Southwest Fisheries Center Administrative Report H-89-8

REVIEW OF THE 1988 BOTTOMFISH FISHERIES OF AMERICAN SAMOA GUAM, AND THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

David C. Hamm, Michael M. C. Quach
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA
Honolulu, Hawaii 96822-2396

Fini Aitaoto
Department of Marine and Wildlife Resources
Government of American Samoa
Pago Pago, American Samoa 96799

Gerald W. Davis
Division of Aquatic and Wildlife Resources
Guam Department of Agriculture
Agana, Guam 96910

Terry J. Donaldson
Division of Fish and Wildlife
Commonwealth of the Northern Mariana Islands
Saipan, Mariana Islands 96950

NOT FOR PUBLICATION

June 1989

This Administrative Report is issued as an informal document to ensure prompt dissemination of preliminary results, interim reports, and special studies. We recommend that it not be abstracted or cited.

PREFACE

A combination of three annual reports compiled for the Bottomfish Plan Monitoring Team of the Western Pacific Regional Fishery Management Council, this document reviews the 1988 bottomfish fisheries of the Commonwealth of the Northern Mariana Islands and the territories of American Samoa and Guam. Each island report addresses the information requirements set forth in the federal Bottomfish and Seamount Fishery Management Plan and its implementing regulations.

The staff of the Honolulu Laboratory's Western Pacific Fishery Information Network (WPACFIN) was instrumental in developing each of the island reports, in concert with a representative from each island's fisheries agency. The reports were combined into this administrative report for documentation purposes and ease of reference. This is the third year WPACFIN has developed report modules on behalf of each of these islands' fisheries agencies.

The Plan Monitoring Team reporting process is still in its early stages of development and is primarily geared toward describing and documenting the fishery rather than analyzing it. As the Plan Monitoring Team defines more specific and in-depth statistically valid analyses to be performed, computerized systems will need to be developed and transferred to each of the islands' fisheries offices to process its data. The WPACFIN program will facilitate this development and transfer so that future annual reports can be completed entirely by local staffs.

TERRITORY

OF

AMERICAN SAMOA

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CNMI Commercial Pelagic Fishery

INTRODUCTION

The Fishery Management Plan (FMP) for the Bottomfish and Seamount Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) in 1986. The Western Pacific Regional Fishery Management Council (Council) developed the FMP to manage the bottomfish and seamount resources occurring in its area of jurisdiction as defined in the Magnuson Fishery Management and Conservation Act of 1976.

The Bottomfish FMP required the Council to establish a Bottomfish Plan Monitoring Team (Team) to prepare an annual report on the status of the bottomfish fisheries for each of the island areas served by the Council. The Team decided to adopt a modular approach to developing the annual report, whereby each island area would develop an individual report for its bottomfish fishery and would submit it to the Team for review. This is the third annual report module submitted to the Team on behalf of the American Samoa Department of Marine and Wildlife Resources (DMWR) to help the Team determine the effectiveness of the FMP in meeting its goal in the American Samoa.

Preparation of this report was a cooperative effort among staff of NOAA Fisheries Honolulu Laboratory's Western Pacific Fishery Information Network (WPACFIN) and a newly appointed Team member from the DMWR. Most data processing was done by WPACFIN in Honolulu and was based entirely on data collected by DMWR. The majority of the text was prepared by DMWR's Team member. The DMWR is upgrading its computer processing capabilities to enable the new Team member to complete all processing for writing future reports. The WPACFIN is assisting DMWR in meeting this goal. Through cooperative efforts of the agencies involved, this annual report on the bottomfish fisheries of American Samoa is the official submission of the DMWR to the Team for the 1988 calendar year.

This report provides data for 1988 and updates the time series of published data on the bottomfish fishery of American Samoa. It does not review all previously described and published information on the fishery. For additional background information on American Samoa's data collection systems, assumptions, and analyses used to summarize data in this report, the bottomfish fishery, or specifics on other American Samoan fisheries, refer to DMWR annual reports (Aitaoto 1988), the Team's other annual reports, volumes of WPACFIN's "Fishery Statistics of the Western Pacific" (Hamm and Kassman 1986; Hamm and Quach 1988b, 1989), or Hamm and Quach (1988a).

Before October 1985, DMWR obtained most of the bottomfish catch and effort data through interviews with fishermen and catch examinations made at landing sites and time of landing. The DMWR attempted to obtain data from every boat and for as many fishing trips as possible. On 1 October 1986, DMWR implemented a new fisheries data collection system: a systematic, random sampling program that stratifies sampling by type of day, either weekday

or weekend-holiday. Sampling was done for 2 weekdays and 1 weekend-holiday per week. Data summaries in this report are therefore adjusted to account for the percent coverage of the sampling program.

I. STATUS OF THE FISHERY

Overview

Tables 1-6 and Figures 1-12 summarize annual and monthly fishery performance data for 1988 and update the time series available for establishing trends in the fishery.

The 1988 total harvest of bottomfish for American Samoa is estimated at 59,811 pounds. This total catch by 20 local vessels generated an ex-vessel revenue of $97,245. Bottomfish landings peaked in 1983, dropped 25% in 1984, and remained essentially at that level for 3 years before making a further drop (70%) in 1987. The 1988 landings were double the 1987 record low landings (Figure 1).

The 1988 catch per hour, the highest on record, is a reassuring sign after the radical decline in the bottomfish fishery in 1987. The bottomfish fishery has been the second most important fishery, after the pelagic fishery, in the past 6 years (Figure 2).

An influx of fresh bottomfish imported from Western Samoa in the past 4 years has caused some concern amongst the local fishermen. Recently adopted fishery regulations will enable DMWR to monitor the importation of fresh fish into the territory.

Between 1983 and 1985, bottomfish fishermen experienced problems in finding outlets to sell their catches. A proposed fish processing project that will buy fresh fish from the local fishermen is scheduled to begin operation in late 1989.

Total Landings and Trends

After the lowest drop of bottomfish landings on record (in 1987), total bottomfish landings and percent bottomfish management unit species (BMUS) of the total commercial fishery increased in 1988 (Figure 3). Overall, BMUS landings declined during the past 6 years, with the first notable increase in 1988 (Figure 4).

Bottomfish Catch Compared to Other Fisheries

The bottomfish fishery has comprised as much as 50% of the total commercial catch in the past 6 years. Comparison of the monthly trends in the bottomfish fishery to other fisheries is shown in Figure 5. Total commercial landings (Figure 6) and commercial landings attributable to the BMUS (Figure 4) increased in 1988 after declining in 1987. Commercial landings of the various fisheries for 1982-88 are in Figure 2.

Revenue and Other Economic Indicators

Table 1 provides the 1988 estimated ex-vessel value of the bottomfish landings by species. Figure 6 shows an increase in the total value of bottomfish landings from 1987 to 1988. Table 2 provides monthly estimated commercial bottomfish landings summaries of pounds, values, and average price per pound by species for 1988.

Fleet Dynamics

In 1987, a hurricane destroyed the entire fishing fleet of the Manu'a Islands, resulting in the lowest recorded number of vessels landing bottomfish (Table 3, Figure 7). Three 29-foot catamarans (alias) were purchased in 1988 from Western Samoa, through DMWR to replace the damaged village-owned vessels. The number of vessels landing bottomfish has declined since it peaked in 1985 (with a total of 46 vessels) but increased slightly in 1988.

An important factor contributing to the decline in the bottomfish fleet in the past 5 years is the decrease in the number of Western Samoan fishermen who fished for American Samoan boat owners. These fishermen have either returned to their home country or found other more lucrative employment.

Number of Trips and CPUE

The number of bottomfish fishing trips increased slightly in 1988 after drastically declining in 1987 (Table 3). Two assumptions were made when calculating the estimated number of fishing trips per year: all fish landed by a vessel on a given day were caught on a single trip, and each trip using the bottomfish method was included even if trolling also was employed. Average trip length and catch-per-hour calculations were made by using data from exclusive bottomfish fishing trips.

The 1988 catch-per-hour figure of 17.5 (Table 3, Figure 8) is the highest on record. This can be attributed to the more skillful fishermen remaining in the fishery and the reduced effort exerted on the stocks. Nevertheless, more analysis is needed to further explain the prominent CPUE recorded in 1988.

Characteristics of the Catch
Geographical and Seasonal Variations

In general, most of the bottomfish were caught in areas 31, 33, and 36 over the past 7 years (Table 4, Figure 9), although other areas such as 9, 12, 32, 34, and 35 ranked in the top three most productive areas for certain years. During 1988, the offshore area of East Bank ranked third in overall production levels, which demonstrates a possible shift of the fleet to areas farther from shore. Recovery of the Manu'a bottomfish fishery after the devastating hurricane in 1987 was also evident by landings being recorded from areas 41 and 45.

The seasonality of the BMUS landings is compared with the tuna and the PMUS landings of the pelagics fishery in Figure 5. Three peak periods of bottomfish landings in American Samoa occurred during March, July, and October (Figure 10). Further analysis is needed to explain this general occurrence.

Species Composition

About 60% of the recorded bottomfish landings were identified to species in 1988 (Table 5). This is the best identification of bottomfish catch on record and has resulted in a better representation of the species landed in American Samoa.

If the assumption is made that the identified portions of the catches are representative samples of the true percent composition of the fishery, the unidentified catch can be allocated appropriately to individual species (Table 6). Figure 3 shows the cursory analysis of these allocated data and the plotting of percent BMUS of the total commercial landings. Percent species composition of six of the major species is presented in Figures 11 and 12. The 1988 landings by species or group are in Table 1. The redgill emperor, Lethrinus rubrioperculatus, appeared for the first time in the annual estimated commercial bottomfish landings tables as a result of the improvement in species identification. Redgill emperors were landed in past years but were lumped into the miscellaneous emperors and bottomfish categories.

The DMWR Statistical Analysis Division and the WPACFIN program have partially succeeded in reducing the species identification problems expressed in the Team's second recommendation for Council action in the 1987 BPMT Annual Report.

Maximum Sustainable Yield

The estimated maximum sustainable yield (MSY), 45 metric tons (99,000 pounds) per year, for American Samoa, was essentially reached during 1983-86. In 1988, following the drastic decline in total bottomfish landings in 1987 to only 30% of the MSY, 60% of the MSY was achieved.

Summary Table of Fishery Status.

Status of the American Samoa Bottomfish Fishery

Problem Condition	Present in the Bottomfish Fishery	Comment
1. Age at entry is prereproduction	Data not available	
2. Unacceptable ratio of fish mortality to natural mortality	Data not available	
3. Catch exceeds maximum sustainable yield	Not indicated	
4. Significant decline in CPUE	Not indicated	Highest catch/hr on record in 1988
5. Substantial decline in ex-vessel revenue relative to baseline levels	Not indicated	WPRFMC/DMWR/NMFS vessel economics survey data being processed by Honolulu Laboratory
6. Significant shift in gear by area	Not indicated	
7. Significant change in the frozen/fresh components of catch	Data available in 1990	New fisheries regulation requirement
8. Unstable pattern of entry/exit to the fishery	Yes	1988 recovery after 1987 drastic decline
9. Per trip costs exceed per trip revenues	Data unavailable	Data available next year; refer to item 5 above
10. Significant decline or increase in total bottomfish landings	Not indicated	Slight increase in 1988

Problem Condition	Present in the Bottomfish Fishery	Comment
11. Change in species composition of catch	Not indicated	Best species ID on record
12. Research results indicate problems	Data unavailable	
13. Habitat degradation or environmental problems	Data unavailable	Hurricane in 1987; no follow up on initial survey
14. Increased interaction with protected species	Data unavailable	

II. RECENT RESEARCH AND SURVEY RESULTS

Otolith samples and length-frequency data of certain bottomfish species have been forwarded to NOAA Fisheries Honolulu Laboratory as part of a Team recommended project to assess bottomfish stocks in American Samoa. Analyses of these data have been postponed because of two position vacancies (a DMWR biologist and a NOAA Fisheries scientist); analyses will continue as soon as appropriate personnel arrangements are made.

III. HABITAT CONDITIONS AND RECENT ALTERATIONS

No surveys of the recovering reef areas in Manu'a that were affected by the January 1987 hurricane have been conducted.

IV. ENFORCEMENT ACTIVITIES AND PROBLEMS

Enforcement of new DMWR fishery regulations will commence after the completion of a public awareness program. Serious problems pertaining to the enforcement of the regulations are expected to be greatly minimized as a result of the program.

The Director of DMWR will distribute a memo to various local government agencies and the private sector, informing them of the new law prohibiting the disposal of plastics in the ocean.

V. NMFS ACTIONS

A Honolulu Laboratory scientist should be assigned to assist DMWR complete the Team recommended project to assess bottomfish stocks in American Samoa.

The DMWR supplied the Western Pacific Program Office with advice and comments on the environmental review of development projects. The DMWR also assisted with on-site surveys for these projects.

VI. STATE/TERRITORIAL MANAGEMENT ACTIONS

The DMWR is preparing a public awareness program aimed at educating the public about the newly adopted fishery regulations. This educational program, scheduled to begin in July 1989, will use all existing channels of the media to obtain extensive coverage and thereby reach as many individuals as possible in the public and private sectors.

VII. ASSESSMENT OF NEED FOR COUNCIL ACTION

The rudimentary analyses conducted on existing data for this report did not statistically document problems in the bottomfish fishery. There remain several significant deficiencies in our information base upon which conclusions can be drawn. Additional data are needed, data systems need to be improved, analyses need to be expanded and strengthened, and local expertise needs to be utilized more fully. Existing computer programs for summarizing and analyzing available data are insufficient to properly monitor the resource and describe the fishery. Assistance is needed to develop these tools to be used by the DMWR Team member in preparation of subsequent annual reports.

VIII. RECOMMENDATIONS FOR COUNCIL ACTION

1987 Team Recommendations

American Samoa now has a participant in the Team, actualizing the Team's first recommendation for Council action in the 1987 annual report. This person is also named to the Pelagic Team and is also American Samoa's coordinator for the WPACFIN program, thus facilitating the performance of Bottomfish and Pelagic Team functions. However, this new member should have been given a familiarization period of at least a year before being assigned the responsibility of producing the bottomfish annual report module for American Samoa.

The second recommendation by the Bottomfish Team in 1987 pointed out the need for "better species identification and acquisition of extensive size-frequency data." In 1988, DMWR's identification of bottomfish landings to the species level was the best on record. About 60% of the total bottomfish catch was

identified and recorded to the species level. The DMWR continued to collect length-frequency data from local stores during 1988.

The Team's third recommendation in 1987 for continuation of the DMWR-NMFS joint assessment of bottomfish stocks in American Samoa is being hindered by the recent resignation of DMWR and Honolulu Laboratory scientists who worked on this project.

In general, DMWR has acted favorably on the Team's 1987 recommendations.

1988 Recommendations

The Council should improve the selection process in determining suitable candidates for panels and Council members since some of those selected are sometimes non-cooperative with Council-related projects in their respective countries.

The DMWR should continue to improve the identification of bottomfish catches to the species level. A further 10% improvement is recommended for 1989.

A Honolulu Laboratory scientist should be assigned to work with DMWR biologists for the continuation of the joint project to assess bottomfish stocks in American Samoa.

To date, only visual interpretations have been used on the data. The fishery has undergone tremendous fluctuations. More thorough and statistically valid analyses should be performed on the data to determine whether trends or problems actually exist in this fishery. The Team should identify specific questions about the fishery; form hypotheses to answer these questions; determine analytical methods to test these hypotheses; provide guidelines for interpreting the analyses; and determine what constitutes trends, changes, or problems in the fishery. The Team should develop specific recommendations for format and content of the annual report modules. A special 2- to 5-day workshop should be held, possibly in concert with the Pelagic Team and select members of the Council's Scientific and Statistical Committee, to resolve these problems for all Council management areas.

Existing computer programs for summarizing and analyzing available data are insufficient to properly monitor the resource and describe the fishery. Assistance is needed to develop these tools to be used by the DMWR Team member in preparation of subsequent annual reports. It is recommended that the WPACFIN program complete the programming of the Bottomfish Team's annual report modules for American Samoa, preferably by November 1989, so that the DMWR can use portions of this module in preparing its government's 1989 annual report on the offshore fisheries, thereby eliminating the need to reproduce the same information using different formats.

REFERENCES

Aitaoto, F.
1988. Status of the Offshore Fisheries in American Samoa. Department of Marine and Wildlife Resources, Annual Report.

Hamm, D. C. and T. T. Kassman.
1986. Fishery statistics of the western Pacific, volume I. American Samoa (1982-84), Commonwealth of the Northern Mariana Islands (1979-84), State of Hawaii (1987). Southwest Fisheries Center . Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-86-4, var. pag.

Hamm, D. C., and M. M. C. Quach.
1988a. Bottomfish fisheries of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-15, 76 p.

1988b. Fishery statistics of the western Pacific, volume III. Territory of American Samoa (1985-86), Commonwealth of the Northern Mariana Islands (1985-86), Territory of Guam (1985-86), State of Hawaii (1985-86). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-4, var. pag.

1989. Fishery statistics of the western Pacific, volume IV. Territory of American Samoa (1987), Commonwealth of the Northern Mariana Islands (1987), Territory of Guam (1987) State of Hawaii (1987). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-89-1, var. pag.

Western Pacific Regional Fishery Management Council (Council).
1988. 1987 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

1988. 1986 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

APPENDIX A: TABLES

Table 1

AMERICAN SAMOA 1988 ANNUAL ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
JACKS	706	1,115	1.58
BLACK JACK	1,976	3,471	1.76
WHITEMOUTH TREVALLY	50	75	1.50
BOTTOMFISH	24,570	37,273	1.52
GROUPERS	885	1,371	1.55
PEACOCK GROUPER	643	1,039	1.62
FLAGTAIL GROUPER	670	1,047	1.56
STRIPED GROUPER	51	84	1.65
SPOTTED GROUPER	273	450	1.65
GIANT GROUPER	45	72	1.60
LUNARTAIL GROUPER	2,800	4,431	1.58
BLUE LINED SNAPPER	6,712	11,284	1.68
ONESPOT SNAPPER	13	20	1.54
TWINSPOT/RED SNAPPER	82	111	1.35
HUMPBACK SNAPPER	666	1,111	1.67
BLOOD SNAPPER	180	291	1.62
BROWN JOBFISH	231	383	1.66
GRAY JOBFISH	1,244	2,070	1.66
DEEPWATER BOTTOMFISH	619	1,006	1.63
OPAKAPAKA	1,012	1,671	1.65
GINDAI (FLOWER SNAP)	495	812	1.64
LEHI (SILVERJAW)	2,276	4,487	1.97
ONAGA (RED SNAPPER)	1,820	3,684	2.02
EHU (RED SNAPPER)	2,076	3,897	1.88
STONE'S SNAPPER	288	559	1.94
BIGEYE EMPEROR	157	251	1.60
EMPERORS (MISC)	554	933	1.69
LONGNOSE EMPEROR	3,736	6,076	1.63
AMBON EMPEROR	1,166	1,856	1.59
BLUELINE BREAM	133	219	1.65
ORANGESPOT EMPEROR	457	757	1.66
REDGILL EMPEROR	3,225	5,338	1.66
** Total Bottomfish **	59,810	97,244	1.63
** TOTAL ALL SPECIES**	281,036	325,415	1.16

Table 2

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** January **			
JACKS	23	32	1.39
BOTTOMFISH	5,688	7,708	1.36
GROUPERS	35	54	1.54
LUNARTAIL GROUPER	5	6	1.20
BLUE LINED SNAPPER	54	86	1.59
TWINSPOT/RED SNAPPER	12	16	1.33
GRAY JOBFISH	89	159	1.79
LONGNOSE EMPEROR	145	218	1.50
** Total Bottomfish **	6,051	8,279	1.37
** TOTAL ALL SPECIES**	24,575	33,458	1.36
** February **			
JACKS	353	554	1.57
BLACK JACK	128	212	1.66
BOTTOMFISH	12,363	19,162	1.55
FLAGTAIL GROUPER	92	152	1.65
BLUE LINED SNAPPER	308	472	1.54
HUMPBACK SNAPPER	19	23	1.25
BLOOD SNAPPER	180	291	1.62
BROWN JOBFISH	231	383	1.66
OPAKAPAKA	287	473	1.65
ONAGA (RED SNAPPER)	60	120	2.00
EMPERORS (MISC)	100	151	1.51
AMBON EMPEROR	458	760	1.66
ORANGESPOT EMPEROR	132	219	1.66
REDGILL EMPEROR	56	70	1.25
** Total Bottomfish **	14,766	23,043	1.56
** TOTAL ALL SPECIES**	40,241	50,469	1.25
** March **			
BLACK JACK	159	283	1.78
BOTTOMFISH	5,207	8,569	1.65
GROUPERS	62	102	1.65
PEACOCK GROUPER	16	27	1.69
LUNARTAIL GROUPER	91	146	1.60
BLUE LINED SNAPPER	344	553	1.61
HUMPBACK SNAPPER	125	213	1.70
OPAKAPAKA	153	252	1.65
LEHI (SILVERJAW)	125	246	1.97
ONAGA (RED SNAPPER)	59	122	2.07
LONGNOSE EMPEROR	146	235	1.61
REDGILL EMPEROR	700	1,127	1.61
** Total Bottomfish **	7,187	11,875	1.65
** TOTAL ALL SPECIES**	22,399	34,712	1.55

Table 2 (Cont.)

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** April **			
BLACK JACK	65	104	1.60
BOTTOMFISH	144	180	1.25
PEACOCK GROUPER	231	371	1.61
LUNARTAIL GROUPER	58	88	1.52
BLUE LINED SNAPPER	825	1,270	1.54
ONESPOT SNAPPER	13	20	1.54
HUMPBACK SNAPPER	91	146	1.60
GRAY JOBFISH	211	322	1.53
LEHI (SILVERJAW)	120	193	1.61
ONAGA (RED SNAPPER)	19	30	1.58
STONE'S SNAPPER	32	51	1.59
BIGEYE EMPEROR	10	16	1.60
LONGNOSE EMPEROR	162	259	1.60
REDGILL EMPEROR	682	1,050	1.54
** Total Bottomfish **	2,663	4,100	1.54
** TOTAL ALL SPECIES**	13,391	21,011	1.57
** May **			
BLACK JACK	330	648	1.96
BOTTOMFISH	88	109	1.25
PEACOCK GROUPER	103	232	2.25
LUNARTAIL GROUPER	83	129	1.55
BLUE LINED SNAPPER	703	1,296	1.84
HUMPBACK SNAPPER	89	141	1.58
LEHI (SILVERJAW)	979	2,095	2.14
ONAGA (RED SNAPPER)	914	1,910	2.09
EHU (RED SNAPPER)	611	1,341	2.20
REDGILL EMPEROR	670	1,232	1.84
** Total Bottomfish **	4,569	9,132	2.00
** TOTAL ALL SPECIES**	11,762	18,392	1.53

Table 2 (Cont.)

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** June **			
WHITEMOUTH TREVALLY	50	75	1.50
GROUPERS	105	169	1.61
PEACOCK GROUPER	73	125	1.71
FLAGTAIL GROUPER	217	329	1.52
LUNARTAIL GROUPER	249	373	1.50
BLUE LINED SNAPPER	630	927	1.47
GRAY JOBFISH	119	179	1.50
DEEPWATER BOTTOMFISH	44	66	1.50
LEHI (SILVERJAW)	263	515	1.96
ONAGA (RED SNAPPER)	193	397	2.06
EHU (RED SNAPPER)	610	945	1.55
BIGEYE EMPEROR	147	235	1.60
LONGNOSE EMPEROR	512	773	1.51
AMBON EMPEROR	203	304	1.50
** Total Bottomfish **	3,415	5,412	1.58
** TOTAL ALL SPECIES**	28,830	27,675	0.96
** July **			
BLACK JACK	189	308	1.63
BOTTOMFISH	1,081	1,545	1.43
GROUPERS	95	136	1.43
LUNARTAIL GROUPER	27	43	1.59
BLUE LINED SNAPPER	258	420	1.63
GRAY JOBFISH	31	46	1.48
LEHI (SILVERJAW)	153	246	1.61
EHU (RED SNAPPER)	119	238	2.00
LONGNOSE EMPEROR	506	819	1.62
REDGILL EMPEROR	163	270	1.66
** Total Bottomfish **	2,622	4,071	1.55
** TOTAL ALL SPECIES**	23,543	21,191	0.90

Table 2 (Cont.)

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** August **			
JACKS	133	211	1.58
BLACK JACK	88	176	2.00
GROUPERS	88	136	1.55
PEACOCK GROUPER	133	134	1.01
SPOTTED GROUPER	273	450	1.65
GIANT GROUPER	45	72	1.60
LUNARTAIL GROUPER	522	817	1.56
BLUE LINED SNAPPER	1,120	2,022	1.81
TWINSPOT/RED SNAPPER	70	95	1.36
HUMPBACK SNAPPER	119	206	1.74
GRAY JOBFISH	137	275	2.01
DEEPWATER BOTTOMFISH	519	856	1.65
GINDAI (FLOWER SNAP)	56	84	1.50
LEHI (SILVERJAW)	221	444	2.01
ONAGA (RED SNAPPER)	161	262	1.63
EHU (RED SNAPPER)	181	272	1.50
STONE'S SNAPPER	239	478	2.00
EMPERORS (MISC)	19	28	1.50
LONGNOSE EMPEROR	701	1,254	1.79
** Total Bottomfish **	4,825	8,272	1.71
** TOTAL ALL SPECIES**	28,743	26,910	0.94
** September **			
BLACK JACK	50	100	2.00
GROUPERS	338	523	1.55
LUNARTAIL GROUPER	643	1,009	1.57
BLUE LINED SNAPPER	588	1,181	2.01
HUMPBACK SNAPPER	33	66	2.00
GRAY JOBFISH	27	54	2.00
OPAKAPAKA	300	495	1.65
EHU (RED SNAPPER)	300	594	1.98
STONE'S SNAPPER	17	30	1.76
EMPERORS (MISC)	60	120	2.00
LONGNOSE EMPEROR	440	712	1.62
BLUELINE BREAM	133	219	1.65
ORANGESPOT EMPEROR	50	82	1.64
REDGILL EMPEROR	331	549	1.66
** Total Bottomfish **	3,310	5,734	1.73
** TOTAL ALL SPECIES**	18,352	16,036	0.87

Table 2 (Cont.)

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** October **			
JACKS	85	141	1.66
BLACK JACK	280	464	1.66
GROUPERS	51	79	1.55
STRIPED GROUPER	51	84	1.65
LUNARTAIL GROUPER	352	584	1.66
BLUE LINED SNAPPER	205	330	1.61
HUMPBACK SNAPPER	17	28	1.65
GRAY JOBFISH	229	382	1.67
LEHI (SILVERJAW)	221	366	1.66
ONAGA (RED SNAPPER)	189	378	2.00
EHU (RED SNAPPER)	123	246	2.00
EMPERORS (MISC)	44	72	1.64
LONGNOSE EMPEROR	528	839	1.59
ORANGESPOT EMPEROR	275	456	1.66
** Total Bottomfish **	2,650	4,449	1.68
** TOTAL ALL SPECIES**	20,696	21,510	1.04
** November **			
JACKS	112	178	1.58
BLACK JACK	270	434	1.61
GROUPERS	111	172	1.55
PEACOCK GROUPER	87	150	1.72
FLAGTAIL GROUPER	215	337	1.57
LUNARTAIL GROUPER	492	800	1.63
BLUE LINED SNAPPER	1,232	1,998	1.62
HUMPBACK SNAPPER	69	111	1.61
GRAY JOBFISH	401	653	1.63
DEEPWATER BOTTOMFISH	56	84	1.50
OPAKAPAKA	272	451	1.66
GINDAI (FLOWER SNAP)	439	728	1.66
LEHI (SILVERJAW)	194	382	1.97
ONAGA (RED SNAPPER)	225	465	2.07
LONGNOSE EMPEROR	436	710	1.63
AMBON EMPEROR	505	792	1.57
REDGILL EMPEROR	623	1,040	1.67
** Total Bottomfish **	5,739	9,485	1.65
** TOTAL ALL SPECIES**	22,863	30,945	1.53

Table 2 (Cont.)

AMERICAN SAMOA 1988 MONTHLY ESTIMATED COMMERCIAL BOTTOMFISH LANDINGS

Species	Pounds	Value	$/lb
** December **			
BLACK JACK	417	742	1.78
FLAGTAIL GROUPER	146	229	1.57
LUNARTAIL GROUPER	278	436	1.57
BLUE LINED SNAPPER	445	729	1.64
HUMPBACK SNAPPER	104	177	1.70
EHU (RED SNAPPER)	132	261	1.98
EMPERORS (MISC)	331	562	1.70
LONGNOSE EMPEROR	160	257	1.61
** Total Bottomfish **	2,013	3,393	1.69
** TOTAL ALL SPECIES**	25,643	23,107	0.90

Table 3

American Samoa Bottomfish Catch and Effort

	1982	1983	1984	1985	1986	1987	1988
Estimated Number of Bottomfish Trips	594	652	662	873	738	233	269
Number of Vessels Landing Bottomfish	21	26	35	46	33	18	20
Average Bottomfish Trip Length (hrs)	13.5	17.6	14.7	14.6	15.3	11.3	10.3
Average Catch per Hour	8.2	11.1	9.9	8.0	9.2	12.4	17.5

Table 4

Percent of Bottomfish Catch by Area

Area	1982	1983	1984	1985	1986	1987	1988
2	0	2.3	1.4	3.1	0.5	0	1.2
3	1.3	1.3	8.9	8.4	6.5	4.2	0
4	0	0	0.4	0	5.6	0	3.2
9	0	5.7	15.5	11.8	14.2	3.9	8.4
10	0	0.1	3.7	2.2	8.0	10.8	6.4
11	0	0	0.9	0	0	0	0
12	0	10.7	2.4	0.2	6.9	3.6	11.3
20	0	0	0	0.3	0	0	0
31	3.4	15.9	25.6	23.0	7.4	11.1	8.1
32	2.6	7.9	4.6	16.2	5.5	3.6	12.9
33	49.2	15.7	3.1	8.8	15.1	40.3	11.2
34	3.1	4.7	6.5	2.3	2.6	12.6	8.3
35	31.8	9.8	1.6	1.3	6.2	0	5.1
36	8.6	22.8	25.1	18.6	17.4	9.9	19.6
41	0	0.7	0	0	0	0	2.3
42	0	2.0	0.3	0.3	0	0	0
43	0	0.2	0	3.4	2.4	0	0
44	0	0	0	0	1.2	0	0
45	0	0	0	0	0.6	0	2.1

Table 5

AMERICAN SAMOA BOTTOMFISH LANDINGS
(UNALLOCATED MISCELLANEOUS BOTTOMFISH)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Jacks	139	1962	1909	467	615	94	706
	0.22%	1.57%	2.06%	0.47%	0.62%	0.32%	1.18%
Amberjack	0	111	0	0	0	0	0
	0.00%	0.09%	0.00%	0.00%	0.00%	0.00%	0.00%
Black Jack	20	151	15	80	388	33	1976
	0.03%	0.12%	0.02%	0.08%	0.39%	0.11%	3.30%
Trevally	0	0	14	0	0	0	0
	0.00%	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%
Bigeye Trevally	0	19	0	95	0	0	0
	0.00%	0.02%	0.00%	0.10%	0.00%	0.00%	0.00%
Bluefin Trevally	0	6	0	0	0	0	0
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Whitemouth Trevally	0	0	0	0	0	0	50
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.08%
Groupers	141	1705	1510	173	128	14	885
	0.23%	1.36%	1.63%	0.17%	0.13%	0.05%	1.48%
Blacktip Grouper	0	6	10	13	0	0	0
	0.00%	0.00%	0.01%	0.01%	0.00%	0.00%	0.00%
Flagtail Grouper	10	4	0	0	0	0	670
	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%	1.12%
Giant Grouper	282	348	243	0	0	0	45
	0.45%	0.28%	0.26%	0.00%	0.00%	0.00%	0.08%
Lunartail Grouper	504	198	564	397	232	34	2800
	0.81%	0.16%	0.61%	0.40%	0.24%	0.11%	4.68%
Peacock Grouper	0	0	0	0	0	0	643
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.08%
Spotted Grouper	0	0	0	0	0	0	273
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.46%
Striped Grouper	0	22	0	0	0	0	51
	0.00%	0.02%	0.00%	0.00%	0.00%	0.00%	0.09%
Tomato Grouper	0	167	0	196	157	27	0
	0.00%	0.13%	0.00%	0.20%	0.16%	0.09%	0.00%
Snappers	0	52	128	43	126	0	0
	0.00%	0.04%	0.14%	0.04%	0.13%	0.00%	0.00%
Black Snapper	0	0	40	27	0	0	0
	0.00%	0.00%	0.04%	0.03%	0.00%	0.00%	0.00%
Blacktail Snapper	0	111	546	51	0	0	0
	0.00%	0.09%	0.59%	0.05%	0.00%	0.00%	0.00%
Blood Snapper	0	0	0	0	0	0	180
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.30%
Blue Lined Snapper	1209	2973	3713	553	340	150	6712
	1.95%	2.38%	4.00%	0.56%	0.35%	0.51%	11.22%
Humpback Snapper	561	1174	1698	269	167	34	666
	0.90%	0.94%	1.83%	0.27%	0.17%	0.11%	1.11%
Kusakar's Snapper	0	25	108	18	0	0	0
	0.00%	0.02%	0.12%	0.02%	0.00%	0.00%	0.00%
Onespot Snapper	7	342	381	57	98	7	13
	0.01%	0.27%	0.41%	0.06%	0.10%	0.02%	0.02%

Table 5 (Cont.)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Rufous Snapper	0	0	122	0	0	0	0
	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%	0.00%
Stone's Snapper	0	2039	834	143	0	0	288
	0.00%	1.63%	0.90%	0.14%	0.00%	0.00%	0.48%
Twinspot/Red Snapper	0	259	585	7	47	0	82
	0.00%	0.21%	0.63%	0.01%	0.05%	0.00%	0.14%
Yellowtail Snapper	0	13	3	5	0	0	0
	0.00%	0.01%	0.00%	0.01%	0.00%	0.00%	0.00%
Brown Jobfish	0	52	0	0	0	0	231
	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%	0.39%
Gray Jobfish	230	5943	1521	534	315	25	1244
	0.37%	4.75%	1.64%	0.54%	0.32%	0.08%	2.08%
Yellow Opakapaka	40	1618	1193	522	490	52	0
	0.06%	1.29%	1.28%	0.53%	0.50%	0.18%	0.00%
Hawaiian Opakapaka	68	173	1043	456	342	0	0
	0.11%	0.14%	1.12%	0.46%	0.35%	0.00%	0.00%
Opakapaka	406	0	40	168	0	0	1012
	0.65%	0.00%	0.04%	0.17%	0.00%	0.00%	1.69%
Blue Lined Gindai	13	0	0	125	0	0	0
	0.02%	0.00%	0.00%	0.13%	0.00%	0.00%	0.00%
Gindai	82	918	1729	1211	568	38	495
	0.13%	0.73%	1.86%	1.22%	0.58%	0.13%	0.83%
Lehi	216	4512	1227	396	666	81	2276
	0.35%	3.60%	1.32%	0.40%	0.68%	0.27%	3.81%
Onaga	1002	13738	4282	2139	3921	232	1820
	1.62%	10.98%	4.61%	2.16%	3.98%	0.78%	3.04%
Ehu	1345	5808	4291	4382	4177	298	2076
	2.17%	4.64%	4.62%	4.42%	4.24%	1.01%	3.47%
Emperors	2910	3253	3747	730	119	16	554
	4.69%	2.60%	4.04%	0.74%	0.12%	0.05%	0.93%
Ambon Emperor	0	0	0	0	0	65	1166
	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%	1.95%
Bigeye Emperor	0	0	0	0	0	0	157
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.26%
Longnose Emperor	150	65	111	80	0	0	3736
	0.24%	0.05%	0.12%	0.08%	0.00%	0.00%	6.25%
Orangespot Emperor	0	0	0	0	0	0	457
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.76%
Redgill Emperor	0	0	0	0	0	0	3225
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	5.39%
Bluelined Bream	21	0	0	0	0	0	133
	0.03%	0.00%	0.00%	0.00%	0.00%	0.00%	0.22%
Snake Mackerel	17	41	8	0	0	0	0
	0.03%	0.03%	0.01%	0.00%	0.00%	0.00%	0.00%
Deepwater Bottomfish	2349	0	163	649	1157	0	619
	3.79%	0.00%	0.18%	0.65%	1.18%	0.00%	1.03%
Bottomfish	50294	77359	61063	85230	84384	28425	24570
	81.10%	61.80%	65.77%	85.90%	85.72%	95.95%	41.08%
TOTAL:	62016	125167	92841	99216	98437	29625	59811

Table 6

AMERICAN SAMOA BOTTOMFISH LANDINGS
(ALLOCATED MISCELLANEOUS BOTTOMFISH)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Jacks	885	5137	5596	3451	4639	2321	1207
	1.43%	4.10%	6.03%	3.48%	4.71%	7.83%	2.02%
Amberjack	0	291	0	0	0	0	0
	0.00%	0.23%	0.00%	0.00%	0.00%	0.00%	0.00%
Black Jack	127	395	44	591	2927	815	3378
	0.21%	0.32%	0.05%	0.60%	2.97%	2.75%	5.65%
Trevally	0	0	41	0	0	0	0
	0.00%	0.00%	0.04%	0.00%	0.00%	0.00%	0.00%
Bigeye Trevally	0	50	0	702	0	0	0
	0.00%	0.04%	0.00%	0.71%	0.00%	0.00%	0.00%
Bluefin Trevally	0	16	0	0	0	0	0
	0.00%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Whitemouth Trevally	0	0	0	0	0	0	85
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.14%
Groupers	898	4464	4426	1279	966	346	1513
	1.45%	3.57%	4.77%	1.29%	0.98%	1.17%	2.53%
Blacktip Grouper	0	16	29	96	0	0	0
	0.00%	0.01%	0.03%	0.10%	0.00%	0.00%	0.00%
Flagtail Grouper	64	10	0	0	0	0	1145
	0.10%	0.01%	0.00%	0.00%	0.00%	0.00%	1.92%
Giant Grouper	1795	911	712	0	0	0	77
	2.89%	0.73%	0.77%	0.00%	0.00%	0.00%	0.13%
Lunartail Grouper	3208	518	1653	2934	1750	839	4787
	5.17%	0.41%	1.78%	2.96%	1.78%	2.83%	8.00%
Peacock Grouper	0	0	0	0	0	0	1099
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.84%
Spotted Grouper	0	0	0	0	0	0	467
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.78%
Striped Grouper	0	58	0	0	0	0	87
	0.00%	0.05%	0.00%	0.00%	0.00%	0.00%	0.15%
Tomato Grouper	0	437	0	1449	1184	667	0
	0.00%	0.35%	0.00%	1.46%	1.20%	2.25%	0.00%
Snappers	0	136	375	318	950	0	0
	0.00%	0.11%	0.40%	0.32%	0.97%	0.00%	0.00%
Black Snapper	0	0	117	200	0	0	0
	0.00%	0.00%	0.13%	0.20%	0.00%	0.00%	0.00%
Blacktail Snapper	0	291	1601	377	0	0	0
	0.00%	0.23%	1.72%	0.38%	0.00%	0.00%	0.00%
Blue Lined Snapper	7696	7784	10884	4087	2565	3703	11475
	12.41%	6.22%	11.72%	4.12%	2.61%	12.50%	19.19%
Blood Snapper	0	0	0	0	0	0	308
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.51%
Humpback Snapper	3571	3074	4978	1988	1260	839	1139
	5.76%	2.46%	5.36%	2.00%	1.28%	2.83%	1.90%
Kusakar's Snapper	0	65	317	133	0	0	0
	0.00%	0.05%	0.34%	0.13%	0.00%	0.00%	0.00
Onespot Snapper	45	895	1117	421	739	173	22
	0.07%	0.72%	1.20%	0.42%	0.75%	0.58%	0.04%

Table 6 (Cont.)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Rufous Snapper	0	0	358	0	0	0	0
	0.00%	0.00%	0.39%	0.00%	0.00%	0.00%	0.00%
Stone's Snapper	0	5338	2445	1057	0	0	492
	0.00%	4.26%	2.63%	1.07%	0.00%	0.00%	0.82%
Twinspot/Red Snapper	0	678	1715	52	355	0	140
	0.00%	0.54%	1.85%	0.05%	0.36%	0.00%	0.23%
Yellowtail Snapper	0	34	9	37	0	0	0
	0.00%	0.03%	0.01%	0.04%	0.00%	0.00%	0.00%
Brown Jobfish	0	136	0	0	0	0	395
	0.00%	0.11%	0.00%	0.00%	0.00%	0.00%	0.66%
Gray Jobfish	1464	15559	4459	3947	2376	617	2127
	2.36%	12.43%	4.80%	3.98%	2.41%	2.08%	3.56%
Yellow Opakapaka	284	4236	3511	3894	3752	1284	0
	0.46%	3.38%	3.78%	3.92%	3.81%	4.33%	0.00%
Hawaiian Opakapaka	483	453	3070	3402	2619	0	0
	0.78%	0.36%	3.31%	3.43%	2.66%	0.00%	0.00%
Opakapaka	2885	0	118	1253	0	0	1812
	4.65%	0.00%	0.13%	1.26%	0.00%	0.00%	3.03%
Blue Lined Gindai	92	0	0	932	0	0	0
	0.15%	0.00%	0.00%	0.94%	0.00%	0.00%	0.00%
Gindai	583	2403	5089	9033	4349	938	886
	0.94%	1.92%	5.48%	9.10%	4.42%	3.17%	1.48%
Lehi	1535	11813	3611	2954	5100	2000	4075
	2.48%	9.44%	3.89%	2.98%	5.18%	6.75%	6.81%
Onaga	7121	35968	12603	15956	30024	5728	3258
	11.48%	28.74%	13.57%	16.08%	30.50%	19.33%	5.45%
Ehu	9558	15206	12630	32688	31984	7357	3717
	15.41%	12.15%	13.60%	32.95%	32.49%	24.83%	6.21%
Emperors	18525	8517	10984	5395	898	395	947
	29.87%	6.80%	11.83%	5.44%	0.91%	1.33%	1.58%
Ambon Emperor	0	0	0	0	0	1605	1993
	0.00%	0.00%	0.00%	0.00%	0.00%	5.42%	3.33%
Bigeye Emperor	0	0	0	0	0	0	268
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.45%
Longnose Emperor	955	170	325	591	0	0	6387
	1.54%	0.14%	0.35%	0.60%	0.00%	0.00%	10.68%
Orangespot Emperor	0	0	0	0	0	0	781
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	1.31%
Redgill Emperor	0	0	0	0	0	0	5514
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	9.22%
Bluelined Bream	134	0	0	0	0	0	227
	0.22%	0.00%	0.00%	0.00%	0.00%	0.00%	0.38%
Snake Mackerel	108	107	23	0	0	0	0
	0.17%	0.09%	0.03%	0.00%	0.00%	0.00%	0.00%
TOTAL:	62016	125167	92841	99216	98437	29625	59811

APPENDIX B: FIGURES

Figure 1

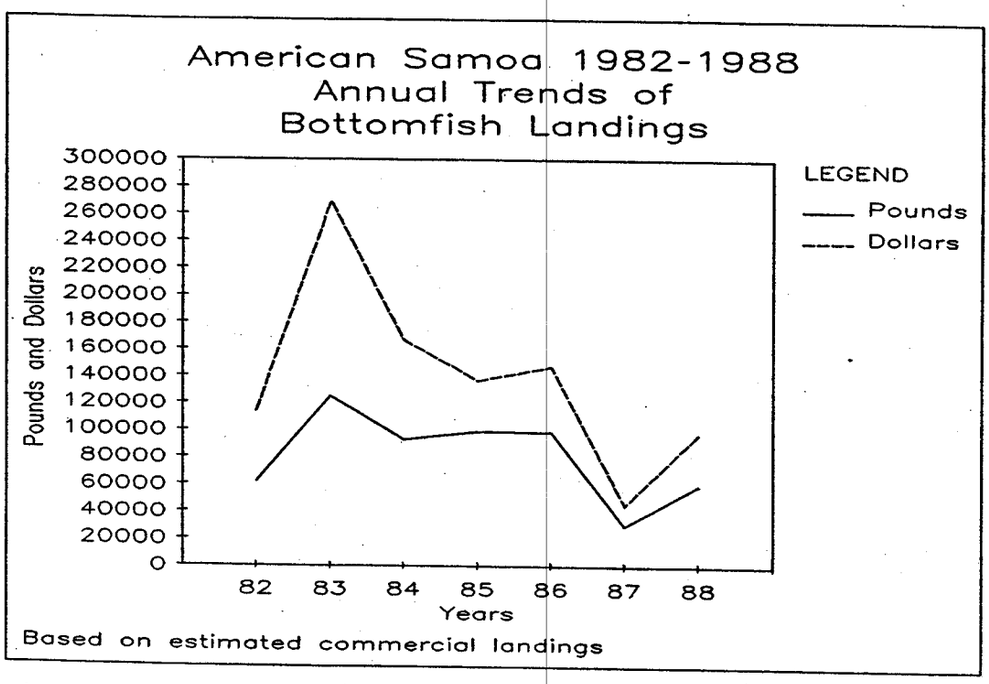


Figure 2

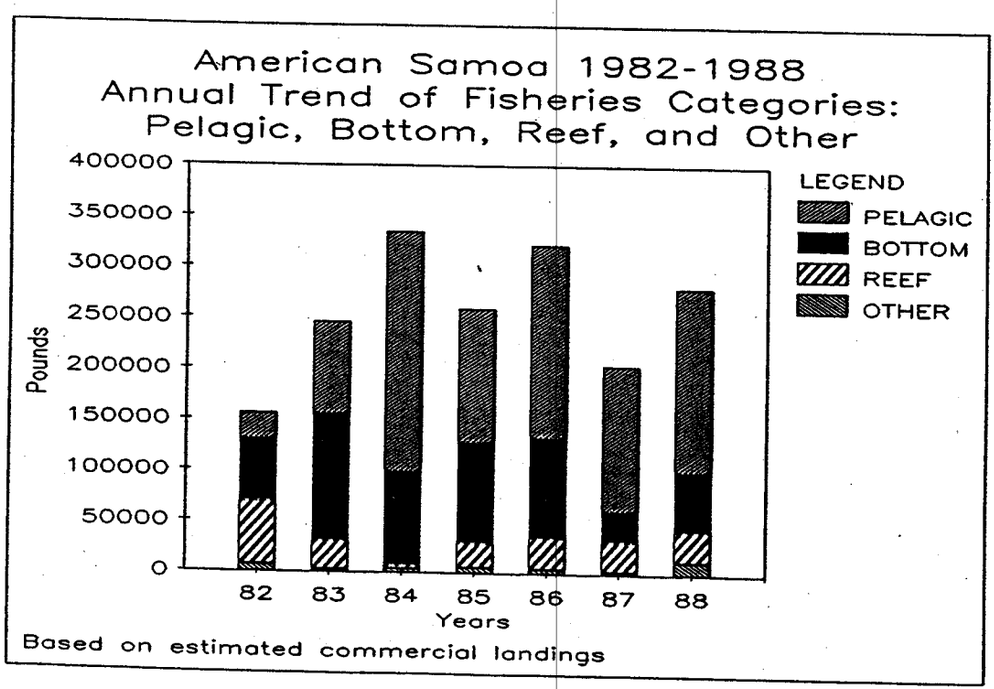


Figure 3

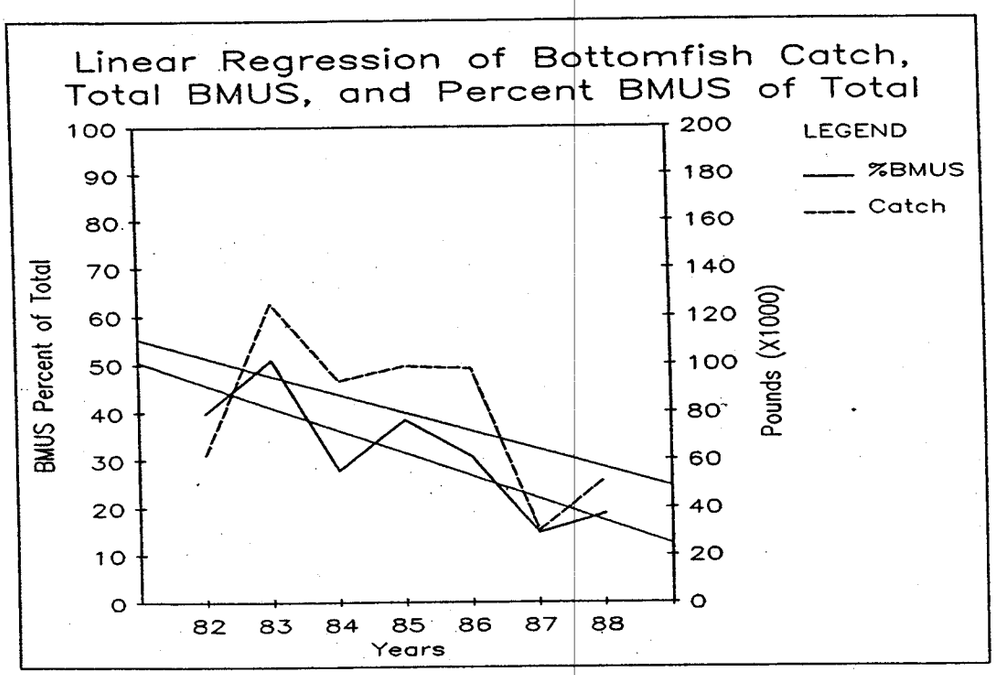


Figure 4

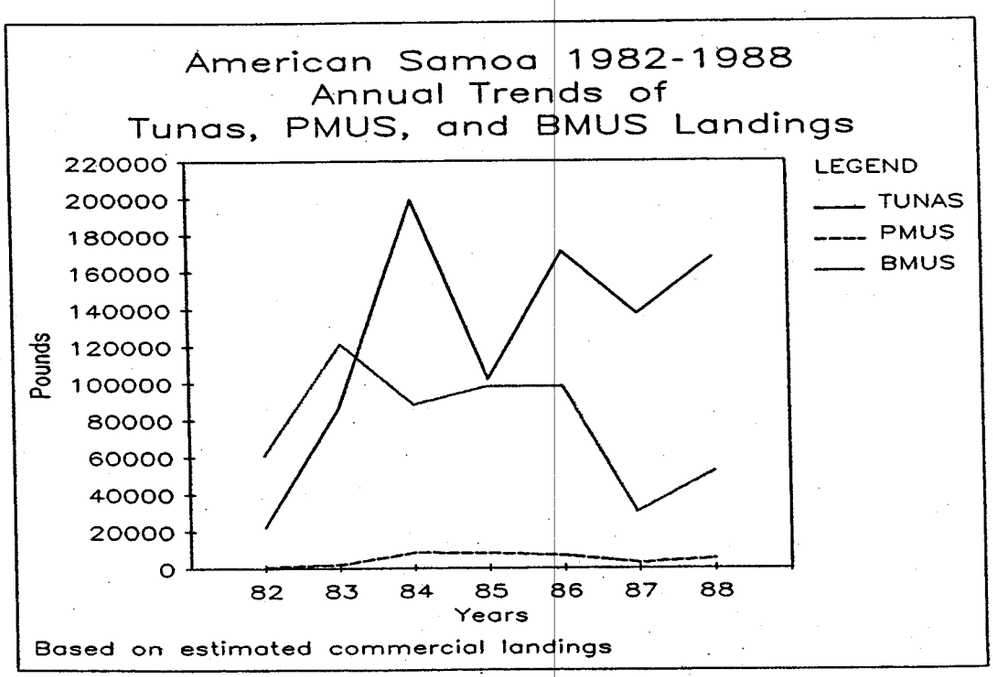


Figure 5

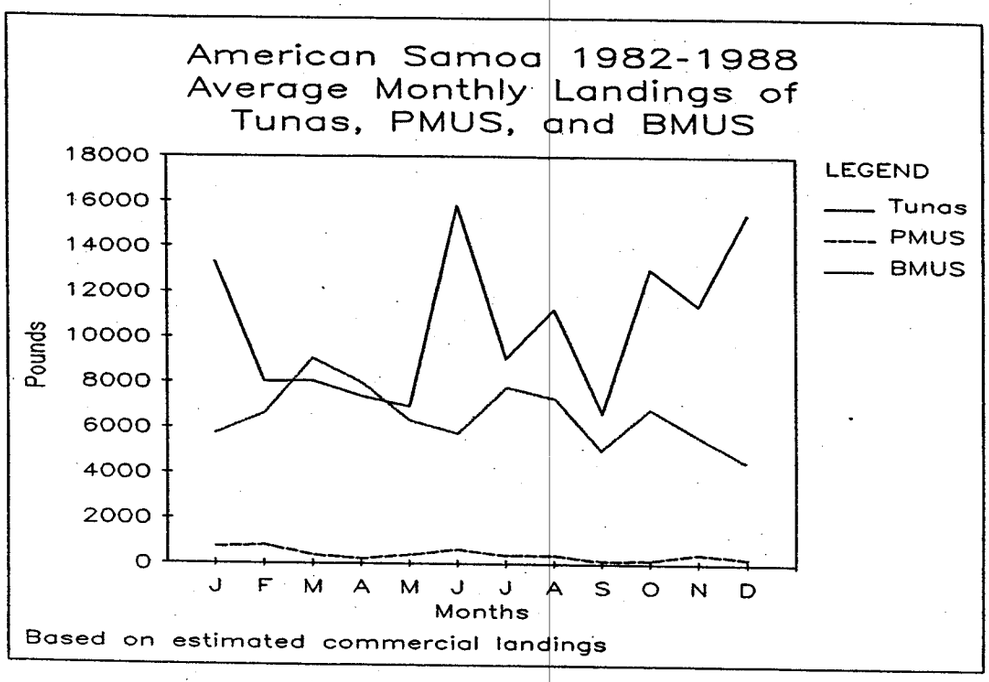


Figure 6

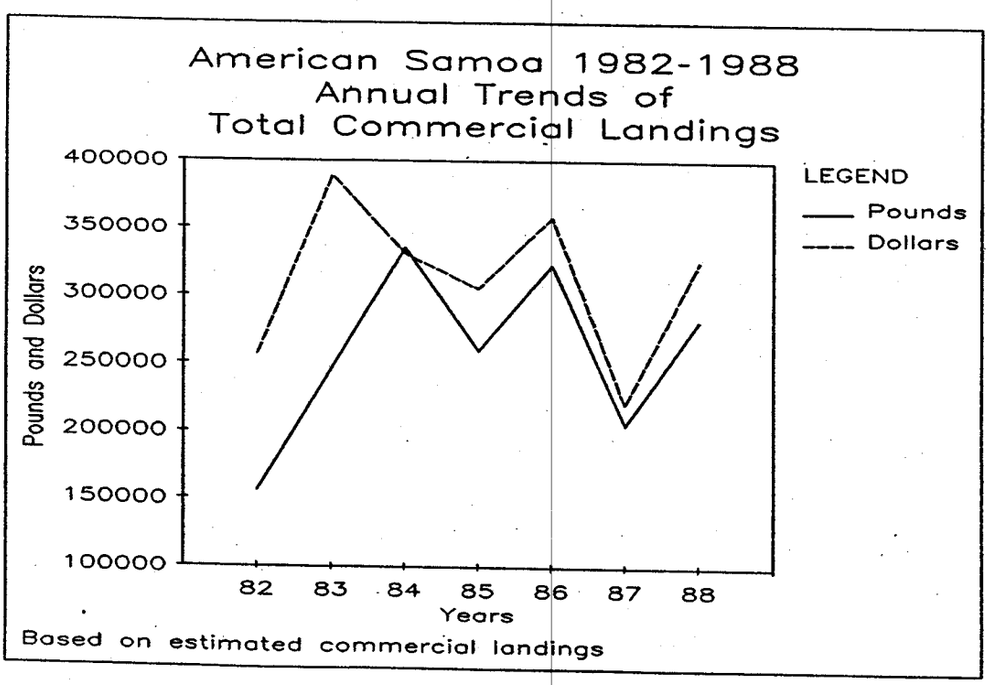


Figure 7

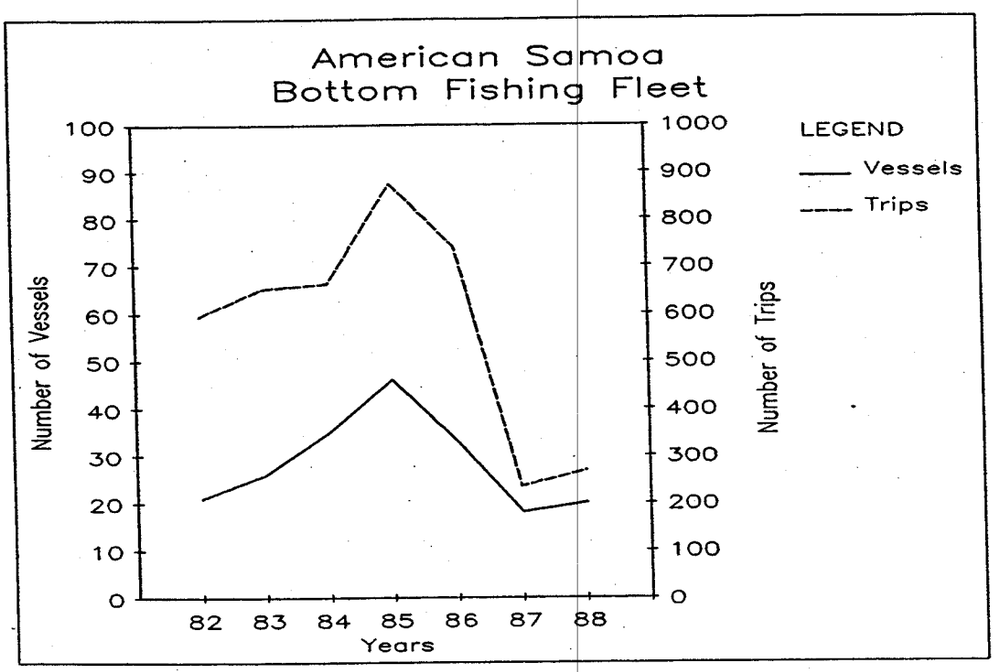


Figure 8

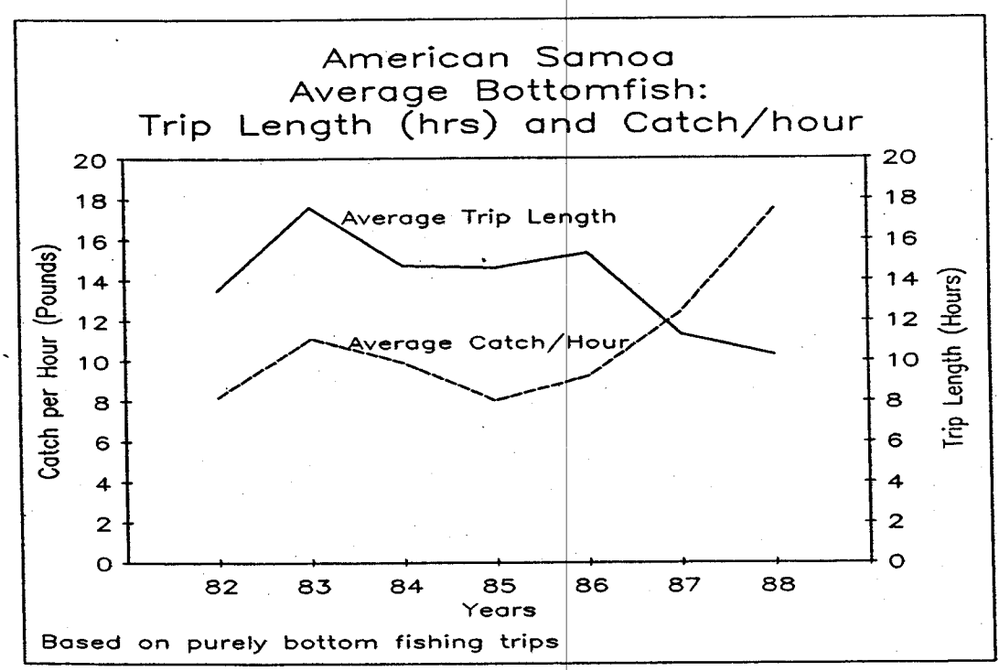
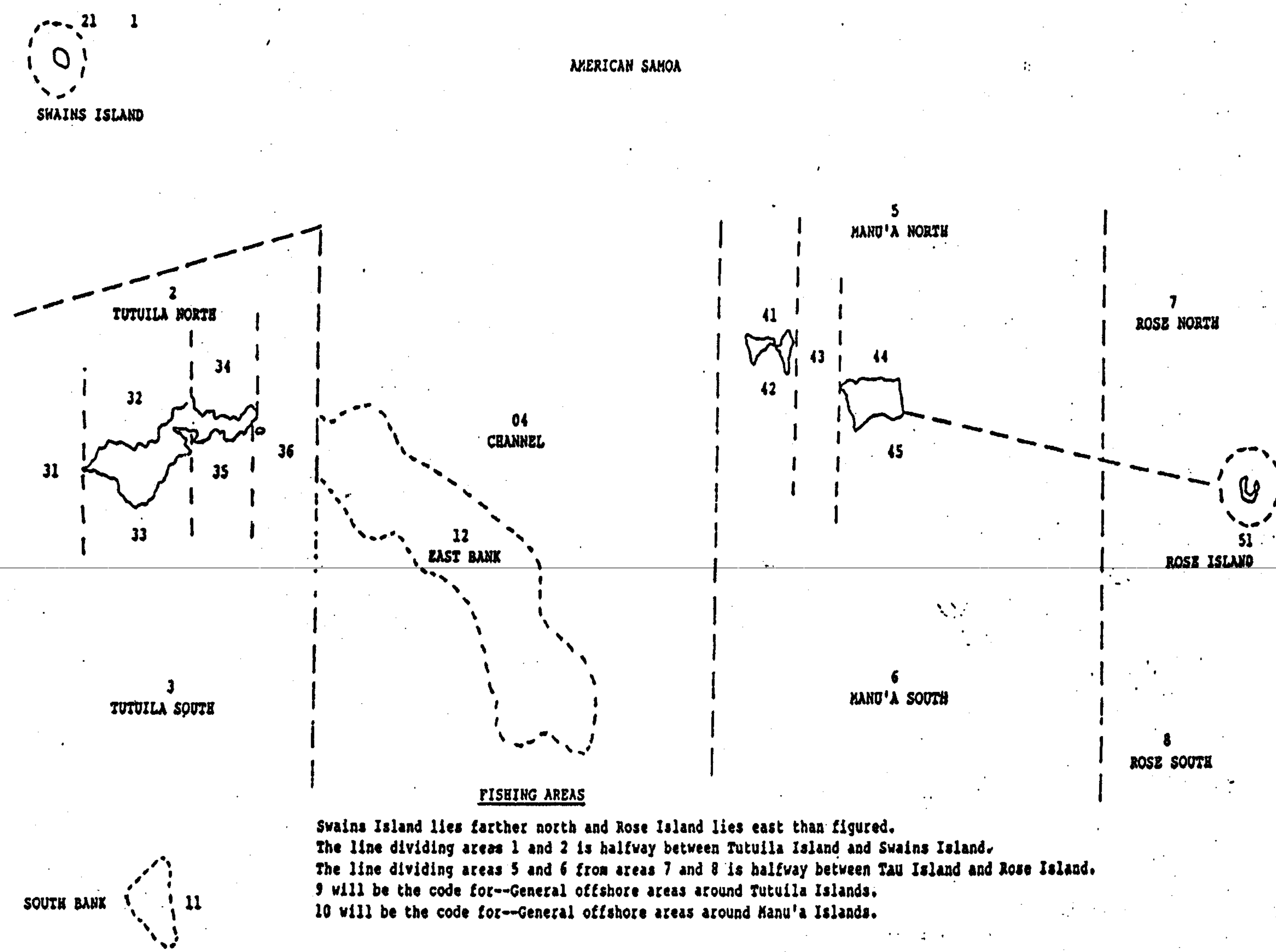


Figure 9



AMERICAN SAMOA
21
1
SWAINS ISLAND
2
TUTUILA NORTH
31
32
33
34
35
36
3
TUTUILA SOUTH
04
CHANNEL
12
EAST BANK
SOUTH BANK
11
41
42
43
44
45
5
MANU'A NORTH
6
MANU'A SOUTH
7
ROSE NORTH
51
ROSE ISLAND
8
ROSE SOUTH
FISHING AREAS
Swains Island lies farther north and Rose Island lies east than figured.
The line dividing areas 1 and 2 is halfway between Tutuila Island and Swains Island.
The line dividing areas 5 and 6 from areas 7 and 8 is halfway between Tau Island and Rose Island.
9 will be the code for--General offshore areas around Tutuila Islands.
10 will be the code for--General offshore areas around Manu'a Islands.

Figure 10

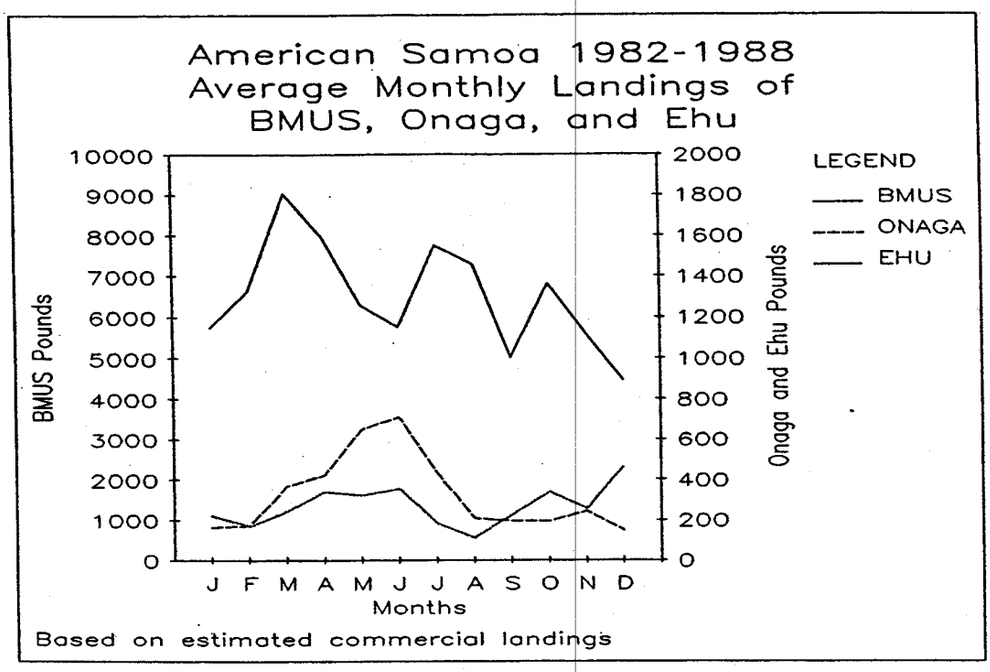


Figure 11

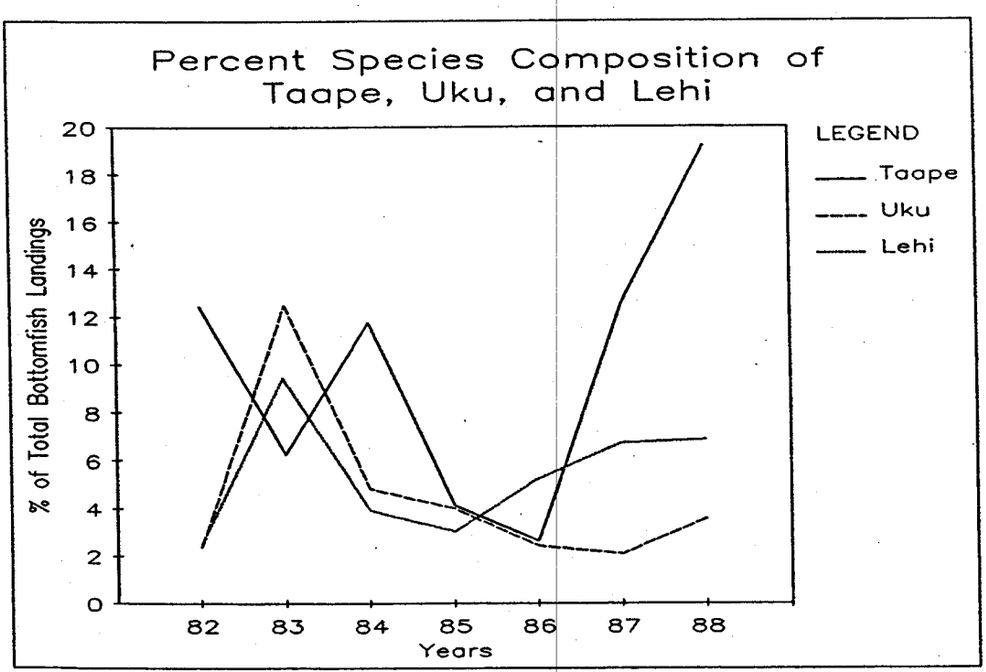
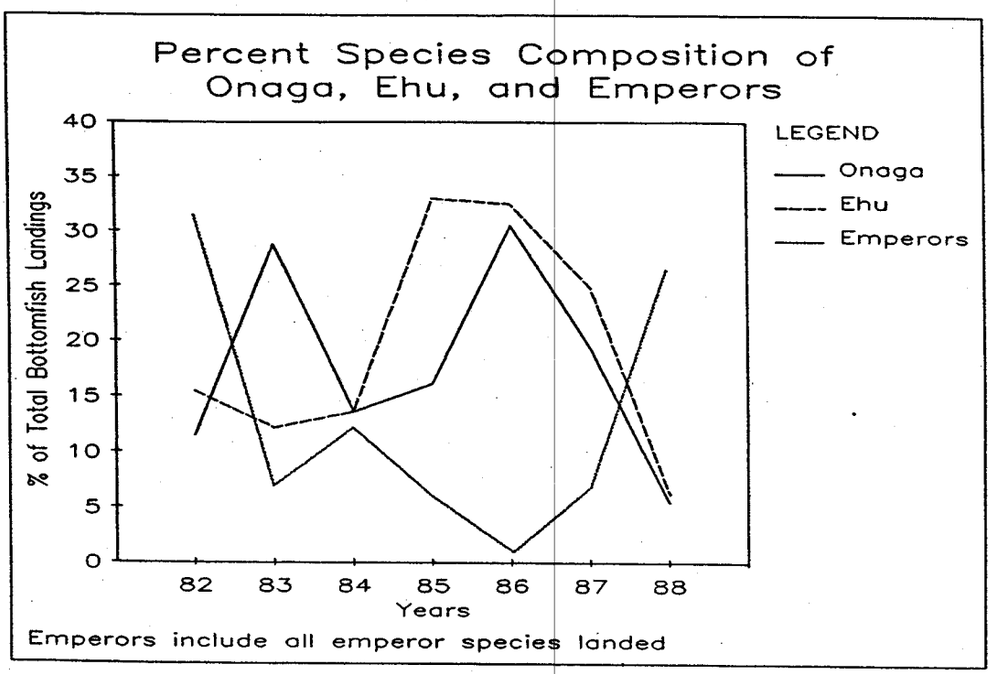


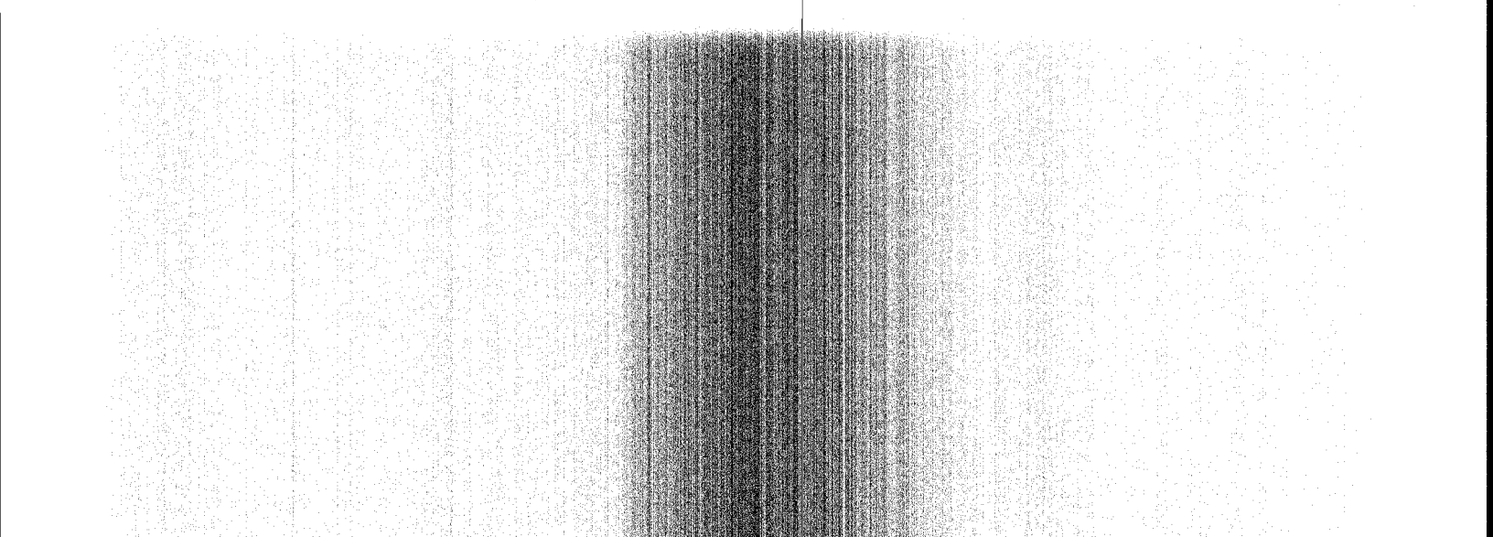
Figure 12


Percent Species Composition of
Onaga, Ehu, and Emperors
% of Total Bottomfish Landings
40
35
30
25
20
15
10
5
0
82
83
84
85
86
87
88
Years
LEGEND
Onaga
Ehu
Emperors
Emperors include all emperor species landed

TERRITORY

OF

GUAM



ANNUAL REPORT FOR THE 1988 BOTTOMFISH FISHERY

OF THE

TERRITORY OF GUAM

JUNE 1989

Prepared By

David C. Hamm and Michael M. C. Quach
Western Pacific Fishery Information Network
National Marine Fisheries Service
Honolulu Laboratory

and

Gerald W. Davis
Fisheries Section
Division of Aquatic and Wildlife Resources
Guam Department of Agriculture

FOR THE

Western Pacific Regional Fishery Management Council's

BOTTOMFISH PLAN MONITORING TEAM

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION

The Fishery Management Plan (FMP) for the Bottomfish and Seamount Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) in 1986. The Western Pacific Regional Fishery Management Council (Council) developed the FMP to manage the bottomfish and seamount resources occurring in its area of jurisdiction as defined in the Magnuson Fishery Management and Conservation Act of 1976.

The Bottomfish FMP required the Council to establish a Bottomfish Plan Monitoring Team (Team) to prepare an annual report on the status of the bottomfish fishery for each of the island areas served by the Council. The Team decided to adopt a modular approach to developing the annual report, whereby each island area would develop an individual report for its bottomfish fishery and would submit the report to the Team for review. This is the third annual report module submitted to the Team on behalf of the Government of Guam to help the Team determine the effectiveness of the FMP in meeting its goal in Guam.

This report was prepared by staff members of NOAA Fisheries Honolulu Laboratory's Western Pacific Fishery Information Network (WPACFIN) and the Guam Division of Aquatic and Wildlife Resources (DAWR). It is based on two major sets of data: commercial landings data collected by WPACFIN through a voluntary reporting system established by WPACFIN in 1982 with major fresh fish dealers on Guam, and creel survey data collected by DAWR. Through cooperative efforts of the agencies involved, this annual report on the bottomfish fishery of Guam is DAWR's official submission to the Team for the 1988 calendar year.

This report provides data for 1988 and updates the time series of published data on the bottomfish fishery of Guam. Although additional data quality control procedures conducted recently resulted in minor data base modifications, this report does not review all previously described and published detailed information on the fishery. However, it does provide tables of updated annual summary data for important parameters. Both data collection systems used to monitor Guam's fisheries have limitations related to the sample sizes included in the data bases; hence, data from both systems are presented to provide a more complete and accurate description of the fishery. For additional background information on Guam's data collection systems, assumptions, and analyses used to summarize data in this report, the bottomfish fishery, or specifics on other Guam fisheries, refer to the Team's other annual reports, volumes of WPACFIN's "Fishery Statistics of the Western Pacific" (Hamm et al. 1986, Hamm and Quach 1988b, 1989), Hamm and Quach (1988a), or DAWR annual reports.

I. FISHERIES PERFORMANCE DATA

Tables 1-9 and Figures 1-15 summarize annual and monthly fishery performance data for 1988 and update the time series available for establishing trends in the fishery.

1. Total Landings by Species, by Area, and by Month

The bottomfish fishery remains a fairly small fraction (5%) of the total commercial fisheries of Guam (Figures 1-2). Recorded 1988 commercial bottomfish landings (7,896 pounds) continued to decline for the third year in a row to the lowest recorded landings since 1982, whereas, DAWR-estimated total bottomfish landings (53,729 pounds) continued to increase for the third consecutive year (Figure 4). The relative importance of productivity of the offshore banks northeast of Guam (Figure 3) continued to increase, as did the nearshore tips of the island, while the banks southwest of Guam decreased in relative importance (Figure 5). The general trend of increasing importance of offshore banks in the bottomfish fishery continued in 1988 (Figure 6). Further testing will be required to establish whether this can be attributed to a fall in catch per unit effort (CPUE) nearshore, an increase in boat size, or some combination of both.

2. Estimated Ex-Vessel Revenue by Species

Tables 3 and 4 provide the 1988 annual and monthly ex-vessel values by species and the average price paid for each species. Figure 4 shows the historical fluctuations in the value of the fishery, that the 1988 value of the landings ($14,784) was the lowest recorded since 1982, and that the average price per pound has remained fairly stable.

3. Fishing Effort

A. Number of Vessels and Trips

The number of vessels making commercial bottomfish trips and landings continued to decline during 1988, to the lowest number since 1982 (Figure 7). The CPUE of these boats is measured by trip or by hour. Even though the number of boats declined, the overall average catch per trip for all vessels landing bottomfish commercially remained the same for the third consecutive year. For those trips in which effort (hours) was recorded, the average catch per trip and catch per hour increased slightly in 1988 (Figure 8).

The DAWR creel survey data show fluctuating but similarly stable CPUE (Figure 9), but a contrasting increase in catch and effort for the past 2 years (Figure 10). The creel survey catch per trip is about half that recorded for commercial trips. The absence of obvious trends in CPUE seems to indicate a relatively stable fishery resource.

Table 2 demonstrates two ways to calculate catch per hour

and its associated standard deviation (SD) and coefficient of variation (CV). The differences in the two methods of calculation are based on differences in the definition of CPUE. The estimated annual average CPUE (CPUE1) is calculated by adding all of the catch for the year and dividing by the sum of the hours required to land that catch, and has no associated variance. (Actually, there may be one or more somewhat more complicated ways to estimate this variance given certain assumptions, but these methods were not investigated). This method of calculating CPUE essentially weights the estimate by size of landing. The other average CPUE (CPUE2) treats each trip as an observation and weights each resultant individual trip catch rate equally. Its associated variance, and hence SD and CV, can also be calculated two ways, depending on one's definition of trip CPUE, e.g., based on whether it is considered a single observation or an average of hourly observations. As can be seen in Table 2 and Figure 8, the resultant CPUE's and CV's can differ radically depending on which definition is used, e.g., in 1984 CPUE's were 2.5 vs. 6.4 pounds per hour, with CV's of 512 vs. 31 percent. Similar comparisons are shown for the creel survey data in Table 7 and Figure 9. In the calculation of CPUE2 for the creel survey data, a daily average catch per hour, rather than individual trip, is used as the observation. Standardization of definition is obviously needed. However, regardless of which method is used, in the absence of more precise statistical analysis of changes in CPUE's, it does not appear that the decline in the Guam bottomfish fishery is due to declining catch rates.

A cursory examination of landings from Baby Banks, formerly one of the most productive banks southwest of Guam, shows that the fishing pressure decreased and the catch rate increased in 1988 (Table 6). It also shows that none of the three main fishermen who previously fished this bank fished it during 1988. Once again, the declining catch appears to be for reasons other than declining catch rates.

B. Species Composition and Other Indicators of Fishery Performance

Figure 11 shows the seasonal distribution of the bottomfish landings. Most landings are made during the calmer summer months, May through August, when the major pelagic fisheries for mahimahi and wahoo are least active. However, even during the peak bottomfish fishing season, landings of pelagic species far outweigh bottomfish, and virtually all commercial bottomfish fishing trips are also trolling trips. Guam does not have an exclusive bottomfish fishery.

Changes in species composition typically indicate changes in a fishery, either in the stocks or the fishing activity itself. The percent composition of commercial bottomfish catch for eight important deepwater bottomfish species are plotted in Figures 12 and 13. Onaga and grouper showed fairly substantial increases, whereas uku showed a tremendous decline. The other species remained relatively unchanged, with slight increases for all but

ehu, which decreased slightly. The creel survey percent species composition for these eight species (Figures 14 and 15) showed similar trends as the commercial landings for all but uku, which increased substantially rather than declined. Based on a cursory examination of these data, there does not seem to be any significant changes in species composition. A statistically valid examination of the data is needed.

4. Biological Characteristics of the Landings

A. Size-Frequency Analysis

Specific objectives and guidelines for this area have not been determined by the Team. Currently available bottomfish size-frequency data are sparse and not in a single, easily analyzed form. No analyses were performed.

B. Maximum Sustainable Yield

The 1988 commercial landings of 7,896 pounds were only 14% of the estimated maximum sustainable yield (MSY) of 56,800 pounds for Guam bottomfish. However, the DAWR creel survey estimated that the total catch of bottomfish for 1988 (53,729 pounds) was 95% of the estimated MSY. Since the current MSY estimates exclude the Lethrinids, the most important group in Guam's bottomfish management unit species (BMUS), these figures may be misleading. Additionally, recent research indicates that use of MSY theories may not be realisitc for management purposes.

5. Summary Table of Fishery Status

Status of the Guam Bottomfish Fishery

	Problem Condition	Present in the Bottomfish Fishery	Comment
1.	Mean catch size is prereproductive	Data not available	
2.	Unacceptable ratio of fish mortality to natural mortality	Data not available	Mortality may be a useful management tool, but it may not be possible to determine
3.	Catch exceeds MSY	No	MSY needs to be reestimated

	Problem Condition	Present in the Bottomfish Fishery	Comment
4.	Significant decline in CPUE	Not indicated	Need to standardize which CPUE and CV to use, and establish limits of significance
5.	Substantial decline in ex-vessel revenue relative to baseline levels	Possibly	Price is stable but fishery has declined in landings and revenue
6.	Significant shift in gear, by area	Possible shift in area, same gear	Shift isn't CPUE related
7.	Significant change in the frozen/fresh components of catch	No, it is still a fresh fish fishery	
8.	Unstable pattern of entry/exit to the fishery	Yes	Need to define unstable statistically
9.	Per trip costs exceed per trip revenue	Data not available	Survey results available later
10.	Significant decline or increase in total bottomfish landings	Possibly	Need more analysis and definition of significant
11.	Change in species composition of catch	Not indicated	Need to define change statistically
12.	Research results indicate problems	No research done	
13.	Habitat degradation or environmental problems	Data not available	
14.	Increased interaction with protected species	No	

II. RECENT RESEARCH AND SURVEY RESULTS

Results of DAWR's offshore creel surveys are presented, in part, in the previous section. For additional information on these surveys see the references. The DAWR is making more in-depth analyses of its existing creel survey data, but results are not yet available.

III. HABITAT CONDITIONS AND RECENT ALTERATIONS

No information regarding this topic is available at present.

IV. ENFORCEMENT ACTIVITIES AND PROBLEMS

Information on enforcement activities should be obtained from the NMFS Enforcement Southwest.

V. ADMINISTRATIVE ACTIONS AND RECOMMENDATIONS

Arrangements should be made to transfer the technical capability and physical responsibility of producing Guam's annual Team module to the newly appointed Bottomfish Team member from Guam.

It is recommended that the existing DAWR creel survey system be modified or a special program established to collect enough size-frequency data to properly monitor the fishery.

The existing commercial landings system should be expanded to include some of the smaller direct purchasers of fish (stores, hotels, restaurants); the system should be improved to collect better location and effort data and better species breakdown of the bottomfish catch. Neither the WPACFIN program nor DAWR has funds to accomplish this task. Additionally, current funding at DAWR allows no personnel time for working on commercial fisheries. This must be changed if DAWR is to fully take over the Team responsibilities for Guam.

Further analyses and studies should be conducted to better describe the fishery, explain, and interpret the fluctuations, and make recommendations for stabilization of the fishery. Studies of stock assessment also are needed. The Team needs to hold a workshop to establish structured objectives and guidelines describing the recommended data collection, statistical analyses, and reporting necessary to meet the needs of the Team and the Council.

VI. TERRITORY MANAGEMENT ACTIONS

No territorial management actions have taken place regarding the bottomfish fishery. Based on the information presented in this report, no fishery management territorial actions are needed

at this time. However, improvement of the commercial landings data collection system would best be handled through action on the part of Guam's fisheries agencies, e.g., the Department of Commerce and DAWR.

VII. ASSESSMENT OF NEED FOR COUNCIL ACTION

Although the presentation of available data does not identify any problems in the bottomfish fishery of Guam, except for a continuing decline of unknown cause in the commercial fishery, there remain several significant deficiencies in the data base. Additional data are needed, data systems need to be improved, analyses need to be expanded and strengthened, and local expertise needs to be utilized.

Existing computer programs for summarizing and analyzing available data are insufficient to properly monitor the resource and describe the fishery. Assistance is needed to develop these tools to be used by DAWR biologists in preparation of subsequent annual reports. The development of relevant island modules is currently limited by the vague guidelines established in the FMP. The data available since the formulation of the FMP have changed, and amendment of the FMP to reflect a new structure would be helpful. If island modules are expected to provide data, analyses, and recommendations, the procedures, types of data required, statistical approaches, and overall objectives must be specifically identified by the Team.

VIII. RECOMMENDATIONS FOR COUNCIL ACTION

To date, only visual interpretations have been used on the data. More thorough and statistically valid analyses should be performed on the data to determine whether trends or problems actually exist in this fishery. The Team should identify specific questions about the fishery; form hypotheses to answer these questions; determine analytical methods to test these hypotheses; provide guidelines for interpreting the analyses; and determine what constitutes trends, changes, or problems in the fishery. The Team should develop specific recommendations for format and content of the annual report modules. A special 2- to 5-day workshop should be held, possibly in concert with the Bottomfish Team and select members of the Council's Scientific and Statistical Committee, to resolve these problems for all Council management areas.

The commercial landings system should be improved to include a broader coverage. Currently the WPACFIN staff coordinate, collect, and process the commercial landings and effort data for Guam. The DAWR has a concern and interest in collecting this information but is limited to involvement in recreational and subsistence fisheries only, because 100% of its funding is through Dingell-Johnson funds, which cannot be used for commercial activities. If the Guam report module is to include commercial data, a mechanism, e.g., funding, must be developed to

support DAWR's involvement in the commercial fisheries.

It is recommended that the Council support development of a special study on size frequency of the most important commercial bottomfish species for Guam. This study should include complete analysis of existing data and a sampling program capable of obtaining enough size information to adequately describe the current stock structure.

IX. ESTIMATED IMPACTS OF RECOMMENDED ACTION

Analysis of existing data and development of a size-frequency sampling project will provide a more complete understanding and monitoring of the Guam bottomfish fishery.

REFERENCES

Guam Department of Agriculture, Division of Aquatic and Wildlife Resources Annual Reports. Fiscal years 1979 through 1988. var. pag.

Hamm, D. C., and M. M. C. Quach.
1988a. Bottomfish fisheries of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-15, 76 p.

1988b. Fishery statistics of the western Pacific, volume III. Territory of American Samoa (1985-86), Commonwealth of the Northern Mariana Islands (1985-86), Territory of Guam (1985-86), State of Hawaii (1985-86). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-4, var. pag.

1989. Fishery statistics of the western Pacific, volume IV. Territory of American Samoa (1987), Commonwealth of the Northern Mariana Islands (1987), Territory of Guam (1987) State of Hawaii (1987). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-89-1, var. pag.

Hamm, D. C., M. M. C. Quach, and Todd T. Kassman.
1986. Fishery statistics of the western Pacific, volume II. Territory of Guam (1979-84). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-86-20, var. pag.

Western Pacific Regional Fishery Management Council (Council).
1988. 1987 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

1988. 1986 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

APPENDIX A: TABLES

Table 1

Summary of the Guam Commercial Bottomfish Fishery 1980-88

		1980	1981	1982	1983	1984	1985	1986	1987	1988
Total commercial landings in pounds		105014	145970	140762	311029	281402	296624	237512	219507	159716
Total landings of bottomfish species	pounds	7036	8367	5625	33020	19182	25494	10869	10111	7896
	dollars	8594	14872	10840	59825	37051	47604	19618	18841	14784
	avg $/lb	1.22	1.78	1.93	1.81	1.93	1.87	1.80	1.86	1.87
Percent of bottomfish landings to total landings		6.7	5.7	4.0	10.6	6.8	8.6	4.6	4.6	4.9
Number of trips which landed bottomfish		111	187	152	409	396	431	229	213	169
Number of fishermen (boats) landing bottomfish*		30	38	34	50	63	59	43	38	35
Bottomfish catch per trip		63	45	37	81	48	59	47	47	47
Total catch of bottomfish by highliners**		4398	2090	1634	26037	11275	14540	5395	4240	2016
Percent of total bottomfish landed by highliners		63	25	29	79	59	57	50	42	26
Number of trips made by highliners		9	40	29	110	142	128	27	56	18
Number of highliners		1	1	1	6	5	6	2	3	1
Catch per trip of highliners		489	52	56	237	79	114	200	76	112

* Number of known fishermen plus one to account for landings by miscellaneous fishermen.

** Highliners = fishermen (boats) landing over 1,000 pounds of bottomfish during the year.

Table 2

Summary of the Guam Commercial
Bottomfish Fishery
for Boats With Known Effort 1980-88

	1982	1983	1984	1985	1986	1987	1988
Number of fishermen	12	38	55	51	42	36	34
Percent of total bottom fishermen	35	76	78	85	100	95	97
Number of trips	33	210	273	357	216	179	162
Percent of total bottomfish trips	22	51	69	83	94	84	96
Total hours	377	3443	4653	4821	2240	1796	1303
Total landings	1184	17058	11669	22226	9196	8160	7714
Hours per trip	11	16	17	14	10	10	8
CV	96	118	102	121	82	76	58
Catch per trip	36	81	43	62	43	46	48
CV	103	307	120	162	143	103	116
Catch per hour (CPUE1) (sum catch/sum hrs) (Annual est. observation)	3.1	5.0	2.5	4.6	4.1	4.5	5.9
Catch per hour (CPUE2) (sum(catch/hrs)/sum trips) (trip is an observation)	4.0	4.1	6.4	5.9	7.3	4.9	7.1
Standard Deviation and Coefficient of Variation of CPUE2							
With trip CPUE defined as a sample observation							
SD=std(lbs/hrs) (SD1)	2.4	6.5	32.5	7.8	39.4	4.3	8.7
CV=(SD1/CPUE2) (CV1)	60	158	512	132	540	88	124
With trip CPUE defined as a "mean" observation							
SD=(SD1/sqrt(trips)) (SD2)	0.4	0.5	2.0	0.4	2.7	0.3	0.7
CV=(SD2/CPUE2) (CV2)	11	11	31	7	37	7	10

Table 3

Guam 1988 Commercial Landings
Of Bottomfish Species

Species	Records	Pounds	Value	$/lb
Jacks	48	1,215.45	1,649.40	1.36
Bottomfish	104	3,198.25	6,377.22	1.99
Ehu (red snapper)	7	82.50	185.62	2.25
Gindai (flower snap)	31	580.00	1,304.95	2.25
Grouper	5	773.50	726.00	0.94
Kalikali (pink snap)	7	60.50	122.12	2.02
Lehi (silverjaw)	3	97.00	218.25	2.25
Onaga (red snapper)	19	910.50	2,272.87	2.50
Opakapaka (pink snp)	17	462.50	1,040.63	2.25
Uku (gray snapper)	21	286.50	428.50	1.50
Emperor (mafute)	9	229.25	458.50	2.00
** Total Bottomfish**	271	7,895.95	14,784.06	1.87
** TOTAL ALL SPECIES**	3,722	159,715.61	227,828.37	1.43

Table 4

Guam 1988 Monthly Commercial Landings
Of Bottomfish Species

Species	Records	Pounds	Value	$/lb
** January **				
Jacks	2	118.00	131.75	1.12
Bottomfish	3	42.00	84.00	2.00
** Total Bottomfish**	5	160.00	215.75	1.35
** TOTAL ALL SPECIES**	273	9,719.75	17,418.79	1.79
** February **				
Jacks	1	35.00	43.75	1.25
Bottomfish	1	6.00	12.00	2.00
** Total Bottomfish**	2	41.00	55.75	1.36
** TOTAL ALL SPECIES**	341	14,086.50	21,171.53	1.50
** March **				
Bottomfish	3	127.00	245.75	1.94
** Total Bottomfish**	3	127.00	245.75	1.94
** TOTAL ALL SPECIES**	399	24,229.62	34,376.69	1.42

Table 4 (Cont.)

Species	Records	Pounds	Value	$/lb
** April **				
Jacks	3	60.00	80.37	1.34
Bottomfish	11	457.00	1,001.85	2.19
Gindai (flower snap)	1	19.50	43.87	2.25
Uku (gray snapper)	5	85.50	128.25	1.50
** Total Bottomfish**	20	622.00	1,254.34	2.02
** TOTAL ALL SPECIES**	428	17,928.00	24,694.54	1.38
** May **				
Jacks	6	73.00	109.50	1.50
Bottomfish	8	139.00	251.00	1.81
Gindai (flower snap)	3	102.50	230.62	2.25
Onaga (red snapper)	3	135.00	334.12	2.47
Opakapaka (pink snp)	2	6.50	14.62	2.25
Uku (gray snapper)	2	12.00	18.00	1.50
Emperor (mafute)	5	164.75	329.50	2.00
** Total Bottomfish**	29	632.75	1,287.36	2.03
** TOTAL ALL SPECIES**	404	14,212.45	20,426.41	1.44
** June **				
Jacks	11	168.45	222.67	1.32
Bottomfish	18	426.00	825.00	1.94
Ehu (red snapper)	1	4.00	9.00	2.25
Gindai (flower snap)	6	171.50	385.87	2.25
Grouper	1	208.00	156.00	0.75
Kalikali (pink snap)	2	13.00	26.00	2.00
Lehi (silverjaw)	1	18.00	40.50	2.25
Onaga (red snapper)	3	175.50	438.75	2.50
Opakapaka (pink snp)	6	113.00	254.26	2.25
Uku (gray snapper)	4	54.50	81.75	1.50
** Total Bottomfish**	53	1,351.95	2,439.80	1.80
** TOTAL ALL SPECIES**	305	13,237.45	17,855.66	1.35

Table 4 (Cont.)

Species	Records	Pounds	Value	$/lb
** July **				
Jacks	6	255.00	352.25	1.38
Bottomfish	16	740.00	1,459.50	1.97
Ehu (red snapper)	1	8.00	18.00	2.25
Gindai (flower snap)	5	65.00	146.25	2.25
Grouper	1	4.50	9.00	2.00
Kalikali (pink snap)	2	25.00	50.00	2.00
Onaga (red snapper)	3	93.50	233.75	2.50
Opakapaka (pink snp)	4	187.00	420.75	2.25
Uku (gray snapper)	7	114.00	169.75	1.49
Emperor (mafute)	1	5.00	10.00	2.00
** Total Bottomfish**	46	1,497.00	2,869.25	1.92
** TOTAL ALL SPECIES**	348	14,348.15	18,073.37	1.26
** August **				
Jacks	5	118.50	159.25	1.34
Bottomfish	11	293.50	570.12	1.94
Ehu (red snapper)	2	44.00	99.00	2.25
Gindai (flower snap)	4	82.00	184.49	2.25
Grouper	1	303.50	303.50	1.00
Kalikali (pink snap)	2	18.00	36.00	2.00
Lehi (silverjaw)	1	17.00	38.25	2.25
Onaga (red snapper)	2	216.00	540.00	2.50
Opakapaka (pink snp)	1	47.50	106.87	2.25
Uku (gray snapper)	1	4.50	6.75	1.50
** Total Bottomfish**	30	1,144.50	2,044.23	1.79
** TOTAL ALL SPECIES**	297	14,379.75	16,755.73	1.66
** September **				
Jacks	9	208.50	286.49	1.37
Bottomfish	15	432.25	864.50	2.00
Ehu (red snapper)	1	9.00	20.25	2.25
Gindai (flower snap)	8	97.00	218.24	2.25
Lehi (silverjaw)	1	62.00	139.50	2.25
Onaga (red snapper)	5	134.50	336.25	2.50
Opakapaka (pink snp)	3	72.00	162.00	2.25
Uku (gray snapper)	1	4.00	6.00	1.50
** Total Bottomfish**	43	1,019.25	2,033.23	1.99
** TOTAL ALL SPECIES**	218	10,087.75	14,693.86	1.46

Table 4 (Cont.)

Species	Records	Pounds	Value	$/lb
** October **				
Jacks	2	137.00	205.50	1.50
Bottomfish	14	438.50	869.50	1.98
Ehu (red snapper)	1	15.00	33.75	2.25
Gindai (flower snap)	4	42.50	95.61	2.25
Grouper	2	257.50	257.50	1.00
Kalikali (pink snap)	1	4.50	10.12	2.25
Onaga (red snapper)	2	130.50	326.25	2.50
Opakapaka (pink snp)	1	36.50	82.13	2.25
Uku (gray snapper)	1	12.00	18.00	1.50
** Total Bottomfish**	28	1,074.00	1,898.36	1.77
** TOTAL ALL SPECIES**	308	12,625.94	19,849.57	1.57
** November **				
Bottomfish	2	53.00	106.00	2.00
** Total Bottomfish**	2	53.00	106.00	2.00
** TOTAL ALL SPECIES**	217	8,752.25	12,910.48	1.48
** December **				
Jacks	3	42.00	57.87	1.38
Bottomfish	2	44.00	88.00	2.00
Ehu (red snapper)	1	2.50	5.62	2.25
Onaga (red snapper)	1	25.50	63.75	2.50
Emperor (mafute)	3	59.50	119.00	2.00
** Total Bottomfish**	10	173.50	334.24	1.93
** TOTAL ALL SPECIES**	184	6,108.00	9,601.74	1.57

Table 5

Percent Of Total Known Bottomfish Landings
By Area Fished

Area	84	85	86	87	88
Northern Mariana Islands	38	10	10	0	0
Northeast Banks	7	16	9	16	39
Southwest Banks	9	17	36	48	31
Nearshore Island Tips	4	17	14	16	18
Other Nearshore Reefs	42	40	31	20	12
EEZ - >3 miles from shore	54	43	55	64	70
Guam - <3 miles from shore	46	57	45	36	30

Table 6

Baby Bank Summary Information

	1985	1986	1987	1988
Number Of Boats	12	13	16	9
Number Of Trips	24	27	30	15
Bottomfish Landings	1325	1613	1814	932
Hours Fished	305	432	355	125
Catch Per Trip	55	60	60	62
Catch Per Hour	4.3	3.7	5.1	7.5
Catch Per Hour Fisher 1	8.6	2.0	4.0	-
Catch Per Hour Fisher 2	7.9	1.7	5.3	-
Catch Per Hour Fisher 3	5.7	5.3	-	-

Table 7

Guam DAWR Creel Survey Summary Statistics

Year	Catch	CV	Boat hrs.	CV	Trips	CV	*CPUE1	**CPUE2	CV
1979	28243	22	8416	20	1918	17	3.4	4.3	13
1980	37149	38	4734	29	919	24	7.8	6.6	53
1981	61639	27	8523	17	2082	14	7.2	6.9	36
1982	60417	21	8215	11	2129	9	7.4	7.2	20
1983	53002	25	8620	16	2378	12	6.1	5.2	13
1984	52355	14	7141	12	2019	11	7.3	6.9	10
1985	92916	13	16242	11	3419	8	5.7	5.5	10
1986	29892	34	4945	18	1229	15	6.0	5.1	22
1987	34601	22	6191	20	1428	16	5.6	5.5	13
1988	53729	19	10044	14	2606	12	5.3	4.8	8

* CPUE1 = annual catch divided by annual boat hours
** CPUE2 = average of daily CPUE

Table 8

GUAM CREEL SURVEY SPECIES COMPOSITION OF SELECTED BOTTOMFISH
(UNALLOCATED MISCELLANEOUS BOTTOMFISH)

SPECIES %	1980	1981	1982	1983	1984	1985	1986	1987	1988
Grouper	627	6442	9441	3971	1519	7736	1226	4087	7403
	2.40%	11.79%	17.95%	8.75%	3.02%	9.25%	4.67%	13.09%	15.31%
Jacks	2591	3887	2255	2918	1747	5028	5852	2501	8476
	9.90%	7.11%	4.29%	6.43%	3.47%	6.01%	22.28%	8.01%	17.53%
Snapper	615	2028	3716	2125	765	2976	1911	1097	2993
	2.35%	3.71%	7.06%	4.68%	1.52%	3.56%	7.27%	3.51%	6.19%
Lehi	347	2444	2708	2726	322	1161	609	514	1753
	1.33%	4.47%	5.15%	6.01%	0.64%	1.39%	2.32%	1.65%	3.63%
Uku	1363	1557	4964	1330	841	3149	1348	1052	4079
	5.21%	2.85%	9.44%	2.93%	1.67%	3.77%	5.13%	3.37%	8.44%
Ehu	828	4845	1283	1147	32	1506	694	434	2138
	3.16%	8.86%	2.44%	2.53%	0.06%	1.80%	2.64%	1.39%	4.42%
Onaga	0	4095	1087	3809	220	2904	310	466	1164
	0.00%	7.49%	2.07%	8.39%	0.44%	3.47%	1.18%	1.49%	2.41%
Taape	80	486	479	172	60	1022	199	1438	1181
	0.31%	0.89%	0.91%	0.38%	0.12%	1.22%	0.76%	4.61%	2.44%
Y.T. Kalekale	793	2768	1602	5783	1110	3211	1179	555	1463
	3.03%	5.06%	3.05%	12.74%	2.21%	3.84%	4.49%	1.78%	3.03%
Opakapaka	1491	698	744	1221	117	1219	704	340	268
	5.70%	1.28%	1.41%	2.69%	0.23%	1.46%	2.68%	1.09%	0.55%
Y.E. Opaka	389	2353	1723	4342	484	1677	1394	435	741
	1.49%	4.31%	3.28%	9.57%	0.96%	2.01%	5.31%	1.39%	1.53%
Kalekale	0	17	307	764	0	183	23	0	68
	0.00%	0.03%	0.58%	1.68%	0.00%	0.22%	0.09%	0.00%	0.14%
Gindai	197	1558	1896	1632	291	2521	842	650	1692
	0.75%	2.85%	3.60%	3.60%	0.58%	3.02%	3.21%	2.08%	3.50%
Emperor	10184	11321	17146	11281	10124	28305	4273	11966	12255
	38.91%	20.71%	32.59%	24.86%	20.13%	33.85%	16.27%	38.33%	25.35%
Shallow Bottomfish	0	0	0	0	0	6159	1114	899	1382
	0.00%	0.00%	0.00%	0.00%	0.00%	7.37%	4.24%	2.88%	2.86%
Mixed Bottomfish	6668	10155	3254	2154	32651	13168	3323	3166	547
	25.48%	18.58%	6.19%	4.75%	64.93%	15.75%	12.65%	10.14%	1.13%
Deep Bottomfish	0	0	0	0	0	1687	1268	1615	746
	0.00%	0.00%	0.00%	0.00%	0.00%	2.02%	4.83%	5.17%	1.54%
TOTAL SELECTED SPECIES:	26173	54654	52605	45375	50283	83612	26269	31215	48349
TOTAL ALL BOTTOMFISH SPECIES:	37149	61639	60417	53002	52355	92916	29893	34601	53729

Table 9

GUAM CREEL SURVEY SPECIES COMPOSITION OF SELECTED BOTTOMFISH
(ALLOCATED MISCELLANEOUS BOTTOMFISH)

SPECIES %	1980	1981	1982	1983	1984	1985	1986	1987	1988
Grouper	778	7746	9983	4140	4221	9658	1603	5380	7780
	3.21%	14.48%	19.13%	9.19%	8.62%	11.87%	6.27%	17.56%	16.18%
Jacks	3215	4674	2384	3042	4854	6678	7072	2879	8931
	13.28%	8.74%	4.57%	6.75%	9.91%	8.21%	27.69%	9.40%	18.58%
Snapper	763	2438	3929	2216	2126	3953	2309	1263	3154
	3.15%	4.56%	7.53%	4.92%	4.34%	4.86%	9.04%	4.12%	6.56%
Lehi	431	2939	2863	2842	895	1449	796	677	1842
	1.78%	5.49%	5.49%	6.31%	1.83%	1.78%	3.12%	2.21%	3.83%
Uku	1691	1872	5249	1387	2337	4182	1629	1211	4298
	6.99%	3.50%	10.06%	3.08%	4.77%	5.14%	6.38%	3.95%	8.94%
Ehu	1027	5825	1357	1196	89	1880	907	571	2247
	4.25%	10.89%	2.60%	2.65%	0.18%	2.31%	3.55%	1.86%	4.67%
Onaga	0	4924	1149	3972	611	3625	405	613	1223
	0.00%	9.20%	2.20%	8.81%	1.25%	4.46%	1.59%	2.00%	2.54%
Taape	99	584	506	179	167	1357	240	1656	1244
	0.41%	1.09%	0.97%	0.40%	0.34%	1.67%	0.94%	5.40%	2.59%
Y.T. Kalekale	984	3328	1694	6030	3084	4009	1541	731	1538
	4.07%	6.22%	3.25%	13.38%	6.30%	4.93%	6.03%	2.38%	3.20%
Opakapaka	1850	839	787	1273	325	1522	920	448	282
	7.64%	1.57%	1.51%	2.83%	0.66%	1.87%	3.60%	1.46%	0.59%
Y.E. Opaka	483	2829	1822	4527	1345	2094	1822	573	779
	1.99%	5.29%	3.49%	10.05%	2.75%	2.57%	7.13%	1.87%	1.62%
Kalekale	0	20	325	797	0	228	30	0	71
	0.00%	0.04%	0.62%	1.77%	0.00%	0.28%	0.12%	0.00%	0.15%
Gindai	244	1873	2005	1702	809	3147	1101	856	1778
	1.01%	3.50%	3.84%	3.78%	1.65%	3.87%	4.31%	2.79%	3.70%
Emperor	12637	13612	18130	11762	28130	37593	5164	13777	12912
	52.21%	25.44%	34.74%	26.10%	57.42%	46.20%	20.22%	44.97%	26.86%
TOTAL SELECTED SPECIES:	24203	53503	52184	45065	48991	81376	25541	30634	48079

APPENDIX B: FIGURES

Figure 1

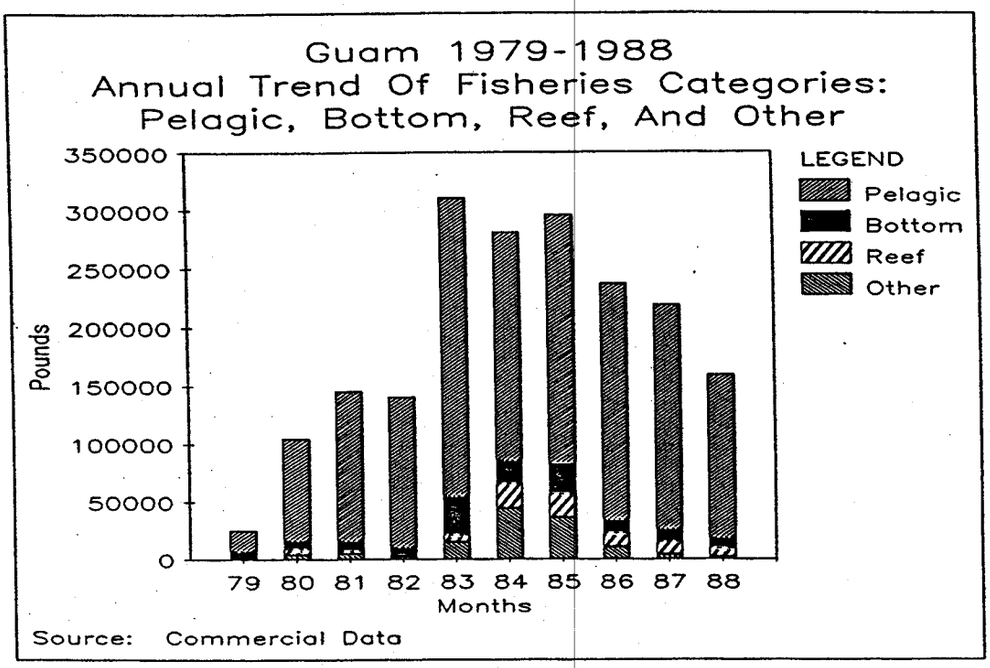


Figure 2

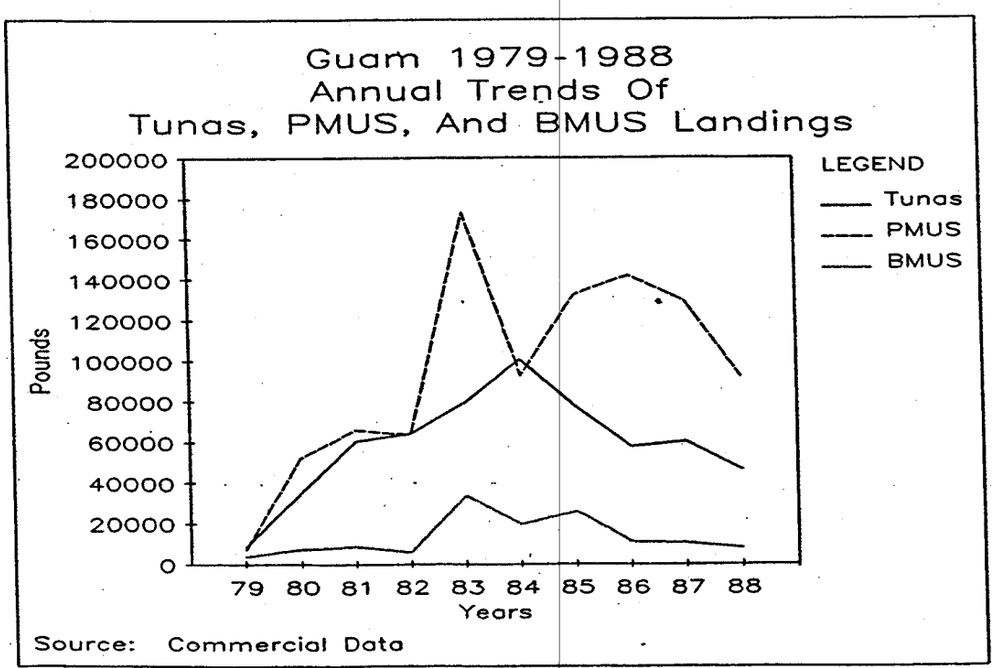


Figure 3

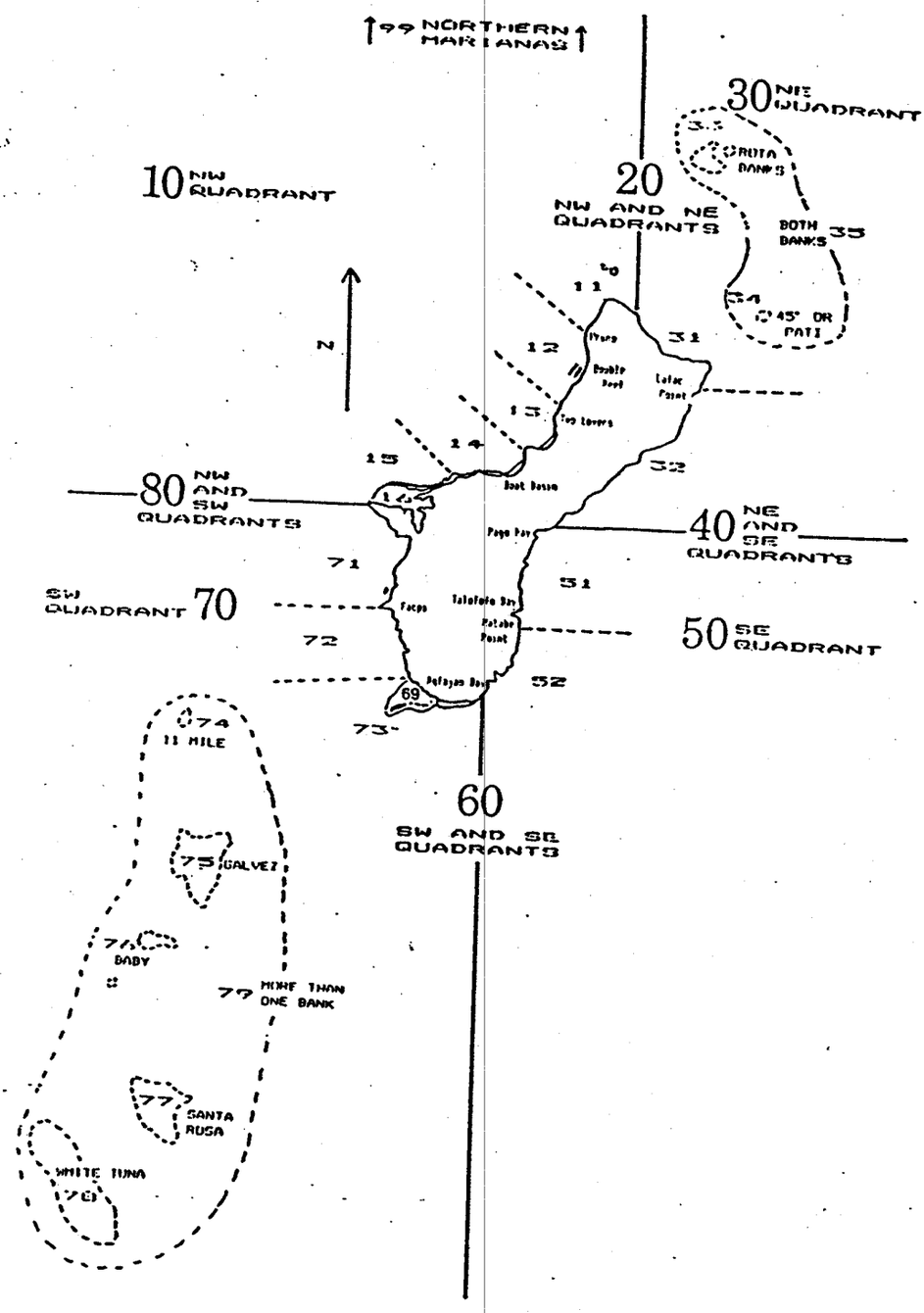

99 NORTHERN MARIANAS
10 NW QUADRANT
20 NW AND NE QUADRANTS
30 NE QUADRANT
ROTA BANKS
BOTH BANKS 35
34 45° OR PATI
N
80 NW AND SW QUADRANTS
40 NE AND SE QUADRANTS
SW QUADRANT 70
50 SE QUADRANT
60 SW AND SE QUADRANTS
74 11 MILE
75 GALVEZ
76 BABY
77 MORE THAN ONE BANK
77 SANTA ROSA
WHITE TUNA
69
11
12
13
14
15
31
32
51
52
71
72
73

Figure 4

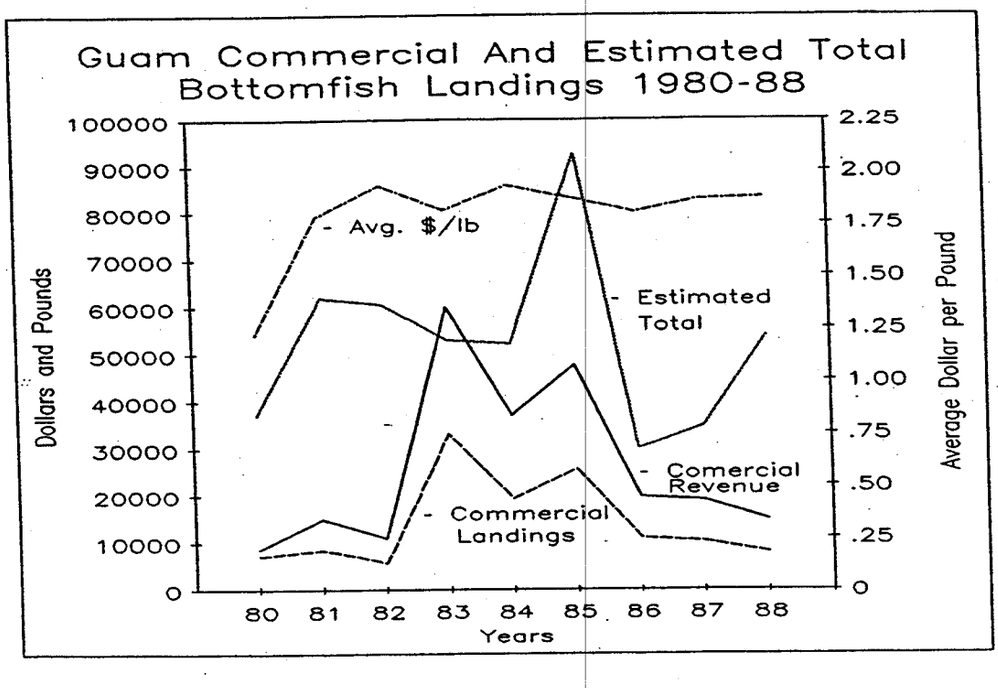


Figure 5

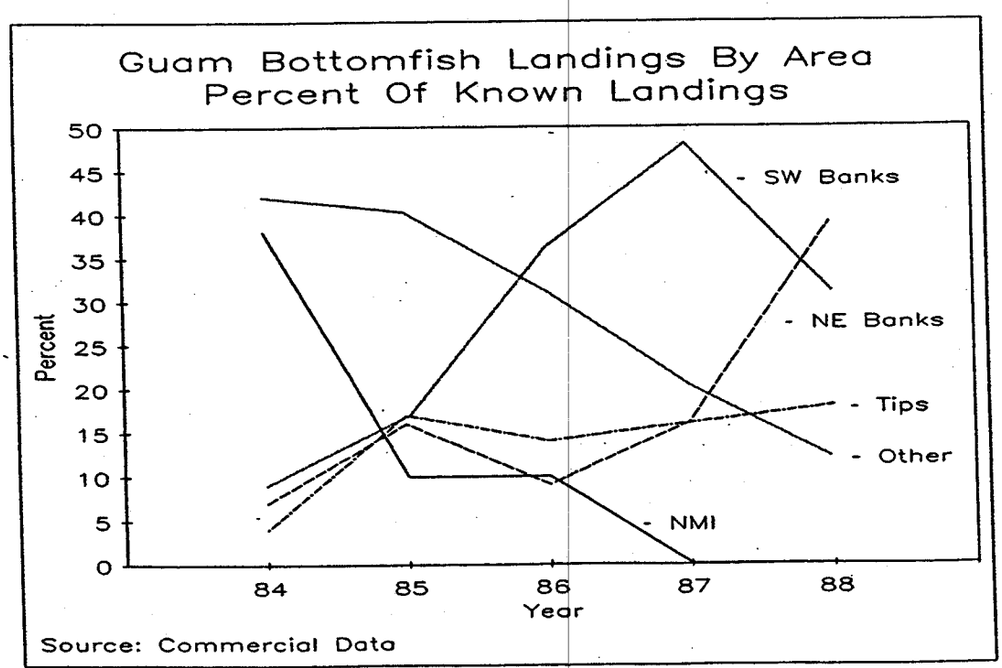


Figure 6

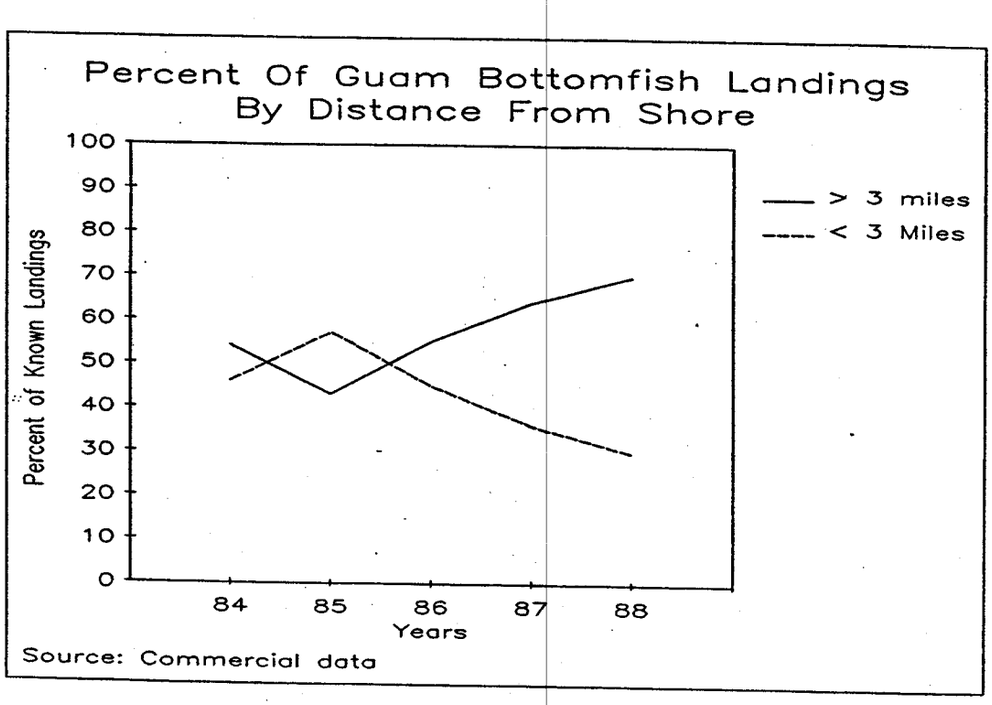


Figure 7

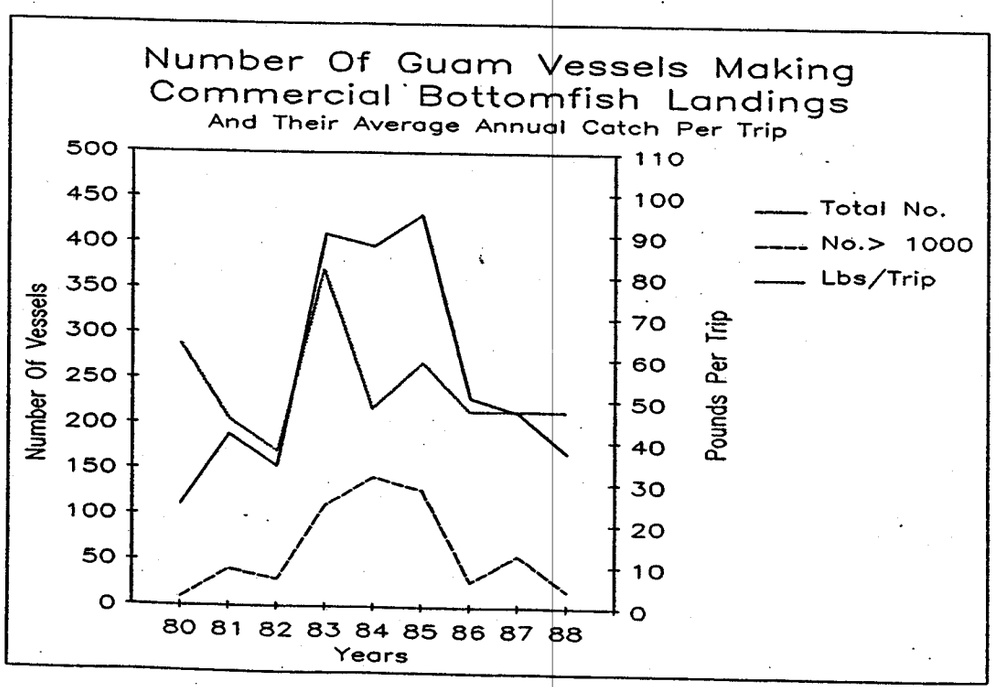


Figure 8

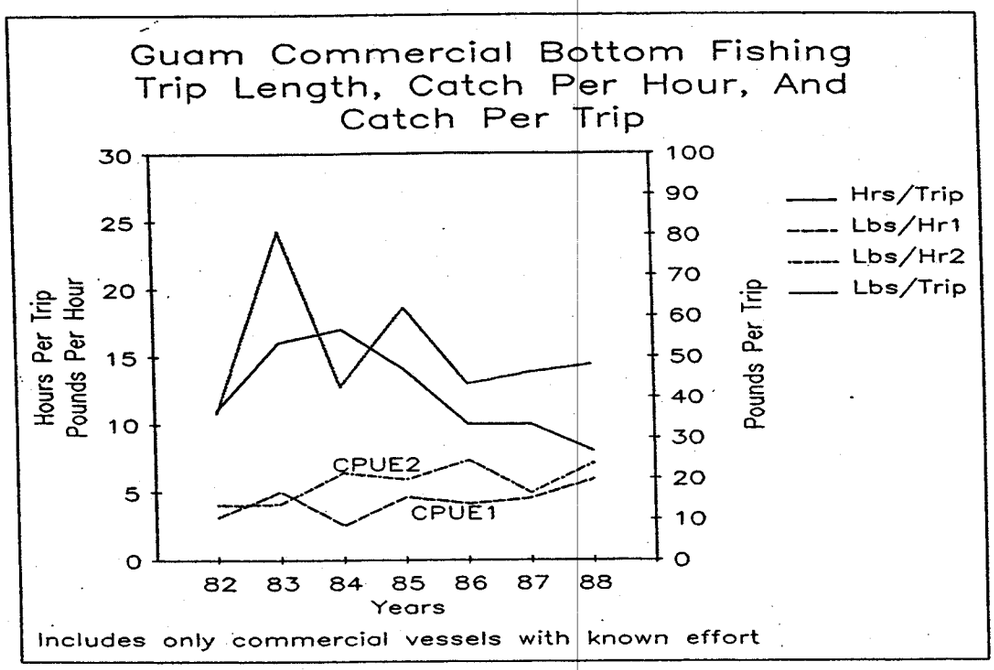


Figure 9

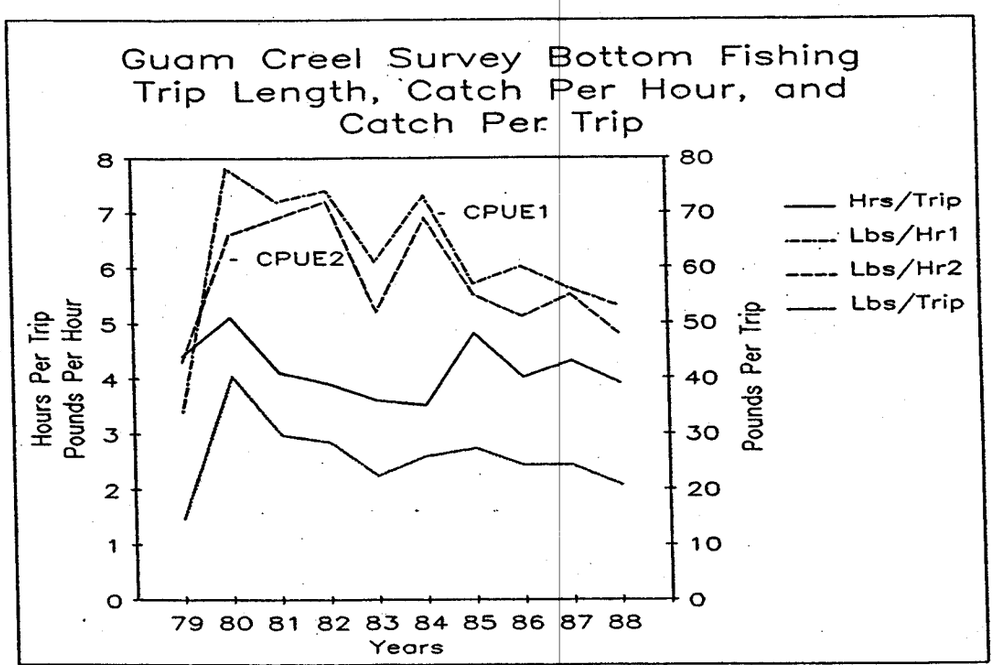


Figure 10

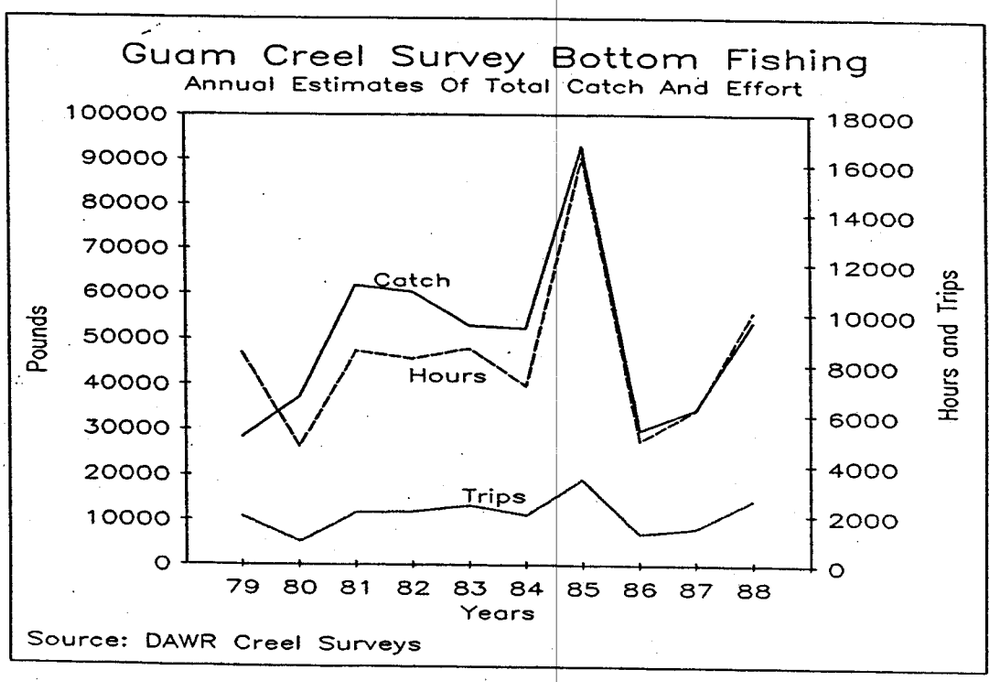


Figure 11

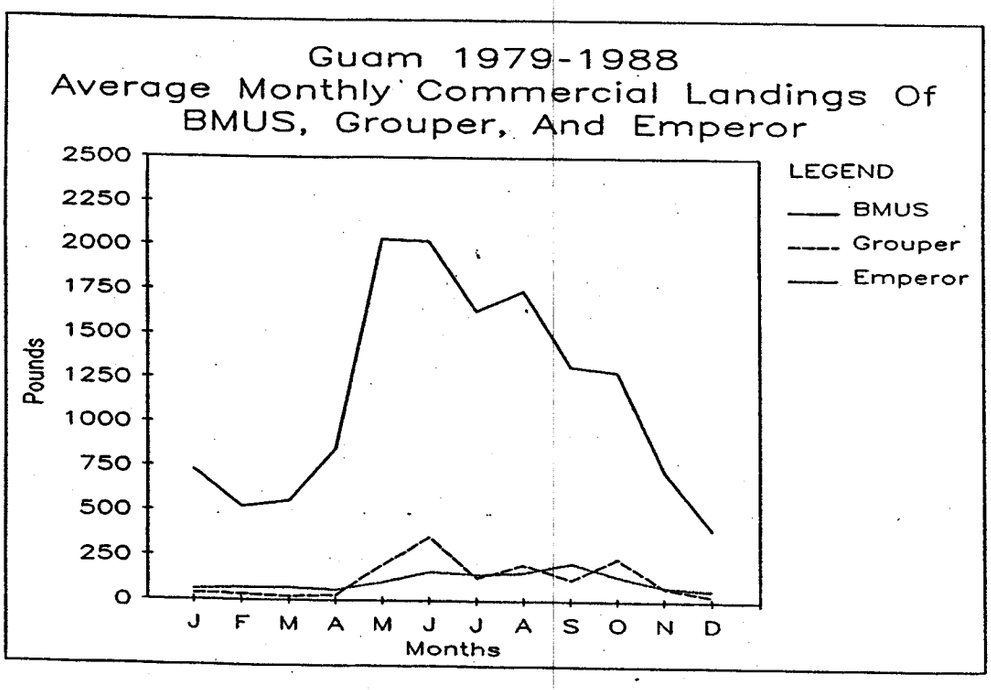


Figure 12

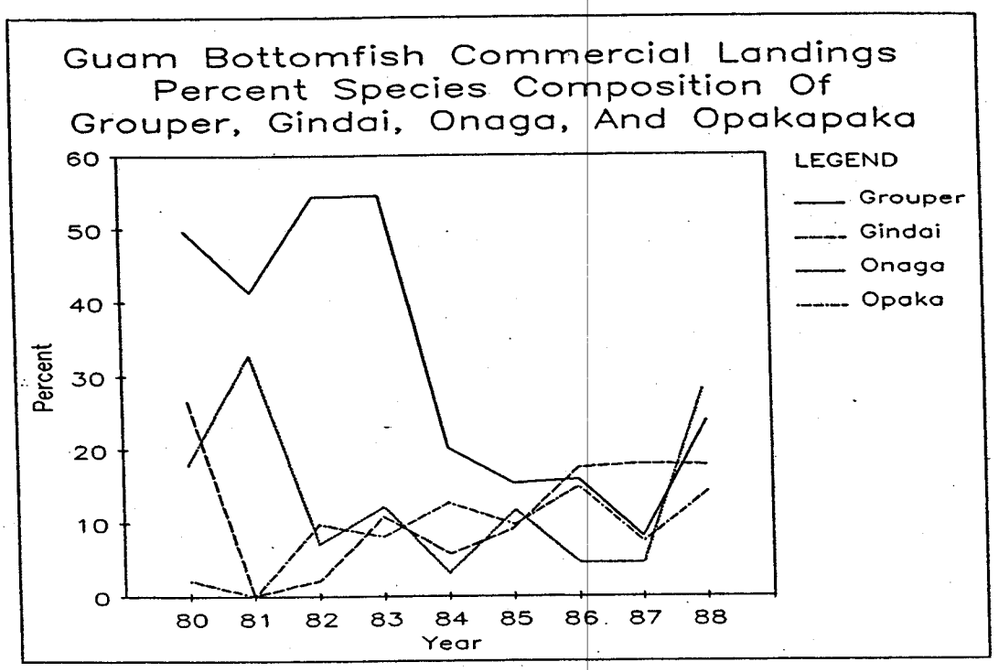


Figure 13

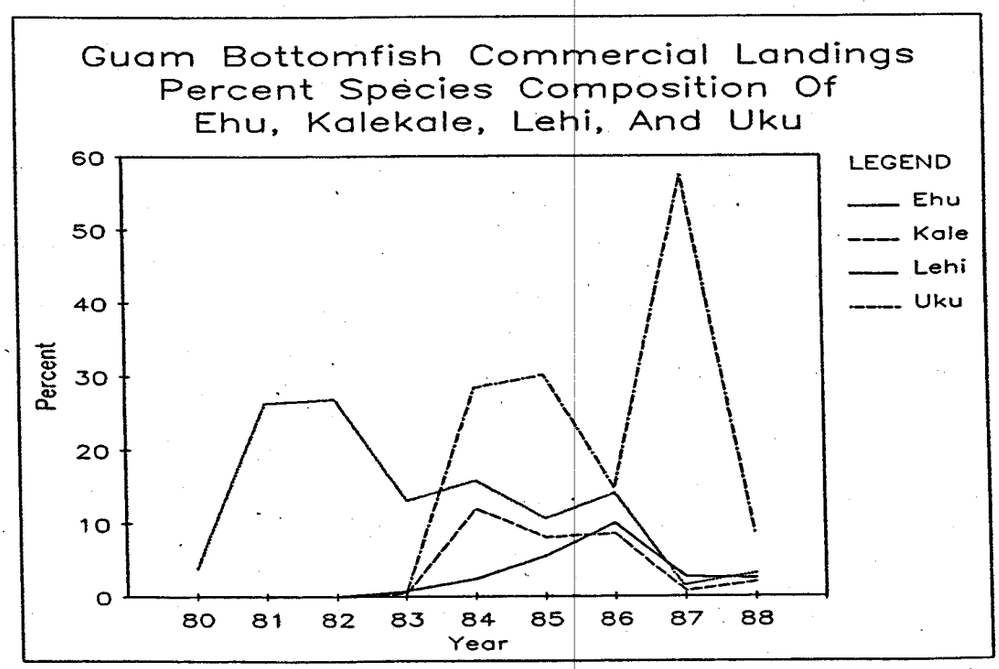


Figure 14

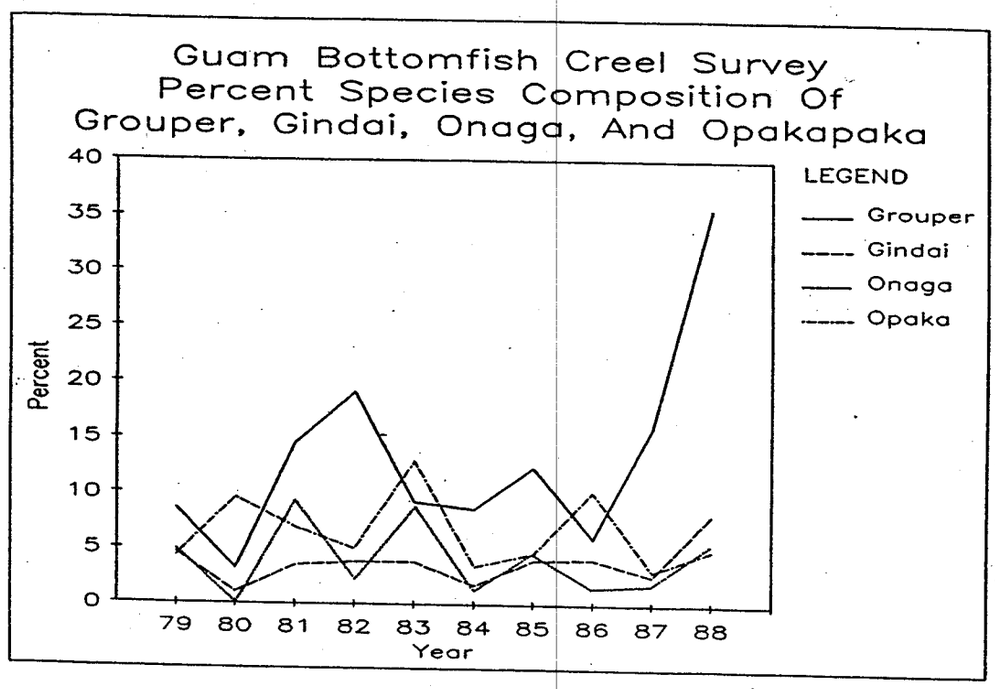
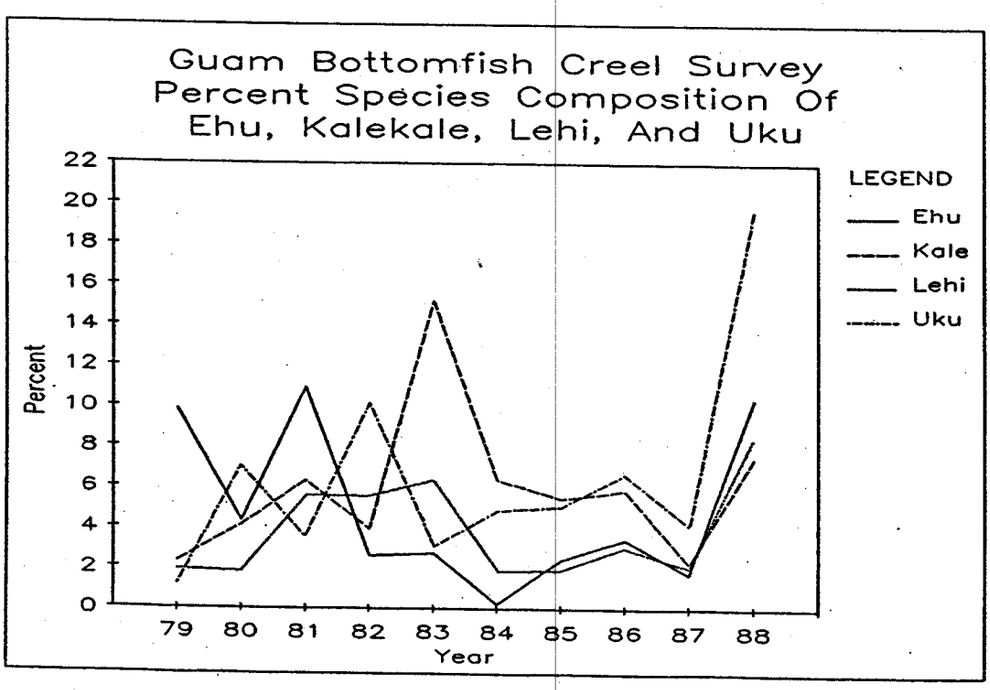


Figure 15



COMMONWEALTH

OF THE

NORTHERN MARIANA ISLANDS

ANNUAL REPORT FOR THE 1988 BOTTOMFISH FISHERY OF THE COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

JUNE 1989

PREPARED BY

David C. Hamm and Michael M. C. Quach
Western Pacific Fishery Information Network
Southwest Fisheries Center Honolulu Laboratory
National Marine Fisheries Service, NOAA

and

Terry Donaldson
Division of Fish and Wildlife
Commonwealth of the Northern Mariana Islands

FOR THE

Western Pacific Regional Fishery Management Council's

BOTTOMFISH PLAN MONITORING TEAM

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CNMI Commercial Pelagic Fishery

INTRODUCTION

The Fishery Management Plan (FMP) for the Bottomfish and Seamount Fisheries of the Western Pacific Region was implemented by the National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) in 1986. The Western Pacific Regional Fishery Management Council (Council) developed the FMP to manage the bottomfish and seamount resources occurring in its area of jurisdiction as defined in the Magnuson Fishery Management and Conservation Act of 1976.

The Bottomfish FMP required the Council to establish a Bottomfish Plan Monitoring Team (Team) to prepare an annual report on the status of the bottomfish fisheries for each of the island areas served by the Council. The Team decided to adopt a modular approach to developing the annual report, whereby each island area would develop an individual report for its bottomfish fishery and would submit it to the Team for review. This is the third annual report module submitted to the Team on behalf of the Commonwealth of the Northern Mariana Islands' (CNMI) Division of Fish and Wildlife (DFW) to help the Team determine the effectiveness of the FMP in meeting its goal in the CNMI.

Preparation of this report was a cooperative effort among staff of NOAA Fisheries Honolulu Laboratory's Western Pacific Fishery Information Network (WPACFIN) and a newly appointed Team member from the DFW. All data processing was done by WPACFIN in Honolulu but was based on commercial landings data collected by DFW. This report does not include any analyses of DFW's creel survey data. The DFW is upgrading its computer processing capabilities to enable the new Team member to complete all processing for writing future reports, including analysis of creel survey data. The WPACFIN is assisting DFW in meeting this goal. Through cooperative efforts of the agencies involved, this annual report on the bottomfish fisheries of the CNMI is the official submission of the DFW to the Team for the 1988 calendar year.

This report provides data for 1988 and updates the time series of published data on the bottomfish fishery of the CNMI. It does not review all previously described and published information on the fishery. For additional background information on CNMI's data collecting systems, assumptions and analyses used to summarize data in this report, the bottomfish fishery, or specifics on other CNMI fisheries, refer to the Team's other annual reports, volumes of WPACFIN's "Fishery Statistics of the Western Pacific" (Hamm and Kassman 1986; Hamm and Quach 1988b, 1989), or Hamm and Quach (1988a).

I. FISHERIES PERFORMANCE DATA

The CNMI's bottomfish fishery is composed mainly of small boats making trips of up to 24 hours to nearby banks. These trips are often made with mixed gear; boats troll to the banks, commence bottomfishing, and troll during the return leg of the

trip. Fish are taken mostly from banks off Saipan and Tinian, but data are from fish landed on Saipan only.

Tables 1-5 and Figures 1-10 summarize annual and monthly fishery performance data for 1988 and update the time series available for establishing trends in the fishery.

1. Total Landings by Area and Month

Total commercial landings for all CNMI fisheries combined increased in 1988 (Figure 1), but landings of bottomfish declined slightly (Figures 2 and 3). Tunas remained the predominant commercial fishery, while landings of bottomfish management unit species (BMUS) remained slightly higher than landings of the pelagic management unit species (Figure 2).

2. Estimated Ex-Vessel Revenue by Species

The total value of bottomfish landed during 1988 declined proportionally to the decline in the total landings because the average price for the year was essentially the same as in 1987 (Figure 4). Ex-vessel revenue by species is given in Tables 1-2.

3. Fishing Effort Information

A. Number of Vessels and Trips

The total number of fisherman landing bottomfish commercially has declined every year since 1984, down to only 29 in 1988 (Figure 5). The number of fishermen landing over 1,000 pounds of bottomfish per year also declined. The catch of these major fishermen remained essentially the same as 1987 (Figure 6), but they took more trips to catch their fish (Figure 7); thus, their catch per trip during 1988 declined (Figure 8). This is the first year since 1983 that the catch rate of the major fishermen declined.

B. Species Composition and Other Indicators of Fishery Performance

Although the trip ticket receipts used by DFW to collect the commercial data provide several categories for identifying the bottomfish catch, 88% of the bottomfish landings recorded during 1988 were not identified below the general "bottomfish" category. Emperorfish remained the predominant species group of bottomfish during 1988, but onaga showed a tremendous increase (Figure 9). This increase was caused almost entirely by a single fisherman on Tinian; this fisherman has recently begun to target deepwater snappers and is marketing his fish on Saipan.

According to personal communication with the major producer of commercially landed bottomfish on Saipan, the main bottomfish target species, emperorfish, is becoming much harder to catch, and the average size of the fish has decreased. Seasonality of the fishery was typical during 1988 and did not noticeably change the long-term graph (Figure 10). Seasonality in the fishery may

not be a function of the presence or absence of fish on the fishing sites throughout the year, but rather may be the result of seasonal weather patterns that bring rough seas.

4. Biological Characteristics of the Landings

No specific size-frequency data are currently available for bottomfish landed in the CNMI. The trip ticket receipts have been modified to include a field for the number landed, but no data are available for analysis.

The 1988 commercial landings of 37,850 pounds were 21% of the estimated 183,000-pound maximum sustainable yield (MSY) for the CNMI. However, since the vast majority of the catch came from the most southern islands, the percentage of the MSY that was harvested from some locations is undoubtedly much higher.

5. Summary Table of Fishery Status

Status of the CNMI Bottomfish Fishery

Problem Condition	Present in the Bottomfish Fishery	Comment
1. Mean catch size is prereproductive	Data not available	
2. Unacceptable ratio of fish mortality to natural mortality	Data not available	
3. Catch exceeds MSY	No	May have localized problems
4. Significant decline in CPUE	Not indicated	Need further analysis
5. Substantial decline in ex-vessel revenue relative to baseline levels	Maybe	More trips by highliners needed to land same amount as last year
6. Significant shift in gear, by area	Data not available	
7. Significant change in the frozen/fresh components of catch	No, still fresh fish fishery	

Problem Condition	Present in the Bottomfish Fishery	Comment
8. Unstable pattern of entry/exit to the fishery	Yes	Fewest fishers since 1982, steady decline
9. Per trip costs exceed per trip revenue	Data not available	Survey results available later
10. Significant decline or increase in total bottomfish landings	Not indicated	Need more analysis and definition of significant
11. Change in species composition of catch	Possible	More onaga due to new fisher
12. Research results indicate problems	No research done	
13. Habitat degradation or environmental problems	Data not available	
14. Increased interaction with protected species	No	

II. RECENT RESEARCH AND SURVEY RESULTS

The DFW recently began a research program to investigate deepwater bottomfish; however, no data are yet available.

III. HABITAT CONDITIONS AND RECENT ALTERATIONS

No information regarding this topic is available at present.

IV. ENFORCEMENT ACTIVITIES, PLAN ADMINISTRATION, AND PROBLEMS

This section should be added by the NMFS Enforcement branch and the U.S. Coast Guard.

V. ADMINISTRATIVE ACTIONS AND RECOMMENDATIONS

To date, only visual interpretations have been used on the data. The shallow water bottomfish, especially emperorfish, may be under stress. The fishery appears to be declining as a whole. More thorough and statistically valid analyses should be

performed on the data to determine whether trends or problems actually exist in this fishery. The Team should identify specific questions about the fishery; form hypotheses to answer these questions; determine analytical methods to test these hypotheses; provide guidelines for interpreting the analyses; and determine what constitutes trends, changes, or problems in the fishery. The Team should develop specific recommendations for format and content of the annual report modules. A special 2- to 5-day workshop should be held, possibly in concert with the Pelagic Team and select members of the Council's Scientific and Statistical Committee, to resolve these problems for all Council management areas.

The creel survey data that DFW has been collecting since 1986 should be studied to see whether they should be included in the description and analyses of the bottomfish fishery.

The commercial landings system should be improved on Saipan (coverage increased and/or verified) and expanded to Tinian and Rota. Efforts should be made to increase the level of recording actual species identification on the receipts, as well as redesigning the form to include additional species categories.

Length-frequency and biological sampling should be implemented to monitor the major bottomfish species.

VI. TERRITORY MANAGEMENT ACTIONS

No management actions have taken place regarding the bottomfish fishery in the CNMI. Improving the commercial landings system to provide better data on the bottomfish group will be a priority for the DFW.

VII. ASSESSMENT OF NEED FOR COUNCIL ACTION

Although the rudimentary analyses conducted on existing data for this report did not specifically identify any problems in the bottomfish fishery of the CNMI, there remain several significant deficiencies in our information base upon which conclusions can be drawn. Additional data are needed, data systems need to be improved, analyses need to be expanded and strengthened, and local expertise needs to be utilized more fully. Existing computer programs for summarizing and analyzing available data are insufficient to properly monitor the resource and describe the fishery. Assistance is needed to develop these tools to be used by DFW biologists in preparation of subsequent annual reports.

VIII. RECOMMENDATIONS FOR COUNCIL ACTION

It is recommended that the Council support improvement of the CNMI commercial landings system and development of a special study on size frequency of the most important commercial

bottomfish species for the CNMI. This study should include a sampling program capable of obtaining enough size information to adequately describe the current stock structure. The Council should also support the Team and WPACFIN efforts to meet the administrative actions identified above.

IX. ESTIMATED IMPACTS FOR RECOMMENDED ACTIONS

Improvements in the data collecting and processing systems used to monitor and analyze the CNMI's bottomfish fishery would help the Team identify problems in the fishery by providing it with a more complete understanding of the fishery.

REFERENCES

Hamm, D. C. and T. T. Kassman.
1986. Fishery statistics of the western Pacific, volume I. American Samoa (1982-84), Commonwealth of the Northern Mariana Islands (1979-84), State of Hawaii (1987). Southwest Fisheries Center . Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-86-4, var. pag.

Hamm, D. C., and M. M. C. Quach.
1988a. Bottomfish fisheries of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands. Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-15, 76 p.

1988b. Fishery statistics of the western Pacific, volume III. Territory of American Samoa (1985-86), Commonwealth of the Northern Mariana Islands (1985-86), Territory of Guam (1985-86), State of Hawaii (1985-86). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-88-4, var. pag.

1989. Fishery statistics of the western Pacific, volume IV. Territory of American Samoa (1987), Commonwealth of the Northern Mariana Islands (1987), Territory of Guam (1987) State of Hawaii (1987). Southwest Fish. Cent. Honolulu Lab., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Southwest Fish. Cent. Admin. Rep. H-89-1, var. pag.

Western Pacific Regional Fishery Management Council (Council).
1988. 1987 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

1988. 1986 Western Pacific Regional Fishery Management Council annual report for the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, 1164 Bishop Street, Honolulu, HI 96813, var. pag.

APPENDIX A: TABLES

Table 1

CNMI 1988 Annual Commercial Landings
Of Bottomfish Species

Species	Records	Pounds	Value	$/lb
Bottomfish	205	33,458.00	58,686.16	1.75
Gindai (flower snap)	1	68.00	119.00	1.75
Onaga (red snapper)	19	1,601.00	4,819.50	3.01
Opakapaka (pink snp)	6	261.00	676.30	2.59
Emperor (mafute)	12	2,462.00	4,750.95	1.93
** Total Bottomfish**	243	37,850.00	69,051.91	1.82
** TOTAL ALL SPECIES**	3,081	442,326.88	621,962.98	1.41

Table 2

CNMI 1988 Monthly Commercial Landings
Of Bottomfish Species

Species	Records	Pounds	Value	$/lb
** January **				
Bottomfish	16	3,535.50	6,032.38	1.71
Emperor (mafute)	1	115.00	258.75	2.25
** Total Bottomfish**	17	3,650.50	6,291.13	1.72
** TOTAL ALL SPECIES**	198	24,433.05	36,307.37	1.49
** February **				
Bottomfish	17	3,639.00	6,268.15	1.72
Onaga (red snapper)	1	38.00	152.00	4.00
** Total Bottomfish**	18	3,677.00	6,420.15	1.75
** TOTAL ALL SPECIES**	230	30,843.98	46,532.84	1.51
** March **				
Bottomfish	13	3,183.00	5,868.30	1.84
Onaga (red snapper)	2	130.00	373.00	2.87
** Total Bottomfish**	15	3,313.00	6,241.30	1.88
** TOTAL ALL SPECIES**	299	38,065.50	56,640.71	1.49

Table 2 (Cont.)

Species	Records	Pounds	Value	$/lb
** April **				
Bottomfish	27	3,216.00	5,622.75	1.75
Onaga (red snapper)	3	94.00	313.00	3.33
Opakapaka (pink snp)	1	11.00	27.50	2.50
** Total Bottomfish**	31	3,321.00	5,963.25	1.80
** TOTAL ALL SPECIES**	294	39,639.00	56,665.10	1.48
** May **				
Bottomfish	17	3,494.50	6,255.68	1.79
Onaga (red snapper)	1	55.00	275.00	5.00
Emperor (mafute)	1	19.00	30.40	1.60
** Total Bottomfish**	19	3,568.50	6,561.08	1.84
** TOTAL ALL SPECIES**	285	41,418.50	55,082.80	1.33
** June **				
Bottomfish	21	3,339.00	5,957.50	1.78
Onaga (red snapper)	3	739.00	1,517.00	2.05
Opakapaka (pink snp)	1	12.00	24.00	2.00
** Total Bottomfish**	25	4,090.00	7,498.50	1.83
** TOTAL ALL SPECIES**	279	45,400.00	61,609.35	1.36
** July **				
Bottomfish	40	6,761.00	11,488.50	1.70
** Total Bottomfish**	40	6,761.00	11,488.50	1.70
** TOTAL ALL SPECIES**	250	41,207.50	55,806.35	1.35
** August **				
Gindai (flower snap)	1	68.00	119.00	1.75
Onaga (red snapper)	3	146.00	471.00	3.23
Opakapaka (pink snp)	2	82.00	197.00	2.40
Emperor (mafute)	3	455.00	870.25	1.91
** Total Bottomfish**	9	751.00	1,657.25	2.21
** TOTAL ALL SPECIES**	305	56,210.75	75,744.33	1.35
** September **				
Bottomfish	17	1,712.00	3,069.55	1.79
Onaga (red snapper)	3	269.00	1,153.50	4.29
Opakapaka (pink snp)	1	108.00	307.80	2.85
Emperor (mafute)	2	309.00	585.80	1.90
** Total Bottomfish**	23	2,398.00	5,116.65	2.13
** TOTAL ALL SPECIES**	236	29,227.60	41,947.98	1.44

Table 2 (Cont.)

Species	Records	Pounds	Value	$/lb
** October **				
Bottomfish				
Onaga (red snapper)	9	1,485.00	2,572.50	1.73
Emperor (mafute)	2	95.00	355.00	3.74
	3	1,444.00	2,730.75	1.89
** Total Bottomfish**	14	3,024.00	5,658.25	1.87
** TOTAL ALL SPECIES**	279	41,480.00	57,742.05	1.39
** November **				
Bottomfish	28	3,093.00	5,550.85	1.79
** Total Bottomfish**	28	3,093.00	5,550.85	1.79
** TOTAL ALL SPECIES**	217	30,280.00	42,802.20	1.41
** December **				
Onaga (red snapper)	1	35.00	210.00	6.00
Opakapaka (pink snp)	1	48.00	120.00	2.50
Emperor (mafute)	2	120.00	275.00	2.29
** Total Bottomfish**	4	203.00	605.00	2.98
** TOTAL ALL SPECIES**	209	24,121.00	35,081.90	1.45

Table 3

Summary of the CNMI Commercial Bottomfish Fishery 1982-88

	1982	1983	1984	1985	1986	1987	1988
Total Commercial Landings (lbs)	150763	330752	444559	338428	410025	312186	442327
Bottomfish Landings Lbs.	11076	22683	33924	32780	23929	39772	37850
Bottomfish Landings $	18084	40003	59005	55396	45079	71868	69052
Average Price/Lb.	1.63	1.76	1.74	1.69	1.88	1.81	1.82
Percent Bottomfish to Total Commercial Landings	7.3%	6.8%	7.6%	9.7%	5.8%	12.7%	8.6%
Number of Recorded Species Landings	99	673	640	348	297	293	243
Number of Trips	50	533	492	283	229	237	211
Number of Fishermen	17	90	102	55	54	43	29
Bottomfish Catch/Trip	222	43	69	116	104	168	179
Catch of Fishermen with > 1000 lbs/yr	10373	10027	21729	24542	17767	33598	33854
Percent of Total Catch by Fishermen Landing > 1000 lbs	94%	44%	64%	75%	74%	84%	89%
Number of Trips by Fishermen Landing>1000 lbs/yr	25	140	252	195	124	134	159
Number of Fishermen Landing >= 1000 lbs/yr	2	6	8	5	7	6	5
Catch/Trip for Fishermen Landing 1000 > lbs/yr	415	72	86	126	143	251	213

Table 4

CNMI Commercial Bottomfish Landings
(Unallocated Miscellaneous Bottomfish)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Grouper	569	1091	2513	3368	1195	577	0
	5.14%	4.81%	7.41%	10.27%	4.99%	1.45%	0.00%
Jacks	574	825	725	770	655	486	0
	5.18%	3.64%	2.14%	2.35%	2.74%	1.22%	0.00%
Gindai	11	214	639	166	699	217	68
	0.10%	0.94%	1.88%	0.51%	2.92%	0.55%	0.18%
Lehi	0	0	0	0	0	0	0
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Onaga	199	894	821	894	1278	378	1601
	1.80%	3.94%	2.42%	2.73%	5.34%	0.95%	4.23%
Opakapaka	86	1618	1311	545	790	917	261
	0.78%	7.13%	3.86%	1.66%	3.30%	2.31%	0.69%
Emperor	2383	7644	11140	9341	7400	12455	2462
	21.51%	33.70%	32.84%	28.50%	30.92%	31.32%	6.50%
Amberjack	0	0	0	108	0	0	0
	0.00%	0.00%	0.00%	0.33%	0.00%	0.00%	0.00%
Uku	0	0	0	65	291	0	0
	0.00%	0.00%	0.00%	0.20%	1.22%	0.00%	0.00%
Bottomfish	7257	10398	16777	17523	11622	24743	33458
	65.50%	45.84%	49.45%	53.46%	48.57%	62.21%	88.40%
TOTAL Bottomfish:	11079	22684	33926	32780	23930	39773	37850

Table 5

CNMI Commercial Bottomfish Landings
(Allocated Miscellaneous Bottomfish)

SPECIES %	1982	1983	1984	1985	1986	1987	1988
Grouper	1649	2014	4971	7236	2323	1527	0
	14.89%	8.88%	14.65%	22.08%	9.71%	3.84%	0.00%
Jacks	1664	1523	1434	1654	1273	1286	0
	15.02%	6.71%	4.23%	5.05%	5.32%	3.23%	0.00%
Gindai	32	395	1264	357	1359	574	586
	0.29%	1.74%	3.73%	1.09%	5.68%	1.44%	1.55%
Lehi	0	0	0	0	0	0	0
	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Onaga	577	1651	1624	1921	2485	1000	13797
	5.21%	7.28%	4.79%	5.86%	10.38%	2.51%	36.45%
Opakapaka	249	2987	2594	1171	1536	2427	2249
	2.25%	13.17%	7.64%	3.57%	6.42%	6.10%	5.94%
Emperor	6908	14113	22038	20069	14388	32959	21217
	62.35%	62.22%	64.96%	61.22%	60.12%	82.87%	56.06%
Amberjack	0	0	0	232	0	0	0
	0.00%	0.00%	0.00%	0.71%	0.00%	0.00%	0.00%
Uku	0	0	0	140	566	0	0
	0.00%	0.00%	0.00%	0.43%	2.36%	0.00%	0.00%
TOTAL Bottomfish:	11079	22684	33926	32780	23930	39773	37850

APPENDIX B: FIGURES

Figure 1

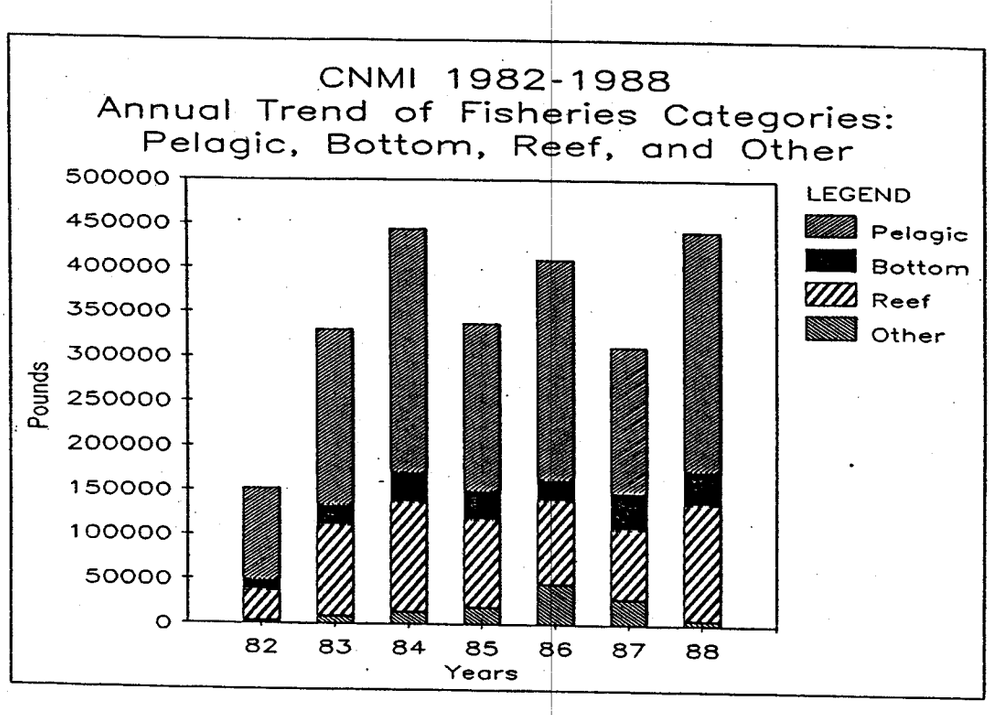


Figure 2

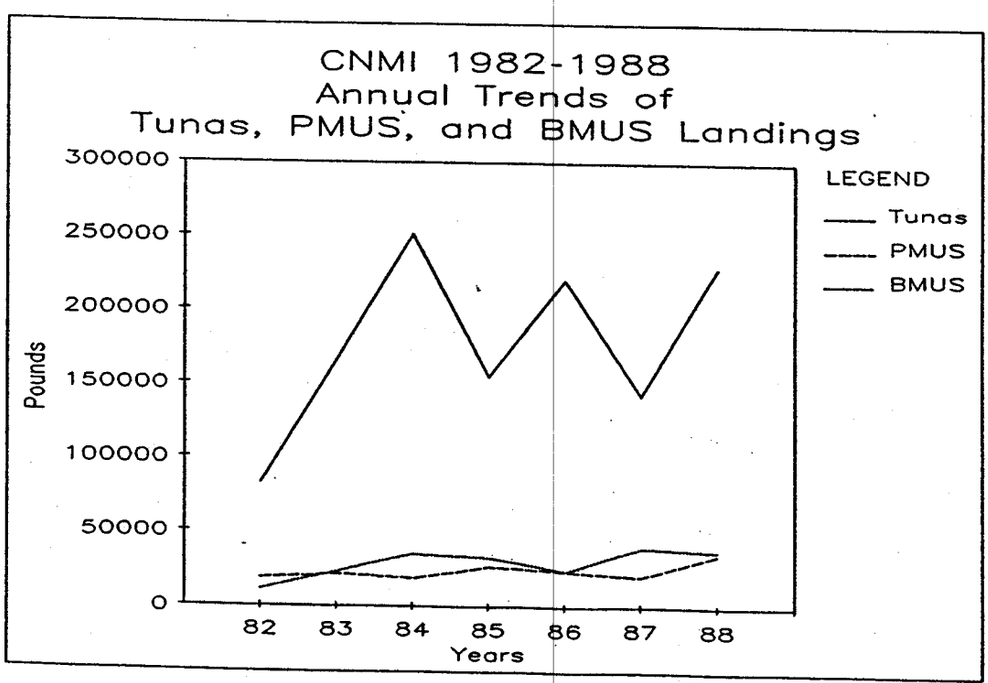


Figure 3

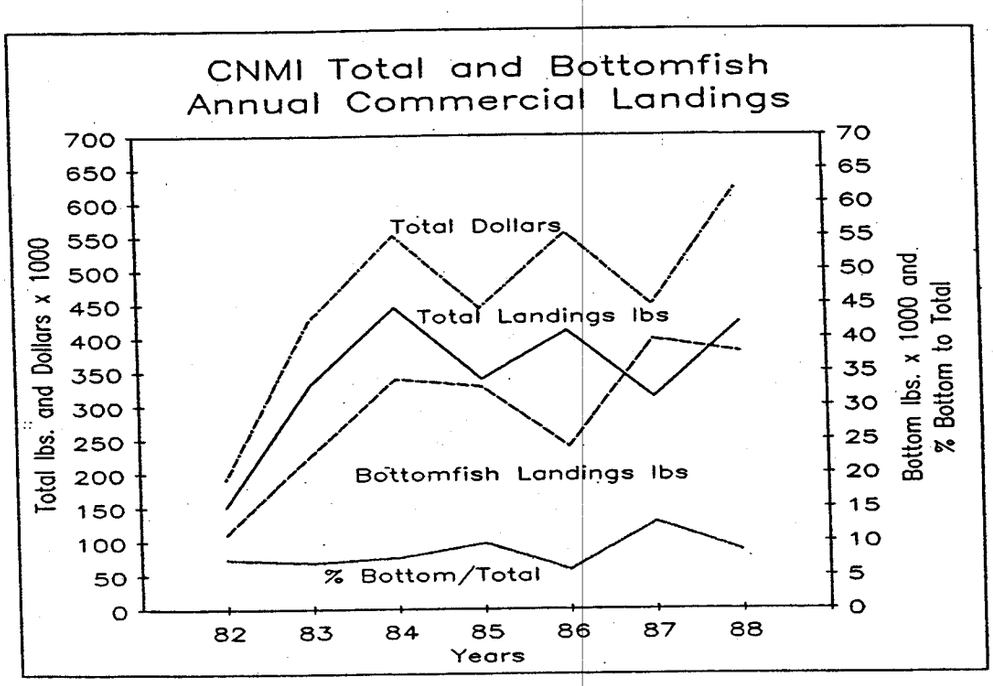


Figure 4

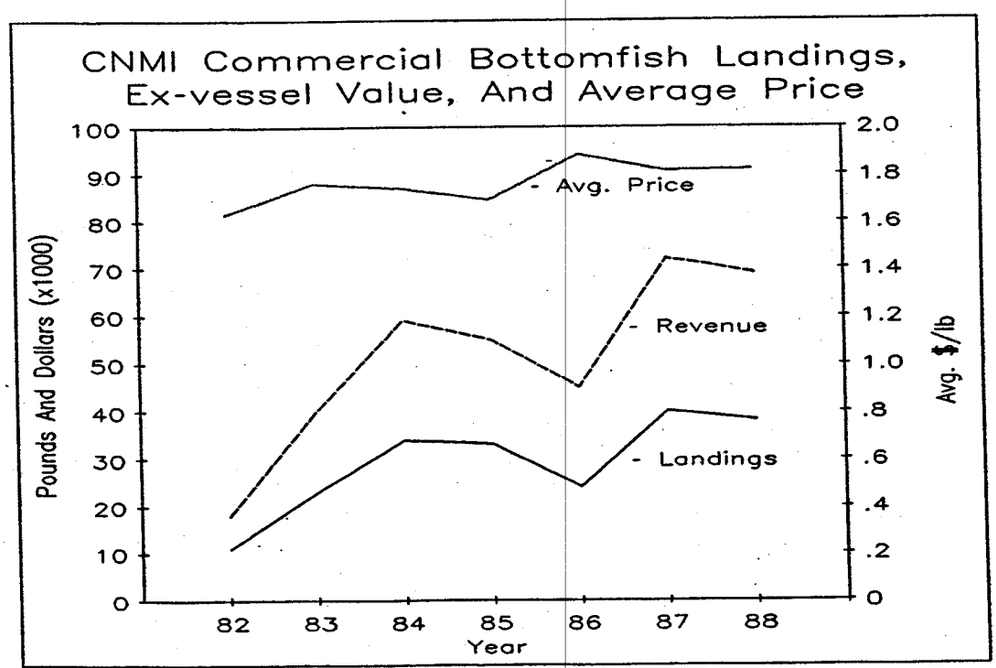


Figure 5

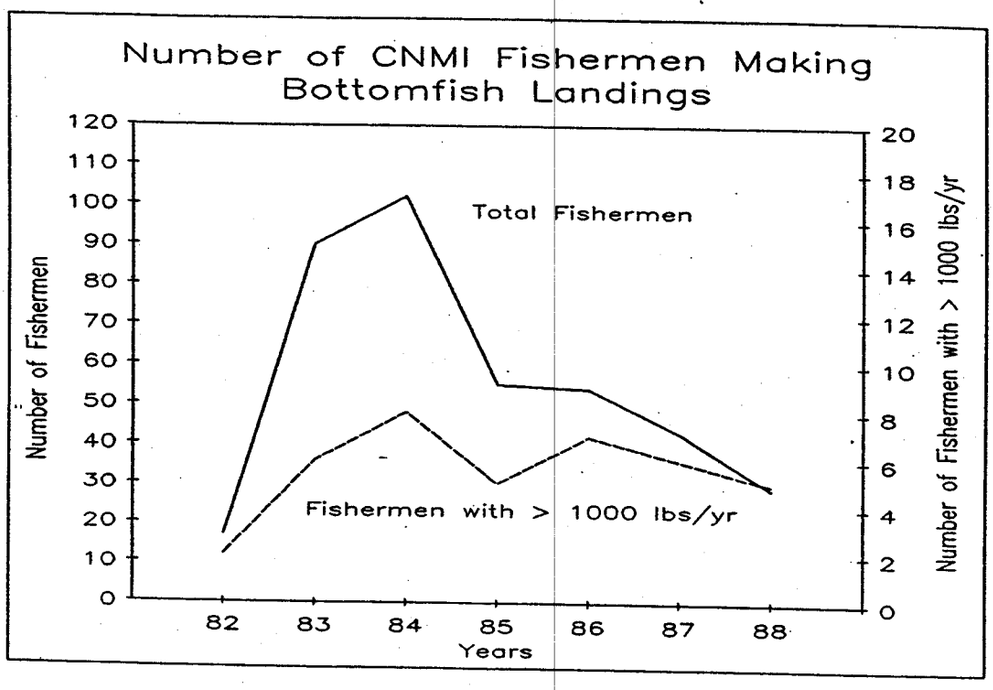


Figure 6

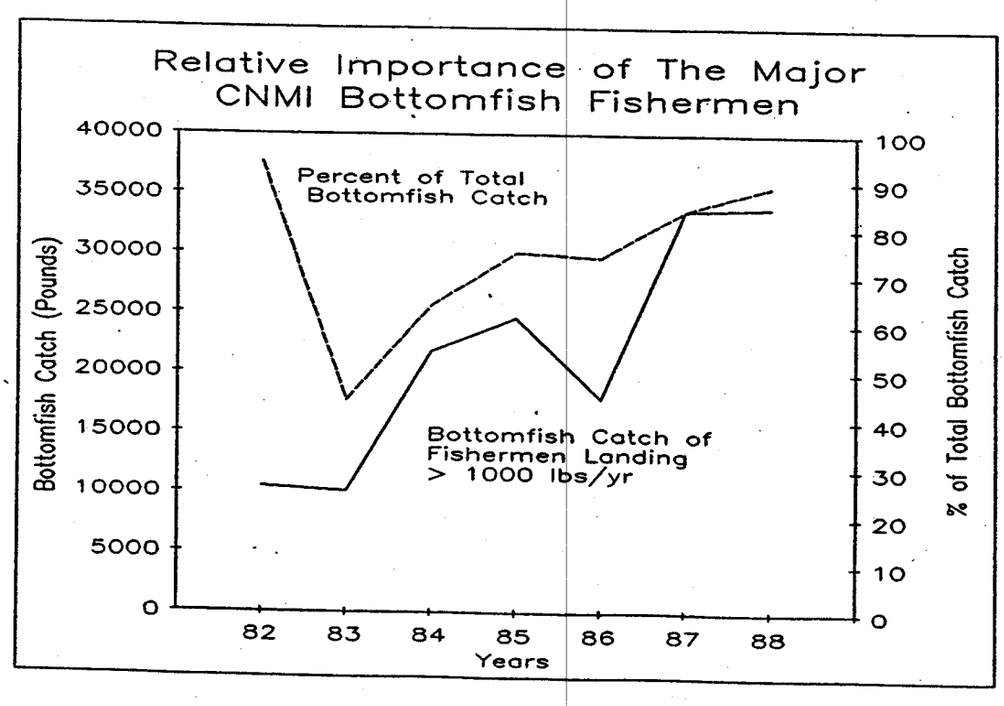


Figure 7

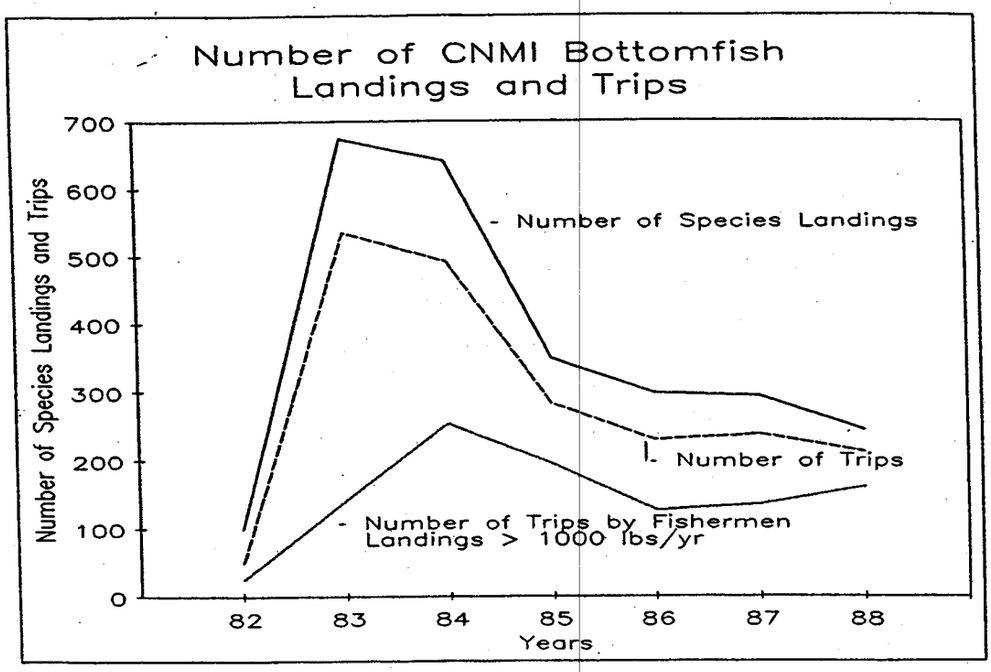


Figure 8

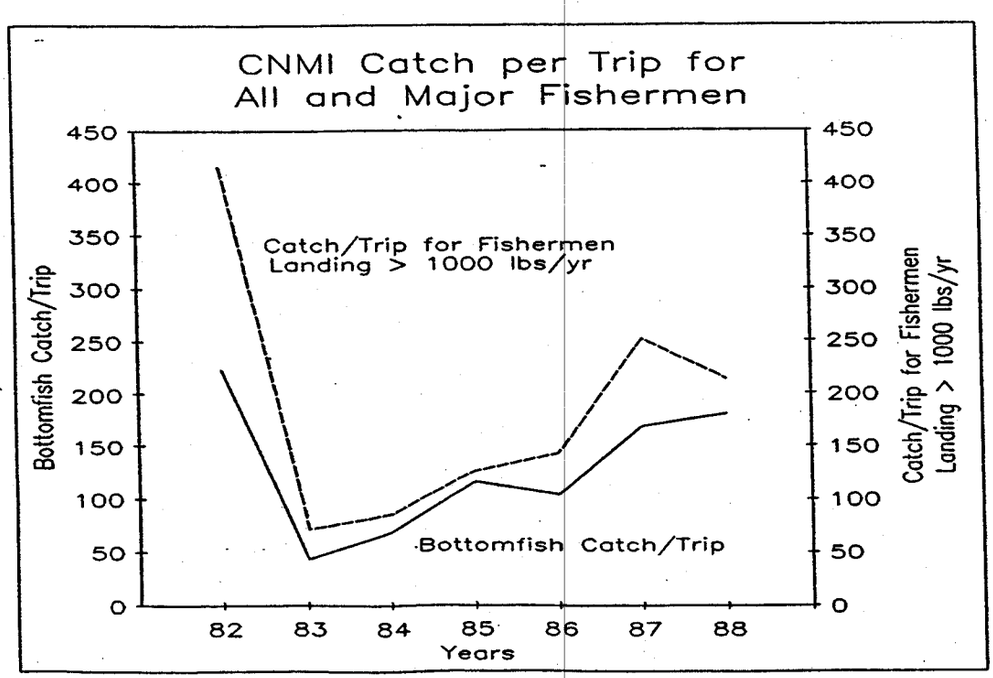


Figure 9

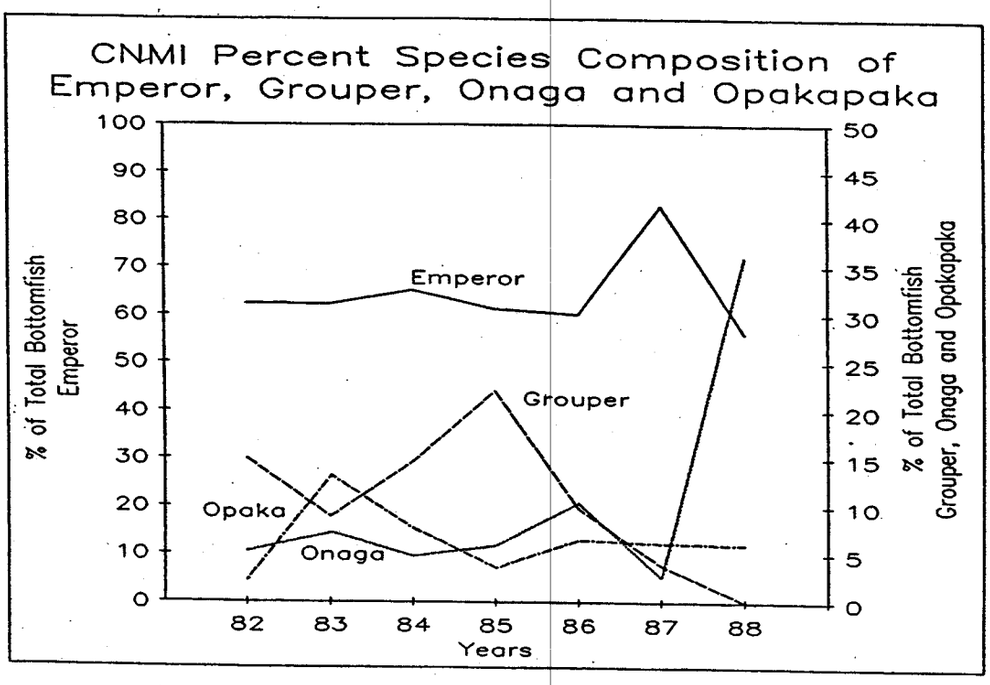


Figure 10