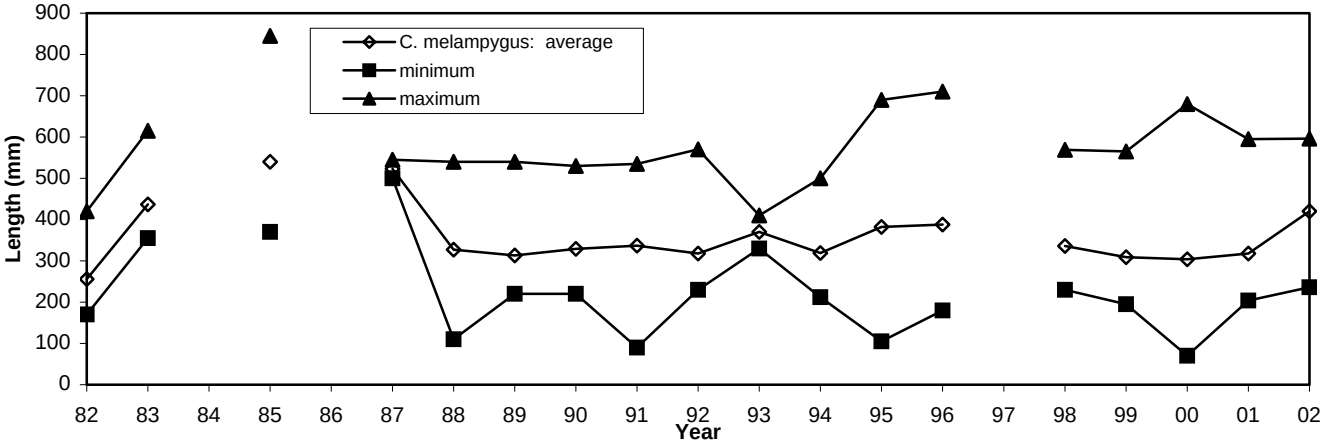


Figure 8d. Average Size Harvested: *Caranx ignobilis*

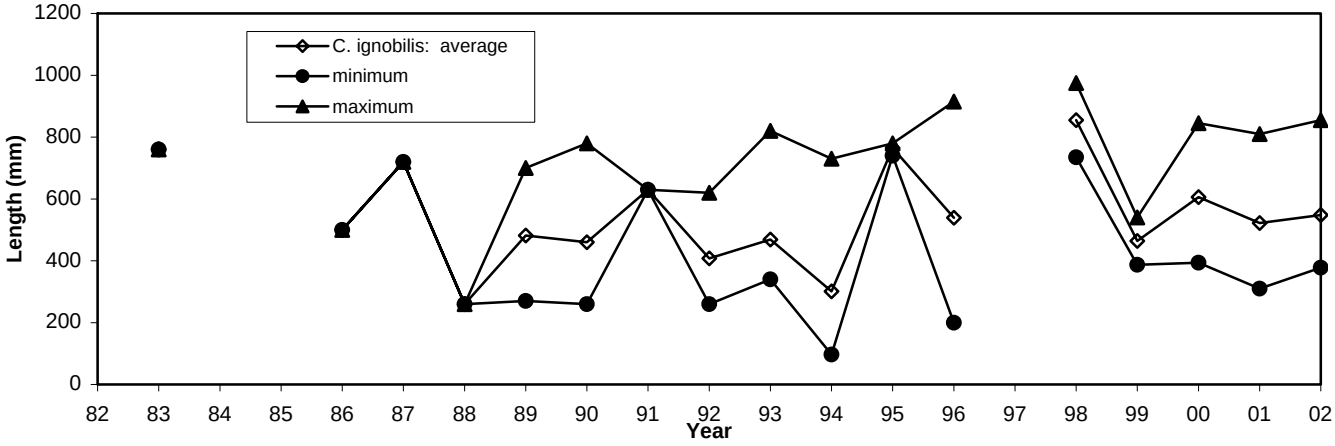
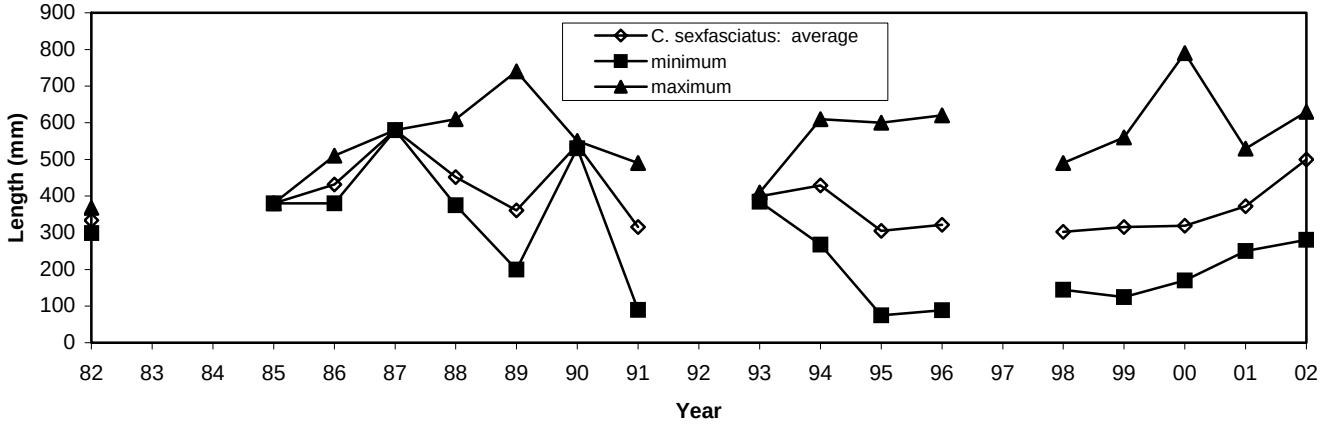


Figure 8e. Average Size Harvested: *Caranx sexfasciatus*



Interpretations: The total, non-charter, and charter harvest of jacks decreased 14%, increased 2%, and decreased 45% respectively in 2002. Total and non-charter CPUE decreased 50% and 25% respectively, with charter CPUE becoming almost negligible. It is hoped that the establishment of the marine preserves on Guam can lead to the increase in number and size of jacks harvested. Juvenile jacks are harvested as a seasonal fishery, making this species of fish targeted during most of its lifespan. The harvesting of juvenile jacks was allowed at the Achang Bay preserve during 2002, which may allow for their take in other preserves. In 2002, offshore fisheries accounted for 80% of the harvest of jacks.

The charter harvest shows extreme fluctuations prior to 1995, then increased fivefold in 1995 with the inclusion of the Agat Marina bottomfish charter boats. Extreme fluctuations in charter harvest and charter CPUE is a reflection of the charter activity in Agat, which account for over 80% of the bottomfish charter activity. These charter boats have high effort, low catches, and fish primarily in the same area over the years, and their low CPUE values in recent years may be an indication of overfishing.

The average size of the three (3) species of jacks over the 21 year period vary show either year-to-year fluctuations or little change. The average size for *C. melampygus* shows less fluctuation, but the average size for 2002 is larger than the 21-year average. The average size for *C. ignobilis* shows greater fluctuations, but the average size in 2002 is similar to the 21-year average. The average size *for C. sexfasciatus* shows less fluctuation than *C. ignobilis*, but the average size in 2002 is significantly larger than the 21-year average. The average maximum sizes for all three jacks were larger in 2002 than the 21-year average, with the average minimum sizes varying.

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

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.

Year	Total Harvest	Offshore Harvest	Offshore Non-charter	Offshore Charter	Inshore Harvest	CPUE All Jacks	CPUE Non-charter	CPUE Charter
82	5,300	5,300	5,280	20		0.3	0.3	0
83	6,557	6,557	6,557	0		0.5	0.5	0
84	3,387	3,387	3,387	0		0.2	0.2	0
85	13,925	10,612	10,577	35	3,313	0.4	0.4	0.4
86	16,418	11,529	10,126	1,404	4,889	1.0	1.0	0.8
87	14.5-9	8,241	7,997	244	6,267	0.4	0.4	3.0
88	24,975	19,764	19,443	321	5,211	0.5	0.5	0.7
89	15,153	12,680	12,454	226	2,473	0.3	0.3	0.2
90	12,096	9,006	8,944	62	3,090	0.3	0.3	0.3
91	13,905	8,660	8,420	240	5,245	0.3	0.4	0
92	15,031	12,508	11,546	962	2,523	0.5	0.5	0.2
93	17,501	15,311	14,984	327	2,190	0.4	0.4	0.1
94	22,418	20,304	20,067	238	2,114	0.5	0.5	0.3

95	23,072	20,082	18,700	1,382	2,990	0.2	0.2	0.2
96	47,093	44,186	43,153	1,032	2,907	0.5	0.6	0.2
97	18,865	15,130	14,301	828	3,735	0.2	0.2	0.1
98	19,084	13,592	13,233	359	5,492	0.2	0.2	0
99	41,986	29,732	28,166	1,566	12,254	0.3	0.3	0.2
00	28,996	26,095	24,753	1,342	2,901	0.3	0.3	0.1
01	26,742	19,277	19,039	238	7,465	0.4	0.4	0.1
02	**22,939**	**18,252**	**19,267**	**132**	**4,687**	**0.2**	**0.3**	**0.0**
Average	19,521	15,598	15,056	522	4,430	0.4	0.4	0.3
Std. deviation	10,716	9.588	9,266	536	2,480	0.2	0.2	0.6

Year	***C.melampygus* (average)**	***C. melampygus* (min)**	***C.melampygus* (max)**	***C.ignobilis* (average)**	***C.ignobilis* (min)**	***C.ignobilis* (max)**	***C.sexfasciatus* (average)**	***C.sexfasciatus* (min)**	***C.sexfasciatus* (max)**
82	256	170	420				334	299	368
83	437	355	615	760	760	760			
84									
85	540	370	845				380	380	380
86				500	500	500	432	380	510
87	523	500	545	720	720	720	580	580	580
88	327	110	540	260	260	260	452	375	610
89	313	220	540	482	270	700	361	200	740
90	329	220	530	460	260	780	540	530	550
91	337	90	535	630	630	630	316	90	490
92	318	230	570	408	260	620			
93	370	330	410	469	340	820	399	385	410
94	319	212	500	301	97	730	429	268	610
95	382	105	690	765	740	780	305	75	600
96	388	180	710	539	200	915	322	89	620
97									
98	336	230	569	855	735	975	303	145	490
99	309	195	565	464	387	540	316	125	560
00	304	70	680	606	394	845	319	170	790
01	318	204	595	522	310	810	372	250	529
02	**420**	**236**	**596**	**548**	**378**	**855**	**500**	**281**	**630**
Average	363	224	581	546	426	720	392	272	557
Std. deviation	76	109	103	162	214	172	86	152	113

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

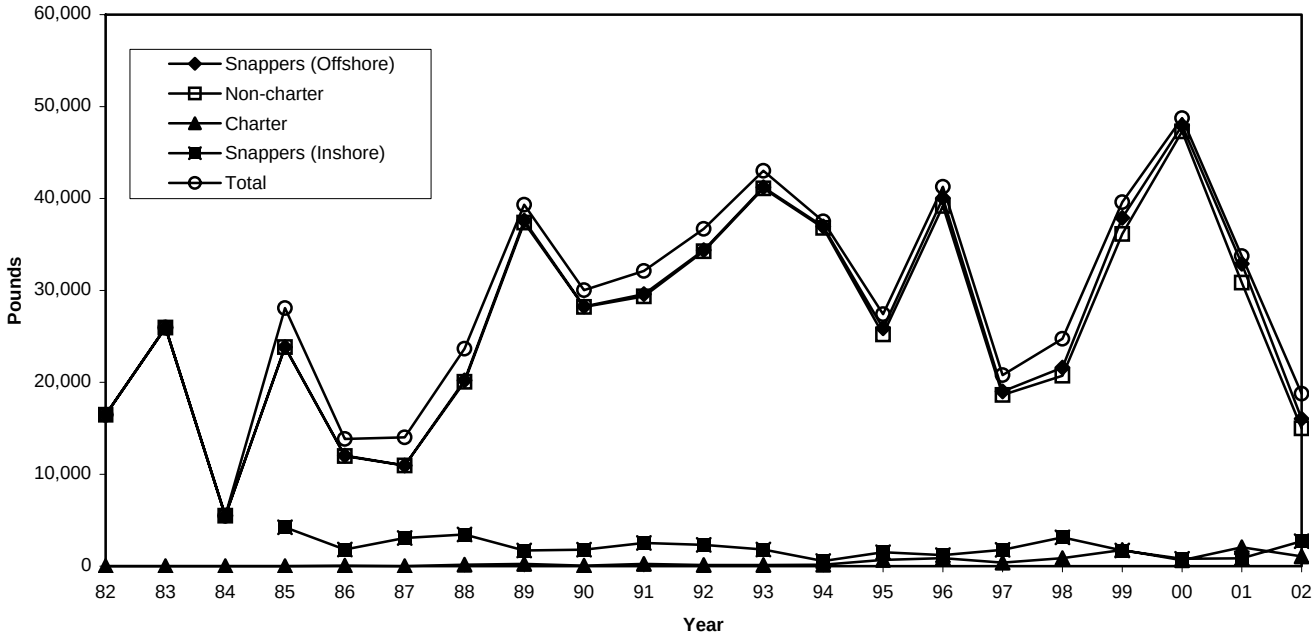


Figure 9b. Snappers *(Lutjanus, Pristipomoides, Aphareus, Etelis*): CPUE

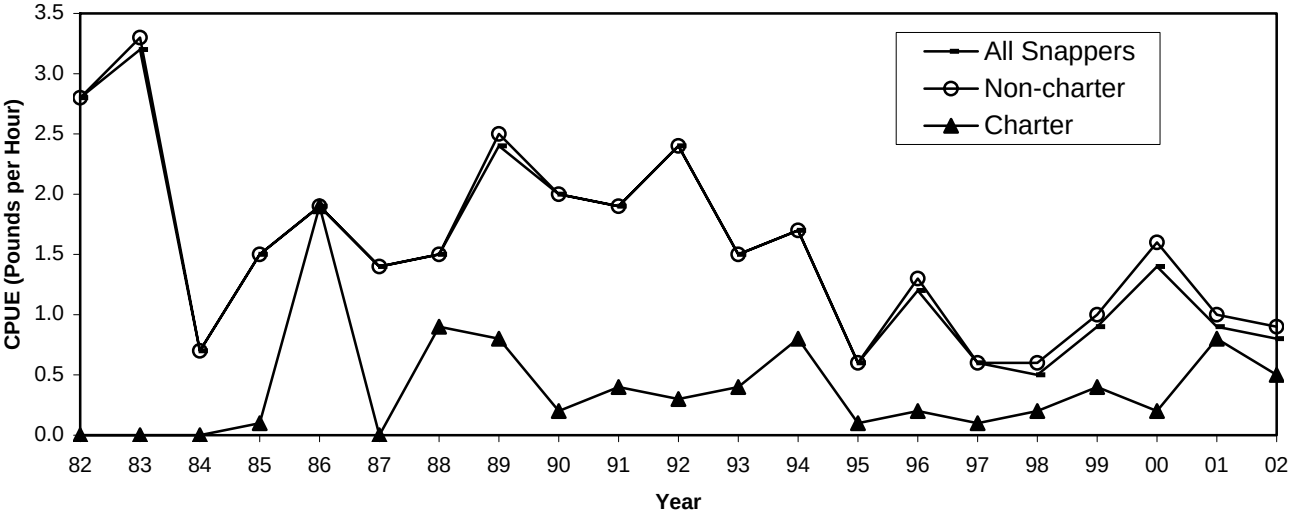


Figure 9c. Average Size Harvested: *Etelis carbunculus*

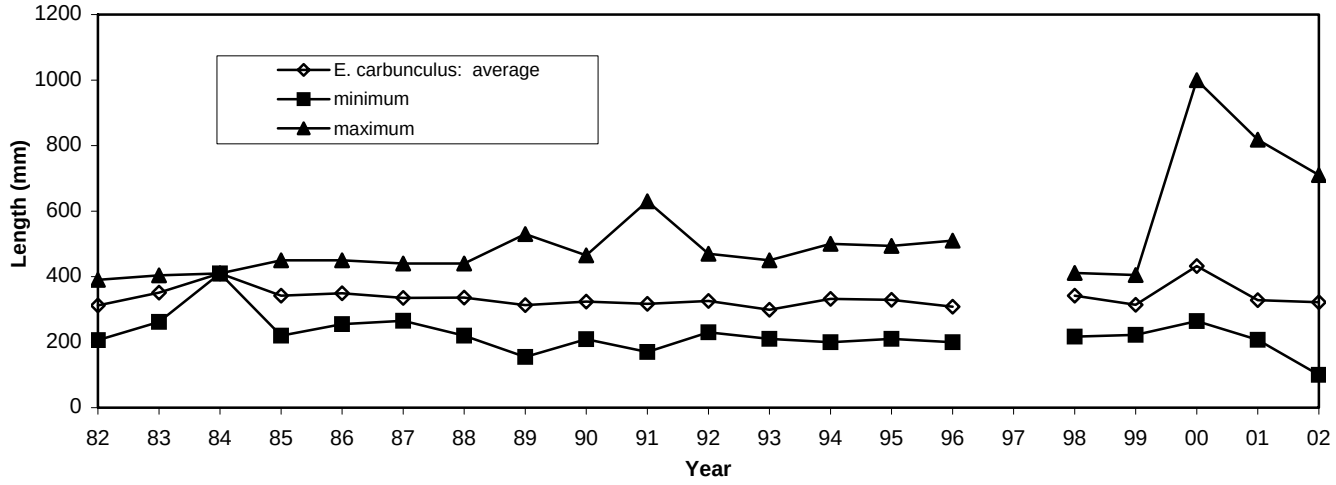


Figure 9d. Average Size Harvested: *Lutjanus kasmira*

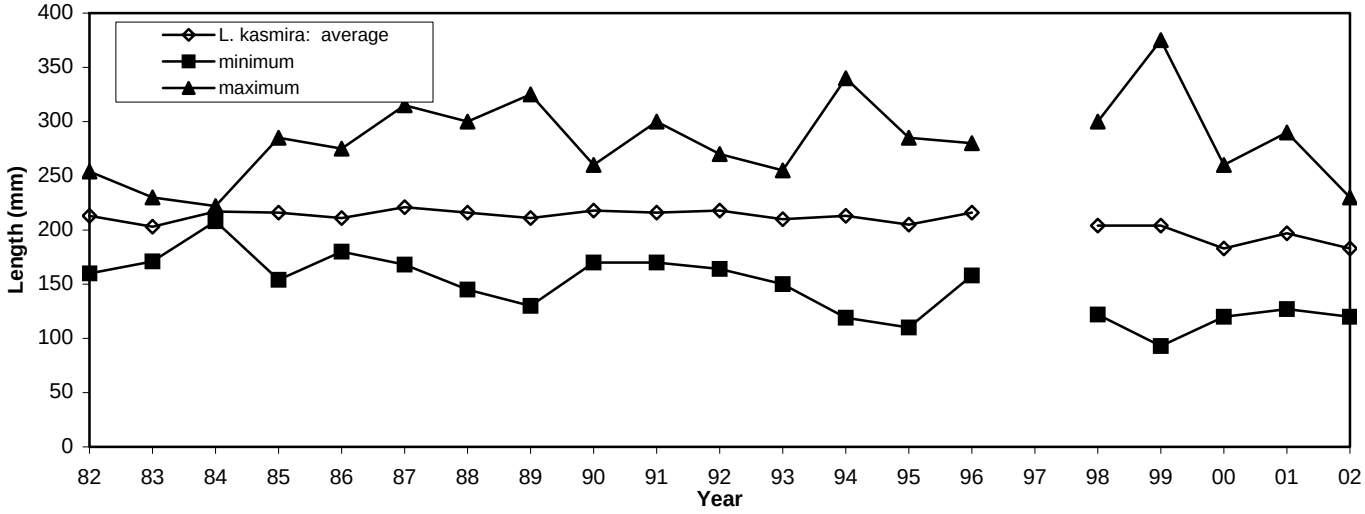
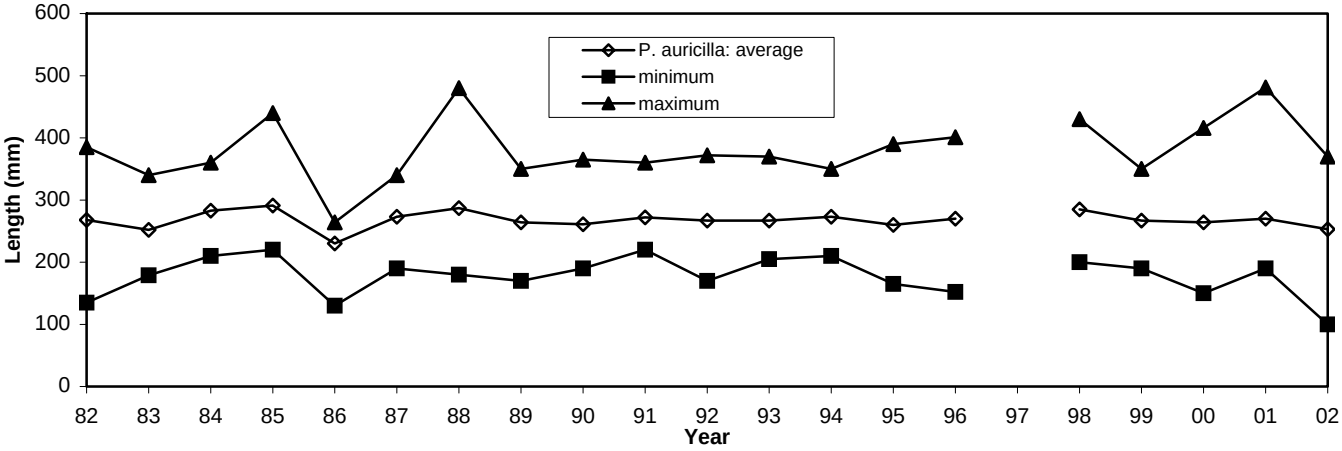


Figure 9e. Average Size Harvested: *Pristipomoides auricilla*



Interpretations: The total, non-charter, and charter harvest of snappers decreased 44%, 51%, and 49% respectively in 2002. The total, non-charter, and charter CPUE decreased 11%, 10%, and 38% respectively. The overall harvest of snappers appeared to be increasing over time, although decreased in harvest were observed the past several years. CPUE, however, appears to show a decreasing trend. The harvest of deepwater snappers is increasing compared with shallower species. Catches of deepwater snappers appear to be interviewed more frequently, as these fishermen usually return during creel census hours. Offshore fisheries made up 85% of the total snapper harvest for 2002.

The average sizes for the three selected snapper species appear to have remained relatively constant for the past 21 years, even with the inclusion of Merizo boat ramp and the Agat marina. Two of the three snapper species are considered deepwater snappers, with both species having 2002 average sizes within one standard deviation. The third snapper species (*L. kasmira*) also shows a relatively constant average size, yet its average size for the past three years has fallen below 200 mm.

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

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.

Year	Total Harvest	Offshore Harvest	Offshore Non-charter	Offshore Charter	Inshore Harvest	CPUE Offshore	CPUE Non-charter	CPUE Charter
82	16,472	16,472	16,472	0		2.8	2.8	0.0
83	25,945	25,945	25,945	0		3.2	3.3	0.0
84	5,475	5,475	5,475	0		0.7	0.7	0.0
85	28,069	23,833	23,830	4	4,236	1.5	1.5	0.1
86	13,845	12,029	11,983	46	1,816	1.9	1.9	1.9
87	14,009	10,951	10,951	0	3,058	1.4	1.4	0.0
88	23,657	20,214	20,054	161	3,443	1.5	1.5	0.9
89	39,314	37,604	37,367	237	1,710	2.4	2.5	0.8
90	30,027	28,242	28,198	44	1,785	2.0	2.0	0.2
91	32,118	29,591	29,352	239	2,527	1.9	1.9	0.4
92	36,692	34,377	34,257	119	2,315	2.4	2.4	0.3
93	43,016	41,214	41,094	120	1,802	1.5	1.5	0.4
94	37,506	36,955	36,802	153	551	1.7	1.7	0.8
95	27,407	25,884	25,209	675	1,523	0.6	0.6	0.1
96	41,262	40,059	39,182	877	1,230	1.2	1.3	0.2
97	20,789	19,014	18,624	391	1,775	0.6	0.6	0.1
98	24,735	21,597	20,720	877	3,138	0.5	0.6	0.2
99	39,605	37,895	36,130	1,765	1,710	0.9	1.0	0.4
00	48,732	47,940	47,289	652	792	1.4	1.6	0.2
01	33,741	32,896	30,843	2,053	845	0.9	1.0	0.8
02	**18,761**	**16,038**	**14,980**	**1,057**	**2,723**	**0.8**	**0.9**	**0.5**
Average	28,627	26,868	26,989	451	2,053	1.5	1.6	0.4
Std. deviation	11,210	11,327	11,120	589	983	0.8	0.8	0.5

Year	*E.carbunculus* (average)	*E.carbunculus* (min)	*E. carbunculus* (max)	*L.kasmira* (average)	*L.kasmira* (min)	*L.kasmira* (max)	*P.auricilla* (average)	*P.auricilla* (min)	*P.auricilla* (max)
82	312	206	390	213	160	254	268	135	385
83	351	262	404	203	171	230	252	179	340
84	410	410	410	217	208	222	283	210	360
85	342	220	450	216	154	285	291	220	440
86	349	255	450	211	180	275	230	130	264
87	335	265	440	221	168	315	273	190	340
88	336	220	440	216	145	300	287	180	480
89	313	155	530	211	130	325	264	170	350
90	324	209	465	218	170	260	261	190	365
91	317	170	630	216	170	300	272	220	360
92	326	230	470	218	164	270	267	170	372
93	299	210	450	210	150	255	267	205	370
94	332	200	500	213	119	340	273	210	350
95	329	210	494	205	110	285	260	165	390
96	308	200	510	216	158	280	270	152	401
97									
98	342	217	411	204	122	300	285	200	430
99	314	222	405	204	93	375	267	190	350
00	432	264	1,000	183	120	260	264	150	416
01	328	207	818	197	127	290	270	190	481
02	**322**	**100**	**710**	**183**	**120**	**230**	**253**	**100**	**370**
Average	336	222	519	209	147	283	268	178	381
Std. deviation	32	59	157	11	28	38	14	32	51

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

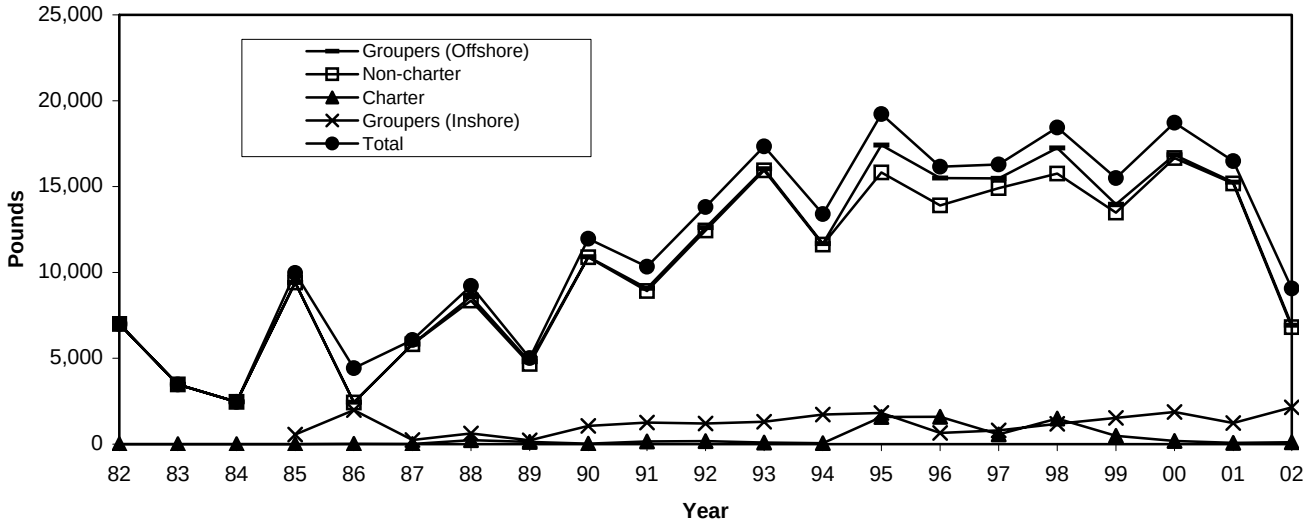


Figure 10b. Groupers *(Epinephelus, Cephalopholis, Variola*): CPUE

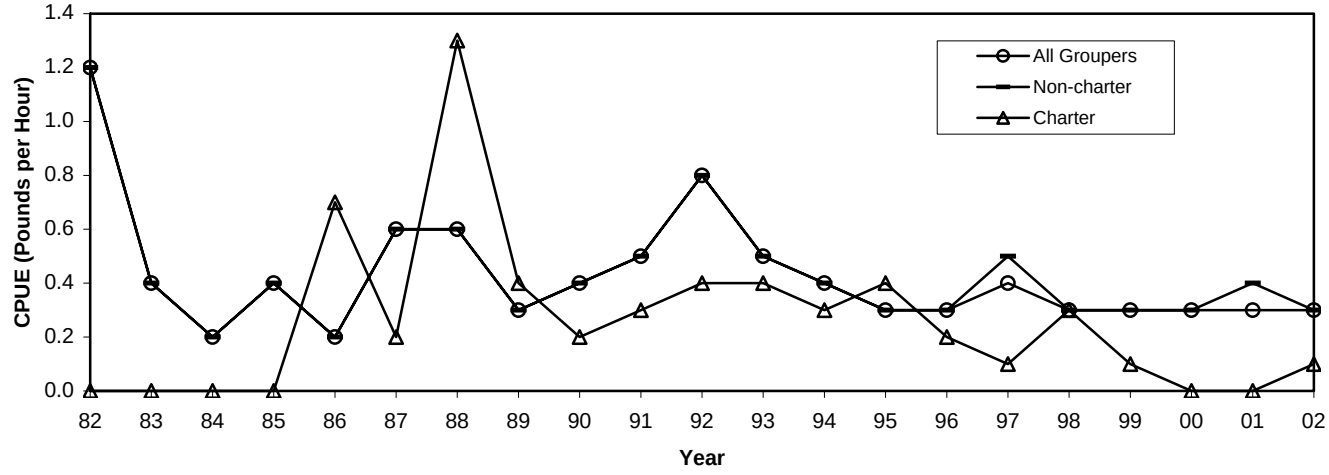


Figure 10c. Average Size Harvested: *Epinephelus fasciatus*

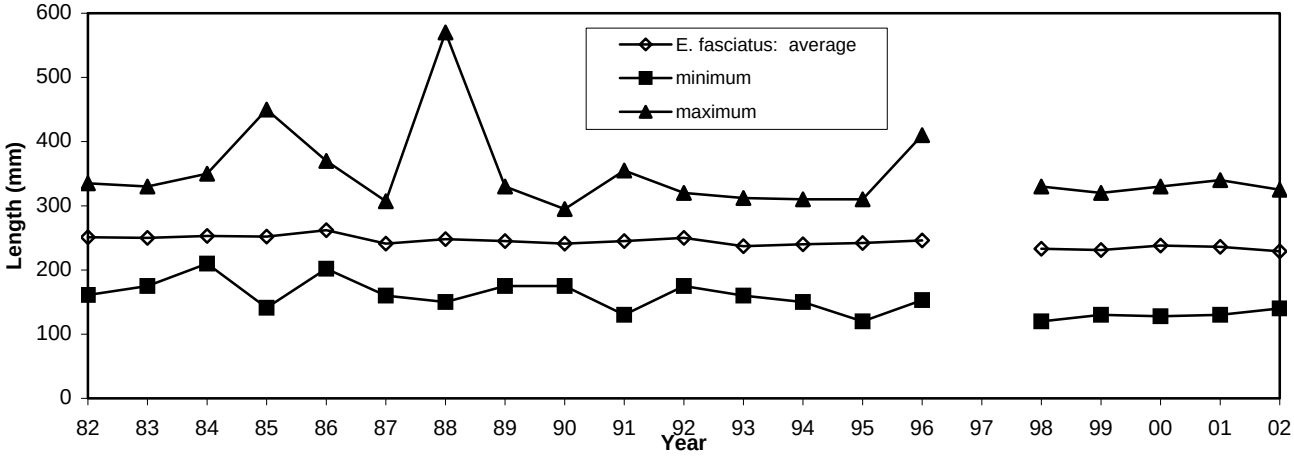


Figure 10d. Average Size Harvested: *Epinephelus merra*

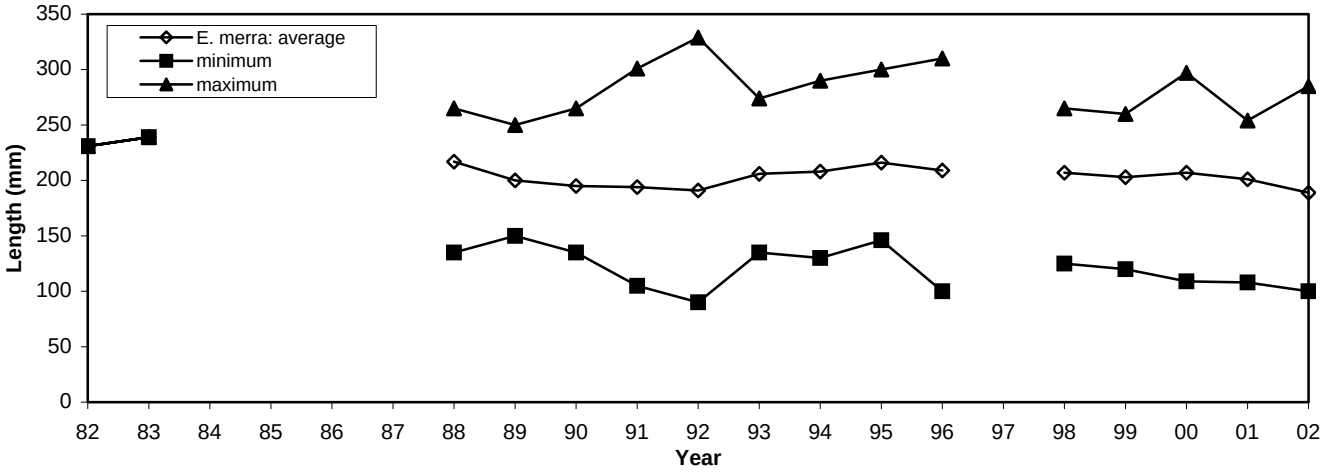
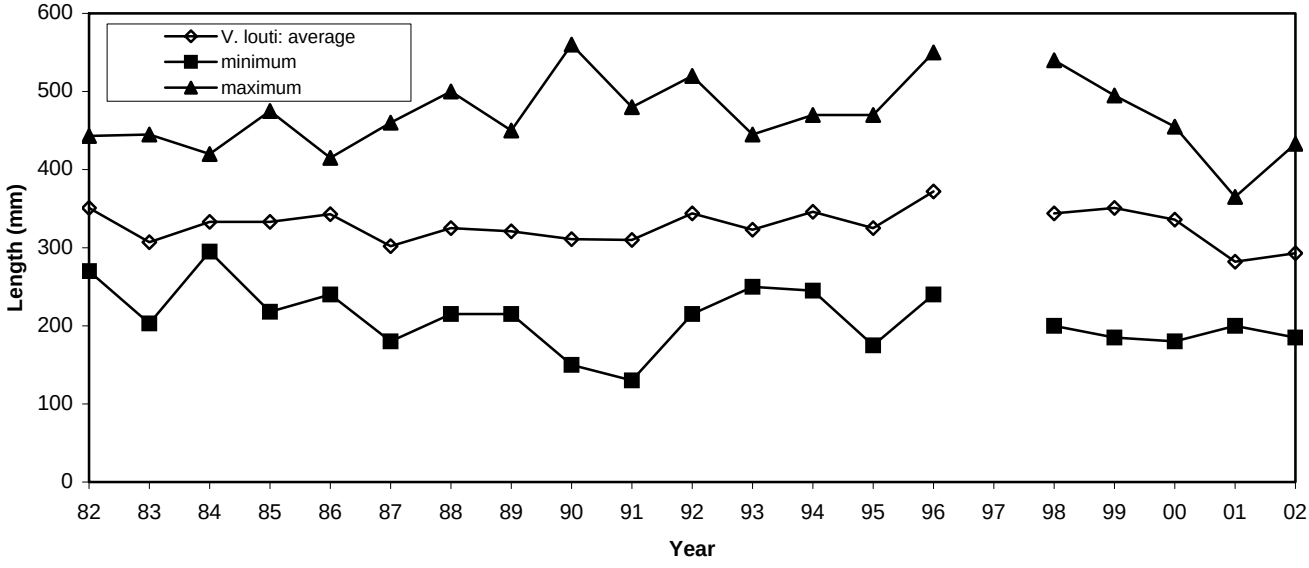


Figure 10e. Average Size Harvested: *Variola louti*



Interpretations: The total and non-charter harvest of groupers both decreased 45% and 55% respectively, while the charter harvest increased 53% in 2002. The CPUE for total harvest, non-charter, and charter fishing had no significant changes. CPUE for total groupers decreased from 0.3 to 0.4 lb/hr, CPUE for non-charter fishing remained the same, while CPUE for charters increased from virtually zero to 0.1 lb/hr. In recent years, the majority of large groupers observed in the field were harvested by spearfishing, rather than bottomfishing. Offshore fisheries made up 76% of the total grouper harvest.

The average sizes for the three selected grouper species appear to be relatively constant over the past 21 years, although there are year-to-year fluctuations. The spikes in the maximum sizes observed with *E. fasciatus* in 1985 and 1988 appear to be unusually large individuals (450 mm and 507 mm) since this species tends to have a terminal size around 300 mm.

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

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.

Year	Total Harvest	Offshore Harvest	Offshore Non-charter	Offshore Charter	Inshore Harvest	CPUE Offshore	CPUE Non-charter	CPUE Charter
82	7,000	7,000	7,000	0		1.2	1.2	0.0
83	3,471	3,471	3,471	0		0.4	0.4	0.0
84	2,463	2,463	2,463	0		0.2	0.2	0.0
85	9,972	9,410	9,410	0	562	0.4	0.4	0.0
86	4,425	2,442	2,425	17	1,983	0.2	0.2	0.7
87	6,066	5,823	5,814	9	243	0.6	0.6	0.2
88	9,215	8,594	8,359	236	621	0.6	0.6	1.3
89	5,016	4,795	4,668	127	221	0.3	0.3	0.4
90	11,965	10,907	10,879	28	1,058	0.4	0.4	0.2
91	10,332	9,076	8,918	158	1,256	0.5	0.5	0.3
92	13,812	12,609	12,435	175	1,203	0.8	0.8	0.4
93	17,343	16,037	15,939	97	1,306	0.5	0.5	0.4
94	13,403	11,677	11,620	57	1,726	0.4	0.4	0.3
95	19,226	17,411	15,826	1,585	1,815	0.3	0.3	0.4
96	16,153	15,500	13,906	1,594	653	0.3	0.3	0.2
97	16,286	15,480	14,906	573	806	0.4	0.5	0.1
98	18,438	17,252	15,759	1,493	1,186	0.3	0.3	0.3
99	15,499	13,969	13,484	484	1,530	0.3	0.3	0.1
00	18,721	16,846	16,663	183	1,875	0.3	0.3	0.0
01	16,485	15,252	15,177	75	1,233	0.4	0.4	0.0
02	**9,070**	**6,925**	**6,810**	**115**	**2,145**	**0.3**	**0.4**	**0.1**
Average	11,636	10,616	10,282	334	1,190	0.4	0.4	0.3
Std. deviation	5,437	5,097	4,790	534	586	0.2	0.2	0.3

Year	*E.fasciatus* (average)	*E.fasciatus* (min)	*E. fasciatus* (max)	*E. merra* (average)	*E. merra* (min)	*E. merra* (max)	*V. louti* (average)	*V. louti* (min)	*V. louti* (max)
82	251	161	335	231	231	231			
83	250	175	330	239	239	239			
84	253	210	350						
85	252	141	450				265	250	290
86	262	202	370				350	310	390
87	241	160	307				302	220	385
88	248	150	507	217	135	265	270	195	350
89	245	175	330	200	150	250	261	215	295
90	241	175	295	195	135	265	285	205	38-
91	245	130	355	194	105	301	270	250	320
92	250	175	320	191	90	329	284	235	310
93	237	160	312	206	135	274	346	29-	479
94	240	150	310	308	130	290	284	170	330
95	242	120	310	216	146	300	295	275	315
96	246	153	410	209	100	310	415	170	600
97									
98	233	120	330	207	125	265	263	180	340
99	231	130	320	203	120	260	288	179	430
00	238	128	330	207	109	297	241	190	300
01	236	130	340	201	108	254	310	239	440
02	**229**	**140**	**325**	**189**	**100**	**285**	**299**	**185**	**411**
Average	244	154	350	207	135	276	296	221	374
Std. deviation	8	26	63	14	43	27	42	42	81

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

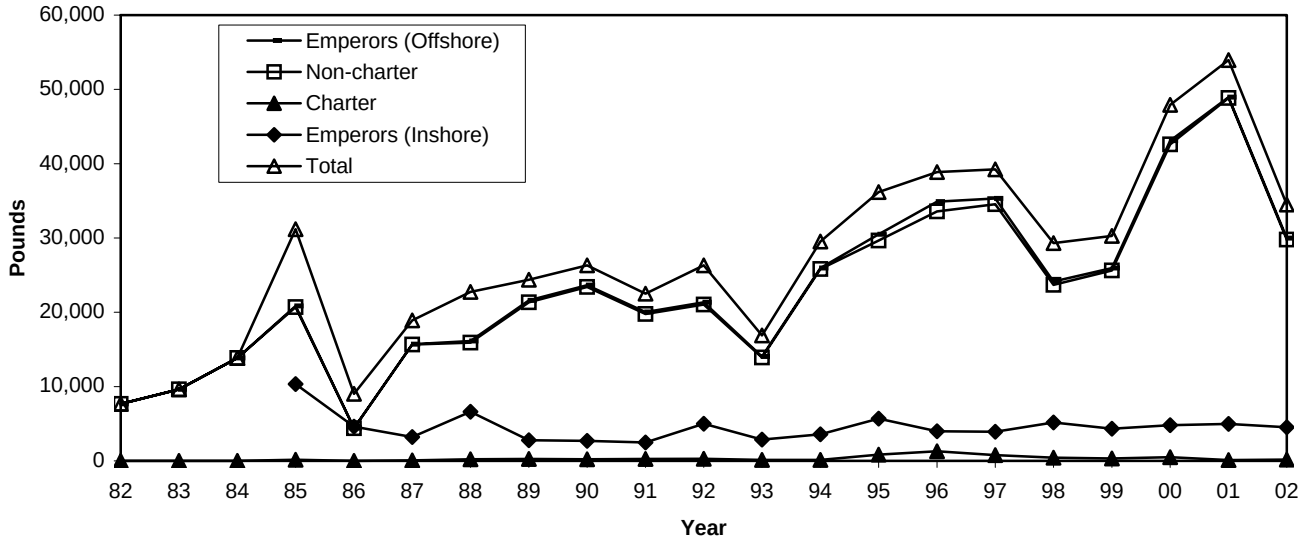


Figure 11b. Emperors *(Lethrinus, Gnathodentex, Gymnocranius, Monotaxis*): CPUE

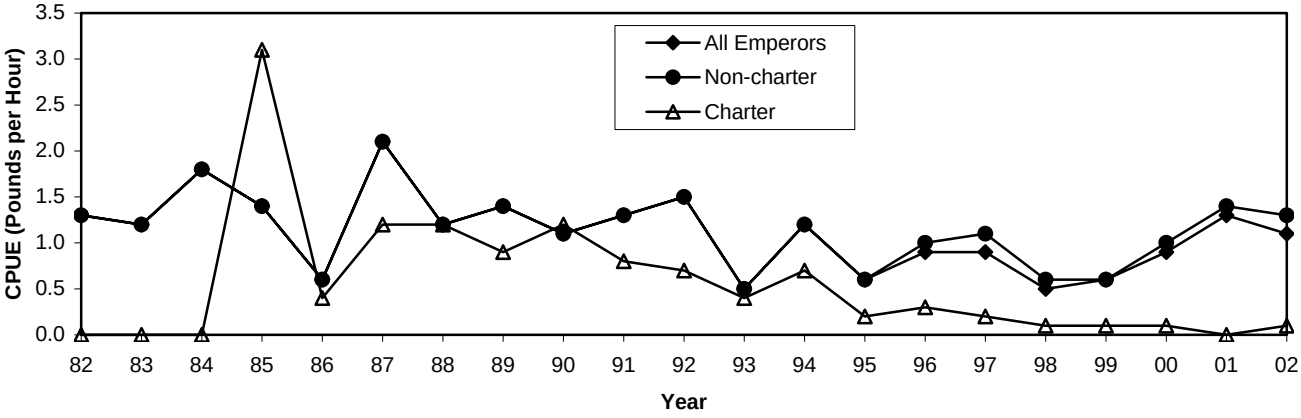


Figure 11c. Average Size Harvested: *Lethrinus olivaceus*

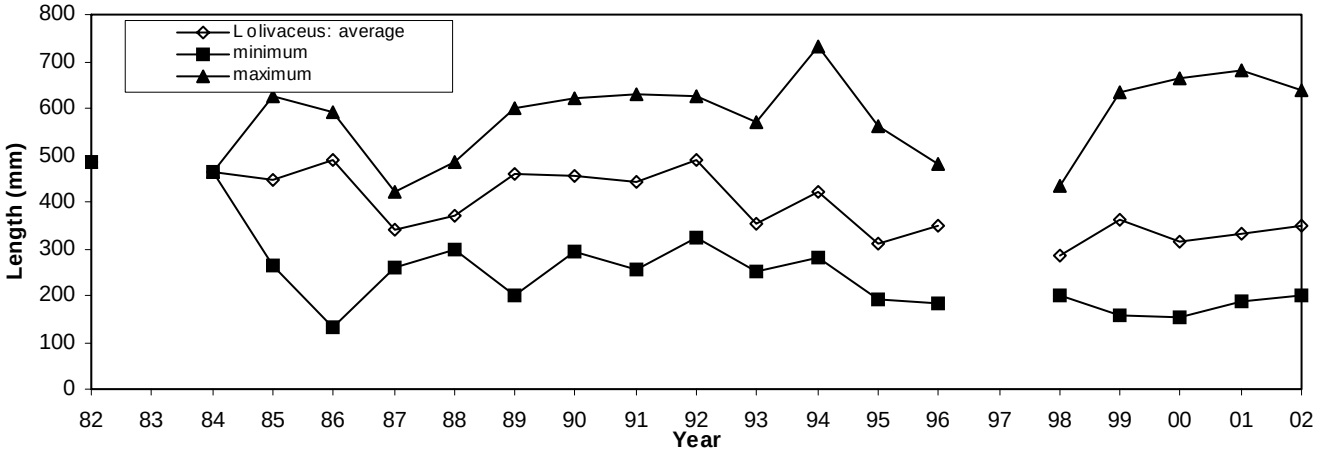


Figure 11d. Average Size Harvested: *Lethrinus obsoletus*

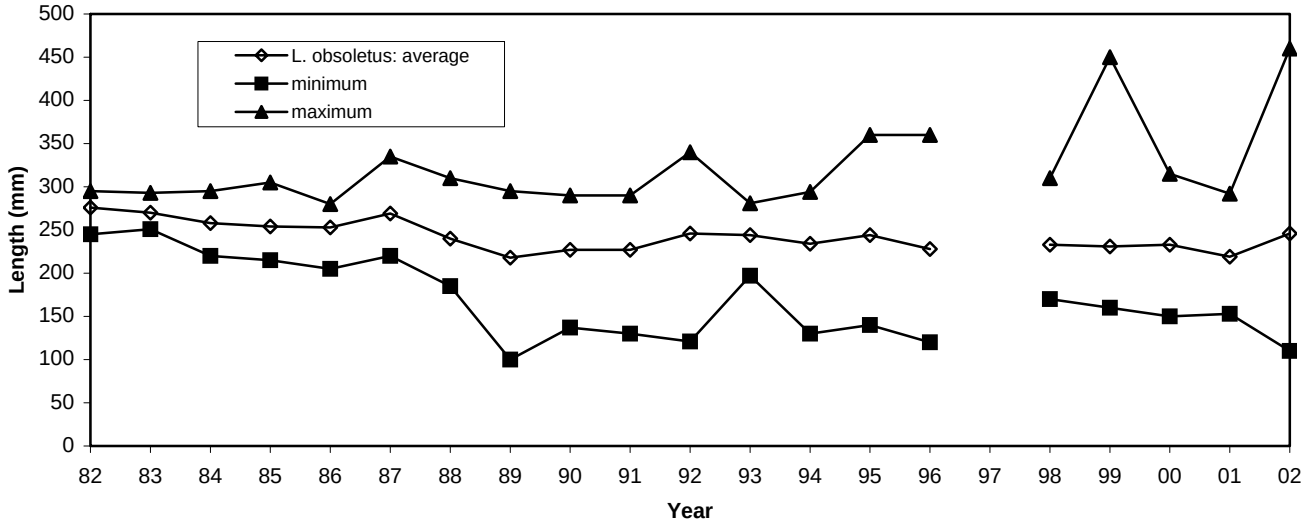
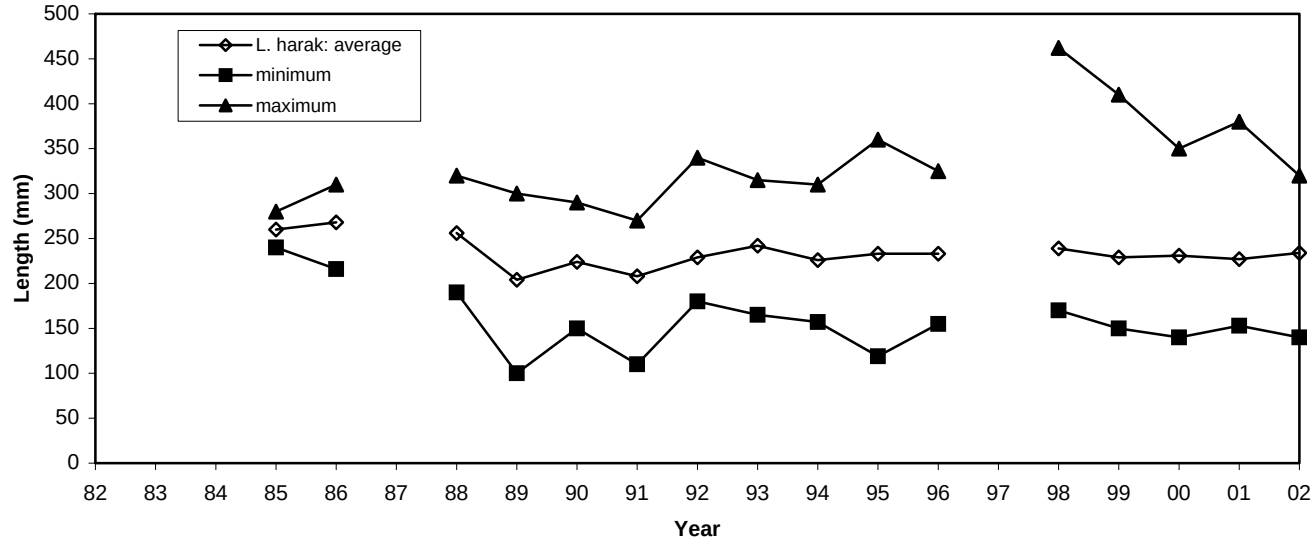


Figure 11e. Average Size Harvested: *Lethrinus harak*



Interpretations: The increased in the harvest of emperors in both the charter and non-charter sectors in 1995 and 1996 may have be due to the addition of the Agat Marina as an offshore sampling port. The CPUE for emperors, however, decreased 50% between 1994 and 1995.

The total and non-charter harvest of emperors decreased 36% and 39% in 2002, while charter harvest increased 56%. The CPUE for total and non-charter harvest of snappers also decreased, decreasing 15% and 7% respectively in 2002. Offshore fisheries made up 87% of the emperor harvest for 2002.

The average sizes for the two smaller species of emperors, *L. obsoletus* and *L. harak*, appear to be relatively constant for the past 21 years. The average size for *L. olivaceous* shows wider fluctuations due to it being

the longest emperor species on Guam, but has shown a general decrease in average size for the past 10 years.

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

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.

Year	Total Harvest	Offshore Harvest	Offshore Non-charter	Offshore Charter	Inshore Harvest	CPUE Offshore	CPUE Non-charter	CPUE Charter
82	7,677	7,677	7,677	0		1.3	1.3	0.0
83	9,635	9,635	9,635	0		1.2	1.2	0.0
84	13,843	13,843	13,843	0		1.8	1.8	0.0
85	31,182	20,841	20,691	149	10,341	1.4	1.4	3.1
86	9,030	4,411	4,402	9	4,619	0.6	0.6	0.4
87	18,910	15,706	15,648	58	3,204	2.1	2.1	1.2
88	22,742	16,123	15,909	215	6,619	1.2	1.2	1.2
89	24,379	21,599	21,341	257	2,780	1.4	1.4	0.9
90	26,320	23,637	23,417	220	2,683	1.1	1.1	1.2
91	22,508	20,030	19,774	256	2,478	1.3	1.3	0.8
92	26,327	21,333	21,049	283	4,994	1.5	1.5	0.7
93	16,892	14,033	13,913	121	2,859	0.5	0.5	0.4
94	29,520	25,949	25,827	122	3,571	1.2	1.2	0.7
95	36,185	30,498	29,657	840	5,687	0.6	0.6	0.2
96	38,868	34,879	33,578	1,301	3,989	0.9	1.0	0.3
97	39,246	35,323	34,550	773	3,923	0.9	1.1	0.2
98	29,317	24,139	23,700	439	5,178	0.5	0.6	0.1
99	30,275	25,941	25,620	321	4,334	0.6	0.6	0.1
00	47,908	43,103	42,607	496	4,805	0.9	1.0	0.1
01	53,943	48,961	48,844	117	4,982	1.3	1.4	0.0
02	**34,508**	**29,978**	**29,795**	**183**	**4,530**	**1.1**	**1.3**	**0.1**
Average	27,105	23,221	22,927	293	4,532	1.1	1.1	0.6
Std. deviation	12,286	11,260	11,081	327	1,835	0.4	0.4	0.7

Year	*L.olivaceous* (average)	*L.olivaceous* (min)	*L.olivaceous* (max)	*L. obsoletus* (average)	*L.obsoletus* (min)	*L. obsoletus* (max)	*L. harak* (average)	*L. harak* (min)	*L. harak* (max)
82	485	485	485	276	245	295			
83				270	251	293			
84	462	462	462	258	220	295			
85	445	265	625	254	215	305	260	240	280
86	491	134	590	253	205	280	268	216	310
87	340	260	420	269	220	335			
88	370	300	483	240	185	310	256	190	320
89	460	200	600	218	100	295	204	100	300
90	454	295	620	227	137	290	224	150	290
91	443	255	630	227	130	290	208	110	270
92	490	325	625	246	121	340	229	180	340
93	353	250	570	244	197	281	242	165	315
94	420	280	731	234	130	294	226	157	310
95	312	190	560	244	140	360	233	119	360
96	348	185	480	228	120	360	233	155	325
97									
98	286	170	435	233	170	310	239	170	462
99	361	160	635	231	160	450	229	150	410
00	313	150	665	233	150	315	231	140	350
01	330	153	680	219	153	292	227	153	380
02	**351**	**110**	**640**	**246**	**110**	**460**	**234**	**140**	**320**
Average	396	168	576	243	168	323	234	158	334
Std. deviation	69	46	90	17	46	51	17	36	50

12a. 2002 Bottomfish Bycatch: Charter

Species	Released alive	Released dead/injured	Total # Released	Total Number Landed	% Bycatch
Serranidae	1		1	1	100.0
E. fasciatus	8		8	15	53.33
Mullidae	14		14	14	100.00
P. multifasciatus	46		46	55	83.64
Siganus argenteus	3		3	5	60.0
Mugilidae	1		1	1	100.0
M. vidua	9		9	9	100.00
M. niger	7		7	7	100.00
O. niger	5		5	8	62.50
Shallow bottomfish	10		10	40	25.00
TOTAL	**145**		**145**	**194**	**74.74**
Compared with All Species				**237**	**61.18**

12b. 2002 Bottomfish Bycatch: Non-Charter

Species	Released alive	Released dead/injured	Total Number Released	Total Number Landed	Percent Bycatch
Carcharhinidae					
C. amblyrhynchos	1		1	4	25.00
C. melanopterus	5		5	5	100.00
Serranidae	5		5	5	100.00
C. urodeta	4		4	24	16.67
E. merra	64		64	160	40.00
Lutjanidae					
Variola louti	1		1	21	4.76
L. kasmira	1		1	21	4.76
Lethrinidae	102		102	103	99.03
L. harak	5		5	132	3.79
Labridae	1		1	1	100.00
Balistidae	17		17	17	100.00
R. aculeatus	5		5	25	20.00
TOTAL	**211**	**0**	**211**	**518**	**40.73**
Compared with All Species				**2,267**	**9.31**

12c. 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	1,855	33.6	58	183	31.7
2002	356	0	356	712	50.0	33	137	24.1

*"percent bycatch" is the percentage of a species of fish that was discarded compared to what was landed. Species that did not have bycatch are not included, only species that had bycatch.

Interpretation: Bycatch information was recorded beginning in 2000 as a requirement of the Bottomfish

FMP. Historically, most fish that is landed by fishermen is kept, regardless of size and species. This may indicate a decrease of fish stocks of more desirable species, resulting in the harvest of juveniles and less desirable species.

Source: The DAWR creel survey data for bottomfishing method.

Calculations: Bycatch is obtained from the interviews with bottomfishing where bycatch was voluntarily reported. The numbers recorded are not expanded numbers, only from the bottomfish interviews obtained during 2002. Information obtained about bycatch includes the number of each individual fish species, an estimated length, and a computer generated calculated weight based on the estimated length. While most bycatch species are known by fishermen, characteristics of the fish are provided in an attempt to identify the fish to the species level.