

Appendix 2

Guam

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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 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*.

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 has increased in recent years, making it profitable to sell locally caught bottomfish. The demand for reef fish, when combined with environmental pressures, may be stressing local bottomfish stocks. On Guam, bottomfish and BMUS species are harvested by other methods such as gillnets, castnets, and spearing, with jacks harvested from their juvenile stage.

Bottomfish imported from the Philippines and Micronesia compete with locally caught fish, but may also be reducing fishing pressure on local stocks. Preferred imported bottomfish sold in local fish markets are primarily caught from the shallow complex, generally groupers, emperors, and snappers. These tend to be larger than what is caught on average by local fishermen.

An eco-permitting system was passed by the Legislature in 2004 which regulates activities at marine preserves. Permits will be required of businesses and organizations that operate in preserves, including diving, SNUBA, dinner cruises, organized paddling and swimming events, and non-motored watercrafts. Their impact, when combined with the effects from local recreational users and hotel visitors, significant impact the various marine habitats in the marine preserves. The eco-permit requires prospective and existing businesses to outline their activity's impact in marine preserves, and businesses with significant impacts to the marine ecosystem may not be allowed to operate.

The makeshift ramp at Ylig Bay provides boating and fishing access to the eastern coast of Guam. These fishing areas are not accessible most of the year due to rough seas, with most of the coast inaccessible for public shore-based fishing. However, during periods of calm weather, as many as two dozen vehicles with trailers can be seen at Ylig, primarily trolling and bottomfishing during the day, and bottomfishing and spearing during the evenings. Highliners regularly utilize the ramp at Ylig, able to weather conditions and maneuver through Ylig River, a task difficult for most boaters. Participation and catch at Ylig may be significant during the summer months when compared to the three offshore creel census sites. Also, the new wave buoy deployed south of the ramp off Talofofo Bay is reported to be regularly used by trollers as a FAD. However, surveying this ramp remains challenging. Inadequate lighting, no public phone, return fishing times well after midnight, and other safety issues make fishery data collecting challenging. A lack of freshwater for rinsing and large catches which can require substantial time to sample also discourages fishermen from staying too long after trailering their boats. The few attempts in 2004 to informally obtain fishing data resulted in either incomplete information being given or an interview decline. Currently, creel census data cannot regularly be obtained at this site. An educational outreach and modifying current sampling techniques addressing all the above challenges is necessary before adding Ylig as a creel census site.

Several other factors may have affected boat-based bottomfishing activity. First, there were a significant number of bad weather days in 2004. As a result, a number of creel census days had zero activity due to rough seas due to passing storms. Also, the price of fuel increased significantly in 2004, increasing the cost to fish. Most fishermen sell a portion of their catch during the year to help recoup fishing costs.

The loss of staff biologists has been significant in the past several years. Two fisheries technicians, however, were hired during 2004. DAWR staff biologists continue to provide on-going training to ensure the high quality of data being collected by all staff. All fisheries staff are trained to identify the most commonly caught fish to the species level.

Summary

Despite the significant number of bad weather days, the 2004 total bottomfish and total BMUS bottomfish harvest slightly decreased, 8% and 12% respectively. The offshore total bottomfish and total BMUS harvests decreased 10% and 13% respectively, while the inshore harvest total and BMUS harvests increased 24% and 82% respectively. This may have been due to an 84% in snapper harvest by inshore methods. Offshore bottomfish non-charter and charter components all decreased 10%, with offshore BMUS non-charter and charter components decreased 11%, and 77% respectively.

The commercial sale of bottomfish more than doubled, a 114% increase, with adjusted revenue increasing 86%. Revenue per bottomfish trip increased 8%, with revenue per trip for all species increased less slightly. Both values are well below the 25-year average. The average price of bottomfish, however, decreased 13%, to the lowest price in the entire time series. Locally caught bottomfish, including BMUS, compete with imported fish, which can be larger and less expensive to purchase.

Bottomfish effort decreased in 2004, with bottomfish hours and trips decreasing 15%. Charter and non-charter hours decreased 28% and 13%, with charter and non-charter trips both decreasing 15%. The number of unique boats in the fishery decreased 28% to 347 boats. The total expanded bottomfish CPUE decreased 15% to 4.0 lbs/hr, while unexpanded deepwater and shallow water CPUE increased 11% and 7% to 7.2 lbs/hr and 4.9 lbs/hr respectively. The bulk of charter fishing is from Agat Marina charter boats taking up to several dozen visitors per half day trip. These boats fish generally in the same area year after year, resulting in high effort and low catch rates.

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	39,972	7.2	169.7	44,514	6.41	154
1983	46,957	6.3	175.6	214,911	5.81	106
1984	57,523	7.3	190.9	130,429	5.60	144
1985	86,075	5.7	198.3	148,563	5.30	161
1986	36,839	5.2	203.7	60,412	4.99	118
1987	44,829	5.8	212.7	62,364	4.93	139
1988	67,777	4.9	223.8	75,022	4.71	198
1989	83,911	5.6	248.2	107,472	5.47	223
1990	77,358	4.5	283.5	100,251	5.30	226
1991	71,198	4.8	312.5	57,129	5.07	246
1992	86,911	5.8	344.2	49,660	4.66	236
1993	98,363	4.2	372.9	44,585	4.37	360
1994	109,042	5.6	436.0	135,823	4.47	298
1995	106,434	2.5	459.2	55,004	3.98	402
1996	153,122	4.1	482.0	22,812	3.09	408
1997	102,706	3.7	491.4	36,082	3.40	332
1998	97,760	2.6	488.9	55,031	3.73	354
1999	129,419	3.2	497.9	124,485	4.05	411
2000	145,699	3.7	508.1	85,841	3.92	312
2001	122,490	3.9	501.2	95,539	3.63	337
2002	74,516	3.0	504.5	62,597	3.42	351
2003	111,002	4.7	521.4	39,450	3.36	481
2004	100,010	4.0	563.2	73,466	2.93	347
Average	89,127	4.7		79,823	4.56	276
Standard Deviation	32,143	1.3		43,919	0.98	108

Recommendations

Status of 2003 Recommendations

1. Completing the baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus*, has not been completed. Severe staff shortages in recent years have prevented the Bank A data from being analyzed. A former biologist has been contracted to analyze some of the data.
2. DAWR's inshore and offshore programs have been integrated. Technical staff have been trained to input the majority of the data. Obtaining statistics of confidence, analyses of mean fish size, and separation between the shallow and deepwater bottomfish complexes is ongoing.
3. Opportunistic interview at Ylig Ramp was attempted in 2004 with little success. Survey procedures may need to be modified in order to obtain adequate data from fishermen using the ramp.

2004 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.

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**Table 1. Expanded Offshore Creel Survey Composition Of
Bottomfish Management Unit Species (BMUS) for 2004**

Management Unit Species	Harvest (Pounds)
BMUS	
Lehi (<i>A. rutilans</i>)	1,323
Uku (<i>A. virescens</i>)	6,283
Ehu (<i>E. carbunculus</i>)	1,435
Onaga (<i>E. coruscans</i>)	6,867
Yellowtail Kalekale (<i>P. auricilla</i>)	2,255
Opakapaka (<i>P. filamentosus</i>)	116
Yelloweye Opakapaka (<i>P. flavipinnis</i>)	666
Gindai (<i>P. zonatus</i>)	1,252
Ta'ape (<i>L. kasmira</i>)	433
Giant Trevally (<i>C. ignobilis</i>)	359
Black Jacks (<i>C. lugubris</i>)	299
Amberjack (<i>S. dumerili</i>)	702
Blacktip Grouper (<i>E. fasciatus</i>)	1,634
Lyretail Grouper (<i>V. louti</i>)	2,756
Redgill Emperor (<i>L. rubrioperculatus</i>)	5,641
BMUS Total	32,019
Non-BMUS Bottomfish	
Other Snappers	2,917
Other Jacks	3,410
Other Groupers	3,786
Other Emperors	9,971
Non-BMUS Bottomfish Total	20,084
Bottomfish Total	52,103

Table 2. Commercial Bottomfish Average Prices for 2004

Species Name	Average Price (\$/Lb)
Amberjack	2.64
Black Jack	2.42
Jacks	2.54
Emperor (mafute)	2.65
Snapper	2.52
Uku (gray Snapper)	2.42
Bottom Fish	2.65
Ehu (red Snapper)	3.97
Gindai (flower Snap)	4.00
Grouper	2.82
Kalikali (pink Snap)	3.45
Lehi (silverjaw)	3.59
Onaga (red Snapper)	4.95
Opakapaka (pink Snapper)	4.06
All Bottomfish Species	2.93

Figure 1a. Harvest of All Bottomfish Species

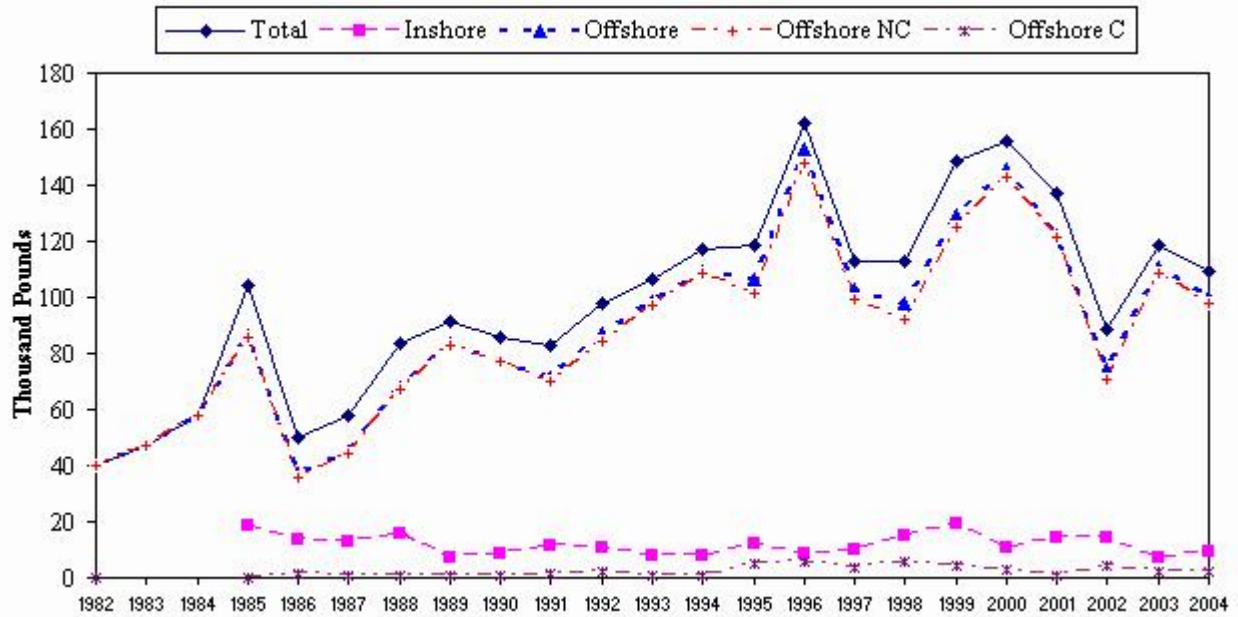
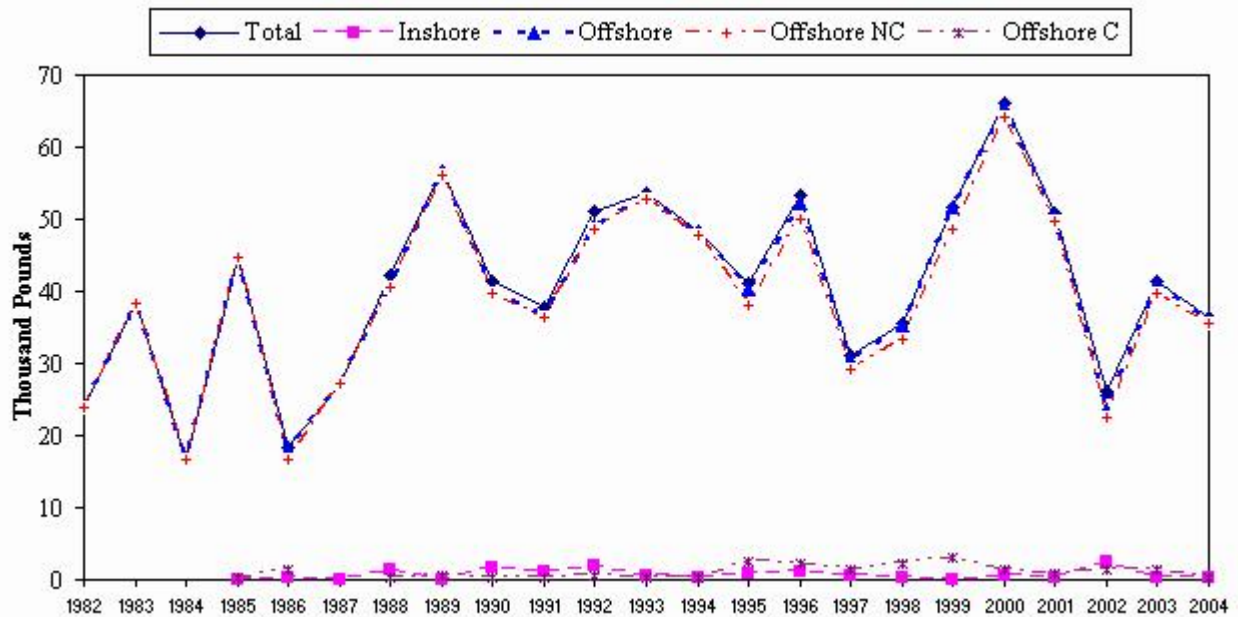


Figure 1b. Harvest of BMUS Species



Interpretations: A decrease in bottomfish and BMUS harvest was observed, except for the inshore harvest which increased 24%. Total bottomfish decreased 8% (109,301 pounds from 118,469 pounds), with the offshore non-charter and charter sectors both decreasing 10%. Total BMUS harvest decreased 12% (36,282 pounds from 41,335 pounds), with the offshore non-charter and charter sectors decreasing 11% and 78% respectively. Inshore harvest increased 82%.

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 both inshore and offshore 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	Inshore	Offshore	Non-Charter	Charter
1982	39,972		39,972	39,953	20
1983	46,957		46,957	46,957	
1984	57,523		57,523	57,523	
1985	104,526	18,451	86,075	85,887	188
1986	50,146	13,307	36,839	35,363	1,475
1987	57,601	12,772	44,829	44,371	458
1988	83,672	15,895	67,777	66,846	931
1989	91,097	7,186	83,911	83,063	848
1990	85,974	8,616	77,358	76,974	384
1991	82,704	11,506	71,198	69,952	1,246
1992	97,946	11,035	86,911	84,577	2,334
1993	106,541	8,178	98,363	97,313	1,049
1994	117,008	7,966	109,042	108,287	755
1995	118,449	12,015	106,434	101,126	5,309
1996	161,923	8,801	153,122	147,721	5,402
1997	112,925	10,219	102,706	99,100	3,606
1998	112,754	14,994	97,760	92,319	5,441
1999	148,603	19,184	129,419	125,088	4,330
2000	156,071	10,372	145,699	143,001	2,697
2001	137,065	14,575	122,490	121,585	905
2002	88,495	13,979	74,516	70,587	3,929
2003	118,469	7,467	111,002	108,611	2,391
2004	109,301	9,291	100,010	97,866	2,144
Average	99,379	11,790	89,127	87,133	2,183
Standard Deviation	34,138	3,554	32,143	31,077	1,807

Harvest of BMUS Species (Pounds)

Year	Total	Inshore	Offshore	Non-Charter	Charter
1982	23,756		23,756	23,756	
1983	38,470		38,470	38,470	
1984	16,602		16,602	16,602	
1985	44,843	34	44,809	44,666	143
1986	18,199	198	18,001	16,561	1,440
1987	27,160	64	27,096	27,096	
1988	42,253	1,368	40,885	40,516	369
1989	56,681	65	56,616	56,166	450
1990	41,463	1,541	39,922	39,774	148
1991	37,853	1,102	36,751	36,426	326
1992	51,112	1,860	49,252	48,733	519
1993	53,748	586	53,162	52,842	320
1994	48,249	245	48,004	47,702	302
1995	41,130	764	40,366	37,922	2,444
1996	53,331	1,154	52,177	49,916	2,261
1997	30,986	417	30,569	29,299	1,270
1998	35,595	187	35,408	33,250	2,158
1999	51,686	50	51,636	48,717	2,919
2000	66,227	576	65,651	64,219	1,432
2001	50,738	170	50,568	49,846	722
2002	26,194	2,445	23,749	22,485	1,264
2003	41,335	171	41,164	39,837	1,328
2004	36,282	311	35,971	35,661	310
Average	40,604	665	40,025	39,151	1,059
Standard Deviation	12,730	692	12,690	12,536	870

Figure 2a. Total and Commercial BMUS Harvest Bottomfish

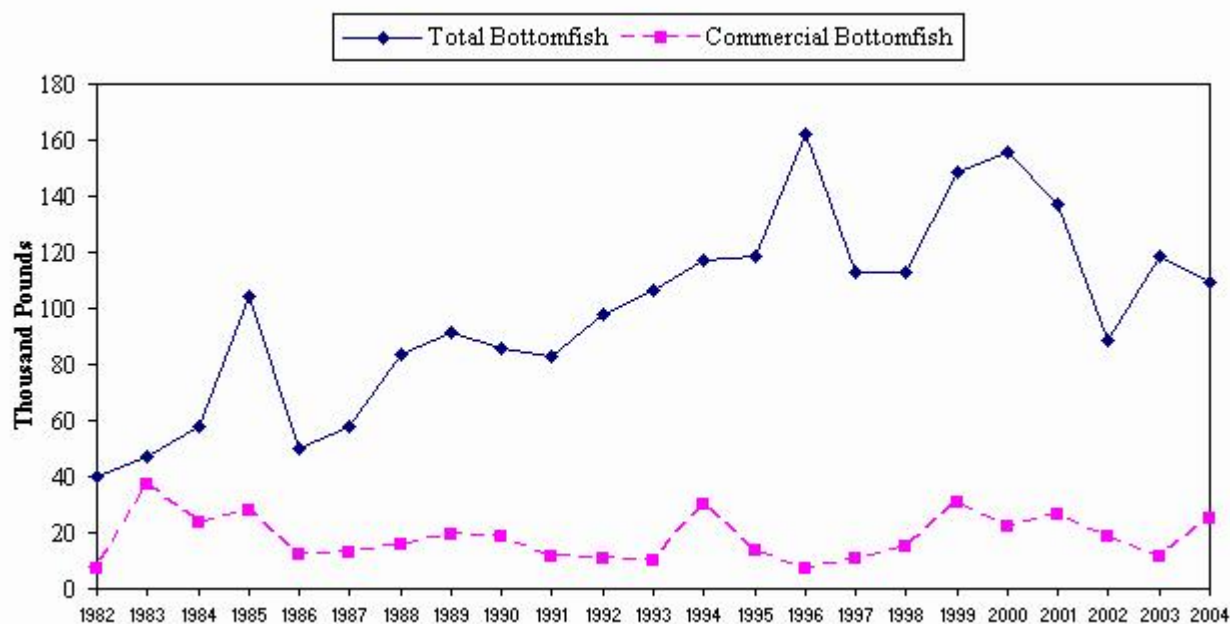
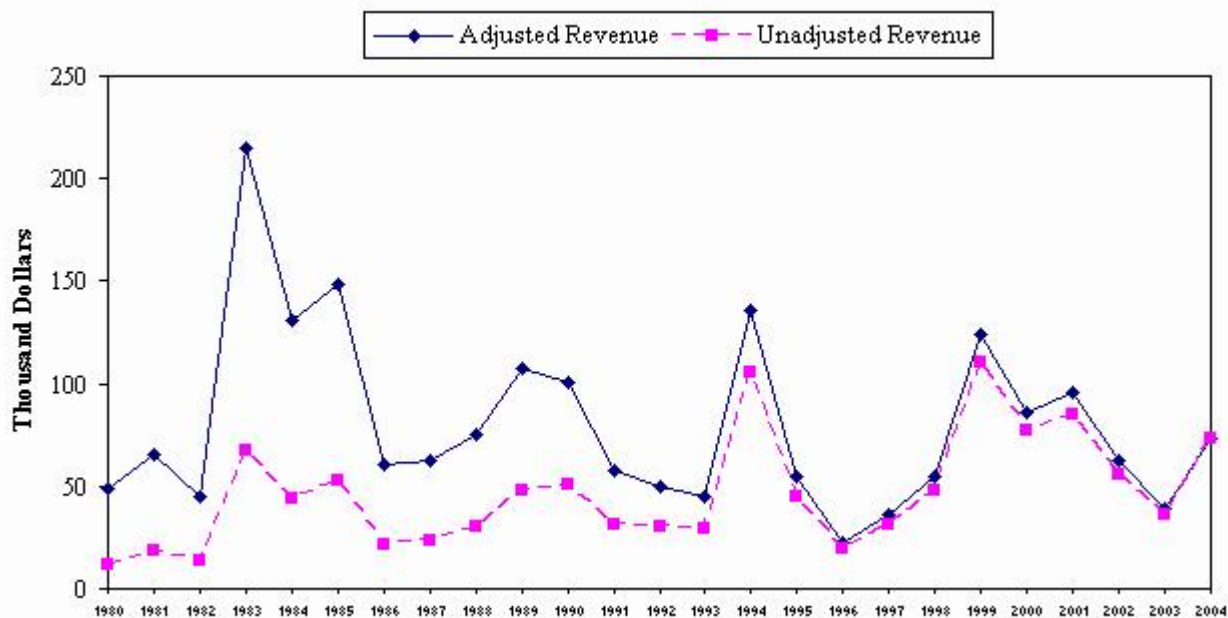


Figure 2b. Commercial BMUS Revenue Bottomfish



Interpretations: Total BMUS harvest decreased 8% in 2004, while the commercial BMUS harvest and adjusted revenues increased 114% and 86% respectively. The increase in fuel costs and available markets for bottomfish species may have resulted in fishermen finding markets to sell their fish more often to recoup fishing expenses. Adjusted revenues in 2004 fell below the 25-year average.

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.

Bottomfish Harvest (Pounds)

Year	Harvest (Pounds)		Revenue (\$)	
	Total	Commercial	Unadjusted	Adjusted
1980		9,434	11,528	48,454
1981		10,596	18,825	65,681
1982	39,972	6,947	13,412	44,514
1983	46,957	36,984	67,013	214,911
1984	57,523	23,291	44,213	130,429
1985	104,526	28,028	52,311	148,563
1986	50,146	12,110	21,849	60,412
1987	57,601	12,639	23,551	62,364
1988	83,672	15,933	29,818	75,022
1989	91,097	19,630	47,365	107,472
1990	85,974	18,916	50,479	100,251
1991	82,704	11,278	31,703	57,129
1992	97,946	10,668	30,355	49,660
1993	106,541	10,191	29,526	44,585
1994	117,008	30,356	105,126	135,823
1995	118,449	13,815	44,865	55,004
1996	161,923	7,389	19,531	22,812
1997	112,925	10,621	31,485	36,082
1998	112,754	14,737	47,770	55,031
1999	148,603	30,757	110,066	124,485
2000	156,071	21,924	77,474	85,841
2001	137,065	26,289	84,999	95,539
2002	88,495	18,297	56,090	62,597
2003	118,469	11,731	36,528	39,450
2004	109,301	25,054	73,466	73,466
Average	99,379	17,505	46,374	79,823
Standard Deviation	34,138	8,287	27,030	43,919

Figure 3a. Estimated Bottomfish Boat Hours

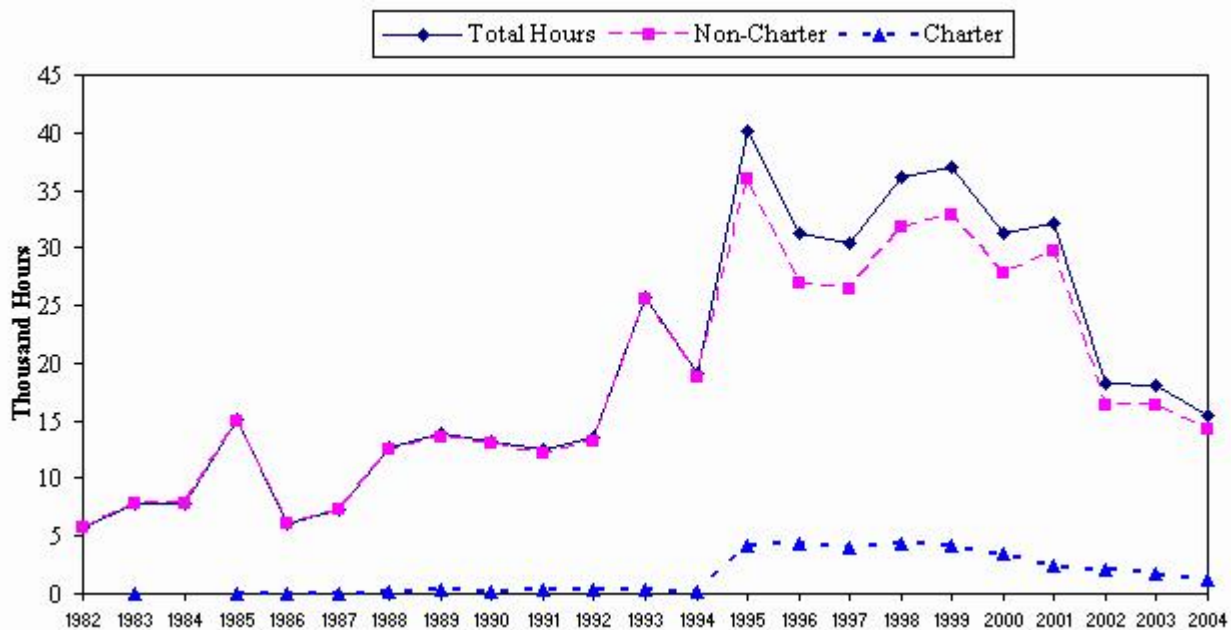
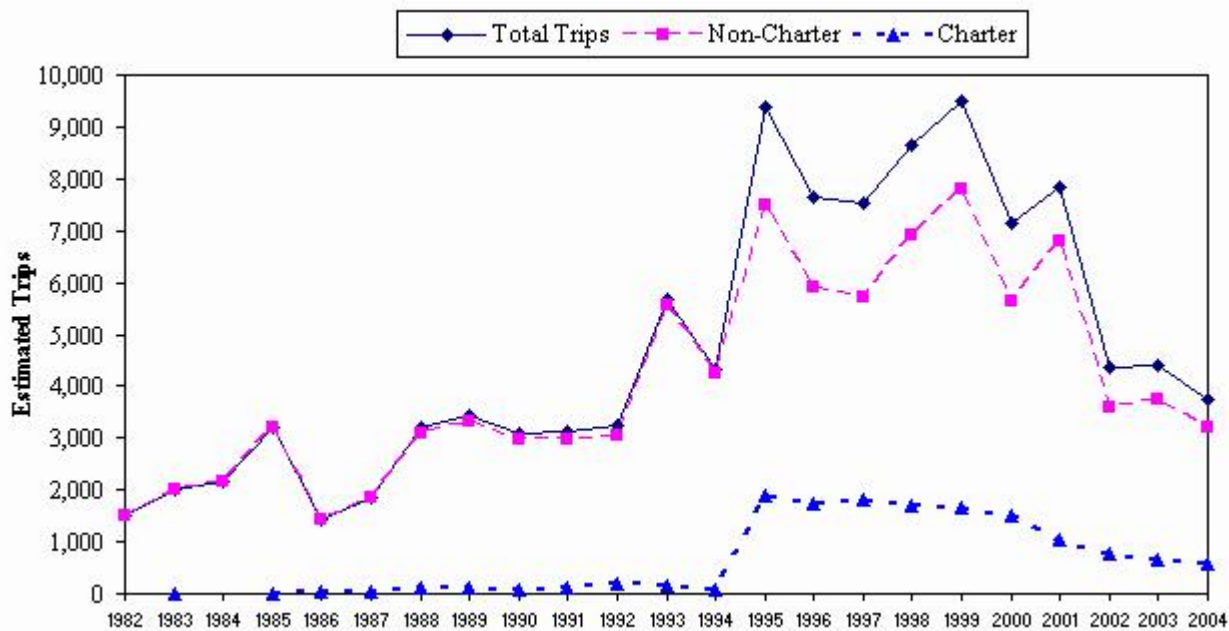


Figure 3b. Estimated Bottomfish Trips



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 increased number of calm days favorable for bottomfishing compared with previous years, and the inclusion of the Agat Marina into the offshore survey in 1994. The charter boat component of the 1995 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 vessels at the Agat marina making up to three trips daily. The number of charter trips

decreases after 1995, due to a drop in the number of tourists, as well as tourists participating in less expensive activities. Declines observed in 1996, 1997, and 2002 were due to typhoons impacting Guam that year.

Bottomfish effort decreased in 2004, decreasing 15% for both trips and hours fished. Non-charter hours and trips decreased 13% and 15% respectively, while charter hours and trips decreased 28% and 15% respectively. These decreases may have been due, in part, to bad weather days in 2004.

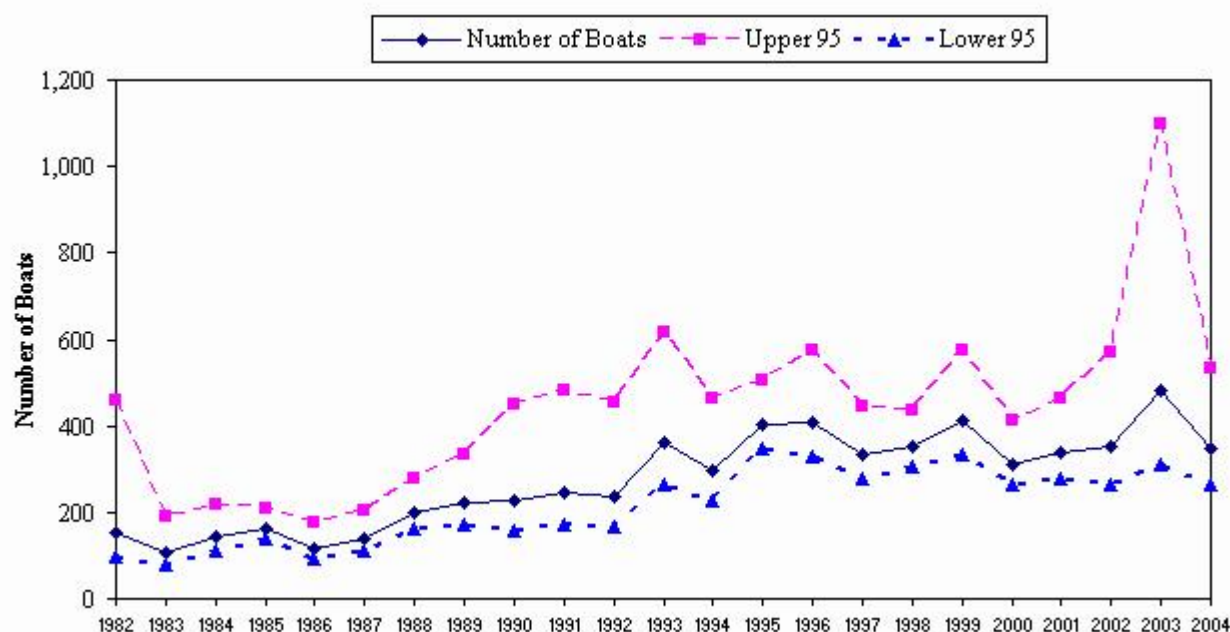
Source: The DAWR creel survey data for bottomfishing method.

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

Estimated Bottomfish Boat Hours and Trips

Year	Bottomfishing Hours			Bottomfishing Trips		
	Total	Non-Charter	Charter	Total	Non-Charter	Charter
1982	5,692	5,692		1,512	1,512	
1983	7,894	7,849	45	2,017	2,006	11
1984	7,813	7,813		2,156	2,156	
1985	15,037	14,989	48	3,212	3,201	11
1986	6,058	6,033	24	1,444	1,422	23
1987	7,313	7,264	48	1,857	1,835	22
1988	12,611	12,435	176	3,190	3,085	105
1989	13,910	13,615	295	3,452	3,338	114
1990	13,128	12,952	177	3,071	2,988	83
1991	12,527	12,217	310	3,109	2,986	123
1992	13,588	13,177	411	3,234	3,054	180
1993	25,733	25,458	275	5,692	5,551	141
1994	19,038	18,849	188	4,331	4,238	93
1995	40,153	35,927	4,226	9,376	7,498	1,878
1996	31,249	26,863	4,386	7,657	5,912	1,745
1997	30,370	26,360	4,010	7,527	5,724	1,803
1998	36,198	31,822	4,376	8,636	6,924	1,712
1999	37,019	32,860	4,159	9,479	7,804	1,675
2000	31,216	27,760	3,457	7,159	5,654	1,505
2001	32,138	29,710	2,428	7,822	6,795	1,027
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
Average	19,592	18,112	1,621	4,717	4,097	679
Standard Deviation	10,949	9,410	1,753	2,618	1,969	730

Figure 4. Bottomfish Fishery Participation



Interpretations: The number of unique boats bottomfishing has leveled off in recent years, but generally increases during years with ideal weather conditions, available marketing opportunities, and a thriving economy. The 53% increase in 1993 and 35% increased in 1995 could have been due to the inclusion of the Merizo Pier in 1993 and the the Agat Marina in October 1994 as an offshore creel survey sites. In 2004, the number of unique boats in the fishery decreased 28% to 347 boats.

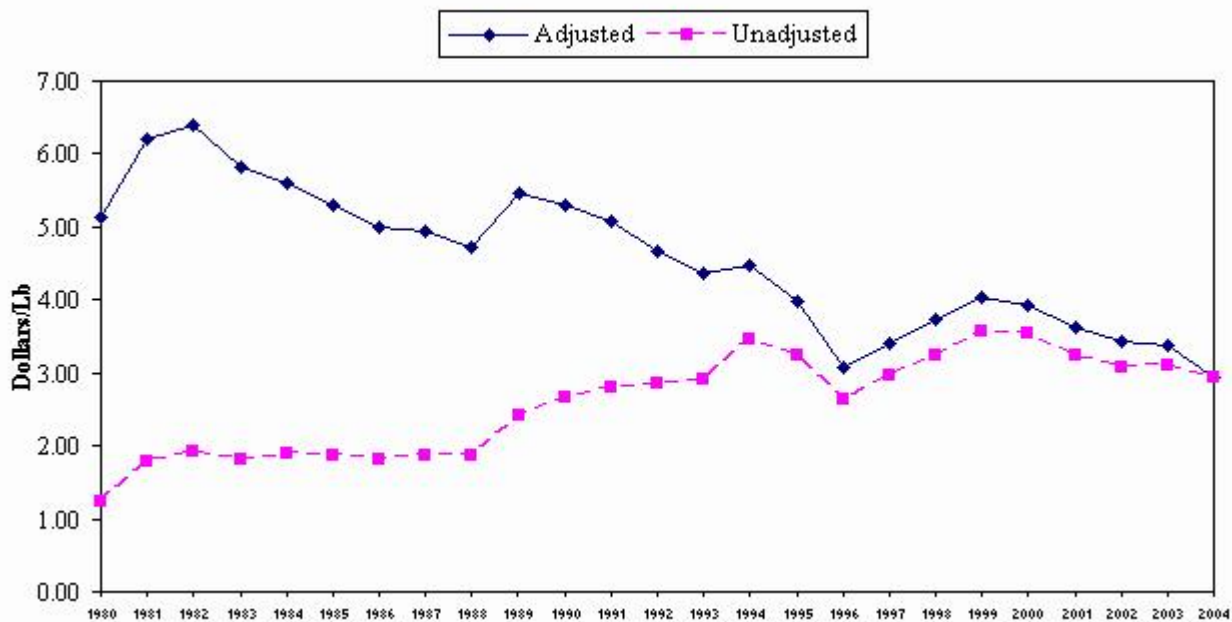
Source: Offshore creel survey boat log data from DAWR's three sampled ports. The data was converted and processed using the WPacFIN-generated boat estimator model.

Calculations: The 2004 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 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
Average	276	441	214
Standard Deviation	108	198	86

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 in 1996 due to health concerns, which could have resulted in the rise in price of locally caught bottomfish. However, new fish shops have opened up in recent years, selling fish imported from the Philippines and Micronesia. These imports compete with locally caught bottomfish, with the imports being less expensive and consisting of large groupers, snappers, and emperors.

The adjusted average price for bottomfish has been showing a general decrease, with unadjusted prices showing a general increase. The average adjusted price for bottomfish decreased 13% between 2003 and 2004. The price, \$2.93, is the lowest adjusted price for bottomfish, 64% below the 25-year average.

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 2004 CPI value was 563.2.

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
Average	2.59	4.56
Standard Deviation	0.68	0.98

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

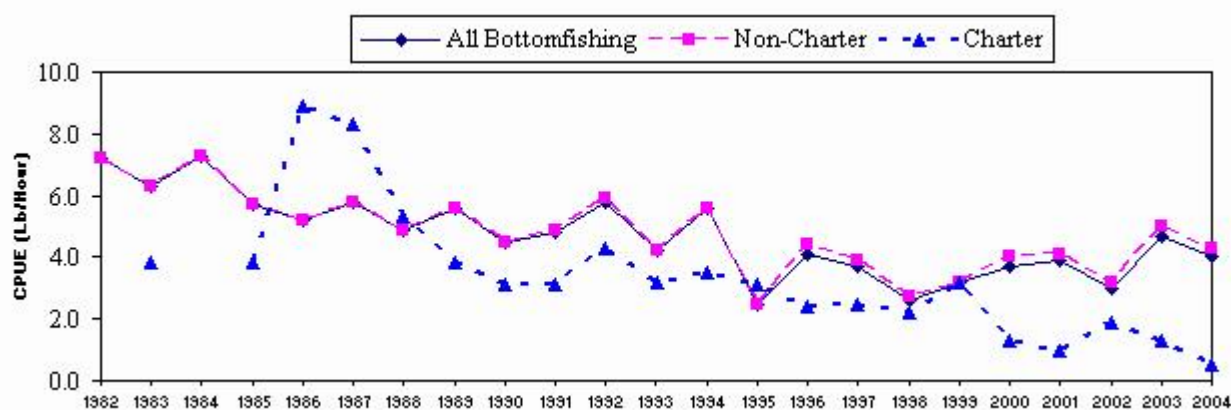


Figure 6b. Deepwater CPUE: Overall, Charter, and Non-charter

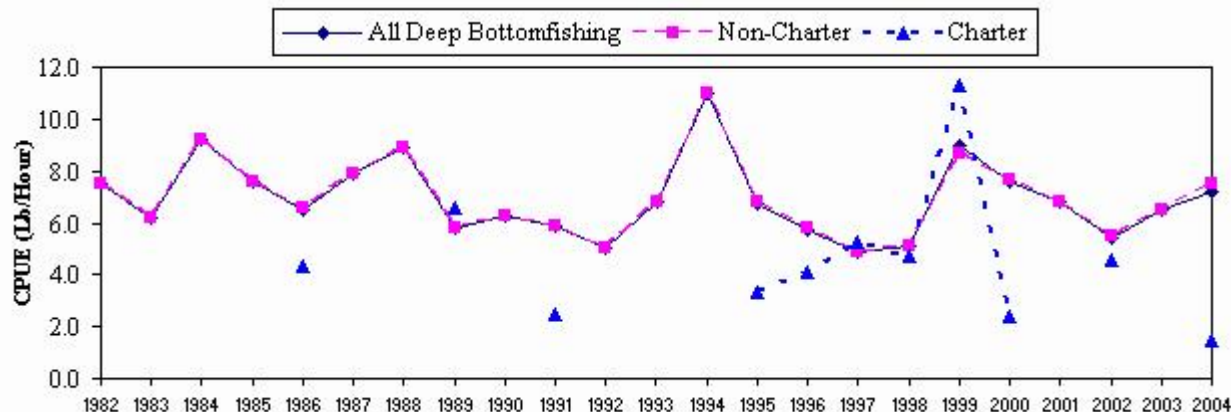
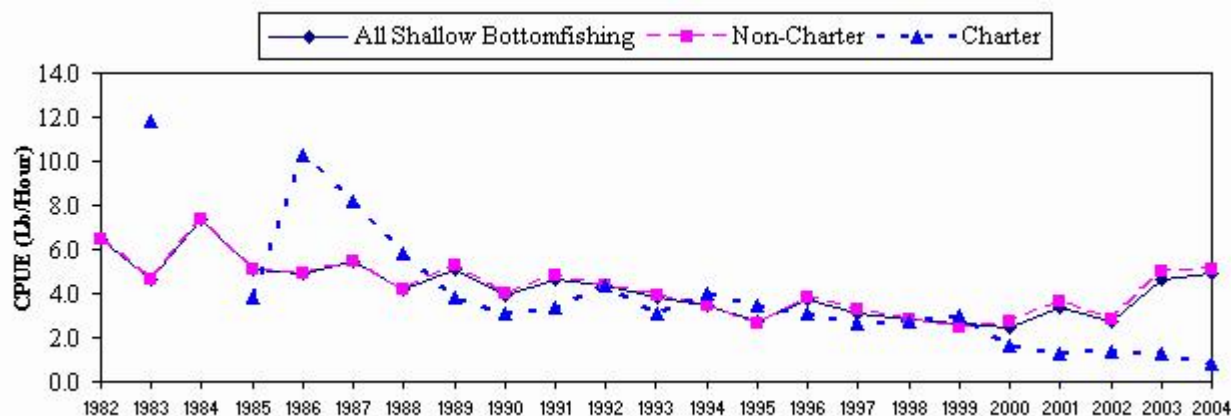


Figure 6c. Shallow Water CPUE: Overall, Charter, and Non-charter



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 to separate out the activity of charter boats. Commercial boats fishing out of the Agat Marina had high effort and low catches, skewing the overall CPUE. Separating out the charter fishery resulted in a CPUE value more representative of bottomfishing activity.

Historically, 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 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.

In 2004, total, non-charter, and charter overall bottomfish CPUE decreased 15% (4.7 to 4.0 lbs/hr), 14% (5.0 to 4.3 lbs/hr), and 62% (1.3 to 0.5 lbs/hr) respectively. The CPUE for deep total and non-charter bottomfishing increased 11% (6.5 to 7.2 lbs/hr) and 15% (6.5 to 7.5 lbs/hr). Charter deep bottomfishing was encountered in 2004, with a CPUE of 1.5 lbs./hr. The CPUE for shallow overall, non-charter, and charter bottomfishing increased 7% (4.6 to 4.9 lbs/hr), increased 2% (5.0 to 5.2 lbs/hr), and decreased 39% (1.3 to 0.8 lbs/hr). The CPUE for deep and shallow overall and non-charter fishing exceeded the 23-year averages.

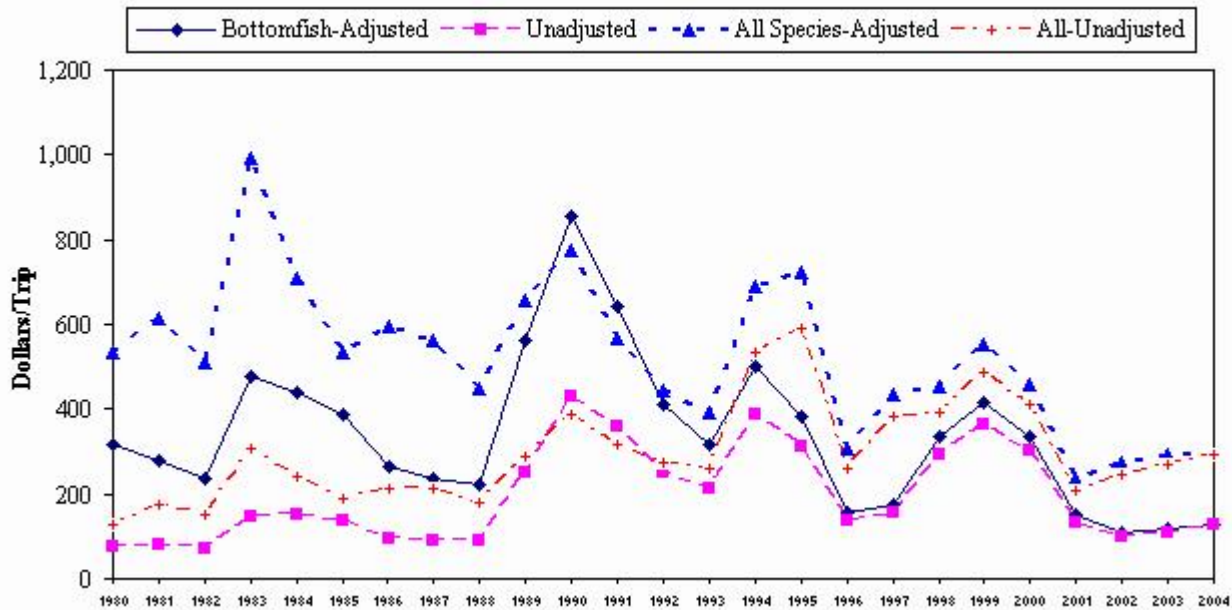
Source: The DAWR creel survey data for the bottomfishing method.

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	7.20	7.20		7.50	7.50		6.50	6.50	
1983	6.30	6.30	3.80	6.20	6.20		4.60	4.60	11.80
1984	7.30	7.30		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	5.80	5.80	8.30	7.90	7.90		5.50	5.50	8.20
1988	4.90	4.90	5.30	8.90	8.90		4.20	4.20	5.80
1989	5.60	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	3.20	6.80	6.80		3.80	3.90	3.10
1994	5.60	5.60	3.50	11.00	11.00		3.50	3.50	4.00
1995	2.50	2.50	3.10	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	3.70	3.90	2.50	4.90	4.90	5.30	3.10	3.30	2.60
1998	2.60	2.70	2.20	5.10	5.10	4.70	2.80	2.80	2.70
1999	3.20	3.20	3.20	9.00	8.70	11.30	2.60	2.50	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	0.50	7.20	7.50	1.50	4.90	5.10	0.80
Average	4.71	4.80	3.36	6.93	6.96	4.60	4.20	4.27	3.95
Standard Deviation	1.33	1.29	2.10	1.52	1.50	2.65	1.26	1.26	2.89

Figure 7. Average Revenue per Trip



Interpretations: The 2004 inflation-adjusted average revenue per trip for bottomfish increased 8%, while increasing slightly for all species. Decreases in revenue in previous years were due to a combination of occurrences: fishermen selling their catch to vendors not participating in the commercial receipt book program, an increase in the amount of imports from Micronesia and the Philippines, and significant numbers of bad weather days and storms.

Locally caught bottomfish had an initial advantage with marketing due to the closure of roadside vendors and a general preference to purchase locally caught fish. However, newly opened vendors selling imported fish consisting of large groupers, snappers, and emperors, are beginning to compete with locally caught fish. 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 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.

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	854	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
Average	194	338	296	522
Standard Deviation	112	178	119	178

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

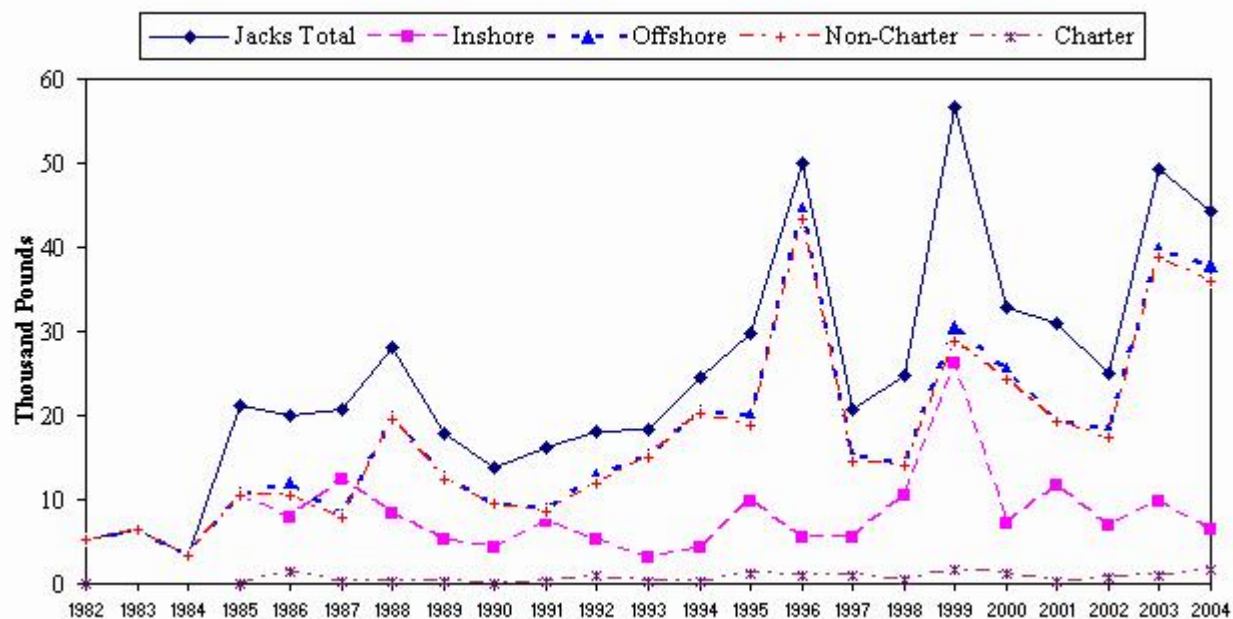


Figure 8b. Jacks/Trevallys (*Caranx, Carangoides*): CPUE

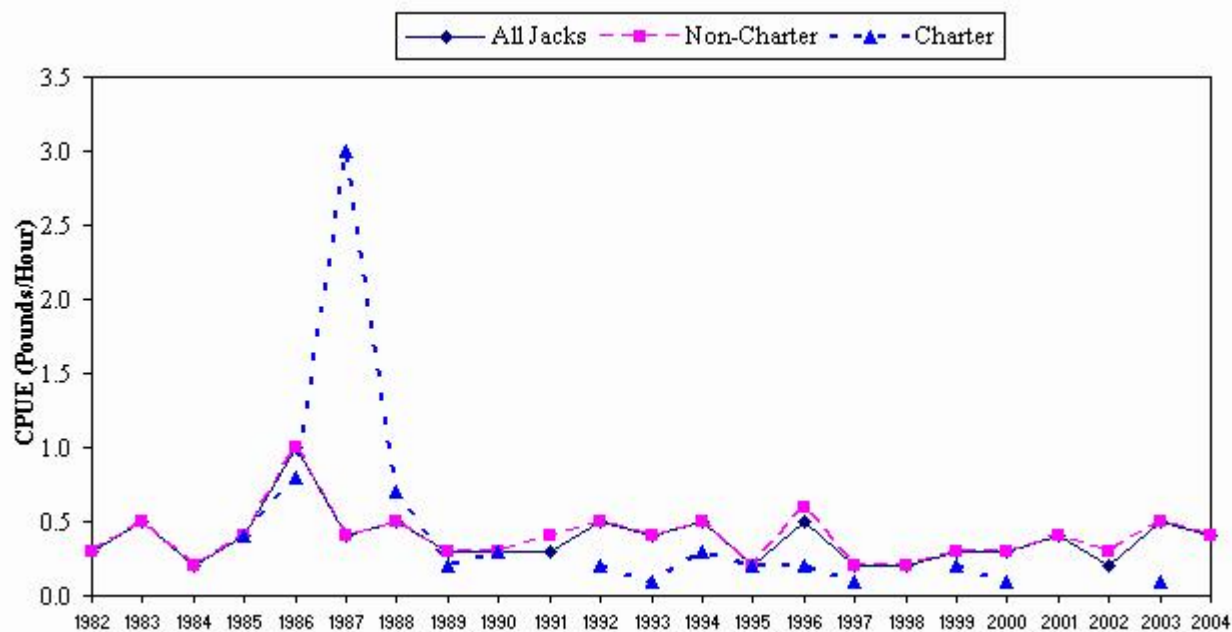


Figure 8c. Average Size Harvested: *Caranx melampygus*

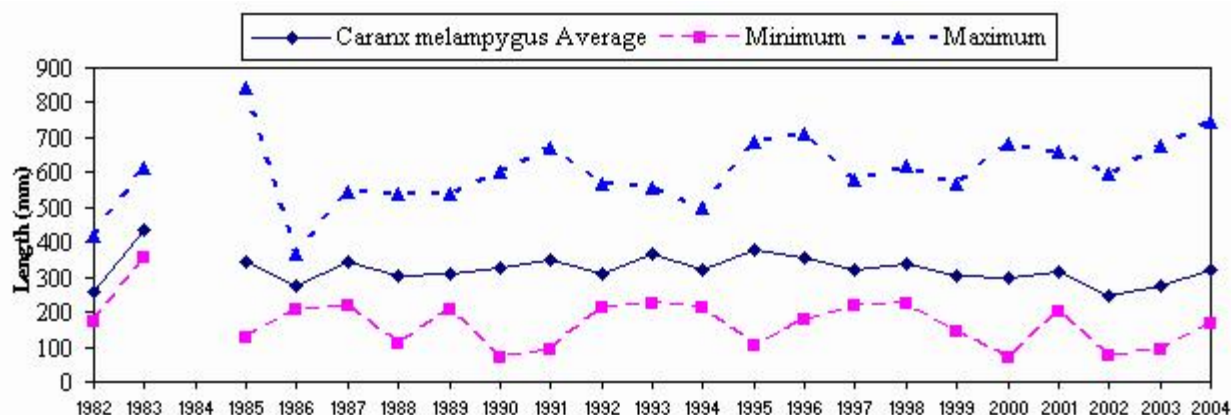


Figure 8d. Average Size Harvested: *Caranx ignobilis*

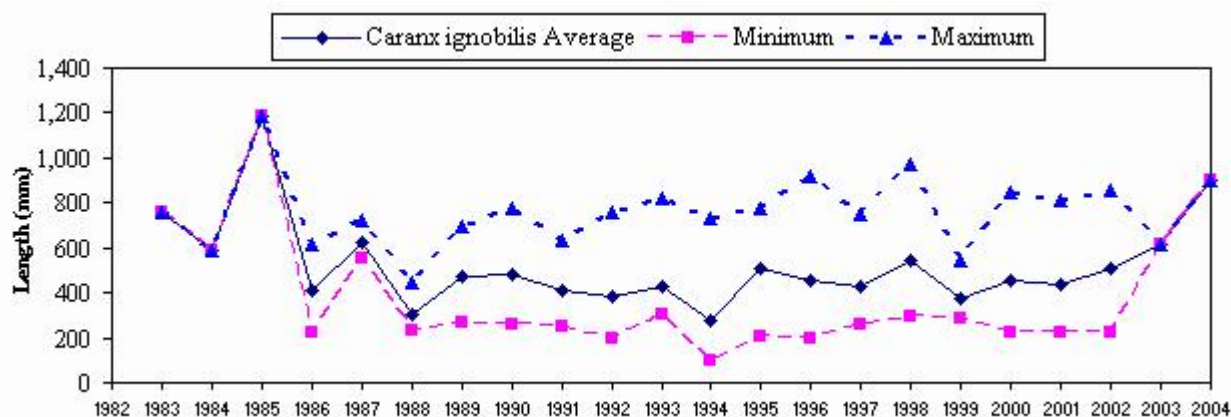
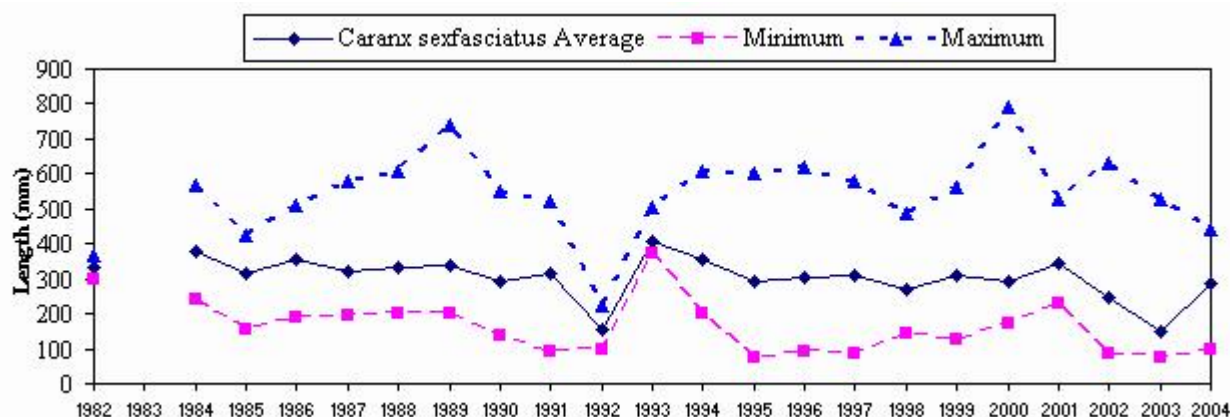


Figure 8e. Average Size Harvested: *Caranx sexfasciatus*



Interpretations: The harvest of jacks decreased in all categories in 2004, except for offshore charter fishing. The total harvest decreased 10%, inshore harvest decreased 34%, and the offshore harvest decreased 5%. The offshore non-charter harvest decreased 7%, while the charter harvest increased 97%. The total and non-

charter offshore CPUE both decreased 20%. The charter CPUE in 2004 was 0.1 lbs/hr in 2004. Jacks or trevally's were not caught in 2003 by charter boats.

The average sizes for the three most commonly caught jacks increased in 2004, increasing 18% for *C. melampygus* and 93% for *C. sexfasciatus*. *C. ignobilis* increased 47%, but only a single individual was encountered in 2004. Jacks are the only bottomfish group that is harvested year round, with juveniles harvested as a pulse fishery several times a year.

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.

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

Jacks	Total Harvest	Inshore Harvest	Offshore Harvest			Offshore CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	5,212		5,212	5,192	20	0.3	0.3	
1983	6,538		6,538	6,538		0.5	0.5	
1984	3,360		3,360	3,360		0.2	0.2	
1985	21,144	10,532	10,612	10,577	35	0.4	0.4	0.4
1986	19,901	7,965	11,936	10,532	1,404	1.0	1.0	0.8
1987	20,633	12,498	8,135	7,890	244	0.4	0.4	3.0
1988	28,162	8,394	19,768	19,448	321	0.5	0.5	0.7
1989	17,944	5,326	12,618	12,392	226	0.3	0.3	0.2
1990	13,722	4,207	9,515	9,452	62	0.3	0.3	0.3
1991	16,084	7,278	8,806	8,566	240	0.3	0.4	
1992	18,171	5,299	12,872	11,910	962	0.5	0.5	0.2
1993	18,315	3,085	15,230	14,903	327	0.4	0.4	0.1
1994	24,599	4,187	20,412	20,175	238	0.5	0.5	0.3
1995	29,722	9,656	20,066	18,842	1,224	0.2	0.2	0.2
1996	50,007	5,562	44,445	43,413	1,032	0.5	0.6	0.2
1997	20,730	5,480	15,250	14,414	836	0.2	0.2	0.1
1998	24,811	10,519	14,292	13,933	359	0.2	0.2	
1999	56,568	26,083	30,485	28,919	1,566	0.3	0.3	0.2
2000	32,745	7,252	25,493	24,257	1,235	0.3	0.3	0.1
2001	31,008	11,609	19,399	19,267	132	0.4	0.4	
2002	25,009	6,790	18,219	17,434	785	0.2	0.3	
2003	49,356	9,700	39,656	38,755	901	0.5	0.5	0.1
2004	44,234	6,393	37,841	36,062	1,779	0.4	0.4	
Average	25,129	8,391	17,833	17,227	663	0.4	0.4	0.5
Standard Deviation	14,045	4,924	11,134	10,765	551	0.2	0.2	0.7

Average Size (mm)

Year	<i>Caranx melampygus</i>				<i>Caranx ignobilis</i>				<i>Caranx sexfasciatus</i>			
	Average	Max	Min	n	Average	Max	Min	n	Average	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	1,18	1,18	1,18	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
Average	323	604	167	38	525	760	379	8	305	545	162	20
Standard Deviation	43	106	70	17	204	160	273	6	61	118	78	16

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

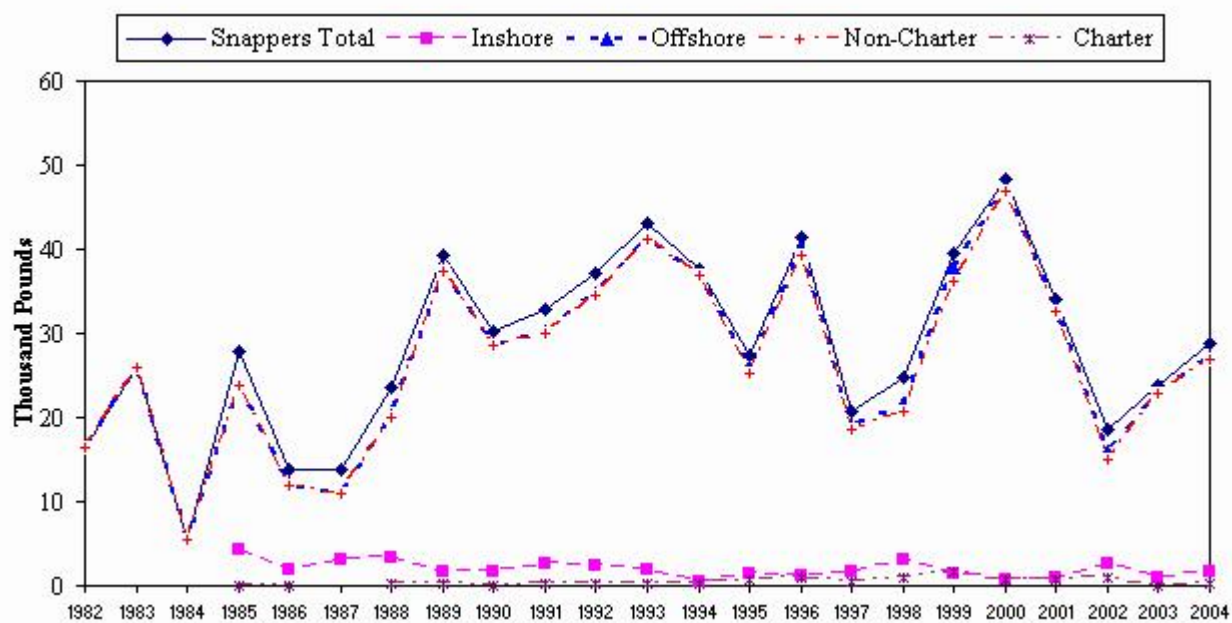


Figure 9b. Snappers (*Lutjanus*, *Pristipomoides*, *Aphareus*, *Etelis*): CPUE

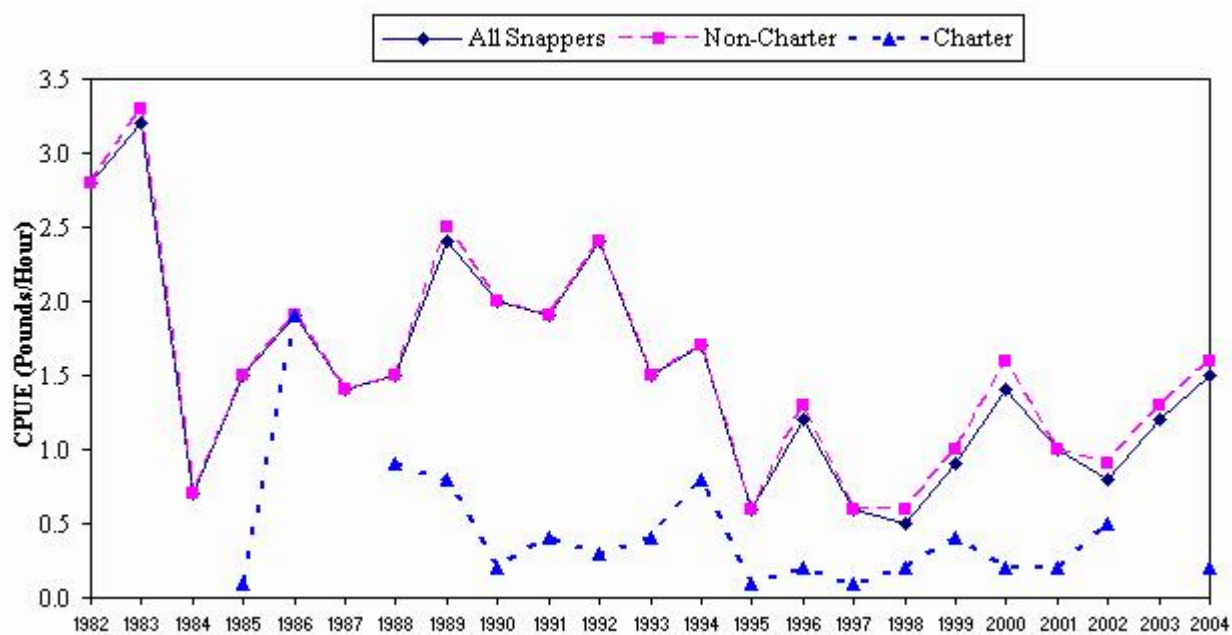


Figure 9c. Average Size Harvested: *Etelis carbunculus*

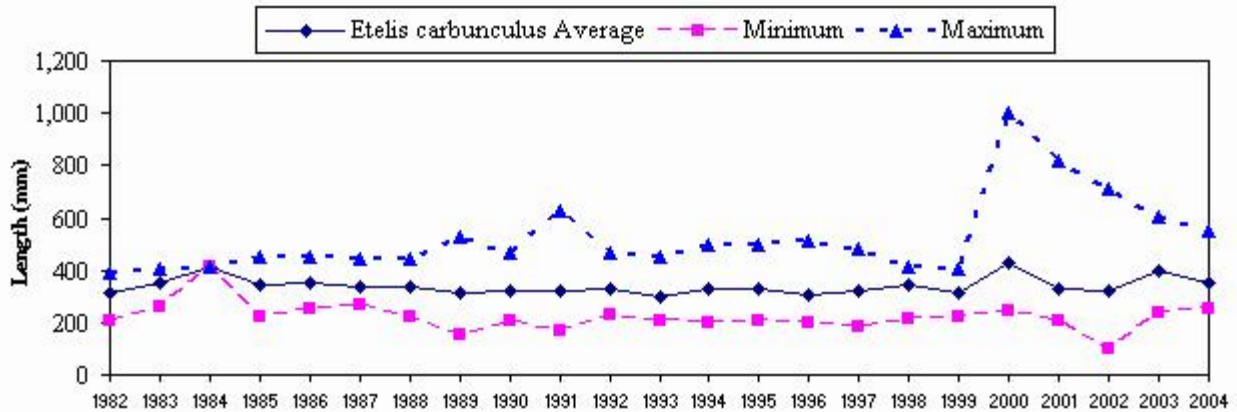


Figure 9d. Average Size Harvested: *Lutjanus kasmira*

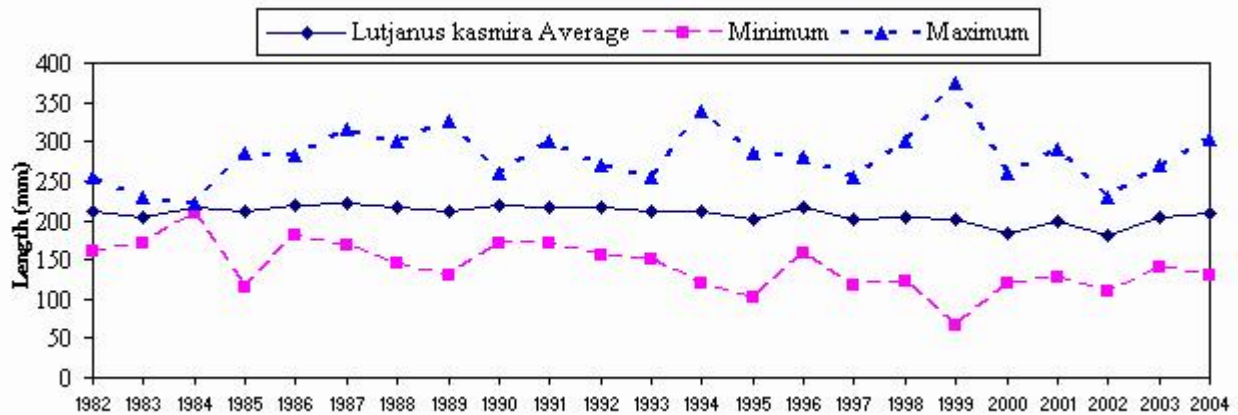
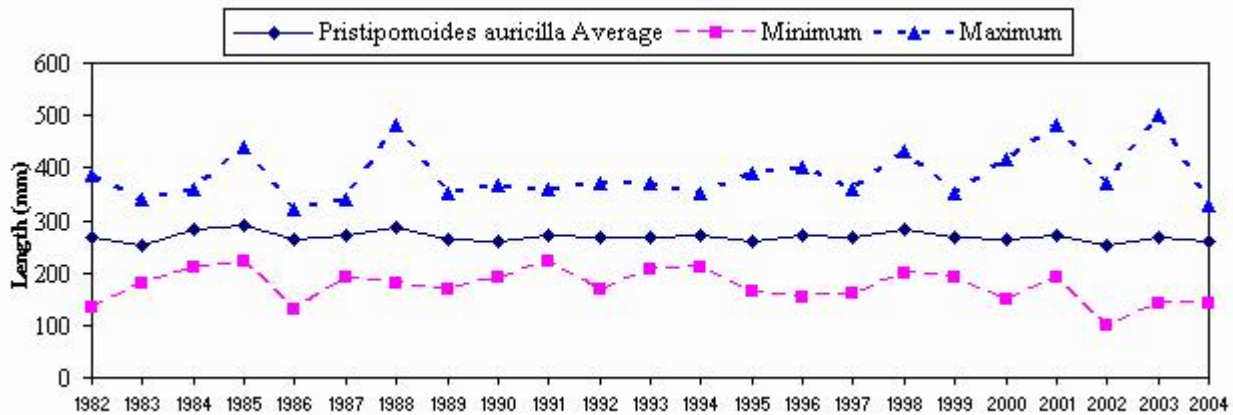


Figure 9e. Average Size Harvested: *Pristipomoides auricilla*



Interpretations: The harvest of snappers increased in all categories in 2004, the only bottomfish group showing an increase in the inshore harvest category. The total harvest increased 21%, the inshore harvest increased 85%, and the offshore harvest increased 18%. The offshore non-charter harvest increased 17%, while the charter harvest increasing from virtually zero to 310 pounds.

The 2004 CPUE values for total and non-charter offshore increased 25% and 23% respectively. The CPUE for snappers increased from virtually zero to 0.2 pounds per hour.

The average sizes for the three representative snapper species decreased 12% for *E. carbunculus*, or ehú, increased 2% for *L. kasmira*, and decreased 3% for *P. auricilla*. The average size for *E. carbunculus* and *L. kasmira* are above the 23-year average, while *P. auricilla* fell below the 23-year average.

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.

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

Snappers	Total Harvest	Inshore Harvest	Offshore Harvest			Offshore CPUE		
			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	16,453		16,453	16,453		2.8	2.8	
1983	25,945		25,945	25,945		3.2	3.3	
1984	5,475		5,475	5,475		0.7	0.7	
1985	27,971	4,236	23,735	23,732	4	1.5	1.5	0.1
1986	13,845	1,816	12,029	11,983	46	1.9	1.9	1.9
1987	13,911	3,058	10,853	10,853		1.4	1.4	
1988	23,657	3,443	20,214	20,054	161	1.5	1.5	0.9
1989	39,318	1,711	37,607	37,370	237	2.4	2.5	0.8
1990	30,287	1,785	28,502	28,458	44	2.0	2.0	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	43,016	1,798	41,218	41,098	120	1.5	1.5	0.4
1994	37,673	551	37,122	36,970	153	1.7	1.7	0.8
1995	27,363	1,523	25,840	25,237	602	0.6	0.6	0.1
1996	41,376	1,203	40,173	39,293	880	1.2	1.3	0.2
1997	20,759	1,769	18,990	18,604	386	0.6	0.6	0.1
1998	24,707	3,138	21,569	20,694	875	0.5	0.6	0.2
1999	39,430	1,537	37,893	36,128	1,765	0.9	1.0	0.4
2000	48,229	792	47,437	46,786	652	1.4	1.6	0.2
2001	33,994	845	33,149	32,545	604	1.0	1.0	0.2
2002	18,681	2,710	15,971	14,919	1,053	0.8	0.9	0.5
2003	23,857	891	22,966	22,963	3	1.2	1.3	
2004	28,786	1,648	27,138	26,828	310	1.5	1.6	0.2
Average	28,461	1,965	26,752	26,391	437	1.5	1.5	0.4
Standard Deviation	10,742	972	10,843	10,701	456	0.7	0.7	0.4

Average Size (mm)

Year	<i>Etelis carbunculus</i>				<i>Lutjanus kasmira</i>				<i>Pristipomoides auricilla</i>			
	Average	Max	Min	n	Average	Max	Min	n	Average	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	1,00	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
Average	338	522	221	24	208	282	141	51	269	385	174	60
Standard Deviation	33	148	55	13	11	36	31	29	10	50	32	32

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

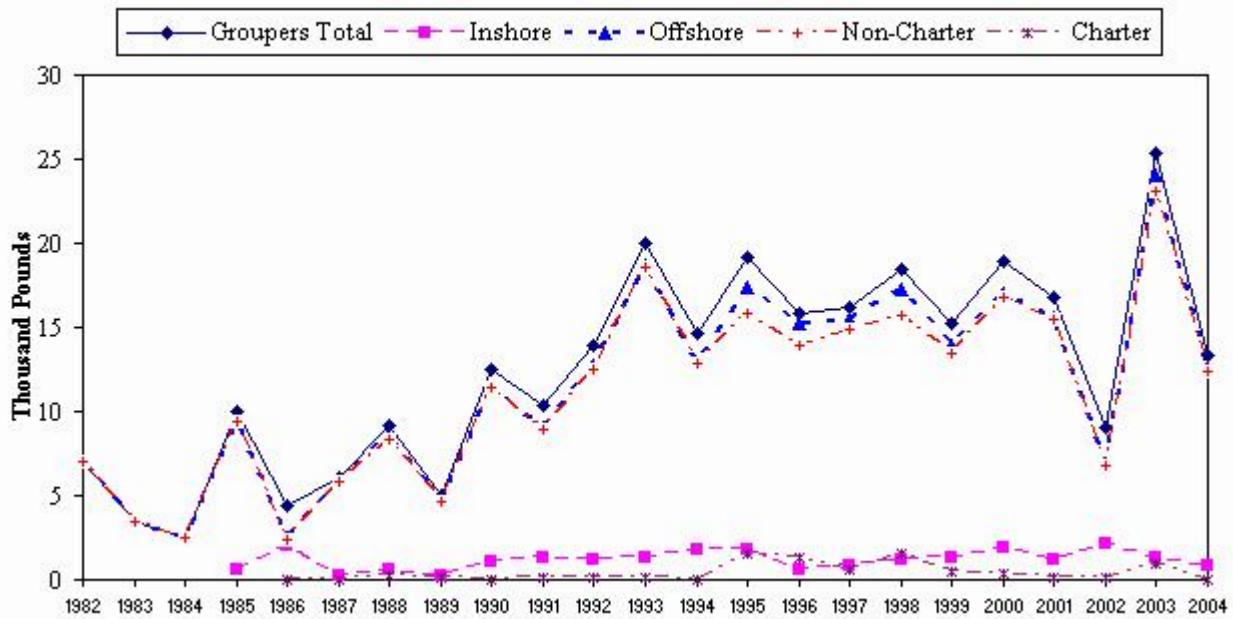


Figure 10b. Groupers (Epinephelus, Cephalopholis, Variola): CPUE

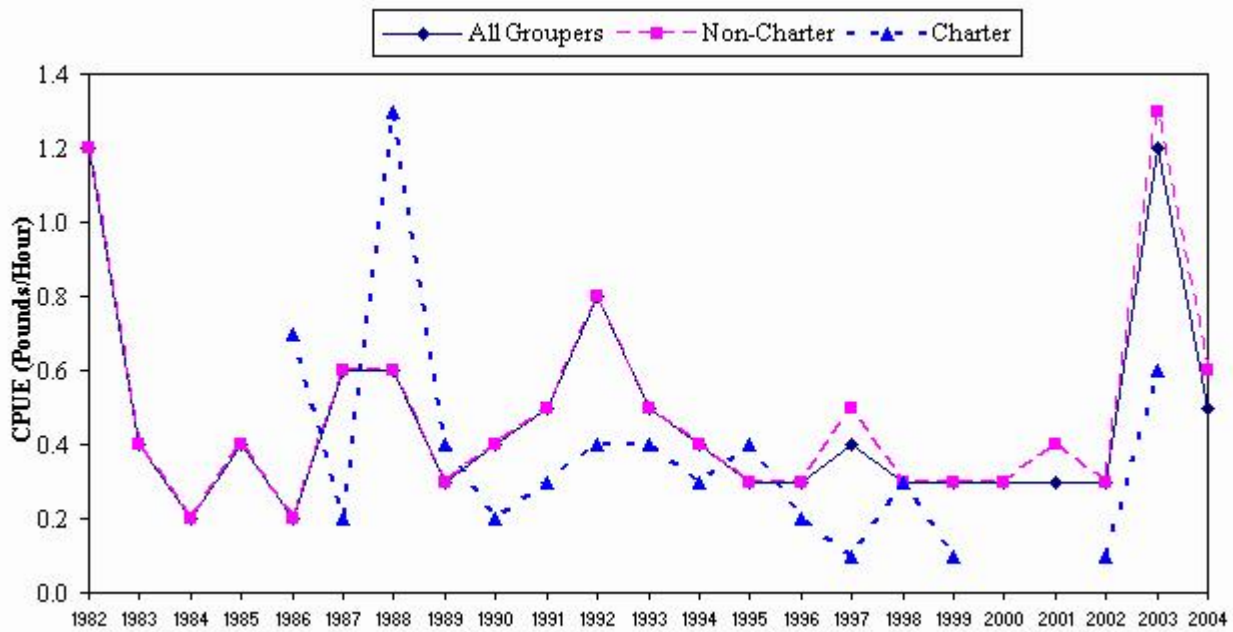


Figure 10c. Average Size Harvested: *Epinephelus fasciatus*

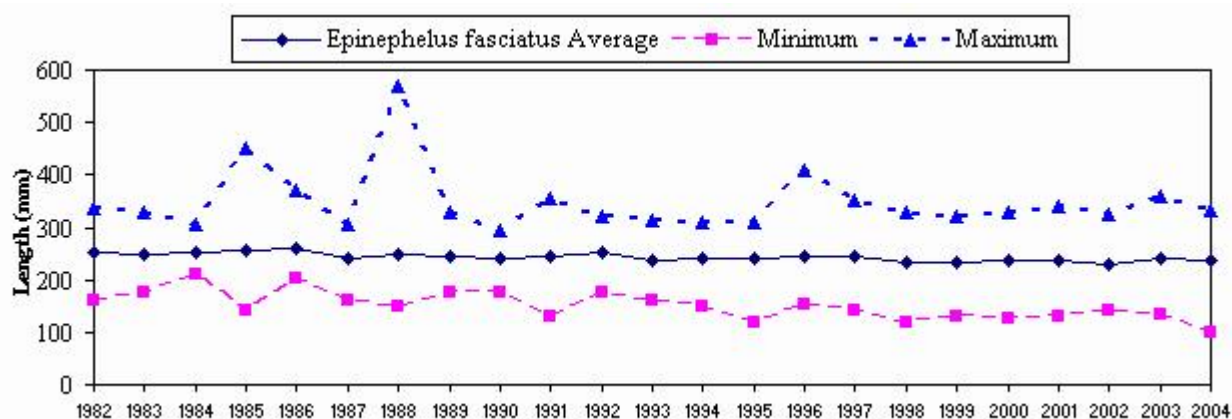


Figure 10d. Average Size Harvested: *Epinephelus merra*

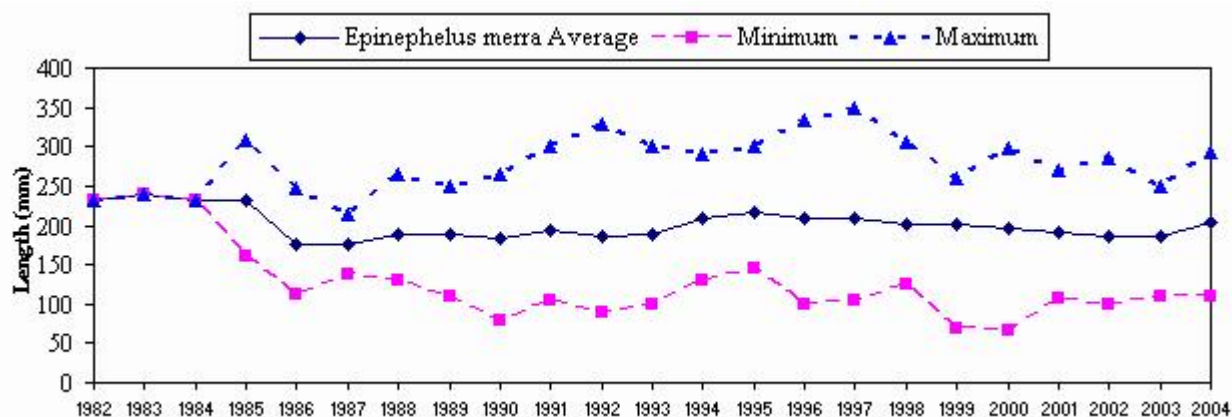
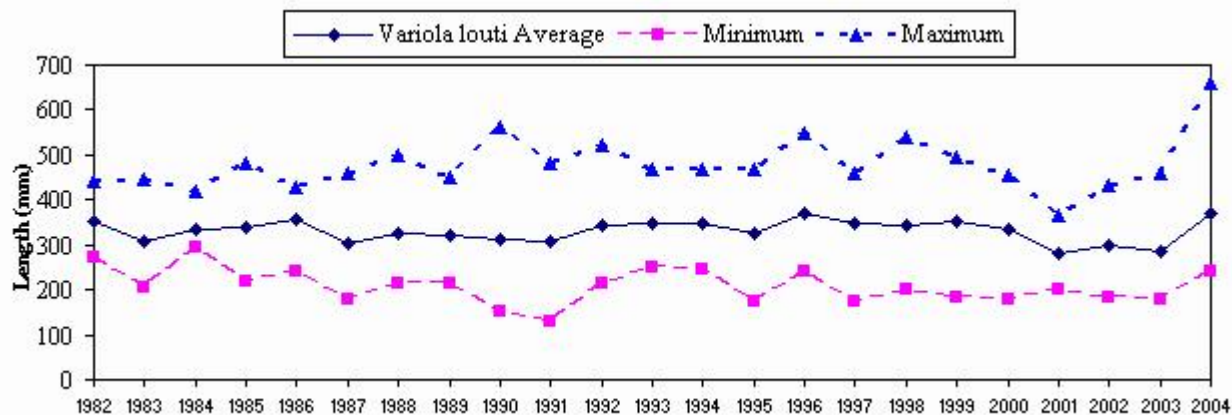


Figure 10e. Average Size Harvested: *Variola louti*



Interpretations: The harvest of groupers decreased in all categories in 2004. Total harvest decreased 47%, inshore harvest decreased 35%, and offshore harvest decreased 48%. Offshore non-charter and charter harvests decreased 46% and 94% respectively. The CPUE for total and non-charter offshore increased 58% and 54%. Groupers are not commonly caught by charter boats. A low grouper harvest and high effort made the grouper CPUE virtually zero in 2004.

The average sizes for the three representative groupers decreased 2% for *E. fasciatus*, increased 9% for *E. merra*, and increased 30% for *V. louti*. The average sizes for *E. fasciatus* fell below the 23-year time series, while *E. merra* and *V. louti* were above the 23-year time series.

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.

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

Groupers	Total Harvest	Inshore Harvest	Offshore Harvest			Offshore CPUE		
			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	7,000		7,000	7,000		1.2	1.2	
1983	3,471		3,471	3,471		0.4	0.4	
1984	2,463		2,463	2,463		0.2	0.2	
1985	10,012	562	9,450	9,450		0.4	0.4	
1986	4,425	1,983	2,442	2,425	17	0.2	0.2	0.7
1987	6,066	243	5,823	5,814	9	0.6	0.6	0.2
1988	9,215	621	8,594	8,359	236	0.6	0.6	1.3
1989	5,012	221	4,791	4,664	127	0.3	0.3	0.4
1990	12,463	1,058	11,405	11,377	28	0.4	0.4	0.2
1991	10,332	1,256	9,076	8,918	158	0.5	0.5	0.3
1992	13,909	1,203	12,706	12,532	175	0.8	0.8	0.4
1993	20,013	1,333	18,680	18,582	97	0.5	0.5	0.4
1994	14,628	1,727	12,901	12,844	57	0.4	0.4	0.3
1995	19,183	1,815	17,368	15,825	1,543	0.3	0.3	0.4
1996	15,861	653	15,208	13,919	1,289	0.3	0.3	0.2
1997	16,222	802	15,420	14,847	573	0.4	0.5	0.1
1998	18,436	1,186	17,250	15,757	1,493	0.3	0.3	0.3
1999	15,179	1,258	13,921	13,437	484	0.3	0.3	0.1
2000	18,947	1,875	17,072	16,758	315	0.3	0.3	
2001	16,816	1,233	15,583	15,516	67	0.3	0.4	
2002	9,075	2,168	6,907	6,792	114	0.3	0.3	0.1
2003	25,322	1,284	24,038	23,048	990	1.2	1.3	0.6
2004	13,313	833	12,480	12,426	55	0.5	0.6	
Average	12,494	1,166	11,480	11,140	412	0.5	0.5	0.4
Standard Deviation	6,064	557	5,755	5,462	519	0.3	0.3	0.3

Average Size (mm)

Year	<i>Epinephelus fasciatus</i>				<i>Epinephelus merra</i>				<i>Variola louti</i>			
	Average	Max	Min	n	Average	Max	Min	n	Average	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
Average	243	348	150	109	201	279	126	78	331	479	208	29
Standard Deviation	8	60	27	57	18	36	48	55	25	59	39	14

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

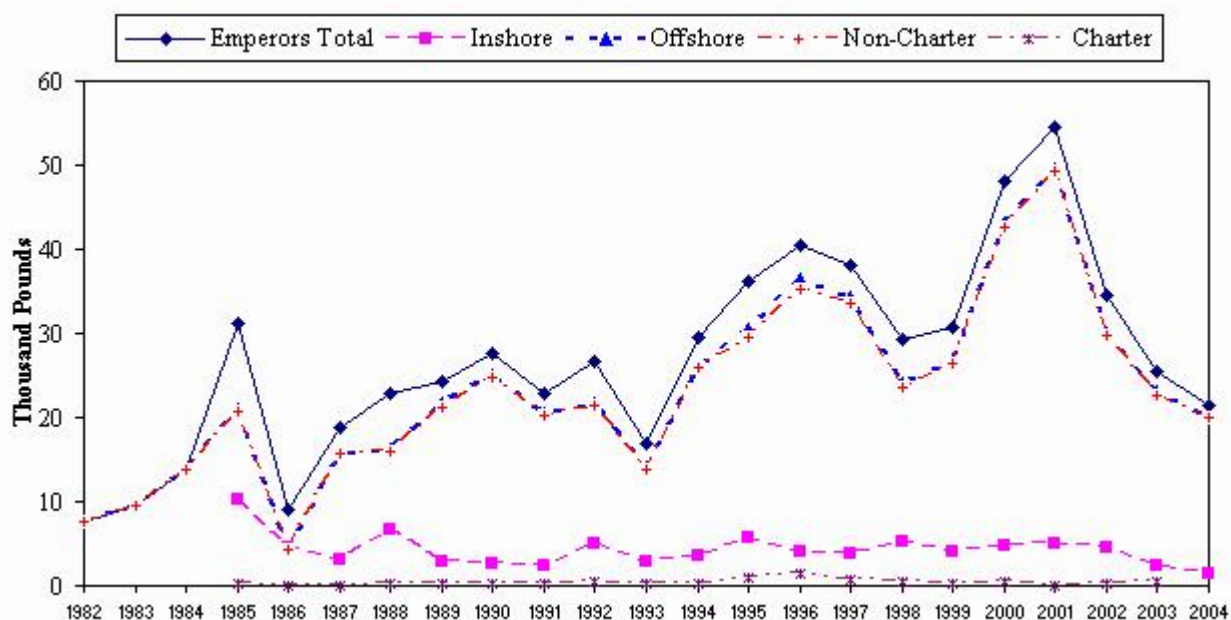


Figure 11b. Emperors (*Lethrinus*, *Gnathodentex*, *Gymnocranius*, *Monotaxis*): CPUE

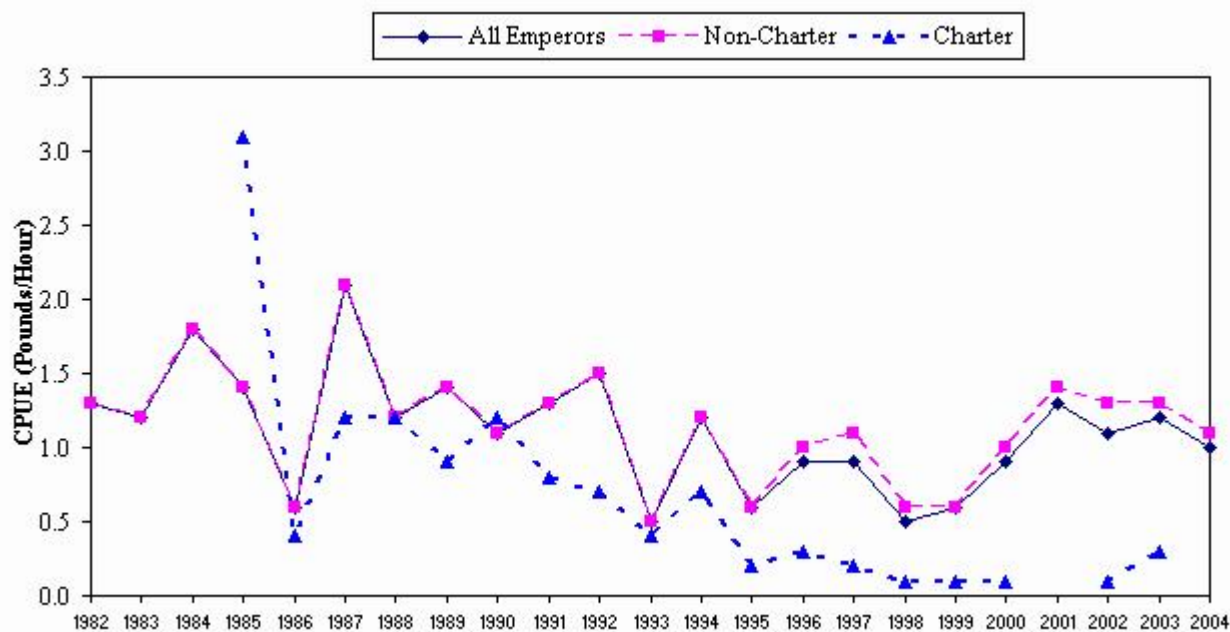


Figure 11c. Average Size Harvested: *Lethrinus olivaceus*

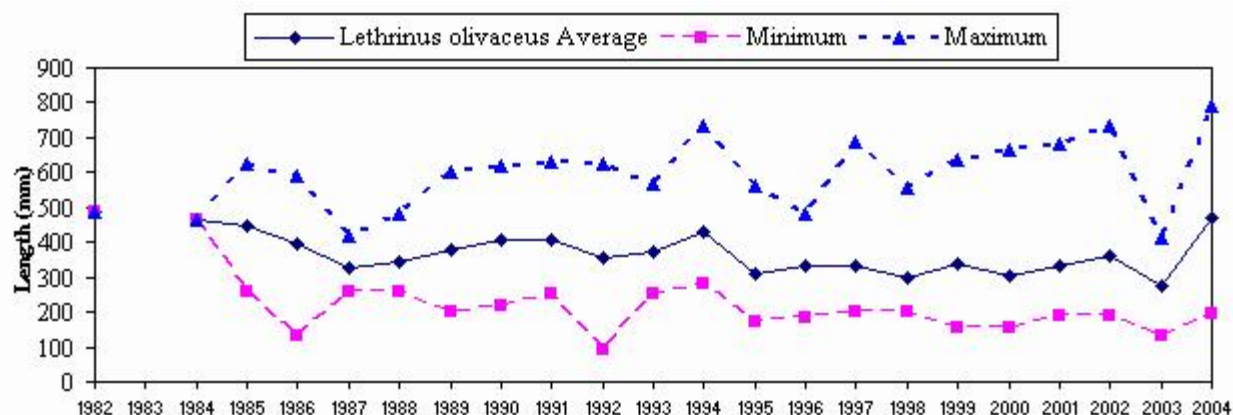


Figure 11d. Average Size Harvested: *Lethrinus obsoletus*

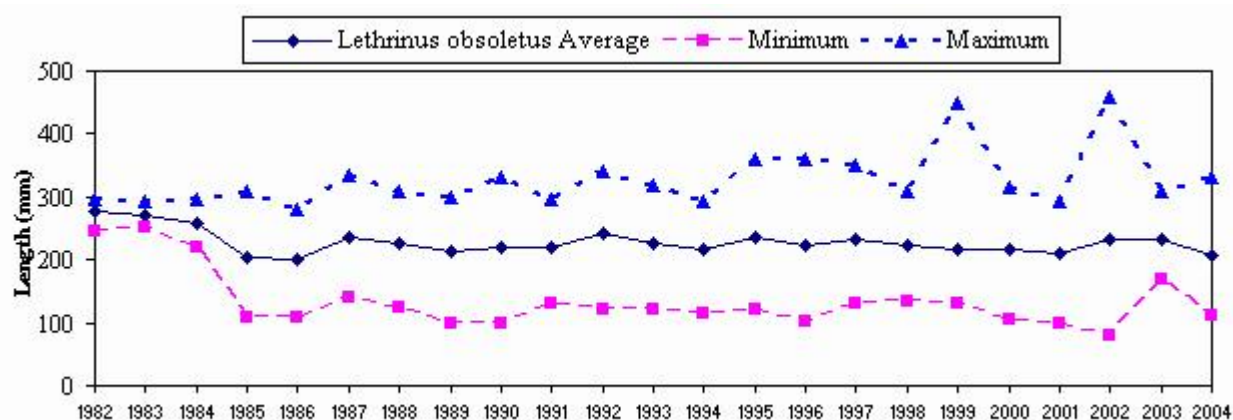
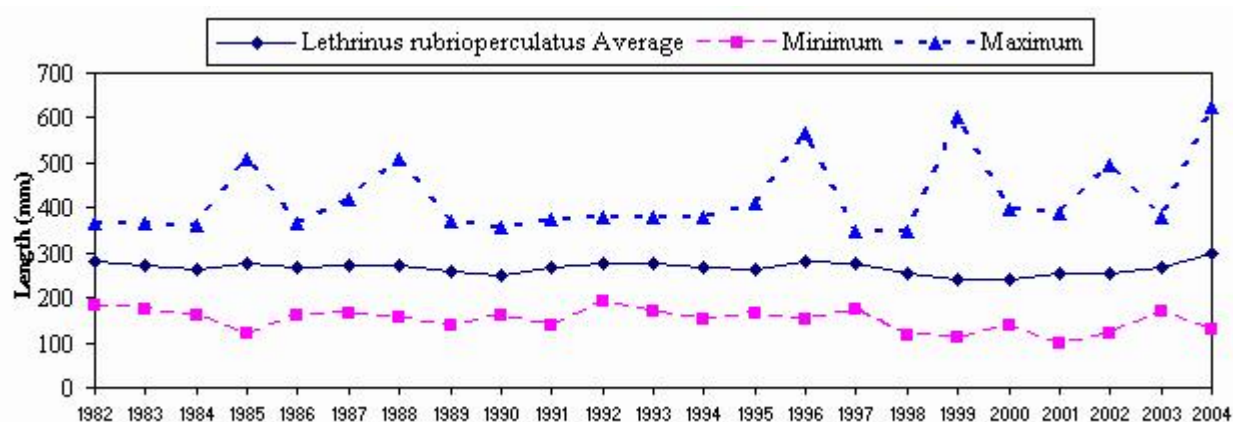


Figure 11e. Average Size Harvested: *Lethrinus harak*



Interpretations: The harvest of emperors decreased in all categories in 2004. Emperors were not encountered by charter boats in 2004. Total harvest decreased 16%, inshore harvest decreased 40%, offshore harvest decreased 13%, and offshore non-charter boats decreased 12%. The CPUE for total and non-charter harvest of snappers also decreased in 2004, decreasing 17% and 15% respectively.

The average sizes of the *L. olivaceous*, *L. obsoletus*, and *L. harak* decreased 72%, decreased 11%, and increased 10% respectively. *L. olivaceous*, a larger species of emperor, shows wider fluctuations in average size throughout the 23-year series, while the average sizes for the other two emperor species show less fluctuation.

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.

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

Emperors	Total Harvest	Inshore Harvest	Offshore Harvest			Offshore CPUE		
Year			All	Non-Charter	Charter	All	Non-Charter	Charter
1982	7,677		7,677	7,677		1.3	1.3	
1983	9,635		9,635	9,635		1.2	1.2	
1984	13,843		13,843	13,843		1.8	1.8	
1985	31,182	10,341	20,841	20,691	149	1.4	1.4	3.1
1986	9,021	4,619	4,402	4,393	9	0.6	0.6	0.4
1987	18,910	3,204	15,706	15,648	58	2.1	2.1	1.2
1988	22,742	6,619	16,123	15,909	215	1.2	1.2	1.2
1989	24,337	2,780	21,557	21,300	257	1.4	1.4	0.9
1990	27,700	2,683	25,017	24,797	220	1.1	1.1	1.2
1991	22,911	2,478	20,433	20,177	256	1.3	1.3	0.8
1992	26,729	4,994	21,735	21,349	385	1.5	1.5	0.7
1993	16,799	2,857	13,942	13,821	121	0.5	0.5	0.4
1994	29,554	3,574	25,980	25,857	122	1.2	1.2	0.7
1995	36,161	5,687	30,474	29,634	840	0.6	0.6	0.2
1996	40,465	3,989	36,476	35,145	1,331	0.9	1.0	0.3
1997	38,202	3,916	34,286	33,516	770	0.9	1.1	0.2
1998	29,220	5,178	24,042	23,603	439	0.5	0.6	0.1
1999	30,783	4,135	26,648	26,327	321	0.6	0.6	0.1
2000	48,005	4,805	43,200	42,705	496	0.9	1.0	0.1
2001	54,484	4,982	49,502	49,401	101	1.3	1.4	
2002	34,447	4,485	29,962	29,781	182	1.1	1.3	0.1
2003	25,542	2,352	23,190	22,693	497	1.2	1.3	0.3
2004	21,488	1,409	20,079	20,079		1.0	1.1	
Average	26,949	4,254	23,250	22,956	356	1.1	1.2	0.7
Standard Deviation	11,874	1,924	10,869	10,694	327	0.4	0.4	0.7

Average Size (mm)

Year	<i>Lethrinus olivaceus</i>				<i>Lethrinus obsoletus</i>				<i>Lethrinus rubrioperculatus</i>			
	Average	Max	Min	n	Average	Max	Min	n	Average	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
Average	371	593	224	21	228	327	133	73	267	421	150	151
Standard Deviation	59	103	94	15	19	46	46	53	14	84	25	82

12a. 2004 Bottomfish Bycatch: Non-charter and Charter

Species Name	Number Released			Total*	Bycatch (%)
	Alive	Dead/Injured	Total		
Non Charter					
<i>Cephalopholis urodeta</i>	10		10	35	28.6
<i>Epinephelus merra</i>	10		10	89	11.2
<i>Odonus niger</i>	5		5	5	100
<i>Lethrinus harak</i>	4		4	188	2.1
<i>Carcharhinus amblyrhymchos</i>	2		2	2	100
<i>Rhinecanthus aculeatus</i>	1		1	1	100
<i>Mullidae</i>	6		6	6	100
<i>Balistidae</i>	36		36	39	92.3
Total: Non-charter Bycatch	74		74	376	19.7
Compare with Total**				1,743	4.3
Charter					
<i>Parupeneus bifasciatus</i>	26		26	26	100
<i>Odonus niger</i>	20		20	20	100
<i>Rhinecanthus aculeatus</i>	2		2	2	100
Total: Charter Bycatch	48		48	48	100
Comparison with Same Species	122		122	424	28.8
Comparison with All Bottomfish Caught			122	1,795	6.8

*unexpanded total number of that species caught

**unexpanded total number of fish caught from non-charter bottomfishing

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

*"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: Bycatch information was recorded beginning in 2000 as a requirement of Bottomfish FMP. Historically, most fish landed by fishermen was kept regardless of size and species. This may indicate a decrease in the availability of locally-caught large individuals of desired bottomfish species, resulting in the harvest of juveniles and less desirable species. In recent years, however, fishermen have been releasing small individuals more often. Charter boats in Agat, which make up the bulk of charter bottomfishing effort, release most of the fish they caught, primarily juvenile groupers, goatfish, and triggerfish, but will still keep small fish to serve as sashimi to their guests.

In 2004, the number of fish discarded as bycatch encountered decreased 59% from 191 pieces to 122 pieces.

Approximately 40% of the bycatch was discarded by charter boats.

Source: The DAWR creel survey data for bottomfishing method.

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