Appendix 3 Hawaii Contents page

- 1. Introduction 3.2
- 2. Summary 3-2
- 3. Recommendations 3-3
- 4. List of Tables 3-4
- 5. List of Figures 3-4
- 6. Historical Annual Statistics for Main Hawaiian Islands and Mau Zone 3-5
- 7. Historical Annual Statistics for Hoomalu Zone 3-6

Introduction

The commercial bottomfish stocks in the Hawaiian Islands are divided into two fisheries: seamount groundfish and deep-slope bottomfish. The seamount fishery targets alfonsin, Beryx spp., and armorhead, Pseudopentaceros wheeleri. The only area in the US EEZ for this fishery is Southeast Hancock Seamount located 1,400 nm northwest of Honolulu. This trawl fishery was started by the Russians and Japanese in the late 1960s and large catches were made for about 10 years until they caused a crash in the fishery. This fishery has never been domestically harvested. A moratorium on fishing within the US EEZ began in 1986 and continues through the present as no substantial recovery in the fishery has been observed.

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids, and a single species of grouper concentrated at depths of 30-150 fathoms. These fish have been fished on a subsistence basis since ancient times and commercially for at least 90 years. The deep-slope fishing grounds within the US EEZ are divided into three management zones. The inhabited main Hawaiian Islands (MHI) support numerous subsistence, recreational, and commercial fishermen with considerable overlap by category. The uninhabited Northwestern Hawaiian Islands (NWHI) are divided into the Mau Zone, closer to the MHI, and the Hoomalu Zone. Fishing in these zones is conducted solely by commercial fishermen and requires federal licensing for such activities. The Hoomalu Zone is a limited entry zone with 6 vessels participating in 1995; 10 vessels fished the Mau Zone in the same year. Vessel size varies considerably with larger fully commercial vessels (30 ft in length and over) conducting trips of about 10 days, and smaller vessels (<30 ft) generally restricted to the MHI and trips of 1-3 days. Most vessels in this fishery are fully outfitted with electronic navigation and fish-finding equipment, as well as with electric or hydraulic line-hauling equipment. The catch is sold fresh in the round for local consumption. Catch and revenue data for bottomfish have been collected by the State of Hawaii Division of Aquatic Resources (HDAR) since 1948 in the form of a report submitted by commercial fishermen. No data is collected for recreational or subsistence fishermen, but their catch is estimated to be about equal to the commercial catch in the MHI. Data obtained from a market monitoring program and data from fishermen interviews are combined with the HDAR data set for the analysis presented in this report.

Summary

The MHI bottomfish fishery has remained relatively stable over the last few years. Landings decreased slightly in 1996 as compared to 1995 as did effort resulting in the lowest CPUE on record for the MHI. Stocks of many of the BMUS species in this zone are stressed. Each of the BMUS species evaluated have a yellow light condition due to a drop in CPUE below 50% of original values. In addition, Onaga and ehu stocks are recruitment overfished by definition since the SPR values are at or below 20% for these species (5% and 8% for onaga and ehu, respectively, using the targeted CPUE). These SPR levels are red light conditions demanding immediate action.

Bottomfish stocks in the NWHI appear to remain relatively healthy. CPUE is 49% of the original level in the Mau Zone (a yellow light condition) and 66% in the Hoomalu zone. Analysis of SPR and percent immature in the catch show no problems to date for either zone.

Armorhead stocks outside of the US EEZ experienced a short pulse in recruitment in 1992 which did not carry over into 1993. SPR values at Southeast Hancock Seamount are the highest since 1986, but at 2.5% in 1993 they still indicate a collapsed fishery. Data for Hancock Seamount has not been available since 1994, but is available for areas outside of the US EEZ for years through 1995 (1996 values are not yet available).

Recommendations

1. The BPT reiterates its concerned regarding the continuing overfished condition of the MHI onaga and ehu stocks as it adds hapuupuu to the list. The Team recommends continued support for the ongoing efforts of the DLNR bottomfish task force toward establishing effective management regulations for the MHI fishery.

2. Again, the BPT strongly encourages the State to proceed expeditiously with computerization of the fish and seafood dealer reporting system and integrate this with the fishermen's commercial catch reporting system.

3. The BPT encourages NMFS and the State to increase the level of bottomfish catch monitoring of the Honolulu auction and expand this sampling to major dealers on all other main Hawaiian Islands.

Tables

page

1. Historical Annual Statistics Main Hawaiian Islands 3-5

- 2. Historical Annual Statistics Mau Zone 3-5
- 3. Historical Annual Statistics Hoomalu Zone 3-6
- 4. Hawaii Bottomfish Market Ex-vessel Prices by Species 3-34
- 5. NWHI Ho'omalu zone bottomfish vessel income statement 3-35
- 6. NWHI Ho'omalu zone bottomfish vessel economics 3-37
- 7. NWHI Mau zone bottomfish vessel income statement 3-38
- 8. NWHI Mau zone bottomfish vessel economics 3-39
- 9. "Optimal" number of NWHI bottomfish vessels 3-40

Figures

- 1. Hawaii's bottomfish landings from the NWHI and MHI 3-7
- 2. NWHI BMUS species composition per trip by weight 3-10
- 3. NWHI BMUS species compostion by weight 3-13
- 4. Number of trips made by NWHI bottomfish fleet 3-15
- 5. Number of vessels in the NWHI bottomfish fleet 3-17
- 6. MHI species composition of landings by weight 3-19
- 7. Standard MHI bottomfishing trips and vessels 3-21
- 8. Current year and historical catch compostion 3-23

9. Hawaii domestic bottomfish landings and revenue 3-24

10. Hawaii bottomfish market

(annual *inflation-adjusted ex-vessel prices and domestic landings) 3-26

11. Hawaii bottomfish landings and revenue by source 3-27

12. Hawaii bottomfish ex-vessel prices by source 3-29

13. Hawaii bottomfish ex-vessel prices by zone 3-31

14. NWHI bottomfish inflation-adjusted revenue per trip by zone 3-34

15a. CPUE for Hawaiian bottomfish 3-42

15b. Partial CPUE for MHI bottomfish 3-45

15c. Partial targeted CPUE for MHI bottomfish 3-48

16. Percent immature in Hawaiian bottomfish catch 3-51

17. Mean weight of Hawaiian bottomfish 3-53

18a. Spawning potential ratio (SPR) for MHI bottomfish using aggregate CPUE 3-55

18b. Spawning potential ratio (SPR) for MHI bottomfish using targeted CPUE 3-57

19. Spawning potential ratio (SPR) for NWHI bottomfish 3-59

20. Research CPUE on SE Hancock Seamount 3-61

21. Armorhead SPR 3-64

22. Armorhead CPUE 3-64

Table 1. Historical Annual Statistics: Main Hawaiian Islands

Year	Total Landings (lbs)	CPUE (Ibs/trip)	Inflation Adjusted Revenue	Price per Pound	Number of Vessels	SPR Average
1986	810,111	274	\$3,175,000	NA	985	33
1987	785,000	237	\$3,454,000	\$4.40	797	25
1988	1,166,000	329	\$4,571,000	\$3.91	785	37
1989	1,007,000	361	\$4,141,000	\$4.11	739	40
1990	651,000	245	\$2,811,000	\$4.31	992	27
1991	562,000	202	\$1,981,000	\$3.52	601	24
1992	588,000	228	\$2,034,000	\$3.46	742	25
1993	462,000	213	\$1,644,000	\$3.55	532	24
1994	536,000	218	\$1,873,000	\$3.44	747	24
1995	568,000	193	\$1,848,000	\$3.26	784	22
1996	421,000	176	\$1,540,000	\$3.66	1079	21
Average	686,919	243	\$2,642,909	\$3.76	798	27
Standard Deviation	232,737	57	\$1,057,299	\$0.40	165	6

Table 2. Historical Annual Statistics: Mau Zone

	Total	CPUE	Inflation	Price	Numbor	CDD
Year	Landings	(lbs/tr	Adjusted	per		JFR Avorago
	(lbs)	ip)	Revenue	Pound	01 4622612	Average
1986	NA	2,206	NA	NA	NA	41
1987	NA	2,889	NA	NA	NA	50
1988	NA	2,136	NA	NA	4	37
1989	118,000	5,412	\$418,000	\$3.53	5	91
1990	249,000	4,454	\$791,000	\$3.17	14	77
1991	103,000	2,413	\$348,000	\$3.37	14	42
1992	71,000	2,092	\$232,000	\$3.26	8	38
1993	98,000	1,992	\$287,000	\$2.92	8	36
1994	160,000	3,748	\$501,000	\$3.12	12	68
1995	166,000	2,460	\$474,000	\$2.86	10	45
1996	135,000	2,876	\$417,000	\$3.09	12	54
Average	·	·				
Standard		0.074	¢400 500	#0.47	40	50
Deviation	137,500	2,971	\$433,500	\$3.17	10	53
s.d.						
	55,175	1,112	\$170,667	\$0.22	4	18
	— • • [′] • • • •	· · · ·				

 Table 3. Historical Annual Statistics: Hoomalu Zone

	Year	Total Landings (Ibs)	CPUE (Ibs/trip)	Inflation Adjusted Revenue	Price per Pound	Number of Vessels	SPR Average				
	1986	ÌΝΑ΄	5,301	NA	NA	NA	75				
	1987	NA	8,187	NA	NA	NA	113				
	1988	NA	4,702	NA	NA	12	66				
	1989	184,000	5,328	\$594,000	\$3.22	5	70				
	1990	173,000	4,793	\$545,000	\$3.14	5	64				
	1991	283,000	5,928	\$854,000	\$3.02	4	82				
	1992	353,000	7,388	\$1,138,00 0	\$3.22	5	98				
	1993	287,000	8,040	\$920,000	\$3.20	4	109				
	1994	283,000	4,651	\$929,000	\$3.28	5	64				
	1995	202,000	5,544	\$606,000	\$3.00	5	73				
2	1996	176,000	5,588	\$576,000	\$3.27	3	75				
	Average Standard Deviation	242,625	5,950	\$770,250	\$3.17	5	81				
		67,386	1,309	\$219,217	\$0.11	3	18				
	Figure 1. Hawaii's bottomfish landings from the NWHI and MHI										

Interpretation: Data for 1995 has been updated and now shows a decline in NWHI landings from those of 1994. The 1996 data shows a continuing decrease of landings. Mau zone landings have decreased more substantially than those from the Hoomalu zone..

Mau zone landings had continued to rise steadily since Hurricane Iniki in 1992 until 1996. On a per trip basis the landings also show a slight decline in 1996. Up until 1996 the landings had rebounded yearly as the Kauai fleet re-entered the fishery and a new full-time vessel from Maui entered the fleet in 1994. Landings of pelagic species have increased over 1995 to nearly 90,000 lobs in 1996. Pelagic species landings are an important part of the landings for the Mau zone, especially for the vessels that make short combination pelagic and bottomfish trips in which the targeted species are pelagic. Hoomalu zone landings have continued to decline since 1992 due to a decline in fishing effort in terms of number of trips and vessels throughout the subsequent years. The landings of BMUS per trip had declined between 1992-1994 but has been relatively stable for the last 2 years. Landings were down for the major target species--onaga and opakapaka. Ehu, butaguchi, and uku landings made up for the shortfall on the target species.

Source: Data are primarily from HDAR and supplemented with data from NMFS market monitoring program. Data are only those from BMUS and other bottomfish species. Pelagic species were not included.. Data for 1996 are preliminary.

Calculation & Adjustment: The HDAR integrated data set was supplemented with very limited number of additional NWHI trips from the NMFS market monitoring data set. The HDAR integrated data set captures the Kauai-based (Mau zone) segment of the NWHI fishing fleet which was previously difficult to monitor. Use of the data sets in combination provides good coverage of the activities of the NWHI bottomfish fleet. It also provides opportunities for the cross-checking of trip and landing information.

Year	Mau	Hoomalu	Total NWHI	MHI ³ Preliminary data	Total Hawaii
1984	NA	NA	661	807	1,481
1985	NA	NA	922	763	1,717
1986	NA	NA	869	810	1,682
1987	NA	NA	1,015	785	1,818
1988	NA	NA	626	1,166	1,794
1989	118	184	303	1,007	1,314
1990	249	173	421	651	1,094
1991	103	283	387	562	983
1992	71	353	424	588	1,043
1993	98	287	385	462	862
1994	160	283	443	536	1,011
1995	166	202	369	568	969



Interpretation: Mau zone per trip landings of BMUS species had been steadily rising from 1992 through 1995 but has declined back to 1994 levels in 1996. The increase in the onaga landings seen last year have since declined in 1996. This decrease is probably not due to any stock related problems but rather due to a physiological condition of the larger onaga that were being caught. This condition appears to be similar to "tuna burn". Many of the large (>20 pounds) onaga have been affected by this condition. The flesh of a large percentage of the large onaga appear whitish as though they have been "cooked". The low value associated with this quality of flesh has caused fishermen to target opakapaka instead. Opakapaka landings have shown an increase in 1996. There has been no occurance of "burn" in this or any other bottomfish species at this time. The cause of the "burn" is not known.

Hoomalu zone per trip landings have been slowly declining since the 1992 uku run but have not hit pre-1992 levels. The 1996 BMUS catch per trip has declined for opakapaka and onaga while ehu, butaguchi and uku sustained large increases. There were only 3 vessels that fished in the Hoomalu zone in 1996. All of them did so on a full-time basis with catch per trip remaining nearly identical.

Source: The 1996 data are mainly from HDAR and supplemented from the NMFS market monitoring program.

Calculation & Adjustment: The HDAR integrated data set was supplemented with additional NWHI trips from the NMFS data set. The BMUS data were totaled by zone and divided by the number of trips to each zone. The 1995 data have been updated.

		<u> </u>		P - · · · P				
Species	1989	1990	1991 ¹	1992 ¹	1993 ¹	1994 ¹	1995 ¹	1996 ¹
Opakapaka	1,820	541	163	488	382	229	149	187
Onaga	120	49	83	124	66	114	270	132
Ehu	65	309	176	48	69	81	65	123
Нариирии	1,050	590	189	121	210	150	153	235
Butaguchi	938	923	228	336	415	346	264	276
Uku	202	830	266	100	112	529	635	558
Other BMUS	268	193	94	56	67	124	99	32
Total per trip	4,463	3,435	1,199	1,273	1,321	1,573	1,635	1,543

NWHI BMUS average pounds per trip by species, Mau Zone

¹ Data from combination of NMFS and HDAR data sets.

	NWHI BMOS average pounds per trip by species, hoomaiu zone									
Species	1989	1990	1991 ¹	1992 ¹	1993 ¹	1994 ¹	1995 ¹	1996 ¹		
Opakapaka	1,910	1,284	1,530	3,208	3,849	2,984	2,741	2,426		
Onaga	293	550	837	450	1,042	771	825	752		
Ehu	231	94	113	148	185	172	47	272		
Нариирии	1,138	1,357	913	1,386	1,305	1,318	1,206	1,166		
Butaguchi	969	1,185	1,196	1,660	1,004	655	665	909		
Uku	20	600	985	2,187	736	623	397	632		
Other BMUS	920	333	297	425	291	380	249	21		
Total per trip	5,481	5,403	5,871	9,464	8,412	6,903	6,130	6,216		



Interpretation: The overall trends of the NWHI bottomfish landings are on a decline. The general trend of decreasing landings in 1996 may be a reflection of the decreasing number of trips as the landings per trip has remained nearly the same as in 1995. Opakapaka landings show the largest decline while ehu and white ulua were the only species to show an increase in 1996.

Source: Data for 1996 is mainly from the HDAR integrated data set and supplemented with data from the NMFS market monitoring program. Data for 1991-1995 are from a combination of HDAR and NMFS market monitoring program. Data from 1987-1990 are expanded NMFS estimates.

Species	1986	1987	1988	1989	1990	1991 ¹	1992 ¹	1993 ¹	1994 ¹	1995 ¹	1996 ¹
Opakapaka	270	370	154	112	79	86	145	158	145	105	79
Onaga	96	77	80	13	21	46	23	40	42	53	30
Ehu	28	40	45	9	25	20	8	11	15	8	17
Нариирии	191	223	156	66	85	59	57	59	68	54	49
Butaguchi	146	217	111	57	103	75	79	64	61	47	46
Uku	7	2	6	5	77	69	86	33	78	75	61
White ulua	29	56	63	38	9	12	12	5	10	5	12
Other BMUS	23	16	6	1	14	10	6	14	17	12	12

Calculation & Adjustment: HDAR data was supplemented with additional NWHI trips from the NMFS market data set. The 1995 data has been updated.

¹ Data from a combination of NMFS and HDAR data.

Figure 4. Number of trips made by NWHI bottomfish fleet, Mau and Hoomalu Zones

Interpretation: The overall trend in the number of trips to the NWHI areas is one of decrease since 1994. The number of vessels fishing in the access restricted Hoomalu zone had remained relatively constant at 4-6 vessels per year since 1989 when the limited entry plan went into effect but has dwindled to 3 in 1996. The decrease in the number of trips to the Hoomalu zone in 1995 is due to the fact that only 3 of the vessels fished in 1996. These 3 vessels did fish on a full time basis. The average number of trips per vessel has risen back to 8 after having dropped to 5 in 1995. The drop to 5 after having averaged 8 per year in 1993-94 was due to the effect of the part-time vessels in the fishery.

The number of trips to the Mau zone also dropped in 1996 but remains above those of the 1989-1993 seasons. The number of trips have rebounded after the low point in 1992 after Hurricane Iniki. Additional trip data from HDAR beginning in 1991 has enhanced the accuracy of the data.

The implementation of the daily trip report for the NWHI bottomfish fishery by the State has resulted in the most complete data set with much improved accuracy. Trips by the Mau zone fleet home-ported on Kauai can now be accurately assessed. Many of these were previously missed using only the NMFS market monitoring system.

Source: Data for 1996 was primarily from HDAR supplemented with NMFS data on an as needed basis. Data for 1991-1995 are from a combination of HDAR and NMFS market monitoring program and the HDAR fast-track data system. Data from 1986-1990 are NMFS estimates.

2

Calculation & Adjustment: HDAR trip data was supplemented with additional NWHI trips from the NMFS market monitoring program. The data for 1995 have been updated. The trips were totaled by area fished.

	Trips								
Year	Mau	Hoomalu	Total						
1984	NA	NA	135						
1985	NA	NA	160						
1986	NA	NA	163						
1987	NA	NA	134						
1988	21	72	93						
1989	22	28	50						
1990	55	25	80						
1991 ¹	84	47	131						
1992 ¹	55	37	92						
1993 ¹	72	34	106						
1994 ¹	1994 ¹ 99		140						
1995	97	33	130						
1996	81	81 26							

¹ Based on combined NMFS and HDAR data.