Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

1998 Annual Report

December 1999

Western Pacific Regional Fishery Management Council
1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813

Cover photo: Lehi (*Aphareus rutilans*), Onaga (*Etelis coruscans*), Opakapaka (*Pristipomoides filamentosus*), Ehu (*Etelis carbunculus*), and Hogo (*Pontinus macrocephala*). Fresh catch from the Northwest Hawaiian Islands

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for the

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Bottomfish and Seamount Groundfish Fisheries of the Western Pacific

1998 Annual Report

1.0. INTRODUCTION

The 1998 annual report provides a set of descriptors and indicators of the bottomfish fisheries from American Samoa, Guam, Hawaii and the Northern Mariana Islands. The descriptors are designed to document recent trends in landings, effort, participation, revenue and prices. Should management action be recommended, descriptor information will aid in assessing potential impacts of the action on fishery participants. The indicators are quantifiable and measurable tools used to identify signs of stress in the stocks or the fishery. Based on changes over time in indicator levels, the Bottomfish Plan Team (BPT) may identify "yellow light" situations (i.e., where stress is first detected) and recommend that either management action or additional study be undertaken or “red light” situations where immediate management action is needed.

The annual report is organized as follows: The introduction section defines and briefly explains the descriptors and indicators. The next section briefly summarizes time trends in descriptor and indicator levels, through the current year, and recommends any areas of concern for each island area. Reports from each island area are appended. The introduction describes the history and present characteristics of the fishery. Results of the current year's descriptors and indicators are presented in detail, in relation to past temporal trends. Figures are supported with information on source of the data, methods of calculation, and data interpretation. Table 1 summarizes 1998 bottomfish statistics for the region. The appended report from each area includes a summary, which addresses progress made on the previous year's recommendations, and lists new recommendations. Finally, additional appendices contain information on NMFS 1998 administrative and enforcement activities, habitat conditions, protected species interactions, and 1998 BPT membership.

Table 2 lists scientific, common English and local/indigenous names for bottomfish management unit species (BMUS) for each area (American Samoa, Guam/Northern Marianas, and Hawaii).

1.1 Definition of Descriptors

The fishery descriptors are defined as follows:

1.1.1 Landings information

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

Table 1. Regional Summary of 1998 Bottomfish Species

				Hawaii			
	AS	GU	NMI	All	MHI	Mau	Hoomalu
BMUS Landings (lb)	12,926	44,097	45,835	793,528	461,528	66,000	266,000
Revenue ($)	34,129	42,966*	156,256	2,590,000	1,629,000	182,000	779,000
No. Of Boats	17	367	50	---	480	7	7
No. Of Trips	91	8,765	317	---	2,857	39	50
CPUE	13.6 lb/hr	2.5 lb/hr	145 lb/trip	---	194 lb/trip	1,689 lb/trip	5,315 lb/trip
SPR	0.45	---	---	0.25-0.53	note 1	note 2	note 2

*_Guam's revenue based on commercial landing of 13,011pounds

Notes:

1) Species with Spawning Potential Ratio near or below threshold level of 0.20, indicating localized subarea depletion: MHI onaga ("targeted" SPR = 0.05); MHI ehu ("targeted" SPR = 0.095); MHI hapuupuu ("best/worst" SPR = 0.24)
2) Healthy (SPR > 0.20) for all species (Mau Zone=0.54, Hoomalu Zone=0.68)
3) Revenue for NWHI zones combined was $961,000

Table 2. Bottomfish Management Unit Species (BMUS) Names			
(Absence of an indigenous name implies no local name established or area is not within the species' geographic range.)			
Scientific	English Common	American Samoa	Guam/ CNMI	Hawaii
Bottomfish:				
Aphareus rutilans	red snapper/silvermouth	palu-gutusiliva	maraap tatoong	lehi
Aprion virescens	gray snapper/jobfish	asoama	tosan	uku
Caranx ignobilis	giant trevally/jack	sapoanae	tarakito	white ulua/pau'u
C. lugubris	black trevally/jack	tafauli	trankiton attilong	black ulua
Epinephelus fasciatus	blacktip gouper	fausi	gadao matai	
E. quernus	sea bass			hapu'upuu
Etelis carbunculus	red snapper	palu-malau	guihan boninas	ehu
E. coruscans	red snapper	palu-loa	onaga	onaga
Lethrinus amboinensis	ambon emperor	filoa-gutumumu	mafuti/lililok	
L. rubrioperculatus	redgill emperor	filoa-pa'o'omumu	mafuti tatdong	
Lutjanus kasmira	blueline snapper	savane	sas/funai	ta'ape
Pristipomoides auricilla	yellowtail snapper	palu-i'usama	guihan boninas	yellowtail kalekale
P. filamentosus	pink snapper	palu-'ena'ena	guihan boninas	opakapaka
P. flavipinnis	yelloweye snapper	palu-sina	guihan boninas	yelloweye opakapaka
P. seiboldi	pink snapper		guihan boninas	kalekale
P. zonatus	snapper	palu-sega	guihan boninas/gindai	gindai
Pseudocaranx dentex	thicklip trevally		terakito	butaguchi/pig ulua
Seriola dumerili	amberjack		guihan tatdong	kahala
Variola louti	lunartail grouper	papa	bueli	
Seamount Groundfish:				
Beryx splendens	alfonsin			kinmedai (Japanese)
Hyperoglyphe japonica	ratfish/butterfish			medai (Jap.)
Pseudopentaceros richardsoni	armorhead			kusakari tsubodai (Jap.)

Hawaii and the Northern Marianas, landings information represents only the commercial harvest.

In Hawaii, changes in species catch composition are provided for the Main Hawaiian Islands (MHI) and the Northwestern Hawaiian Islands (NWHI). Statistical tests for consistency in catch composition over time and between areas are included. Where possible, descriptor information has been presented for each NWHI management zone: Hoomalu and Mau. For 1998, pounds landed by species are presented in tabular form for each area except Hawaii. For Hawaii, NWHI BMUS landings by species are provided for 1986 through 1998.

1.1.2 Effort information

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

1.1.3 Participation information

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

1.1.4 Economic information

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

1.2 Definition of Indicators

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

1.2.1 Aggregate Catch-Per-Unit-Effort

If the current year's aggregate catch-per-unit-effort (CPUE) is less than 50% of the average aggregate CPUE for the first three years of available data, there may be cause for concern. CPUE information is available for all areas; research CPUE is available for SE Hancock Seamount for all years since 1985, except in 1992 and 1994-1998.

1.2.2 Mean Fish Size

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

1.2.3 Percent Immature

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

1.2.4 Spawning Potential Ratio

The spawning potential ratio (SPR) is the ratio of the spawning stock biomass per recruit, at the current level of fishing, to the spawning stock biomass per recruit that would occur in the absence of fishing. According to the overfishing definition contained in the Bottomfish FMP (Amendment 3, 1990), if SPR is less than or equal to 0.20, recruitment overfishing has occurred (i.e., spawners have been reduced to 20%, or less, of their unexploited stock level). Data to calculate SPR were not available from Guam or the Northern Marianas. An estimate of the "worst case" SPR was calculated for American Samoa's bottomfish complex using Dory Project data to estimate the virgin population CPUE and information on percent of immature fish from Hawaii. In Hawaii, SPR was calculated for five major species in the Hoomalu and Mau Zones, of the NWHI, and the MHI; some SPR values changed slightly from previous year's reports due to improvement in the calculations. SPR for armorhead was calculated annually since 1985, except for 1992 and 1994-1998.

1.2.5 Economic Indicators

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

2.0 AREA SUMMARIES

2.1 American Samoa

2.1.1 Descriptors

Bottomfish landings, which declined from 1988 to 1992, rose slightly in 1993 and dramatically in 1994. The decline was attributed to the following: the three hurricanes that struck the territory (in 1987, 1990 and 1991), the departure of several highliners from the fishery, the shift in importance from bottomfishing to trolling, and the substitution of imported fish from Western Samoa and Tonga. The significantly greater 1994 total landings, when compared to the previous years, occurred primarily due to improved catch recording, an increase in effort by

highline vessels, and a high fish demand for government and cultural events. The 1998 total landing dropped 51% from the 1997 landings. 1998 total landings were only 25% of the 17-year average and was the smallest catch since 1982. The declining trend in total landings since 1996 is mainly due to the reduction of bottomfish fishing effort by highlighers to more profitable longlining methods.

Fishing effort, measured by the number of trips, dropped 54% in 1998. Again, the decrease in effort was due to fishermen seeking other more stable and lucrative lines or work. This is reflected by the drop in total number of boats in 1998 from 26 to 17.

The average price per pound increased in 1998 by 40% to $3.01. Inflation adjusted values experienced fluctuations no greater than 12% from 1985-1997. 1998's increase is attributed to an increase in demand for fresh bottomfish.

2.1.2 Indicators

CPUE (pounds per hour), though relatively stable (at about 10 lb/hr) in the early 1990's, increased in 1996 to 17.5 lb/hr, mainly due to improved sampling. CPUE declined by about 12% for the second straight year in 1998 to 13.6 lb/hr. This level is not less than 50% of the average aggregate CPUE for the first three years of available data (9.7 lb/hr), indicating no cause for concern. The proxy "worst case" SPR was 0.45 in 1998, indicating that recruitment overfishing has not occurred. Size and maturity data were collected from key species, but insufficient sample sizes were available for a more realistic SPR estimate. Bottomfish revenue per trip (as opposed to total revenue) remained stable in 1998, halting a three-year declining trend.

2.1.3 Recommendations

According to DMWR Chief Biologist, DMWR will begin collecting appropriate data to calculate a more realistic SPR estimate for American Samoa’s bottomfish complex in 1999, as recommended by this team for the past two years.

2.2 Guam

2.2.1 Descriptors

The fairly large fluctuations over time in bottomfish landings in Guam appear to be due more to entry and exit patterns of fishermen, rather than changes in fish stocks. The number of highliners fishing in the area doubled from 1993 to 1994, increasing the total commercial BMUS harvest and revenue by nearly 300% during that year. In 1998, the total BMUS landings increased by 50%, primarily rebounding from 1997's poor weather and that few fishermen concentrated on deep-water bottomfish. The total commercial BMUS harvest increased 39% from 1997, due to several highliners making multiple trips to a remote bank.

The increase in total BMUS from in the past few years is due primarily to an increase in recreational and subsistence-type boats participating in the fishery. The 1995 total number of

boat hours and trips increased nearly 175% due to the recreational and subsistence-type boats and the calm seas throughout most of 1995, which allowed many of them to participate in bottomfishing more often than usual. The general increasing trend began in 1986. The slight declines in boat hours and trips in 1996 and 1997 may have been the result of the almost complete absence of highliners participating in the fishery. This year's 23% decline in total landings is likely due to the record low CPUE of 2.5 lb/trip.

The adjusted average price for bottomfish has not shown consistent marketing trends. This is believed to have resulted from the seasonal supply of pelagic fish and difficulties in developing a consistent market for locally caught fish. In addition, imported fish from other islands around the region have contributed to the continued marketing problem for local fishermen. The 1998 inflation-adjusted average bottomfish price of $3.30 is up slightly from 1997 ($3.01) but is still low. This may explain why local highliners were almost completely absent from the bottomfish fishery in recent years.

2.2.2 Indicators

In 1998, the CPUE dropped significantly from 1997 to 2.5 lb per hour. Based on an aggregate catch-per-unit-effort average of 6.9 lb/hr for the first three years of data collection on Guam, the 1998 figure has indicated a "yellow light" condition, which may require investigation or a management response. However, it is important to note that CPUE is affected considerably by the predominance of recreational and subsistence-type effort that targets the less productive shallow-water complex of bottomfish.

The adjusted average revenue per trip does not appear to show any long-term trend or cause for concern. The substantial increases in both actual and inflation adjusted revenue per trip occurring in 1994 are best explained by the success of the highliner vessels. The 1995 increase in revenue for all species landed verses the decrease in revenue for bottomfish only, indicated that on average, most commercial fishermen continue to make more money from their trolling efforts than from bottomfishing. The 1996-98 values are representative of the long-term mean.

2.2.3 Recommendations

Status of 1997 recommendations:

Action taken on recommendation 1, to continue working with the WPacFIN program coordinator to develop and implement a customized computer software program that will update, standardize and reprocess Guam's creel survey data, remains ongoing. Included in this effort is the assignment and training of staff to input and process the DAWR creel survey database from 1980 to the present.

With additional funding from WPacFIN and technical assistance from NMFS, considerable progress was made on recommendation 2, to complete a baseline biological and catch study of the red-gill emperor. The ongoing study consists of three sets of research cruises to compare virgin-stock shallow-water bottomfish catch and biological data collected at Bank A to that of a

more heavily fished bank closer to Guam (Galvez Bank and White Tuna Bank). The first set of trips were made in late September and early October, and the second set in mid-October and early November. The third and final set of research trips under the 1998-1999 WPacFIN contract is slated for early May. The results of the research project are expected to be completed by late September, 1999.

The recommendation to establish mean fish size, percent immature and SPR indicators for Guam's shallow-water bottomfish complexes is presently being addressed by the ongoing red-gill emperor project funded by the WpacFIN program. However, technical assistance is still needed to establish the above-mentioned fishery indicators for the deep-water complex.

1998 recommendations:

1) Given the yellow light condition that Guam has gone into based on the CPUE indicator of fishery stress, immediate efforts should be made to confirm and analyze the results of the offshore creel survey expansion in greater detail; especially since the indicator used is an aggregate CPUE and therefore may be more reflective of a localized depletion of shallow-water complex bottomfish in state waters requiring state, rather than federal, management action.

2) Efforts should continue to develop and fine-tune the database computer program that will provide DAWR with the capability of integrating the offshore survey expansion data with the inshore expansion data, and additionally produce statistics of confidence, a compilation of biological data, and a complete species composition analysis according to Plan Team requirements. Upon completion of the computer program, designated DAWR staff should be trained to use the new software to reprocess creel survey data from 1980 to present. Training should also be provided to teach staff how to interface with NMFS/WPacFIN software. Such training would facilitate additional support from NMFS/WPacFIN in the processing and analysis of fisheries data if necessary.

3) The need to complete a baseline biological survey of the red-gill emperor, *Lethrinus rubrioperculatus*, remains as the single most important data deficiency for the Marianas shallow-water bottomfish resource. With the remaining funds provided by the WPacFIN program and technical assistance from NMFS, DAWR should continue with proposed plans to complete the red-gill emperor research project as soon as possible.

4) With additional funding from the WPacFIN program and technical assistance from the NMFS, DAWR should establish mean fish size, percent immature and SPR indicators for Guam's deep- and shallow-water bottomfish complexes.

2.3 Hawaii

2.3.1 Descriptors

Main Hawaiian Islands: Only commercial data are available for both the MHI and NWHI fisheries, even though the MHI recreational/subsistence catch is estimated to be about equal that

of commercial landings. In 1988, there was a dramatic increase in MHI bottomfish landings due to a bonanza uku (gray snapper) harvest. A steady decline in total landings occurred until 1993, which was the lowest recorded annual value. Landings in 1994 went up 32% and have remained relatively stable since. 1998 landings are 10% lower than 1997 but are correlated with a 10% decrease in the total number of trips.

Total ex-vessel revenue from the MHI has shown a general decline from 1988-1998 with the inflation adjusted revenue of the MHI fishery being the lowest since 1974, and one-third of 1988's value.

NWHI Mau Zone: Mau Zone 1998 landings have decreased 37% from 1997 and is only 40% of 1995's total landings. The total number of boats decreased from 9 to 7, while the number of trips decreased by 26%. However, bottomfish landings per trip have been stable since 1994.

NWHI Hoomalu Zone: Hoomalu Zone 1998 landings increased 37% from 1996. Seven boats fished in 1998, one more than in 1997, while the number of trips decreased by 2%. Bottomfish landings per trip decreased by 16% based on NMFS CPUE.

Available revenue data are not separated by zone. Overall NWHI inflation adjusted revenue had been relatively stable since 1990 but was down 24% in 1998, the lowest revenue since 1983. This was in part caused by a decrease in the inflation adjusted average bottomfish price, down 19% from 1997, and the lowest average price since 1990.

2.3.2 Indicators

Hawaii Archipelago-wide:

Archipelago-wide SPR estimates are the best method available to assess the Hawaii bottomfish resources and should be the only values used to evaluate overfishing. Evidence from larval drift simulation and preliminary genetic work point to single archipelago-wide stocks with substantial larval transfer between zones (generally from the more healthy northwestern zones toward the more depleted MHI zone).

SPR values for the five major BMUS species in 1998 are all above the 20% critical threshold level, that defines recruitment overfishing under the FMP, when viewed on an archipelago-wide basis. Of these species, onaga is usually the lowest with the 1998 value at only 24%. Implementation of the state’s management plan should help improve the condition of onaga in the MHI and increase the archipelago-wide SPR.

SPR values are also presented on a management zone basis (MHI, Mau Zone, Hoomalu Zone) for the purpose of determining locally depleted resources.

MHI: CPUE in 1998 rebounded from its lowest level on record to 194 lb/trip, an 18% increase from 1997. Recent CPUE values are approximately one-fourth the early (baseline 1948-50) values, signifying local depletion in the MHI. The decline is most apparent in ehu, with a

recent CPUE of only about 10% that of the initial years of the fishery. The increase in the late 1980's MHI CPUE was primarily due to a large increase in uku catches, and may not indicate an increase in abundance in other species. Most of the more commercially important species in the MHI have had relatively stable mean weights since 1984. Hapuupuu's mean weight dropped sharply in 1993 and has continued to be low. While sample size is low, size of hapuupuu may have declined in the MHI.

For the sixth year 95% confidence intervals were constructed based on "best" and "worst" case bounds of SPR components (CPUE and percent immature). For the fourth year SPR values were calculated using both aggregate CPUE, as in previous years, and targeted CPUE, which gives a more accurate picture for individual species. 1998 aggregate CPUE SPR values for all five major species are marked improvements over critically low levels: onaga (0.08), opakapaka (0.18), uku (0.26), hapuupuu (0.24), and ehu (0.27). The use of targeted CPUE showed a different picture for the four species where targeted trips are available. Here, onaga and ehu SPRs are much worse than indicated using aggregate CPUE (SPR = 0.05 and 0.10, respectively), whereas SPR values for opakapaka and uku are much higher than previously indicated (SPR = 0.31 and 0.33, respectively). Onaga's SPR has now been below 0.20 for 7 of the past 8 years and ehu for all of the last 8 years (using targeted CPUE). Hapuupuu remains on the border of 20% for the fourth straight year.

NWHI Mau Zone: The NMFS CPUE data are only available for the NWHI fishery as a whole since 1984 and by zone since 1988. The NWHI (combined Mau and Hoomalu Zones) NMFS CPUE steadily decreased from 1987 to 1992, rose in 1993, and then declined from 1994-96. CPUE rose in 1997 to the 1993-94 level, but dropped slightly in 1998 to 484 lb/day . The Mau Zone NMFS CPUE had been steadily decreasing since 1989, but increased in 1993 and 1994. In 1997, NMFS CPUE rose 49%. In 1998, the CPUE dropped again to just below the 10-year average at 364 lb/day. The Mau Zone HDAR CPUE decreased 24% in 1998 to 2518 lb/trip, only 50% its 50-year average. Non-parametric 95% confidence intervals were calculated for HDAR CPUEs by the "bootstrapping" method. Mean weights of fish in the Mau Zone continue to exhibit year to year fluctuations, but are generally at much higher values than MHI mean weights. The percent of immature fish in the 1998 Mau Zone catch was still safely under 50% for all species evaluated, except onaga, which rose above 50% for the first time island-wide.

SPR values in the Mau Zone have been decreasing since 1990 (mirroring the pattern in the HDAR CPUE), experienced a surprising rise in 1994, returned to lower levels in 1995, followed by increase from 1996-98. All values are presently above 0.58, well above the critical level of 0.20. SPR values are higher in the NWHI than the MHI because most of the catch is mature fish. SPR values in both NWHI zones have never fallen below 0.35.

NWHI Hoomalu Zone: The Hoomalu Zone NMFS CPUE has been on a downward trend from since data collection began in 1988. 1998 CPUE is at the 11-year low at 527 lb/day. The Hoomalu Zone HDAR CPUE followed an increasing trend, but dropped sharply in 1994 for unclear reasons, rose by 20% in 1995 and has since remained stable. The 1998 5,198 lb/trip was 62% of the average of the first three years (8,440 lb/trip, 1948-50). Mean weights of fish in the Hoomalu Zone continued to exhibit year to year fluctuations, but are still at much higher values

than MHI mean weights. The percent of immature fish in the 1998 catch was still safely under 50% for all species evaluated, except for onaga, experiencing a yellow light for the second straight year.

The SPR values in the Hoomalu Zone remained stable or increased in 1998, with all species showing values of 0.73 or higher. The low 1997 SPR for onaga was likely an anomaly, rebounding from an SPR value of 0.35 to 0.94.

Seamount Groundfish (Armorhead): No fishing has been allowed on the armorhead stocks of the SE Hancock Seamount since the moratorium began in August, 1986. The 1993 CPUE, calculated from research longline catches, was more than double that of the last assessment (in 1991) and nearly as high as the highest CPUE recorded since surveying began in 1985. No research cruise occurred since 1993, and future research assessment cruises are unlikely.

No SPR values were available in 1998 as no research was undertaken. In 1993, SPR within the EEZ (SE Hancock Seamount) was above 0.02, the highest since 1986, but still far below (10% of) the threshold level for recruitment overfishing of 0.20. About 99% of the known armorhead seamount habitat occurs outside the U.S. EEZ, an area which had 0.06 SPR in 1993. During February and March 1997, an oceanic and larval armorhead survey over the seamounts outside the U.S. EEZ was conducted onboard the R/V Kaiyo Maru by the National Research Institute of Far Seas Fisheries Laboratory in Shimizu, Japan. Armorhead larvae were collected from surface waters around all seamounts except for Koko Seamount.

2.3.3 Recommendations

1) The BPT recommends that the Council amend the FMP to become fully consistent with the State of Hawaii Administrative Rule 13-94 on MHI bottomfish. This would include closure of areas within the federal jurisdiction as specified in the administrative rule.

2) The BPT recommends that the Council encourage and assist the State of Hawaii DLNR in the implementation of a postcard survey of non-commercial bottomfish fishermen as determined from the State's BF vessel identification permit list. This survey would be used to estimate recreational catch of bottomfish in the MHI.

2.4 Northern Mariana Islands

2.4.1 Descriptors

Data are available only on the commercial fishery. The declining trend in landings and revenues, which occurred from 1988-91, was reversed by a growth trend which began in 1992. In 1998, bottomfish landings remained high at 45,835 lb, and exceeded the 1994 landings by 125%, due primarily to the growth of the local bottomfishing industry, particularly from new ventures operating full time. The 1994 increase was in vessels of all sizes, including large (50 ft plus) vessels. In 1998, the number of vessels fishing dropped from 68 to 50. The number of

trips decreased 15% in 1998, which included regularly scheduled long trips to the Northern Islands, where bottomfish are more abundant.

The average adjusted price per pound received for bottomfish has been stable the past 4 years, at $3.41 in 1998. The total 1998 ex-vessel revenue remained high at $156,256. The 3-year sustained high levels of landings and revenue are attributed to expanded bottomfish operations.

2.4.2 Indicators

The average bottomfish catch per trip continued its 7-year increasing trend to 145 lb/trip in 1998. Landings per trip have increased more than threefold since 1991. The average catch per trip is subject to significant biases (e.g., changes in trip length and relative amounts of bottomfishing compared to trolling). It may be possible to improve this measure of CPUE by using only those trips which landed bottomfish species exclusively. While such a calculation may be sensitive to other biases due to small sample size, it should be investigated in the future. This indicator does not suggest the need for any management action.

Revenue obtained from bottomfish sales has remained in step with the increases in landings since 1991. 1998 revenue per trip has also seen a threefold increase since 1991. The average revenue per bottomfish trip in 1998 increased 9% for bottomfish species and 19% for all species, continuing an 8-year trend. All species inflation adjusted revenue, which had been declining from 1988 to 1992, has since made a strong 4-year rise. Per trip revenues have doubled in the past 4 years, reaching a 10-year high. Bottomfishermen often troll to and from the bottomfishing site, thus acquiring a mixed catch after spending the day “bottomfishing”.

2.4.3 Recommendations

1) To request NMFS and the Council to assist DFW in adequately assessing the status of bottomfish stocks in the southern islands of CNMI.

2) Establish baseline (virgin stock) parameters (CPUE, percent immature) for the Guam/Northern Marianas deep-water bottomfish complex (e.g., survey on grouper, snapper) utilizing data collected during Resource Assessment Investigation of the Marianas Archipelago (RAIOMA) cruises (1981-1984), the current fishing in the Northern Islands and sampling aboard DFW research vessel to help calculate SPR, with assistance from NMFS. (Same as last year)

3) Establish baseline (virgin stock) parameters (CPUE, percent immature) for the Guam/Northern Marianas shallow-water bottomfish complex (e.g. red-gilled emperor) by sampling program aboard DFW research vessel to help calculate SPR, with assistance from NMFS. (Same as last year)

4) With assistance from NMFS/WPacFIN, software should be developed and implemented to separate fishery statistics for the main islands fishery and from the Northen Islands fishery with separate descriptions and statistics reported in the annual report module. (Same as last year)

2.5 Region-Wide Recommendations

1) Concur with the need to continue the recent progress, made through NMFS assistance, to establish baseline parameters for virgin shallow- and deep-water stocks in the NMI.

2) For NMFS to develop methodology for the collection and analysis of appropriate data (for biological stock parameters) and assist the island areas, while acknowledging the recent progress made in Guam.

3) Expand the BMUS list to include generic level designations to include all species (to the lowest taxa reported) of the following major families of shallow-water bottomfish: Lethrinids, Lutjanids, Carangids and Serranids.

4) Concur with the island-area specific recommendations in the annual report (as detailed in the above summary).