Appendix 4

Commonwealth of the Northern Mariana Islands

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Summary

Landings of bottomfish seem to have significantly increased from last year (57.1% more pounds in 2001 than in 2000), to the highest level in 19 years. Bottom-fishing activity in the CNMI has been higher than the 19-yr mean for the last 6 years. The number of trips during which bottomfish were caught increased dramatically from 2000, yet the average bottomfish catch per trip continued to be below the 19-yr mean. This fishery continues to show a high turnover with changes in the high liners participating in the fishery, and an increased number of local fishermen focusing on reef fishes in preference to bottomfishes. Fishermen are moving towards an increasing number of multi-purpose trips that focus primarily on reef fishes and catch pelagic species while in transit. In doing so, the shallow-water bottomfish complex continues to be exploited, but as part of the exploitation of reefs near the populated islands. Redgill emperor (mafute') is the most frequently harvested and easily identified species in this complex. The CNMI Division of Fish and Wildlife has considerable data that is intended for use in a stock assessment, but an estimate of absolute age is nearly essential to complete the modeling of the populations. If a specialist capable and willing to read otolith daily-growth rings of redgill emperor (mafute') could be identified and contracted to age otoliths already collected, then it should be possible to complete a stock assessment for this species in the CNMI.

The number of large-vessel commercial bottom-fishing ventures active in the Northern Islands appeared to increase to eight during 2000, but only four were active for more than a few trips. Of these four, two primarily sold their catches off the island of Saipan (mostly to the large hotels in Tinian). Commercial trips made by these large vessels continue to be sampled on a monthly basis. These vessels catch the majority of the deep-water bottomfishes.

Domestic US, joint-venture, and foreign vessels continue to inquire about full-time bottom fishing throughout much of the CNMI. The impact of these ventures to the commercial market is still unclear despite a fish-market assessment study conducted in 1994, and completed in late 1996. The results of this study did not correspond with the significant increase in the Northern Islands bottomfish harvest.

Although revenues and prices for bottomfishes were greater in 2001 than in 2000, the average price per pound (adjusted) was still lower than the 19-yr mean. Only 8 years in the last 19 have lower values. Prices increased for all groups (from 5¢ to 56¢ per pound) from last year, with the exception of amberjack, which remained constant at $3.00/lb. Onaga still command the best prices, but the range is narrowing, with emperor (mafute') selling for the same price as ehu, gindai, and amberjack. Fishermen utilizing larger vessels have greater access to these deepwater resources, especially in the Northern Islands of the CNMI. Subsequently, the market demand should continue to increase as long as the supply of these fish increases with consistent quality. This industry could continue to expand with potential support by a training program in bottom fishing that addresses the following; proper fish handling, use of fathometers, nautical charts, modern electronic equipment such as GPS, fish finders, electric reels, anchoring techniques, and marketing. Moreover, side-band sonar mapping of the banks used by commercial fishermen from Farallon de Medinilla to Rota would greatly assist the growth of this sector.

Historical Annual Statistics for CNMI Bottomfishes

Year	Total Landings (lbs)	CPUE (lb/trip)	Inflation-adjusted Revenue ($)	Average Price (per lb)	Number of Boats
1983	22,683	43	76,806	3.39	90
1984	33,924	69	104,439	3.08	102
1985	32,780	116	94,173	2.87	55
1986	23,929	104	74,831	3.13	54
1987	39,772	168	114,270	2.87	42
1988	37,850	179	104,269	2.75	29
1989	19,550	76	58,758	3.01	29
1990	10,903	85	35,799	3.28	29
1991	5,693	46	20,309	3.57	20
1992	8,478	59	24,702	2.91	37
1993	14,769	83	41,414	2.80	20
1994	20,376	74	60,960	2.99	32
1995	28,881	93	102,229	3.54	34
1996	53,089	119	182,328	3.43	70
1997	51,271	136	173,465	3.38	69
1998	47,232	148	164,925	3.49	50
1999	44,961	157	164,126	3.65	51
2000	36,495	57	102,790	2.82	65
2001	**57,328**	**69**	**175,345**	**3.06**	**75**
Mean	31,051	99	98,734	3.16	50
Standard Deviation	15,633	42	52,919	0.29	23

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Introduction

The Commonwealth of the Northern Mariana Islands' (CNMI) bottomfish fishery occurs primarily around the islands and banks from Rota Island to Zealandia Bank north of Sarigan. However, this discussion will be limited to the catches landed on Saipan, which is by far the largest market. The fishery will be characterized by data collected through the Commercial Purchase Database, which indirectly records actual landings by recording all local fish sales to commercial establishments. This data collection system is dependent upon first-level purchasers of local fresh fish to accurately record all fish purchases by species categories on specially designed invoices. Division of Fish and Wildlife (DFW) staff routinely collected and distributed invoice books to almost 50 participating local fish purchasers in 2001; which include practically all fish markets, stores, restaurants, hotels, government agencies, and roadside vendors (fish-mobiles).

Although this data collection system has been in operation since the mid-1970s, only data collected since 1983 are considered accurate enough to be comparable for most aspects of the fishery. Unfortunately, this database has 3 inherent problems, when used in this manner. First, a number of the bottomfish MUS are not listed on the sales receipts. This in turn results in a series of problems. This means that buyers must either write in a species name or decide within which general category that species falls. For example, *Lutjanus kasmira* may be written in as *saas* (the local name for the species), or the vendor must decide whether or not it should be included in "assorted bottomfish" or in "assorted reef fish." Given that this species is also a common reef inhabitant and may be caught while reef fishing, it is entirely possible that it will be included with the reef fishes and underrepresented in the bottom fishes. In addition, for those species that are correctly categorized as "assorted bottomfish," but not listed by the buyer to species, the species-specific totals may vary widely from year to year and under represent the sales of that species. *Etelis carbunculus* (*ehu*) is such a species. Unless the buyer specifically writes it on the invoice, sales of this species are likely to inflate the "assorted bottomfish" category. Moreover, for some species that are correctly listed by the buyer to species, they are input into the database under the "assorted bottomfish" category and therefore cannot be tracked specifically. *Pristipomoides auricilla* (yellowtail kalikali) is an example of this problem. Second, some bottomfish MUS are only listed as part of a general category. For example, *Caranx ignobilis* (giant trevally) and *C. lugubris* (black jack) are both lumped in the category "jacks," potentially with other carangids such as *Carangoides orthogrammus* (yellow-spotted trevally), *Caranx melampygus* (bluefin trevally) and *C. sexfasciatus* (bigeye trevally). Third, *Aprion virescens* (jobfish, highway, or uku) is listed on the sales invoice, but the data analysis software did not include this species in the bottomfish report. Modifications to the report module after the 2001 collection period have corrected this problem for the last 10 years.

The CNMI's bottom fishery still consists primarily of small-scale local boats engaged in commercial and subsistence fishing, but in recent years larger vessels (35–60 ft) have entered the fishery. The bottom-fishery is broken down into two categories; deep (>500 ft) and shallow (100–500 ft) water fishing. The deep-water fishery is primarily commercial, targeting snappers and groupers. The snappers targeted include the Eteline and *Pristipomoides* complexes, whereas the eight-banded grouper (*Epinephelus octofasciatus*) is the only targeted grouper. The shallow-water fishery, which targets the redgill emperor (*Lethrinus rubrioperculatus*), is mostly commercial but also includes subsistence

fishermen. These fishermen are taking not only bottomfishes, but many reef fishes as well. Hand lines, home-fabricated hand reels and electric reels are the common gear used for small-scale fishing operations, whereas electric reels and hydraulics are the common gear used for the larger operations in this fishery. Historically, some trips have lasted for more than a day, but currently, effort is defined and calculated on a daily trip basis. Fishing trips are generally restricted to daylight hours, with most vessels presumed to return before or soon after sunset, unless fishing in the Northern Islands. In terms of participation, the bottomfish fleet consists primarily of vessels less than 24 ft long that are usually limited to a 30-mi radius from Saipan. The larger commercial vessels that are able to fish extended trips and which focus their effort from Esmeralda Bank to Zealandia Bank have landed the majority of the deep-water bottomfish reported through the purchase receipt forms. In 2001, the most consistent high liner of previous years did not fish. Six other companies sold more than 500 pounds of onaga (*Etelis coruscans*), two of whom had previously contributed at this level in the last 5 years. Only five companies sold more than 500 pounds of emperor, and of these, one landed 37.0% of the total catch of emperor sold in 2001.

Bottom fishing requires more technical skill than pelagic trolling, including knowledge of the location of specific bathymetric features. Presently, bottom fishing can still be described as "hit or miss" for most of the smaller size (14–25 ft) vessels. Without fathometers or nautical charts, the majority of fishermen utilizing smaller vessels often rely on land features for guidance to a fishing area. This type of fishing is inefficient and usually results in a lower catch-per-unit-effort (CPUE) in comparison to pelagic trolling. These fishermen tend to make multi-purpose trips—trolling on their way to reefs where they fish for shallow-water bottomfish and reef fish. Larger sized (25-ft and larger) vessels typically utilize Global Positioning System (GPS), fathometers and electric reels, resulting in a far more efficient operation. In addition, reef fishes are beginning to command a consistently higher price than bottomfishes. This appears to be reflected in an increased number of fishermen using small vessels focusing on reef and/or pelagic species over bottomfishes.

Recommendations

1) To request NMFS and the Council to assist DFW in identifying an expert who is capable of and willing to prepare otoliths of redgill emperor and then count daily growth rings.

2) To request NMFS and the Council assist the CNMI by contracting a specialist to map commercial fishing banks, particularly around Farallon de Medinilla, Marpi Reef, and the banks closest to Saipan, Tinian, and Rota.

3) To request that Council merge the Bottomfish Plan Team (as well as the Crustacean Plan Team) with the Coral Reef Ecosystem Plan Team.

Table 1.—CNMI Consumer Price Indices (CPIs).

Year	CPI	CPI Adjustment Factor
1983	140.90	1.92
1984	153.20	1.77
1985	159.30	1.70
1986	163.50	1.66
1987	170.70	1.59
1988	179.60	1.51
1989	190.20	1.42
1990	199.33	1.36
1991	214.93	1.26
1992	232.90	1.16
1993	243.18	1.11
1994	250.00	1.08
1995	254.48	1.06
1996	261.98	1.03
1997	264.95	1.02
1998	264.18	1.03
1999	267.80	1.01
2000	273.23	0.99
2001	**270.98**	**1.00**

Calculation: The Commonwealth of the Northern Mariana Islands' Consumer Price Index is computed by the CNMI Department of Commerce using the Laspeyres' formula.

Table 2.—CNMI 2001 commercial landings of bottomfish species

Species	Landings (lb)	Revenue ($)	Average Price ($/lb)
Jacks	3,009	9,007	2.99
Amberjack	17	51	3.00
Grouper	6,175	15,943	2.58
Emperor (Mafute')	13,590	40,754	3.00
Lehi	2,068	6,889	3.33
Jobfish	340	995	2.92
Onaga	13,087	47,729	3.65
Ehu	6	18	3.00
Gindai	1,533	4,592	3.00
Opakapaka	3,161	10,907	3.45
Sickle Pomfret	323	575	1.78
Alfonsin	32	80	2.50
Assorted Bottomfish	13,988	37,806	2.70
Total	**57,328**	**175,345**	**3.06**

Interpretation: The weight of fishes categorized as "assorted bottomfish" increased from 12.6% of the catch in 1999 to 29.6% of the catch in 2000 and decreased to 24.4% of the catch in 2001. This may reflect an increased catch of BMUS species such as *Lutjanus kasmira, Pristipomoides sieboldii,* and/or *P. auricilla,* or a variety of other species also caught while bottom fishing such as *Lutjanus bohar, Variola albimarginata, Saloptia powelli, Etelis radiosus,* and others. Buyers are also reporting their sales in less detail. This remains a problem largely because the diversity of the catch is great and most buyers sell these species as "assorted bottomfish," so there is no perceived need to identify them more completely. Division of Fish and Wildlife staff members were however, successful in reducing the number of fishermen not identified on sales receipts (1.18% of the receipts in 1999, 0.81% of the receipts in 2000, and 0.86% of the receipts in 2001).

Eight of 13 categories of bottomfish showed increased landings in 2001. Jacks (carangids, including BMUS species *Caranx ignobilis* and *C. lugubris*) have generally increased over the last 7 yrs, with a mean landing of 1,833 lbs and an increase of 75.6% in 2001 over 2000. Amberjack have only been reported for the last 4 years, but the landings have been steadily decreasing, with a mean of 142 lbs and a decrease of 22.7% this year. This decrease is likely a combination of inherent problems with reporting and a change in the fishermen (and therefore the composition of the catch) of the larger vessels targeting the Northern Islands. The landings of groupers (*Epinephelus fasciatus, Variola louti*, and a wide variety of other species including *E. octofasciatus*) have varied widely over the last 7 years, with a mean landing of 5,388 lbs per year. The landings in 2001 were 122% higher than 2000. The landings of emperors (lethrinids, including mafute') seem to have peaked in 1997 and are now stabilizing. The mean weight of landings over the past 7 years was 10,534 lbs, with a 51% increase in the landings in 2001 over 2000. Lehi and jobfish landings have varied widely over the past 7 years, with means of 3,004 lbs and 340 lbs respectively. Lehi landings decreased by 1.1% from 2000, whereas jobfish landings increased 123.8% from 2000. Errors in the reporting of jobfish sales over the last decade were corrected in the database. Landings of onaga over the last 7 years have a mean of 12,530 lbs. The landings in 2001 were a 61.0% increase over last year. Landings of ehu (*Etelis carbunculus*) have only been reported for the last 4 years, with a mean of 214 lbs. This year's landings were 83.3% less than the landings in 2000. This likely is a result of both decreased landings and the inherent problems with the

reporting (given that buyers need to specifically add a line for this species) that are likely to inflate the assorted bottomfish category and result in greater year-to-year variation in reporting. Opakapaka (*Pristipomoides filamentosus,* and likely some *P. flavipinnis*) landings have varied considerably in the last 7 years, with a mean of 2,338 lbs. In 2001, opakapaka landings increased 141.9%. Gindai (*Pristipomoides zonatus,* and likely some *P. argyrogrammicus*) landings have also varied over the last 7 years, with a mean of 1,428 lbs. This year's landings are 793.6% greater than last year's. Kalikali (*Pristipoimoides auricilla* and *P. sieboldii*) and saas (*Lutjanus kasmira*) were not itemized this year. Landings of sickle pomfret (*Taratichthys steindachneri*) have been reported the last 3 years, with a mean of 289 lbs. The landings in 2001 were 9.5% less than those of 2000. Alfonsin (*Beryx decadactylus*) were reported this year for the first time.

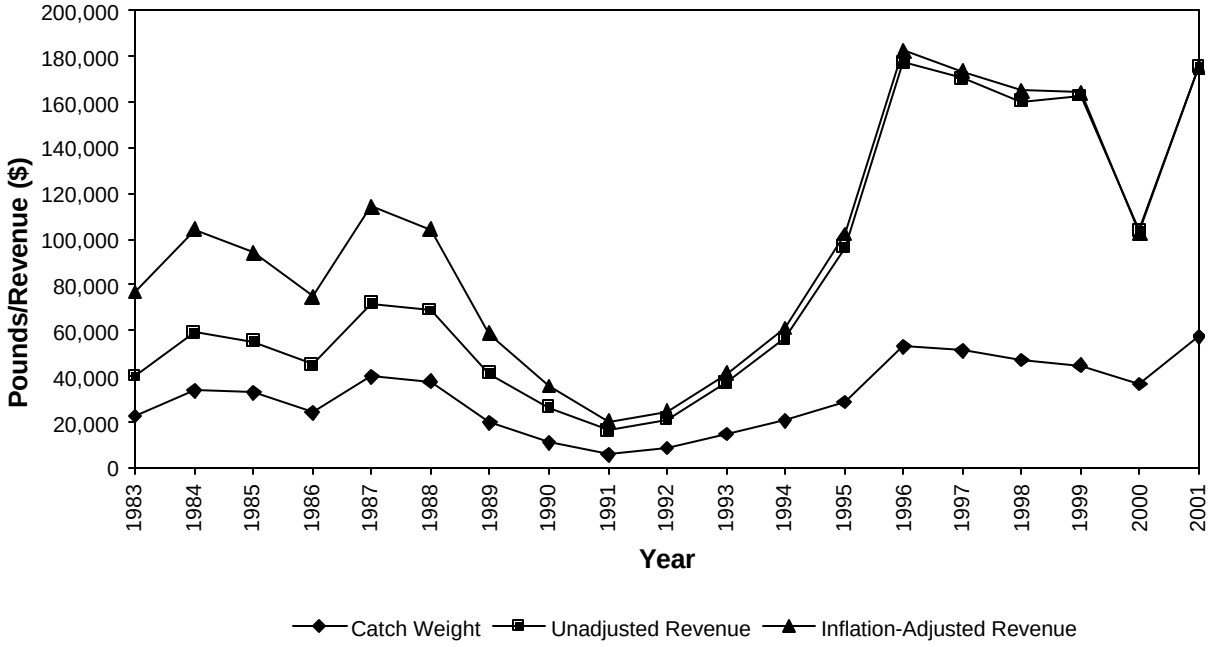
Forty-one percent of the fishermen reporting commercial sales of bottomfishes over the last 5 years have only done so in a single year. Only 8.2% of fishermen have bottomfish sales in all 5 years. Moreover, the high liners for each of the past 5 years have also shown this high rate of turnover. During the same period (1997 to 2001), the number of fishermen selling both pelagic fishes and bottom fishes decreased from 11.5 to 6.8%, the number selling both pelagic and reef fishes increased from 4.8 to 7.6%, and the number selling only reef fishes increased from 10.3 to 26.1%. This high rate of turnover, coupled with an increased focus on the commercial catch of reef fishes likely explains a large portion of this change.

Moreover, by examining the landings of emperors (lethrinids, including BMUS species *Lethrinus rubrioperculatus* and a variety of other species including *Gnathodentex aurolineatus, Lethrinus olivaceus, L. xanthochilus,* and others) the trends are even clearer. Sixty-five percent of the fishermen reporting sales over the past 5 years have only done so in a single year. Only 1 fisherman reported commercial sales of emperors in all 5 years and a single fisherman contributed 36.9% of the 2001 catch. Only 4 other vessels sold more than 500 pounds of emperor in 2001. The number of fishermen selling emperors increased slightly to 37 vessels this year (from 32 for the last 3 years). This species continued to be a seasonal favorite of smaller (25–30 foot) vessels harvesting around the islands of Farallon de Medinilla, Saipan, and Tinian.

Although revenues and prices for bottomfishes were greater in 2001 than in 2000, the average price per pound (adjusted) was still lower than the 19-yr mean. Only 8 years in the last 19 have lower values. Prices increased for all groups (from 5¢ to 56¢ per pound) from last year, with the exception of amberjack, which remained constant at $3.00/lb. Onaga still command the best prices, but the range is narrowing, with emperor (mafute') selling for the same price as ehu, gindai, and amberjack. Most fishes are sold as whole fish (and very few as filets or steaks). The larger species are often purchased by the hotel restaurants, which are now seeing far fewer customers. In addition, it is possible that the local public show greater demand for reef fishes. This may be reflected in the high price commanded by reef fishes such as parrotfishes and rabbitfishes.

Calculation: Annual summaries for each species from invoice data sheets.

Figure 1.—CNMI commercial bottomfish landings and revenue.



Interpretation: Landings, revenues, and adjusted revenues for 2001 were high, with only those of 1996 slightly higher. Most striking is the marked decrease in the landings, revenues, and adjusted revenues for 2000. This may be the result of changes in local staff. The position of supervisor for the section that collects these commercial purchase data was vacant for more than 6 months during 2000. Although the landings, revenues, and adjusted revenues for bottomfishes has been relatively comparatively high for the last 6 years compared to the preceding 13 years, there have been considerable changes in the composition of the fishery during this time.

The number of fishermen selling onaga (as representative of the deepwater bottomfish complex) has remained relatively constant for the previous 4 years (10, 14, 13, and 15, respectively). This year, 23 fishermen sold onaga. In each of the years 1997–2000, 2 or 3 fishermen have landed more than 1000 pounds (3 or 4 have landed more than 500 pounds). This year, 5 fishermen landed more than 1000 pounds (and 6 landed more than 500 pounds). No one fisherman was a high liner every year and only two sold more than 1000 pounds in 4 of the 5 years. In addition, 63% of the fishermen only sold onaga in 1 of the 4 years. Vessels capable of landing large amounts of onaga almost always are larger vessels fishing the Northern Islands. The difficulty of maintaining the equipment, vessel, and crew to consistently and routinely make these trips successful appears to be difficult over the long term for fishermen in the CNMI.

The number of fishermen selling mafute' (as representative of the shallow-water bottomfish complex) remained at 32 for the past 3 years, but increased to 37 in 2001. In each of these years, 1 to 4 fishermen have landed more than 1000 pounds (4 to 6 have landed more than 500 pounds), but only

one has been a high liner in all five years. Like the onaga fishermen, 65.0% of the fishermen only sold mafute' in 1 of the 5 years. In 2001, the number of pounds of mafute' landed would have been much smaller, if it were not for two fishermen who together landed 58.9% of the emperors. Many of the fishermen catching mafute' do so locally, but appear to be increasing their focus on reef fishes. The bottomfishes are a smaller portion of their sales and seem to be co-lateral catch (i.e., if caught in sufficient numbers while focusing on other species, then they too will be sold).

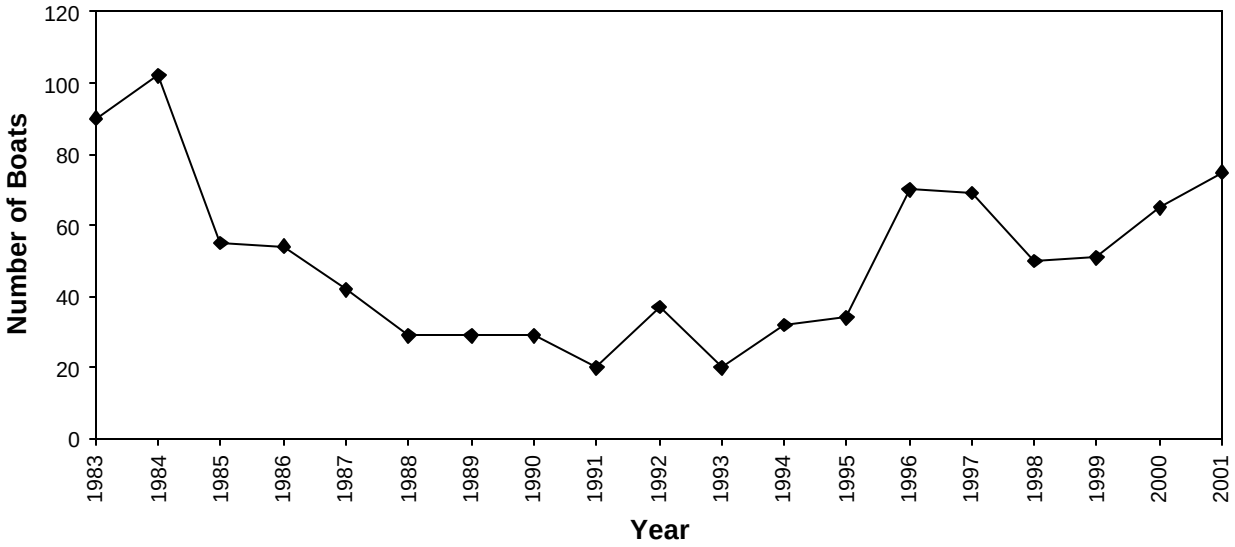
Revenues and inflation-adjusted revenues are high; higher revenues were only reported in 1996. Note that these higher prices were from a smaller total catch. Overall prices of bottomfishes have decreased over the past few years. Local buyers seem to increasingly prefer reef fishes.

Calculation: Landings in pounds are from a simple database summation of reported purchases of all bottomfish species combined. Revenue in dollars is from the same type of data base summation of the value field. The inflation adjustment is made using the Consumer Price Index (CPI) and establishing the 2001 CPI figure as the basis by which calculations of previous years' prices are made.

Summary Data:

Year	Pounds	Unadjusted Revenue	Inflation-adjusted Revenue
1983	22,683	40,003	76,806
1984	33,924	59,005	104,439
1985	32,780	55,396	94,173
1986	23,929	45,079	74,831
1987	39,772	71,868	114,270
1988	37,850	69,052	104,269
1989	19,550	41,379	58,758
1990	10,903	26,323	35,799
1991	5,693	16,118	20,309
1992	8,478	21,295	24,702
1993	14,769	37,310	41,414
1994	20,376	56,444	60,960
1995	28,881	96,442	102,229
1996	53,089	177,017	182,328
1997	51,271	170,064	173,465
1998	47,232	160,121	164,925
1999	44,961	162,501	164,126
2000	36,495	103,828	102,790
2001	**57,328**	**175,345**	**175,345**
Mean	31,051	83,399	98,734
Standard Deviation	15,633	57,149	52,919

Figure 2.—Number of fishermen (boats) making bottomfish landings.



Interpretation: The number of boats or fishermen making commercial landings of any bottomfish species declined from 1985 to 1988, stabilized between 1988–1990, slightly increased during 1992, decreased again in 1993, then increased during 1994 and 1995, and increased 100% in 1996. The number of vessels making bottomfish trips dropped in 1998 and 1999 to near the 16-year average. Over the past 2 years, there seems to have been a steady increase in the number of boats or fishermen making commercial sales.

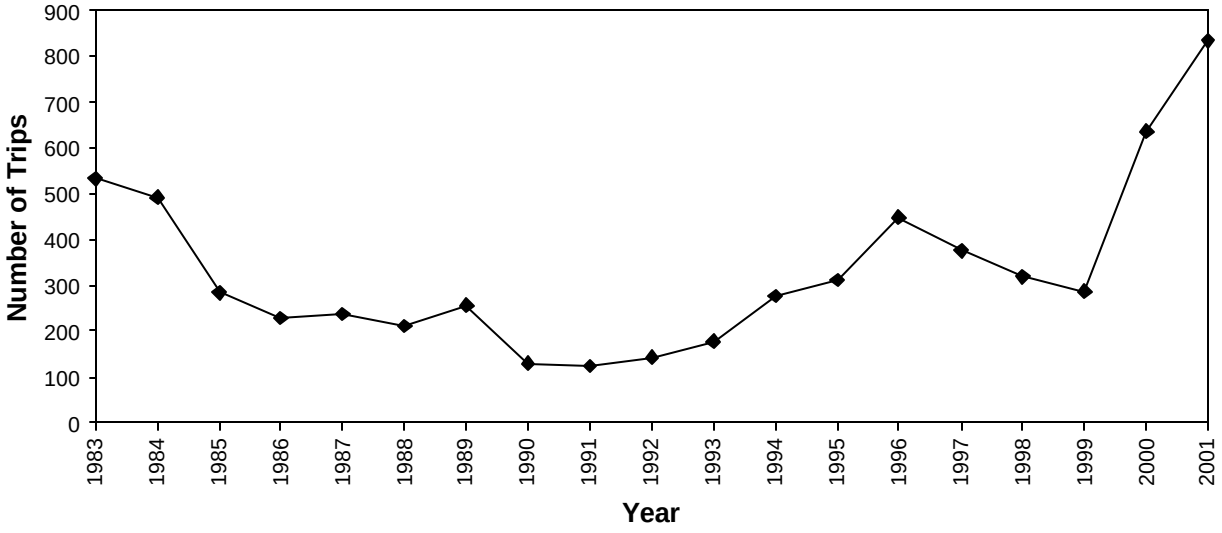
Note however, that almost 62.4% of the vessels selling bottomfishes between 1997 and 2000, only sold bottomfish in 1 of the 4 years. 19.4 to 34% of these fishermen also made a limited number of sales (=2) of any type of fish in any given year. Only 6% sold bottomfishes all 4 years. This seems to be a high rate of turnover. More of the smaller vessels are focusing on reef fishes in preference to bottomfishes. Between 1997 and 2001, the number of fishermen selling pelagic fishes, bottomfishes and reef fishes increased from 12.1 to 16.2%, those selling both pelagic fishes and bottom fishes decreased from 11.5 to 6.8%, the number selling both pelagic and reef fishes increased from 4.8 to 7.6%, and the number selling only reef fishes increased from 10.3 to 26.1%.

Calculation: The fisherman or boats selling the catch is identified on the "trip ticket" invoices used by purchasers. This assumes that the fisherman selling the catch is the only fisherman involved; that is, that these fish were all caught and sold by one fisherman alone. The plot shows the number of unique fishermen making any landings of bottomfish within a given year.

Summary Data:

Year	Boats
1983	90
1984	102
1985	55
1986	54
1987	42
1988	29
1989	29
1990	29
1991	20
1992	37
1993	20
1994	32
1995	34
1996	70
1997	69
1998	50
1999	51
2000	65
2001	**75**
Mean	50
Standard Deviation	23

Figure 3.—Number of CNMI bottomfish trips.



Interpretation: The number of bottomfish trips more than doubled in 2000 (compared to 1999) to reach the highest level in the past 18 years, although the number of fishermen making landings increased only slightly (Figure 2). This same trend continued in 2001. The number of bottomfish trips was high from 1984 through 1988 as a result of consistent fishing activity in the Northern Islands, centered on the island of Farallon de Medinilla. This fishery subsequently ceased by 1990, resulting in the steep drop in bottomfish trips in the early 90s. In 1994, consistent fishing activity in the Northern Islands began once more and has continued to the present. From a high in 1996, the number of trips decreased for a few years (by 16.0% in 1997, by 15.2% in 1998, and by 10.7% in 1999).

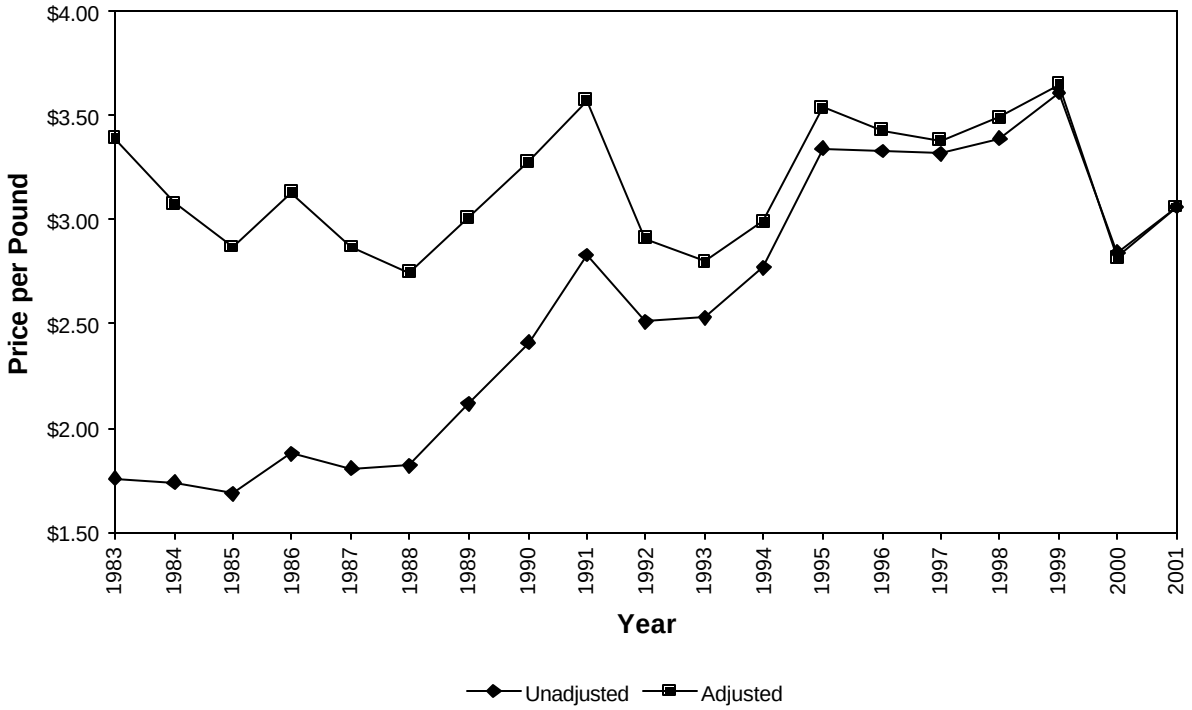
As more of the smaller vessels increase their focus on reef fishes, bottomfishes are still being caught and sold, but they are no longer the largest (or most valuable) part of the catch. This may result in fishermen catching bottomfishes as co-lateral catch on more trips, but adding up to smaller landings. Between 1997 and 2001, the number of fishermen selling pelagic fishes, bottomfishes and reef fishes increased from 12.1 to 16.2%, those selling both pelagic fishes and bottom fishes decreased from 11.5 to 6.8%, the number selling both pelagic and reef fishes increased from 4.8 to 7.6%, and the number selling only reef fishes increased from 10.3 to 26.1%.

Calculation: Adding each recorded fisherman's trip on a given day tallies the number of trips that resulted in landing any bottomfish. This assumes that each fisherman lands only once in a given day, and that all of the catch is sold on that day. Most trips last a single day, but it is also known that the occurrence of longer fishing trips is increasing.

Summary Data:

Year	Trips
1983	533
1984	492
1985	283
1986	229
1987	237
1988	211
1989	257
1990	129
1991	124
1992	143
1993	178
1994	276
1995	311
1996	448
1997	376
1998	319
1999	287
2000	635
2001	**834**
Mean	332
Standard Deviation	185

Figure 4.—CNMI average price of bottomfish.



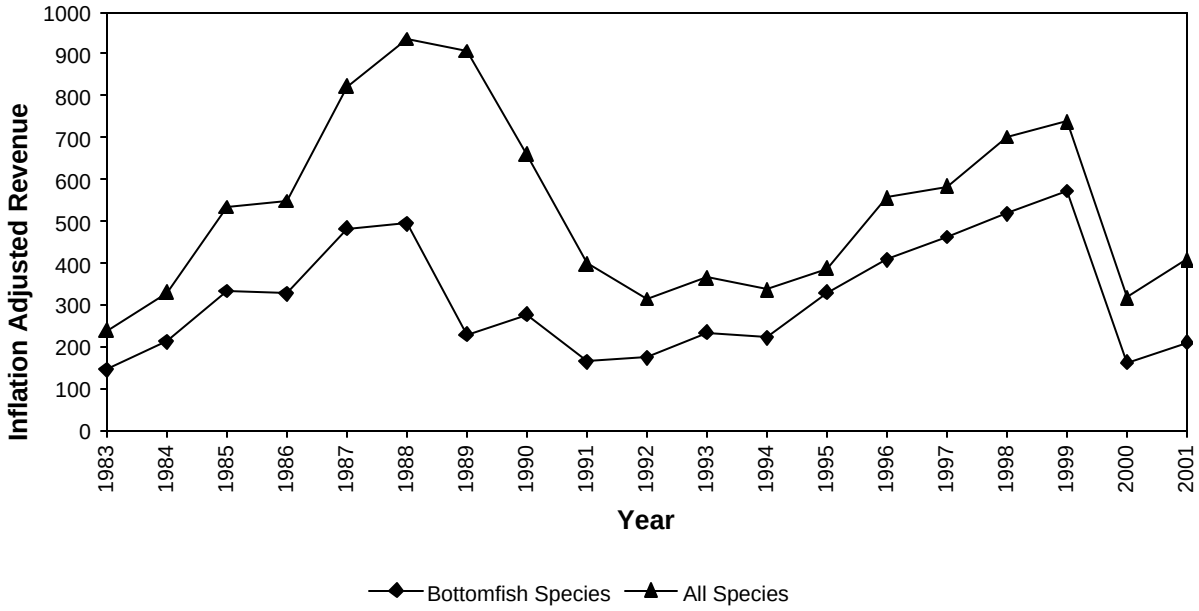
Interpretation: The average price increased steadily from 1988 to 1991, where it reached what was once a record high of $2.83. In 1995, the price increased to a new record high of $3.34. This unadjusted price remained constant through 1997, increased to $3.41 in 1998, and then reached a new record high of $3.63 in 1999. The adjusted price continued to increase from 1997. Both the unadjusted and adjusted prices fell steeply in 2000 and recovered slightly in 2001. Other than the drop in 2000, the unadjusted and adjusted prices were the lowest since 1994. The unadjusted price is slightly higher than the 19-yr mean. The adjusted price was 10¢ lower than the 19-yr mean, but 24¢ higher than last year. Only 8 years in the last 19 have lower adjusted price values.

Calculation: The average price of the bottomfish complex is calculated by dividing the total revenue by the total landings. The inflation adjustment is made using the Consumer Price Index (CPI) and establishing the 2001 CPI figure as the basis by which calculations of previous years' prices are made. The CPIs for 1983–1987 were not available from the appropriate CNMI agency and were, therefore, estimated by using Guam's annual inflation rate to proportionately adjust the 1988 CNMI CPI.

Summary Data:

Year	Unadjusted $/lb	Adjusted $/lb
1983	1.76	3.39
1984	1.74	3.08
1985	1.69	2.87
1986	1.88	3.13
1987	1.81	2.87
1988	1.82	2.75
1989	2.12	3.01
1990	2.41	3.28
1991	2.83	3.57
1992	2.51	2.91
1993	2.53	2.80
1994	2.77	2.99
1995	3.34	3.54
1996	3.33	3.43
1997	3.32	3.38
1998	3.39	3.49
1999	3.61	3.65
2000	2.84	2.82
2001	**3.06**	**3.06**
Mean	2.57	3.16
Standard deviation	0.66	0.29

Figure 5.—CNMI average inflation-adjusted revenue per trip landing bottomfish.



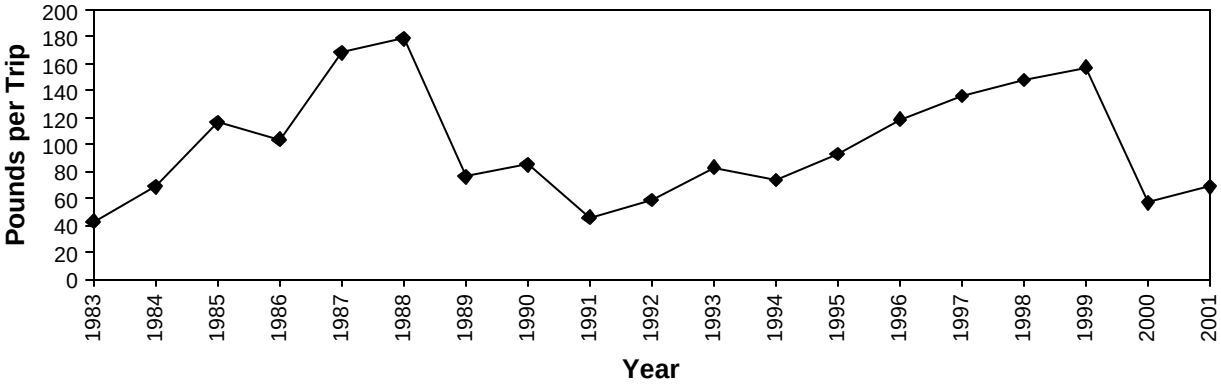
Interpretation: Inflation-adjusted bottomfish and the inflation-adjusted all-species revenues both recovered slightly from the marked decrease of 2000. The "bottomfish species" inflation-adjusted revenue recovered to 81.7% of the 19-yr mean adjusted revenue for bottomfishes. At the same time, the "all-species" inflation-adjusted revenue only recovered to 76.8% of the 19-yr mean. It is not clear whether the dip in "bottomfish species" and "all-species" inflation-adjusted revenues during 2000 was largely the result of staff turnover and the resultant loss of data, or indicative of a decrease. These data may suggest a decadal cycle in abundance (reflected in catch) with peaks in 1988–1989 and 1998–1999. The bottomfish fishery has always been a small proportion of the total fisheries, and it appears that bottomfish are now a relatively lower percentage of the trip revenue on trips where bottomfish were caught.

Calculation: Only trips that landed bottomfish are included in these calculations. "Bottomfish $/Trip" is the total revenue of the bottomfish sold from a trip, and "All Species $/Trip" is the total trip revenue of all other species combined (e.g., any pelagic and reef fish which were sold). The inflation adjustment is made using the Consumer Price Index (CPI) and establishing the 2001 CPI figure as the basis by which calculations of previous years' prices are made. The CPIs for 1983–1987 were not available from the appropriate CNMI agency and were, therefore, estimated by using Guam's annual inflation rate to proportionately adjust the 1988 CNMI CPI.

Summary Data:

	Bottomfish Species		All Species	
Year	**Unadjusted**	**Adjusted**	**Unadjusted**	**Adjusted**
1983	75	144	124	238
1984	120	212	186	329
1985	196	333	314	534
1986	197	327	330	548
1987	303	482	517	822
1988	327	494	621	936
1989	161	229	639	907
1990	204	277	485	660
1991	130	164	316	398
1992	149	173	271	314
1993	210	233	329	365
1994	205	221	312	337
1995	310	329	365	387
1996	395	407	540	556
1997	452	461	573	584
1998	502	517	681	701
1999	566	572	731	738
2000	164	162	320	317
2001	**210**	**210**	**407**	**407**
Mean	257	313	424	530
Standard Deviation	133	134	167	208

Figure 6.—CNMI bottomfish catch in average pounds per trip.



Interpretation: The substantial increase since the low in 1992 can be primarily attributed to the Northern Islands fishery, coincident with the increase in vessels making bottomfish trips, increased revenues, and annual landings during that 8-year period. The average pounds of bottomfish landed per trip in 2000 decreased 63.1% from 1999, and recovered slightly in 2001.

Although the average catch per trip is not a very good measure of CPUE, because it is subject to significant biases (e.g., changes in trip length and relative amounts of bottom fishing compared to trolling or reef fishing); it is the only measure readily obtained from the commercial landings system. However, the smaller vessels commonly make mixed trips and the relative proportions of bottom fishes to pelagic and reef fishes seem to be changing. Between 1997 and 2001, the number of fishermen selling pelagic fishes, bottomfishes and reef fishes increased from 12.1 to 16.2%, those selling both pelagic fishes and bottom fishes decreased from 11.5 to 6.8%, the number selling both pelagic and reef fishes increased from 4.8 to 7.6%, and the number selling only reef fishes increased from 10.3 to 26.1%. Given that fishermen appear to be changing the focus of their trips to include more reef fishing and less bottom fishing, this measure is an increasingly inaccurate portrayal of the actual CPUE. It has been suggested that it may be possible to improve this measure of CPUE by using only those trips that landed bottomfish exclusively. However, in the past 5 years only 2 fishermen exclusively sold bottomfishes in 1997, 1 in 1998, none in 1999, 1 in 2000, and 3 in 2001. These numbers are too low to be indicative of the entire fishery.

Calculation: The average catch per trip is calculated by dividing the total weight of all bottomfish landings by the number of trips that landed bottomfish, regardless of the amount of bottomfish landed on any given trip.

Summary Data:

Year	Pounds per Trip
1983	43
1984	69
1985	116
1986	104
1987	168
1988	179
1989	76
1990	85
1991	46
1992	59
1993	83
1994	74
1995	93
1996	119
1997	136
1998	148
1999	157
2000	57
2001	**69**
Mean	99
Standard Deviation	42

Table 3.—Bycatch during CNMI bottomfishing (totals for 2 years)

Sector	Species	Total number of interviews	Number of interviews with bycatch	Number released alive	Total number taken	% with Bycatch
Non-charter		59	1			1.69
	black jack			1	23	4.35
	dogtooth tuna			1	5	20.00
	all species			2	1508	0.13
Charter		19	3			15.79
	jobfish (uku)			1	2	50.00
	blacktip grouper			4	40	10.00
	lyretail grouper			5	6	83.33
	red snapper			4	5	80.00
	redgill emperor			6	28	21.43
	all species			20	364	5.49

Summary

Almost all fishes caught in the CNMI are considered foodfishes, including many that show a high incidence of ciguatera locally, including lyretail grouper (*Variola louti*) and red snapper (*Lutjanus bohar*). Above are all the data collected during two years (2000–2001) of interviews of fishermen during boat-based creel surveys. These data have not been reduced to per-year values. The interviews are divided into vessels engaged in non-charter (including commercial, non-commercial, and subsistence fishermen) and charter fishing. The charter fishing sector largely caters to the tourist population, of which the majority is Japanese. This sector targets blacktip grouper (*Epinephelus fasciatus*) and redgill emperor (*Lethrinus rubrioperculatus*). Catch rates in this sector must remain high to ensure that the clientele are satisfied with the charter. For this reason, small fishes are often released alive, so that they may be recaptured on subsequent charters. All bycatch, in both sectors, was released alive.